INTERNATIONAL

Tropical Marine Ecosystems Management Symposium

Proceedings

TOWNSVILLE, AUSTRALIA NOVEMBER 1998

International Tropical Marine Ecosystems Management Symposium (ITMEMS)

November 1998

ICRI
INTERNATIONAL CORAL REEF INITIATIVE

PROCEEDINGS

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Published December 1999 by the Great Barrier Reef Marine Park Authority

National Library of Australia Cataloguing-in-Publication data:

International Tropical Marine Ecosystems Management Symposium (ITMEMS), (1998 : Townsville, Qld.).

Proceedings : International Tropical Marine Ecosystems Management Symposium (ITEMS), November 1998.

ISBN 0 642 23080 3

1. Coral reefs and islands - Congresses. 2. Marine parks and reserves - Management. 3. Marine parks and reserves - Congresses. 4. Coral reefs and islands - Management. 5. Ecosystem management - Congresses. I. Kenchington, R. A. II. Dight, I. J. (Ian J.), 1948- . III. Baldwin, John, 1957- . IV. Great Barrier Reef Marine Park Authority (Australia). V. Title.

333.91716

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The International Tropical Marine Ecosystems Management Symposium was presented with the generous support of:

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Marine Parks Center of Japan
National Oceanic and Atmospheric Administration, U.S.A.
Swedish International Development Agency
Townsville City Council, Australia
United Nations Environment Programme
United States Agency for International Development
University of Rhode Island, U.S.A.
World Conservation Union (IUCN)

The production of these Proceedings has been made possible with the generous support of:

Great Barrier Reef Marine Park Authority, Australia
Marine Parks Center of Japan
National Oceanic and Atmospheric Administration, U.S.A.
Swedish International Development Agency

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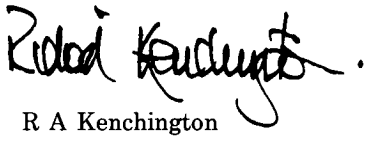
ITMEMS 1998 Proceedings

PREFACE

These Proceedings of the International Tropical Marine Ecosystems Management Symposium are somewhat unusual in form reflecting the nature of this Symposium as a gathering of managers, scientists and stakeholders who met together to consider the management of Coral Reefs and related Ecosystems. The first part is a formal report of an International Gathering. The second part presents the reports and background papers that were provided by the participants and which formed the basis of discussion for various sessions in the Symposium. The third part contains the outputs of the cross-cutting working groups. These reflect the nature of the issues that the workshops were addressing and the variety of approaches brought by the range of participants with different perspectives and fields of expertise. We have not edited these reports for consistency of style and removal of overlap. We consider that the different perspectives and the ways in which they identify and express priorities are likely to be helpful to people seeking to design and implement support and oversight products and programs to improve the management of Coral Reef Ecosystems.

The report is thus a substantial document and, while it does not perhaps fit conventional expectations of the format of a report of a scholarly symposium, we consider that it reflects the present status of coral reef management globally and contains a very wide range of diverse information which is important in the consideration of the complex and interlinked issues of management of Tropical Marine Ecosystems. It is a reflection of the enthusiasm, commitment and effort of every one of the more than 300 delegates that attended the Symposium.

We have also included considerable information on the program and the operation of the workshop so that others who may consider organising a similar symposium can draw on our experience, learn from our mistakes and, we hope, profit from the lessons that we have learned in conducting this inaugural International Tropical Marine Ecosystems Management Symposium.



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26 October 1999

Background

1. Coral reefs around the world are in serious decline. Coral reefs and associated seagrass and mangrove ecosystems are amongst the most biologically productive and diverse on Earth. In addition to the economic benefits of coral reefs, these ecosystems sustain the social fabric and cultural values of many coastal communities around the world. The threats to coral reefs and associated ecosystems place in jeopardy the sustainable development of many communities, global biodiversity and the health of the oceans. Global concern for the coastal and marine environment is reflected in Agenda 21 of the United Nations Conference on Environment and Development (UNCED) and in more recent initiatives including the Jakarta Mandate of the Convention on Biological Diversity (CBD) and the Global Program of Action for the Protection of the Marine Environment from Land-Based Activities.

2. The International Coral Reef Initiative (ICRI) was established in order to stop and reverse the global degradation to coral reefs and associated ecosystems. The ICRI partnership and approach thus far has been to mobilize governments and a wide range of other stakeholders in an effort to improve management practices, increase capacity and political support, and share information on the health of these ecosystems. The International Tropical Marine Ecosystems Management Symposium (ITMEMS) was a further step in this same direction. It aimed to build upon previous ICRI workshops and leave behind increased commitment and clear direction for the future of ICRI and global tropical marine ecosystem management.

3. The Dumaguete City workshop (Philippines, 29 May - 2 June 1995) set in place a strategy for subsequent action under ICRI, including endorsement of the *Call to Action* and development of a *Framework for Action.* The need for periodic review (performance evaluation) of the extent and success of ICRI implementation was identified in both these documents as an essential element of the ICRI strategy. Regional ICRI workshops were held in the Caribbean/Tropical Americas, South and East Asia, South Pacific, Eastern Africa/Western Indian Ocean and Middle East over the two years following the Dumaguete City workshop. The priority threats to coral reefs and associated ecosystems and needs for their conservation and sustainable use were identified on a regional basis through this process. National ICRI workshops and a World Bank conference on coral reefs have since reaffirmed the priority issues threatening the ecological integrity of coral reefs and associated ecosystems. The degree to which action has been taken regionally to implement these priority needs, including the capacity building component, and the success or failure of efforts to reduce the threats to coral reefs globally was unclear.

Introduction to ITMEMS

4. ITMEMS provided a forum for the review and evaluation of ICRI implementation. The review was conducted within a framework of the four ICRI cornerstones: Integrated Management, Capacity Building, Monitoring and Review. The symposium also provided an opportunity to identify shortcomings in the global ICRI strategy and for delegates to give guidance to the Secretariat and ICRI partners on the future direction of the initiative. ITMEMS complements the scientific forum provided by the International Coral Reef Symposia (ICRS) by bringing together coral reef management practitioners and policy makers from around the world to discuss their concerns.

5. The symposium structure was designed to meet the particular needs of management. It was based around the priority issues and needs for conservation and sustainable use of coral reefs and associated ecosystems as identified through the ICRI process. These provided the focus for a series of interactive, action-oriented workshops that were designed to share practical experiences and draw lessons through case study examples from around the world. ITMEMS was designed to make a major contribution to ocean management in 1998 and be one of the premier events during the United Nations International Year of the Ocean.

6. The ***Goal*** of ITMEMS was:

   'To bring together managers of coral reefs and related ecosystems from around the world to review progress in management of these systems, to set an agenda for their future conservation and sustainable use and to build the capacity of practitioners and policy makers to manage these ecosystems.'

7. The ***Objectives*** of ITMEMS were:
   - To review actions taken to date on a global and regional basis to implement the objectives of ICRI as outlined in the *Call to Action* and *Framework for Action*;
   - To identify gaps in the global approach of ICRI to stop the degradation of coral reefs and related ecosystems;
   - To provide direction for the future implementation of ICRI; and
   - To share experiences and lessons amongst coral reef managers and policy makers of recent developments in the conservation and sustainable use of coral reefs and related ecosystems.

8. The structure of ITMEMS was designed to meet the needs of management. The preparation and presentation of Regional Reports ecosystems was an important element of the program. Their purpose was to critically evaluate and summarize progress in the implementation of management actions for the conservation and sustainable development of coral reefs and associated ecosystems. The Regional Reports provided a framework for deliberations that took place within the Working Groups on the priority issues and the future of ICRI.

9. The *Priority Issues* Working Groups then provided the focus for a series of interactive, action-oriented workshops that were designed to share practical experiences and draw lessons through case study examples from around the world. The *Fostering a Sustainable ICRI* Working Groups then synthesised these lessons, identified gaps in the global approach to ICRI and set an agenda for the future conservation and sustainable use of coral reefs and associated ecosystems.

Sessions 1 and 2 – Opening Sessions

Session 1 – Official Opening

10. The Meeting was opened by Dr Ian McPhail, Chairman, Great Barrier Reef Marine Park Authority on behalf of the Government of Australia. In his opening address, Dr McPhail welcomed ITMEMS participants to Australia. He then went on to provide an overview of the major management issues facing coral reefs and associated ecosystems including: urban growth, land clearance and conversion that have drastically altered the flow of sediments, nutrients and pollutants into near-shore waters; heavy and unrelenting fishing pressure; international shipping; and compliance, surveillance and enforcement. Dr McPhail noted that in the hugely dynamic marine system, impacts are often obscured and slow to manifest. Fortunately, an awareness of the connections between human actions and the productivity of the natural systems is now evident. There is greater acceptance that economic benefit does involve environmental obligations.

11. Dr McPhail took the opportunity to share a national perspective and spoke of the Australian Government's initiative to develop this country's, and one of the world's, first national Oceans Policy. He noted a substantial similarity between the four principal outcomes of Australia's Oceans Policy and ICRI's four core elements: integrated coastal management; building capacity to manage; information for management through research and monitoring; and review or evaluation of management performance. Dr McPhail stressed the point that effective management involves understanding and responding to change. He went on to illustrate this point by briefly discussing recent changes to management structures for the Great Barrier Reef Marine Park and World Heritage Area.

12. In concluding, Dr McPhail reflected on the unusual, but promising, nature of ICRI as an informal and catalytic partnership designed to focus on an issue of global concern which should be pursued by the international community. Dr McPhail acknowledged the great privilege accorded to the Government of Australia in hosting the ICRI Secretariat, through the Great Barrier Reef Marine Park Authority, for the last two years. He then announced that, just as Australia had received the Secretariatship of ICRI from the United States of America, the Government of Australia would pass it on to another ICRI partner – the Government of France – following ITMEMS.

13. Dr Peter Thomas, on behalf of the Government of the United States of America, outlined the history of ICRI. He identified its beginnings arising from initial concerns about the declining health of coral reefs globally that were expressed at the United Nations Conference on Environment and Development (UNCED), Rio de Janeiro 1992, then subsequently at the Small Island Developing States Conference in 1994 where ICRI was first announced. Later that same year, at the First Conference of Parties to the Convention on Biological Diversity, the ICRI partnership of eight founding countries (Australia, France, Jamaica, Japan, Philippines, Sweden, United Kingdom and the United States) took effect.

14. Dr Thomas went on to highlight the continuing relevance of the ICRI *Call to Action* and *Framework for Action* that were adopted at the Dumaguete City Workshop in 1995. He noted the ambitious agenda that was set by the ICRI partners as they departed Dumaguete City and many of the achievements since then, including the global campaign to raise the profile of coral reefs through international fora (such as the Convention on Biological Diversity and Commission on Sustainable Development), regional workshops, the GCRMN and 1997 International Year of the Reef.

15. In conclusion, Dr Thomas noted that while substantial achievements had been made since the ICRI *Call to Action* was adopted in 1995, concern over the state of the world's coral reefs was increasing. He noted, as an example, recent reports of coral bleaching which raise concern not only over the ultimate causation of such events but also over their impacts on the livelihoods of local communities around the world that are dependent on coral reef resources. Dr Thomas posed a number of fundamental questions to be addressed at ITMEMS, including: Is action being taken on the reefs and what can we do to generate more action? Are coastal management programs taking hold? What are the best case studies from which we can learn to limit damage and to sustainably manage human activity? What is standing in the way of getting resources, expertise, training and information to coral reef managers?

16. Professor Bernard Salvat, on behalf of the Government of France, confirmed that France would take over the ICRI International Secretariat and Chair the Coordination and Planning Committee (CPC) for a two year term – 1999 and 2000. He stated that ICRI and the CPC would continue to be a catalyst for more attention and funding devoted to coral reefs under the leadership of France.

17. Professor Salvat noted that ITMEMS was the first international meeting of significance with a focus on the management of coral reefs and associated ecosystems. He went on to review the history of scientific knowledge about coral reefs, which has developed only since the Second World War. Professor Salvat recalled the first International Coral Reef Symposium at Madapam Camp, India, where there were only forty participants and no topics on management or monitoring. He noted significant accomplishments over the following four decades on coral reefs in terms of scientific knowledge and human activities.

18. Professor Salvat concluded by noting the crisis that is presently facing coral reefs and by reaffirming the importance of ICRI and the willingness of its partners and CPC to promote action in favour of the sustainable development of tropical coastal areas and associated human activities.

19. Dr Clive Wilkinson, Coordinator, Global Coral Reef Monitoring Network (GCRMN), began his presentation with an overview of the status of coral reefs globally. He noted 1998 figures which put 26% of reefs at high risk, 31% at medium risk and 43% at low risk. These represented an increased level of risk over 1992 predictions.

20. Dr Wilkinson then proceeded to review the history, objectives, principles, strategies and activities of the GCRMN, noting its role as the research and monitoring arm of ICRI. GCRMN achievements since 1995 were identified as the establishment of monitoring nodes in South Asia and the western Indian Ocean, the provision of data for ReefBase and development of a partnership with Reef Check. Future activities would include the development of a socioeconomic manual and protocols, funding support for existing monitoring nodes and regional monitoring, development of new nodes and partnerships with other organizations, and preparation of reports.

21. Dr Wilkinson provided a region-by-region summary of the status of coral reefs, and a review of impacts of the 1997/98 coral bleaching event. Most severely affected by coral bleaching were areas of the Indian Ocean, while all regions suffered significant coral mortality. He concluded his presentation with an overview of the Reef Check program and summary of 1998 results.

22. Mr Richard Kenchington, Global Coordinator, ICRI Secretariat, introduced and discussed the goal and objectives of the Symposium and the intention of the program design team to stimulate active participation and experience sharing of all delegates through the workshop structure. He stressed the intention that the workshop reports and the future program documents should reflect the contributions of all participants. Mr Kenchington then presented the draft program to Plenary for comment and endorsement. The agreed program is included in these ITMEMS Proceedings.

23. Critical reviews of progress in the implementation of management actions were prepared for each of five ICRI regions: Tropical Americas/Caribbean, Pacific, East Asia, South Asia and Eastern Africa/Western Indian Ocean. These Regional Reports summarize progress in addressing management concerns since the Dumaguete City workshop in 1995. The Regional Reports were drafted within a framework of the four ICRI cornerstones: Integrated Management, Capacity Building, Monitoring and Review (Performance Evaluation). Topics and guiding questions were provided to the authors as an indication of the information needs. The structure of each Regional Report was tailored to the specific characteristics of the individual regions. The five Regional Reports are included in these ITMEMS Proceedings.

24. Dr Jeremy Woodley presented the Regional Report for the Tropical Americas/ Caribbean. The report focuses initially on the Caribbean Environment Program (CEP) and its role in the implementation of activities that emanated from the ICRI Regional Workshop and Montego Bay Declaration. However, a broader account of progress and activities in the Wider Caribbean Region over the last two years, compiled from reports sent in by correspondents within each country or taken from existing relevant publications, is also provided.

25. The ICRI cornerstone which generated the most activity in the Caribbean was that of Capacity Building, while Performance Evaluation (Review) was the cornerstone for which the least amount of activity was reported. Priority actions under each of the four ICRI cornerstones are identified in the report. The report concludes that activities regarding coral reef assessment, management and education have been wide and varied throughout the Tropical Americas/Caribbean over the last two years and, considering the relatively short time frame, impressive in nature and numbers. However, given the status and threats of the reefs in the Region, much more remains to be done particularly as these fragile ecosystems are critical in sustaining activities such as tourism and fisheries on which the Caribbean economies are greatly dependent.

26. Ms Lucille Apis-Overhoff presented the Regional Report for the Pacific. The report focuses on the role of the South Pacific Regional Environment Program (SPREP) and implementation of activities within the ICRI Pacific Regional Action Strategy and Pacific Framework of Action. Funding constraints were identified as the major limiting factor in the implementation of activities under the ICRI umbrella. Three activities were highlighted: Implementation of the 1997 Pacific Year of the Coral Reef; 'Train the Trainers' Coral Reef Monitoring and Survey Workshops in support of the GCRMN; and Development of a Regional Wetland Action Plan. It was noted that these activities involved all SPREP member countries.

27. In her report, Ms Apis-Overhoff outlined the difficulties encountered in the implementation of the ICRI activities, noting in particular the complexity of the activities that were undertaken, and the tyranny of distance and communication amongst the widely dispersed island countries. Constraints, in addition to funding, and lessons learned were identified. However, despite the limiting factors, there were many success stories across the Pacific island region. The three activities were viewed as monumental landmarks because of the time, money and effort contributed by the teams, at the regional, national and local levels, which were united by their effort to raise awareness of the value of coral reefs and the need to manage them for conservation and sustainable development.

28. Mr Shoutao Cao presented the Regional Report for the East Asian Seas. The report identifies strategic ICRI activities that are being addressed in combination with, in particular, implementation of the Global Program of Action for the Protection of the Marine Environment from Land-based Activities (GPA) and a Transboundary Diagnostic Analysis for the South China Sea (TDA). Weaknesses and priorities under each of the four ICRI cornerstones are identified in the report, together with actions for addressing regional priorities.

29. The Regional Report for East Asia notes, however, that due to limited resources many important issues, even though they are among the highest priorities in the region, are not being addressed in regional work plans. These include over-exploitation of fisheries, destructive fishing such as cyanide and dynamite fishing, reduction of ecological impacts of coastal and marine tourism, and rehabilitation and restoration of degraded ecosystems such as coral reefs and mangroves. The report also notes that there are many existing institutions and organizations that are working in various modes to protect the East Asian Seas and calls for the establishment of active connections among UN organizations, international NGOs, member governments, academic institutions, the private sector and individuals in order to facilitate collaboration and cooperation for implementing actions.

30. Mr Arjan Rajasuriya presented the Regional Report for South Asia. The report reviews the status of coral reefs within the region and activities under each of the four ICRI cornerstones on a country-by-country basis. Wide ranging differences in priority, emphasis and capacity among the five countries are evident. Noteworthy is the considerable progress on establishment of a GCRMN node for South Asia and activities that have been undertaken to support research and monitoring.

31. The Regional Report for South Asia concludes that there are many initiatives in the region that are actively supporting programs for strengthening the capabilities of government departments and research units to manage coastal resources. However, although there are a number of other welcome national level coral reef management initiatives in the region, it is not clear whether many of them are fully integrated into, or guided by, the ICRI *Framework for Action*. Research and management have to be improved in the region and more emphasis is required in socioeconomic monitoring as this component is lacking in many countries. This is identified as a major obstacle in the development of management plans.

32. Dr Nyawira Muthiga presented the Regional Report for Eastern Africa and the Western Indian Ocean. The report gives an updated description of a diverse array of coral reef and associated ecosystem programs being undertaken by the Eastern African mainland states on a country-by-country basis. The Regional Environment Program of the Indian Ocean Commission is presented for the Western Indian Ocean island states, as a whole, with an emphasis on coral reef monitoring.

33. The Regional Report for Eastern Africa and the Western Indian Ocean illustrates a wide range of political and economic development among countries of the region. All states are heavily dependent on their coastal environments as sources of food, income and employment. Over-exploitation of marine resources fueled by the increase in the coastal population, destructive methods of fishing, poor land-use practices, tourism-related activities and pollution from land-based activities are threats that are found throughout the region. Given the high dependence of coastal communities on biological resources at the subsistence level, it has become increasingly clear that new strategies incorporating local and national interests must be developed.

Keynote Presentation by Dr Nancy Foster

34. Dr Nancy Foster, Assistant Administrator NOAA and Vice-Chair IUCN World Commission on Protected Areas (WCPA) - Marine, addressed ITMEMS participants on the subject of 'Marine Protected Areas in the New Millennium'. Dr Foster began by identifying various challenges and concerns. In particular, she noted a widespread lack of effective management of marine protected areas (MPAs) and coral reefs, in light of which the concept of MPAs as an important management tool for conserving our world's marine resources works in theory, but not in practice. Dr Foster then went on to suggest the use of four 'navigational aids' as guides for the future: (i) an ecosystem approach to management; (ii) emphasis on public participation by putting people first; (iii) integration of fisheries management with MPA management; and (iv) sustainable tourism for all MPAs, but particularly coastal ecosystems. The text of Dr Foster's presentation is included in these Proceedings.

Sessions 3 to 10 – Priority Issues Concurrent Working Groups

35. The *Priority Issues* Working Groups provide the focus for a series of interactive, action-oriented workshops that are designed to identify lessons through case study examples from around the world. The case studies critically review and evaluate both successes and failures in the implementation of selected projects. The case studies were chosen on the basis of their contribution to tropical marine ecosystem management and, more specifically, to one (or more) of the priority issues that has been identified as a global threat to these ecosystems through the ICRI process.

36. It is recognised that coastal resource management projects will almost inevitably be multi-faceted and address various related issues simultaneously within an integrated framework. However, the focus here on specific issues/themes reflects the reality that limited human and financial resources, combined with specific resource needs and political realities often necessitate a more focused, prioritized approach to issues which are of particular relevance to stakeholders and where meaningful results are achievable. The issue topics were identified as priorities through the regional ICRI workshops that were held from 1995 to 1997.

37. The case studies were drafted within a framework of the four ICRI cornerstones: Integrated Management, Capacity Building, Monitoring and Review (Performance Evaluation). Topics and guiding questions were provided to the authors as an indication of the information needs, but the structure of each case study was tailored to the specific characteristics of each site/project. The case study manuscripts and Session Reports are included in these Proceedings.

Session 3 – Fisheries and Protected Areas

38. Session 3 included case studies from the Philippines, Mexico and Australia, which addressed the implications of MPAs for fishery management. Following presentation of the case studies, break-out sessions looked at the issues in the context of the four ITMEMS cross-cutting themes: Integrated Management, Coordination and Linkages, Stakeholder Partnerships and Community Participation, Public Awareness and Education (including Capacity-Building), and Data and Information for Management. In addition to the specific areas addressed by the session, recommendations also included broader ideas including development of an Internet-based coral reef clearinghouse mechanism and a call for the development of national coral reef initiatives and action plans – ideally prepared in time for the 10th International Coral Reef Symposium in Bali in 2000.

39. A major conclusion from Session 3 was that MPAs have the potential to play a much bigger role in the successful management and sustainable use of fishery resources on coral reefs and associated ecosystems. In particular, it was recommended that participatory development of no-take zones and protection of essential fishery habitat in the context of an ecosystem management approach should be encouraged, where appropriate, at both the community level and for larger areas.

Session 4 – Pollution Control

40. Session 4 included case studies from Australia, the United States of America and various countries of the wider Caribbean region including Colombia, Cuba and Costa Rica amongst others, which addressed the management of land-based activities that cause pollution of nearshore waters. There was vigorous discussion amongst participants who summarized the lessons learned under the four ITMEMS cross-cutting themes. Discussion points included: difficulty in adopting a precautionary approach because governments seem only to be able to respond to crises; need for more scope to look for incentives and other non-legislative mechanisms to facilitate desired outcomes; and the fact that issues are often the outcome of much larger economic factors/systems which drive development – dealing with the symptoms.

41. Workshop participants emphasised the need to minimise the impact of land-based activities, especially pollution, for the protection of coral reefs and associated ecosystems by: (i) adoption of a watershed approach with legislative backing for dealing with non-point sources of pollution;
(ii) active participation of stakeholders and community members in the ICZM process;
(iii) proper coordination among implementing agencies; and (iv) capacity building and adequate funding to implement ICZM projects.

Session 5 – Protected Areas and the Private Sector

42. Session 5 included case studies from the Caribbean, the Philippines and Tanzania, which examined protected area management in cooperation with the private sector. Workshop participants identified both opportunities and challenges for private sector involvement in MPA management, summarized the lessons learned, and identified needs and guiding questions to facilitate discussion under each of the four ITMEMS cross-cutting themes.

43. Workshop participants concluded that private sector involvement in MPA management is not an issue that has yet been examined in great detail and the number of case studies is fairly limited. However, the fact that the group had over 40 participants was significant in itself. Generally, the group felt that the concept of private sector involvement is a good idea, but acknowledged that economic viability (either through profit or public relations benefits) is a main driving factor for the private sector to sustain interest. Private sector interests want assurances that their efforts will improve business.

Session 6 – Tourism and Protected Areas

44. Session 6 included case studies from Egypt, Bonaire and Australia which examined sustainable tourism development based around MPAs. The three examples cover widely differing geographical scales and a diversity of tourism experience. Workshop participants summarized the lessons learned and identified future challenges under each of the four ITMEMS cross-cutting themes.

45. Workshop participants concluded that sustainable tourism may be the last hope for coral reef conservation – that 'tourism is the solution not the problem'. However, a lack of planning and the need for an identified source of financing were evident as key components that weakened outcomes. The need for tourism monitoring by this sector was identified, which could be tied to permits. Follow-up would be by MPA and other more highly trained staff. The role of permits was identified as a very useful approach, but it can not be overused and should have a clear justification.

Session 7 – Destructive Fishing Practices and Collecting Methods

46. Session 7 included case studies from Tanzania, Philippines and Indonesia, which examined the promotion of sustainable coral reef fishing practices and collecting methods. Participatory, community-based approaches were undertaken in all the case studies. Workshop participants summarized the lessons learned under each of the four ITMEMS cross-cutting themes.

47. The case studies all clearly showed that the impacts of destructive fishing were well understood among the local communities and highlighted that community participation was more important than government intervention. The importance of identifying alternative employment opportunities, as well as providing support in development of sustainable practices among the stakeholders, was also evident from the case studies. Workshop participants concluded that there is an urgent need to obtain funding and provide logistic support to communities in order for them to be more effective in managing the fisheries.

Session 8 – Coastal Development

48. Session 8 included case studies from the Philippines, Indonesia and Egypt, which addressed approaches to sustainable coastal development. Workshop participants identified additional lessons learned and challenges. Discussions identified the need to encourage collaborative stakeholder working groups to work together to put innovative, agreed suggestions forward to decision-makers to solve environmental issues.

49. Workshop participants stressed the importance of learning lessons from developed and developing country situations – both successes and failures. The promotion and dissemination of successful models, leading to best practice manuals was advocated. Participants concluded that management plans and other tools should be flexible and dynamic, fit within a well-defined, long-term vision or goal, and incorporate both incentives and enforcement.

Session 9 – Coral Reef Assessment and Monitoring

50. Session 9 included case studies on the establishment of coral reef assessment and monitoring based on the experiences of various organizations and initiatives, including CARICOMP, Conservation International, Reef Check and the GCRMN. Workshop participants summarized lessons learned under each of the four ITMEMS cross-cutting themes and made general recommendations.

51. Workshop participants identified the need to build motivation for monitoring and data collection on a long-term and continuous basis, and to develop regional strategies to share results amongst relevant stakeholders. The development of active monitoring networks and decentralized activities for effective monitoring were amongst their recommendations. Workshop participants concluded that a logical framework for monitoring still needs to be developed in order to accommodate data gathering at various levels and resolutions through broad-scale mapping including remote sensing, scientific research, reef check monitoring, community-based monitoring, etc.

Session 10 – Protected Areas

52. Session 10 included case studies from Mozambique, Philippines and Brazil, which addressed approaches to sustainable protected area management. Workshop participants identified future challenges and summarized the lessons learned under each of the four ITMEMS cross-cutting themes. Project management by, and/or involvement with, non-government organizations was particularly strong amongst this selection of case studies.

53. Workshop participants stressed the importance of taking advantage of available local resources and using existing organisations, whenever possible. Involvement of local community members and other relevant stakeholders from the very beginning, and the promotion of tangible economic and social benefits were also highlighted. The need to create space and mechanisms in order to foster partnerships and consultation, and bring people together was stressed.

Sessions 11 to 14 – Fostering a Sustainable ICRI Concurrent Working Groups (Cross-Cutting Themes)

54. The *Fostering a Sustainable ICRI* Working Groups aimed to identify gaps in the global approach to ICRI and set an agenda for the future conservation and sustainable use of coral reefs and associated ecosystems. The session Chairs, Rapporteurs and selected panellists facilitated discussion on a range of cross-cutting themes that were repeatedly identified through the ICRI regional workshops as priority needs for the management of tropical marine ecosystems. These themes were:
    (i) Integrated Management, Coordination and Linkages with other Initiatives, Programs and Instruments;
    (ii) Stakeholder Partnerships and Community Participation;
    (iii) Public Awareness and Education, including Capacity Building; and
    (iv) Data and Information for Management.

55. Panellists were identified for each session theme and requested to prepare a presentation on the basis of their breadth of experience and knowledge, and objective of the particular theme. Panellist presentations, Regional Reports and the outcomes of the *Priority Issues* Working Groups were all intended to provide a basis for discussions. The Working Group Reports and dot-point summaries of some panellist presentations are included in these ITMEMS Proceedings.

Session 11 – Integrated Management, Coordination and Linkages with other Initiatives, Programs and Instruments

56. The objective of Session 11 was to identify gaps and priority needs in order to foster integrated management, and enhance coordination and linkages with other relevant initiatives, programs and instruments. Participants examined the relevant priorities as identified in the Regional Reports in relation to the cross-cutting theme as a means of identifying constraints and opportunities to address priority issues within the current ICRI context. A set of recommended actions for the next four years is presented in the Working Group report. These actions are based on lessons learned from past experience, gaps in the ICRI process, and under-utilised opportunities to integrate, coordinate and effectively link ICRI with other international programs and instruments.

57. The Working Group identified and discussed the following priority issue areas: Marine Protected Areas, Pollution Control, the Private Sector and Destructive Fishing Practices. Lessons learned, gaps and specific goals and actions were formulated to address the concerns of participants under each of these areas. The use of cyanide for fishing and global change/environmental security were also identified as important issues and specific goals and actions were formulated for these.

58. Two key recommendations were made: (i) bridge the gap between global knowledge and local action through creation of national coral reef initiatives; and (ii) work with the private sector to develop innovative approaches to ensure that uses of coral reef and related ecosystems are ecologically sustainable. ICRI and its partners were found to have played a major awareness-building role at global and regional levels but the lack of strong, national ICRI policy and program teams hindered the use of these international instruments to support local management efforts. There were found to be many limitations and constraints within the international framework as well, including:

(a) treaty obligations and national initiatives require national leadership for implementation;
(b) few international regimes provide direct tools for partnership with industry; and
(c) limitations of human and financial resources to fulfil international mandates and national goals.

Session 12 – Stakeholder Partnerships and Community Participation

59. The objective of Session 12 was to develop a better understanding of effective processes for involvement in, and ownership of, management initiatives by a wide range of stakeholders. Participants identified lessons learned, gaps and priority actions under a series of categories or needs. The participants in this session also suggested a series of amendments that should be made to the Principles in the 1995 *Framework for Action* in order that they better reflect to the needs of stakeholder partnerships and community participation.

60. The key needs under which priority actions were identified are:
    (i) development, dissemination and exchange of information at and across the global, regional and national levels, tailored for non-expert/community use;
    (ii) creation of better bridges between the human and the biophysical dimension in the implementation of coral reef management processes;
    (iii) development and promotion of tools and processes for effective partnerships and participation; and
    (iv) encouragement of donor agencies, governments, developers, and program providers to modify their procedures to support effective community participation and stakeholder partnerships.
61. The Working Group concluded that resource users and dependent local communities are the key custodians of coral reefs and as such they must be involved from the beginning in all aspects of resource management and be empowered to contribute to the process which can best achieve the conservation and sustainable use of coral reefs and related ecosystems.

Session 13 – Public Awareness and Education, including Capacity Building

62. The objective of Session 13 was to review existing activities, facilitate the sharing of experience and identify capacity-building needs covering public awareness and education. Participants identified lessons learned, gaps and a series of key needs. Issues were identified and outline action plans developed to meet these needs.

63. The key needs under which priority actions were identified are:
    (i) capacity building in developing countries;
    (ii) support for the setting up of a centralized inventory of public awareness, educational and capacity building materials, preferably in association with existing organizations;
    (iii) establishment of an effective system to share knowledge and lessons from other programs and projects;
    (iv) establishment of principles and guidelines for awareness raising and capacity building, including monitoring and evaluation methodologies; and
    (v) establishment of accreditation schemes to raise awareness and reward organizations that are employing good practices.

64. Ecosystem management was a reoccurring theme or lesson learned in this context. The Working Group found that the principles of ecosystem-based management should be applied from the outset of the planning process and that there should be stakeholder involvement in determining management objectives and restoration goals based on our best understanding of the concept of sustainability. It was recognized that humans are a part of the ecosystem and that our activities, or the effects of our activities, cannot be separated from any holistic approach to management.

Session 14 – Data and Information for Management

65. The objective of Session 14 was to define the priority data and information needs for implementing and evaluating management initiatives, and to identify mechanisms for bringing the science and management of coral reefs into a closer working relationship. The Working Group addressed the lessons learned, gaps, and priorities for action with regard to social, economic, and biophysical data, and information for management using the experiences and expertise of participants and drawing on the lessons learned from the *Priority Issues* Working Groups and Regional Reports.

66. Three priority actions were identified.
    (i) Improve global capacities for assessing the state of coral reefs and other tropical marine ecosystems.
    (ii) Improve management capacities for setting priorities and making decisions.
    (iii) Develop and implement performance criteria for management success.

67. Amongst other matters, the Working Group found that information for measuring land-based sources of pollution and international actions on transboundary (ecosystem) marine issues are inadequate. Research directed towards these management needs and cross-disciplinary knowledge and understanding in general, should be enhanced, particularly in regard to socioeconomic information. Performance indicators for management, leading to the capacity to determine management success, are also inadequate.

Sessions 15 to 17 – Reporting on the Outcomes of Working Groups

68. The Chairs and/or Rapporteurs of the *Priority Issues* and *Sustainable ICRI* Working Groups presented their reports to Plenary. Participants from the floor reviewed these reports individually, which were also available in hard-copy form. Text was modified and/or added as decided by participants.

69. Mr Richard Kenchington, Global ICRI Coordinator and Executive Director, GBRMPA, presented the draft *Renewed Call to Action* to Plenary. The *Renewed Call to Action* had been drafted by an ad-hoc Working Group that was established from interested participants for the specific purpose of preparing a formal ITMEMS communique. Participants from the floor reviewed the draft communique, which was also available in hard-copy form. Text was modified and/or added as decided by participants.

70. The participants of ITMEMS reaffirmed the relevance and importance of the 1995 *Call to Action* and *Framework for Action*, and identified a series of priority issues to amplify and strengthen the efforts of all the ICRI partnership in their communique. The *Renewed Call to Action*, as adopted, is included in these ITMEMS Proceedings.

71. Two additional ad-hoc Working Groups were established during ITMEMS on the topics of (i) Coral Bleaching and (ii) Crown-of-Thorns Starfish (COTS). Their reports were presented to Plenary for review. These reports were adopted by participants and are included in the ITMEMS Proceedings. The Working Group on coral bleaching concluded that there is a need for a cross disciplinary research effort to evaluate the immediate and ultimate causes of coral bleaching, its link to climate change, and the effect of coral bleaching on the ecosystem as a whole. On the subject of crown-of-thorns starfish, the Working Group concluded that in the absence of satisfactory evidence implicating human activities in the causation of COTS outbreaks, a policy of limited intervention remains a logical and realistic approach to managing the issues.

72. The International Tropical Marine Ecosystems Management Symposium was closed by Dr Ian McPhail, Chairman, Great Barrier Reef Marine Park Authority. In his closing statement, Dr McPhail thanked the major ITMEMS sponsors, including the governments of Australia, Japan, Sweden and the United States, and the meeting organizers, and commended the participants on their outstanding contribution to ICRI and the conservation and management of the world's coral reefs.

KEY OUTCOMES

The deteriorating condition of coral reefs around the world continues to be a source of grave concern. Improved monitoring data and detailed predictive studies presented at the International Tropical Marine Ecosystems Management Symposium (ITMEMS) indicate that, in the four years since the publication of the first *International Coral Reef Initiative (ICRI) Call to Action,* the state of coral reefs and associated marine ecosystems has worsened significantly. This *Call to Action* identified improved coastal management practices, increased national and local capacity and political support, and the sharing of existing and new information as the preferred approach to reducing the threats to coral reefs and associated marine ecosystems. The purpose of the *Call to Action* was, and remains, to mobilise governments and the wide range of other stakeholders whose coordinated vigorous and effective actions are required to address the threats to reefs.

Since the first ICRI Workshop significant progress has been made in implementing the elements of the *ICRI Call to Action* and *Framework for Action.* This resulted from the action of many involved stakeholders and through many large and small efforts from the local to the global level. Governments of ICRI partners and non-government organisations (NGOs) raised the profile of coral reefs in the major international fora. Regional action plans have been developed in all regions of the world, and national and local coral reef initiatives were created based on the elements of the *Framework for Action* and ICRI regional strategies.

The International Tropical Marine Ecosystems Management Symposium (ITMEMS) provided a forum for the review and evaluation of ICRI implementation. Participants at ITMEMS reaffirmed the importance of reefs to their cultures, communities and economies, and the strong relationship between healthy reefs and the sustainable livelihoods of many sectors of society. Participants recognized the wide and shared responsibility of all stakeholders, and the need to continue and strengthen this progress in the face of clear evidence of increasing threats to coral reefs and related ecosystems.

Reaffirmation of the Call to Action and Framework for Action

The participants of ITMEMS reviewed the 1995 ICRI *Call to Action* and *Framework for Action* and reaffirmed their relevance and importance, reiterating the ICRI call for concerted action by the wide range of stakeholders to reduce the threats to coral reefs and related ecosystems.

Current Priorities

In reaffirming the *Call to Action* and *Framework for Action,* ITMEMS participants identified the following priority issues and recommended responses to amplify and strengthen the efforts of all in the ICRI partnership.

Issue: **Ignorance is destroying coral reefs and related ecosystems.**

Response: Launch multi-faceted, global-to-local-level mass marketing awareness campaigns to change the behaviour of people.

Bridge the gap between global knowledge and local action through the creation of national coral reef initiatives.

Issue: **Pollutants, including sediments and nutrients from land-based human activities, severely threaten the health of coral reef ecosystems.**

Response: Develop and implement equitable, participatory, integrated coastal management that incorporates watersheds.

Issue: **Destructive and unsustainable fishing practices such as cyanide, explosives, trawling and other forms of drag-netting, as well as over-exploitation, are destroying coral reefs and related ecosystems.**

Response: Commit to eliminating fishing practices that are not demonstrably sustainable, by promoting effective enforcement, alternative methods and market incentives.

Issue: **Activities of the private sector, including tourism and the trade of coral reef products, can protect or destroy coral reef ecosystems.**

Response: Work with the private sector to foster appreciation of the value of coral reefs and encourage the private sector to use and protect coral reefs and related ecosystems in ecologically sustainable ways by introducing incentives, such as awards and accreditation for better environmental practices.

Issue: **An ecosystem approach to management is needed to conserve and restore the values and functions of coral reefs and related ecosystems.**

Response: Implement an integrated approach to management that includes effective marine protected areas, including no-take zones, as a vital component in managing human activities within larger biogeographic frameworks.

Issue: **Recognition of traditional knowledge and management systems is vital.**

Response: Increase the confidence and capability of communities to sustainably manage and conserve resources through capacity building and validation of their traditional practices. Integrate traditional and modern approaches to management for effective results.

Issue: **Projects have failed because they have not taken into account socioeconomic and cultural factors.**

Response: Socioeconomic and cultural factors are essential components in developing community-based management programs, for tailoring management to local conditions, and for demonstrating the value of tropical marine ecosystems to policy makers and users.

Issue: **Managers and communities are not getting the information and management tools they need to make sound management decisions.**

Response: Create and use networks of knowledge-based management systems through networks of people, ideas and information to promote science-based management and public participation in that process.

Issue: **Data produced by the GCRMN, Reef Check and other innovative programs have proven the value of monitoring to global reef assessment and local management, but more widespread monitoring is needed.**

Response: Strengthen biophysical and socioeconomic monitoring efforts on all scales to improve management effectiveness. Secure long-term financing.

Issue: **Lack of funding undermines actions to address threats to coral reefs, monitor their health, and assess the impact of management practices.**

Response: Develop financing in a strategic manner at local, regional and international levels.

Issue: **Coral reefs are the life support systems for the existence of small island developing states and many coastal communities of developing tropical countries.**

Response: Urge governments that support the goals of ICRI to promote consideration of this report during the next session of the Commission on Sustainable Development as part of its review of Small Island Developing States, Oceans and Sustainable Tourism issues in 1999. The CSD is urged to recognise this vital relationship and support immediate and effective action to understand and address the threats to these ecosystems.

Urge governments to promote ICRI goals within the World Heritage and Ramsar Conventions, in implementation of the Convention on Biological Diversity and its Jakarta Mandate as well as other relevant international and regional instruments.

The Call

The participants in the International Tropical Marine Ecosystems Management Symposium, through their *Renewed Call to Action,* call upon governments, United Nations agencies, bilateral and multilateral financial institutions, scientists, NGOs, local communities and the private sector to implement the 1995 *Call to Action* and the *Framework for Action,* taking into account the *Renewed Call to Action* and working group Priority Actions produced at ITMEMS. Further, we call upon the global community to re-commit to urgent action to address the threats to coral reefs and tropical marine ecosystems.

Looking to the Future

The International Tropical Marine Ecosystems Management Symposium provided the opportunity to share management experience. This is reflected in these Proceedings. Less tangibly but equally importantly it is reflected in the development of a network of contacts for managers facing the day-to-day issues of conservation and sustainable use of coral reefs and related ecosystems.

KEYNOTE ADDRESS: Marine Protected Areas in the New Millennium

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Introduction

It is a privilege to join you today. In this 'International Year of the Ocean', this Symposium is itself something to celebrate!

Today I would like to identify some challenges and share a few concerns that I have as I follow Graeme Kelleher as the incoming Vice Chair – Marine of the IUCN World Commission on Protected Areas.

We often tout marine protected areas (MPAs) as refuges for biodiversity, gene banks for miracle cures, saviours of commercial fisheries, foundations for traditional cultures and subsistence living, and sentinels for climate change. Marine protected areas have become all things to all of us.

In fact, worldwide over 1300 marine protected areas have been identified, as described in *A Global Representative System of Marine Protected Areas.* Of these 1300 MPAs, the recently published Reefs at Risk estimates that 400 contain coral reefs in more than 65 countries and territories.

Looking at the status of MPA management at the site-specific level, perhaps less than one-third of the MPAs are effectively managed. Some are not managed at all and most are plagued by poor funding and over- and destructive use.

Furthermore, more than 150 of the coral reef marine protected areas are less than one square kilometer in size. Many of the MPAs do not include the coral itself, much less the surrounding coral reef ecosystem.

In light of these obstacles, the concept of MPAs as an important tool for conserving our world's marine resources works in theory, but in practice, MPAs are not achieving our goal.

How then can we enhance MPAs as effective tools for conservation and sustainable use of marine biodiversity?

Goals

I believe that the case studies and summary statement of this conference should begin to help bridge this gap between the dream and reality – that by the year 2002 (whether at ITMEMS II or at the World Parks Congress) we should be far ahead of where we are today.

One of our primary goals for the next century would be that:

> MPAs become exemplary systems of integrated and participatory management serving as 'building blocks' for sustainability through integrated coastal management.

How do we get there? I suggest we utilize at least four 'navigational aids' as guides along this new course:

- an 'ecosystem approach' to management;
- emphasis on public participation by putting people first;
- integration of fisheries management with MPA management; and
- sustainable tourism for all MPAs, but particularly coastal ecosystems.

An Ecosystem Approach

The 1990's international policy community has adopted new approaches to marine and coastal management including a shift toward an ecosystem approach. Since the 1960s, coastal policy-makers have preached ecosystem management, but today I believe we are actually trying to do it.

First, the global environment facility has thrown its considerable weight behind the 'large marine ecosystem' (LME) approach with several important projects in the Gulf of Guinea, Yellow Sea, and South China Sea. However, the contribution of MPAs as management tools in LMEs has not emerged at practical level.

Second, IUCN, the Great Barrier Reef Marine Park Authority and the World Bank raised the standard of global discussion of MPAs with their publication of *A Global Representative System of Marine Protected Areas.* Published in 1995, the four-volume report targets action at the local and national levels, calling for national representative systems of MPAs forged by local communities and national teams. The report recognizes that networks of MPAs at national and regional levels can provide a basis for sharing knowledge, experiences, expertise and resources, which play a unique role in safeguarding biodiversity at a regional level.

Third, we have reconfirmed the merits of basin-wide and global coral reef monitoring with the successful monitoring of bleaching 'hotspots' associated with El Niño this year. Reef systems in many MPAs were affected by this global bleaching episode.

Fourth, in considering an ecosystem approach, the Convention on Biological Diversity formally linked conservation and sustainable development, and through the Jakarta Mandate, elevated coastal area management and MPAs among its top concerns.

Fifth, the Global Program of Action for the Protection of the Marine Environment from Land-Based Activities embodies the ecosystem approach. A recent article in the *Marine Pollution Bulletin* noted that in Indonesia stresses from land-based pollution area were associated with 40–70% reductions in coral species diversity illustrating the need for greater ecosystem management.

Yet, despite the fact that we can point to these examples of increasing recognition of ecosystem management as a viable approach, if you look at MPAs around the world MPA managers are typically limited to managing ocean-based activities within their MPA boundaries with no jurisdiction, and limited influence, over land-based activities. Ecosystem-based management strategies that address the breadth of both land- and ocean-based activities affecting the MPA resources are needed.

As the United States has begun to address this issue, one example, management of the Florida Keys, has taught us that conservation gaps result in the demise of coral reef resources. Over the past 40 years we reinvented the boundaries of management in the Florida Keys four times. This evolution began with the designation of John Pennekamp Coral Reef State Park, the world's first underwater park in 1960. In 1975 and 1985 we expanded the boundaries of coral reef protection and in 1990 the Florida Keys National Marine Sanctuary was statutorily designated covering the entire reef tract, an area of over 9500 square kilometres.

However, even these boundaries are not adequate to encompass the land-based threats to the marine ecosystems. Concerns have been raised about the development of South Florida and its impacts on the South Florida ecosystems, including the coral reefs. Altering the water flow of South Florida over the years has transformed the region into one of the fastest growing metropolitan, agricultural and tourism areas in the United States. These changes have pushed the ecosystem to the point that it is now one of the most endangered ecosystems in the nation. Degradation of the marine environment threatens the large tourism and fishing industries which depend on a healthy ecosystem. In order to mitigate this environmental and economic crisis, interagency restoration efforts are being coordinated costing the United States millions of dollars. We have learned at great cost the importance of an ecosystem approach to coastal and marine management.

This brings us to the second of our navigational aids – putting people first!

The Human Dimension

Thirteen years ago, while working to establish a marine sanctuary in Puerto Rico, I was hanged in effigy and had to be police escorted from public meetings. More recently the superintendent of the Florida Keys National Marine Sanctuary was burned in effigy even as he led a broad public consultation of the draft management plan. Roughly three years ago the Ecuadorian army had to intervene in the Galapagos to bring calm to a bristling dispute over the sea cucumber fishery.

'Putting people first' – I'll admit it's a 'sound bite', the kind our politicians love. Nevertheless the necessity of the human dimension was a recurring theme at the ICRI 1995 Symposium in which Dr Bernard Salvat, a director of the International Society for Coral Reef Studies, underscored the need for a better understanding of the linkages between human societies and the integrity of coral ecosystems. Further emphasizing the point, the Philippine environment minister, Dr Angel Alcala, told the Symposium participants that, 'local communities – whether they are village fishermen at Apo island and Bais Bay or dive boat operators in St Lucia – are central to the success of all coral and coastal management efforts.'

In response to this growing recognition of the need to incorporate the human dimension, today across the globe, we:

- create stakeholder dialogues as the cornerstone of the collaborative management process;
- consider guidelines and case studies on indigenous peoples and protected areas;
- engage non-governmental organizations and local communities as manager of MPAs; and
- survey socioeconomic community values – a tool of management that is becoming a standard part of biodiversity conservation and sustainable use.

Perhaps one of the most useful tools for putting people first is the development of guidelines for conducting socioeconomic assessments: a new science-based tool to empower public participation in management. This initiative, which is being coordinated by the global coral reef monitoring network, the United States, and Japan, will produce a manual for marine managers with strategies for assessing and incorporating socioeconomic issues into management programs.

Fisheries

One of my particular interests and areas of expertise is fisheries. An effectively managed MPA that successfully contributes to a sustainable fishery truly puts people first.

The Food and Agricultural Organization (FAO) code of conduct for responsible fisheries was adopted in the early 1990's, as the fisheries community inched toward multi-species management, identification of essential fish habitat, and incorporation of the larger ecosystem. However, the concept of MPAs as essential tools of sustainable fisheries has not taken hold in much of the globe.

In the United States, we are just beginning to look at MPAs as viable tools for fisheries management. Only this year was the concept validated by a study by the National Academy of Science.

Our challenge will be to demonstrate the potential for MPAs to protect and restore marine fisheries biodiversity and to provide a core component of sustainable commercial fisheries.

In the United States, as we were preparing for last month's first meeting of the President's coral reef task force, we found that almost 50% of all federally-managed fisheries species depend on coral reef ecosystems for some part of their life cycle. Yet we are only beginning to explore MPAs as operational tools of sustainable fisheries management.

As a critical step toward bridging fisheries with MPAs, IUCN and the World Bank are developing demonstration projects to show how MPAs can contribute to sustainable fishing in Samoa, Tanzania, and Vietnam by:

- protecting critical breeding, feeding and nursery areas for important fishery species; and
- prohibiting unsustainable fishing methods, such as cyanide and blast fishing.

These approaches are designed to demonstrate that MPAs are beneficial to fisheries because they:

- contribute to increased fish catch outside areas where fishing is prohibited;
- provide a reference area to allow monitoring of the health of marine ecosystems including status of fish stocks; and
- contribute to the sustainable subsistence fishing needs of local people.

As we consider how to link MPAs with fisheries, we acknowledge that more research is needed, especially at larger scales, to determine the ideal size, number and location of marine reserves necessary to optimize fisheries productivity and resource conservation. However, many of us believe that we know enough now to apply marine protected areas as a key tool in fisheries management.

Sustainable Tourism

It is time for a paradigm shift in the tourism industry to recognize that it's not the job of the manager alone to protect and conserve, restore and create, understand and operate MPAs. The tourism sector, which heavily depends on the coral reef ecosystem for tourism attractions, should work with MPA managers to maintain coral ecosystems on which the profits of tourism depend.

The tourism industry is already starting to promote sustainable tourism practices as evidenced by increasingly green hotel practices, the establishment of environmental standards for the industry, and the distribution of internationally recognized environmental awards.

A challenge to the management community represented at ITMEMS is to more effectively reach out to the tourism sector.

We must better define and promote our mutual interest in long-term sustainability of the marine ecosystems using the vocabulary and grammar of the tourism industry. As we work to establish links with the tourism sector we need to stress that a well-maintained natural resource is critical to both the short- and long-term marketability of a tourism destination. Further, we must emphasize that MPAs can increase tourist arrivals and have a positive multiplier effect across the economy.

The benefits of marine protection to the tourism industry are well illustrated by the small island State of Saba, which witnessed a tremendous growth in tourism with the establishment of the Saba Marine Park, making Saba one of the prime dive destinations in the Caribbean. At the same time, the park management measures such as mooring buoys and other enforcement measures, have resulted in reduced impacts on the park's marine resources, ensuring the sustainability of these tourist attractions.

In communicating with the tourism sector, we also need to recognize that if we quantify the direct and indirect long- and short-term benefits of marine resources and their use, marine managers can begin to show tourism operators the advantages of conservation in their own terms.

Such an approach was taken in Montego Bay Marine Park, Jamaica. A socioeconomic assessment conducted by the World Bank found that the net present value of marine resource use associated with tourism, fishing and coastal protection is between 300 and 700 million dollars. These findings have been critical in demonstrating to the tourism industry the value of these resources and subsequently gaining their support.

But perhaps of greater importance to an individual tourism business is to see the direct benefit of supporting marine conservation to their particular business. Best management practices minimize human impacts, enhance the environment, and save money. Again if we look to Jamaica, the U.S. Agency for International Development is supporting an environmental audit for sustainable tourism program to show hotels how much they can save financially while also helping the environment. One of the most talked about examples is from Sandals Montego Bay where the hotel has cut its water bill by 25% by offering guests the option not to have their towels washed daily. It may seem a small start but this measure, if expanded to all the hotels in the area, would significantly reduce the inflow of detergents into the coastal waters.

Further, in addition to reducing costs, tourism businesses that manage their facilities in an environmentally sensitive manner can gain a marketing advantage with discerning, environmentally aware tourists. Recognizing this growing market, several organizations such as green globe have begun standardizing, validating and marketing sustainable tourism practices.

Closing

These 'navigational aids' are just some of the issues to be addressed as we inch toward our goals. Let me restate them as goals for the year 2002 world parks congress:

- MPAs as the jewels in the crown of national systems of integrated coastal ecosystem management;
- MPAs as essential reservoirs of biodiversity nested in national and regional systems of MPAs and as foundations of cultural integrity and diversity;
- MPAs as focal points for collaboration among the diversity of stakeholders;
- MPAs as the biological engine of recruitment for commercial and recreational fisheries; and
- MPAs as benefactors to, and partners with, the tourism sector.

In closing, let me return to putting people first, to IUCN's mission which is:

> To influence, encourage, and assist societies throughout the world to conserve the integrity and diversity of nature and to ensure that any use of natural resources is equitable and ecologically sustainable.

It is now my challenge as the newly appointed Vice-Chair of the WCPA-Marine to further expand and build upon the work of Graeme Kelleher, my friend and colleague, who has worked for 13 years as Vice-Chair of the WCPA-Marine to build a solid foundation for a global representative system of marine protected areas. I encourage you to join me and Graeme, through IUCN, in building and using these regional networks to strengthen ICRI's implementation at regional and national levels.

After all, ICRI and ITMEMS are part of a grand social experiment in global coalition-building outside government structure and across boundaries. I greatly appreciate Australia's leadership of ICRI over the past two years through Richard Kenchington and the staff of the Great Barrier Reef Marine Park Authority and look forward to working with the leadership of the French ICRI Secretariat as a bridge to the new millennium.

Thank you.

REGIONAL REPORTS

CARIBBEAN: Regional report for the Tropical Americas on activities and programs relevant to the International Coral Reef Initiative (ICRI)

Prepared by
Margaret Jones-Williams and Alessandra Vanzella-Khouri[1]

Introduction

The Wider Caribbean Region

The area of the Wider Caribbean Region, as defined by the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region in 1983 (Cartagena Convention), includes all of the insular and coastal States and Territories bordering the Caribbean Sea and the Gulf of Mexico, from the United States Gulf Coast States and the Central and South American countries bordering the Caribbean Sea, up to the Department of French Guiana in South America (UNEP 1983). It is a vast maritime region of great strategic importance with respect to the global economy, and is struggling to achieve its own economic development. The 28 States and 10 Territories of the Wider Caribbean Region constitute the largest membership of any of the Regional Seas Programs of UNEP. The Region has a combination of the most important geographical and biological diversity of the planet and the countries vary enormously in the size of their populations and resource bases. A significant portion of the economic activity of the Region is linked to the marine and coastal resource base. Many of the countries are highly dependent on their coastlines for tourism and fishing (UNEP 1992). The Region has a high level of biodiversity and holds more than 10% of all endemic bird areas in the world and includes countries that are among the richest in the world in biodiversity, such as Colombia, Mexico and Cost Rica. While species numbers are much lower in the insular Caribbean, in the majority of the islands, especially the larger ones, there are high levels of endemism. In terms of Biogeographic Provinces, the Region has 19 tropical and three temperate terrestrial ecosystems represented (UNEP 1996).

The ICRI region entitled 'Tropical Americas', which covers the Wider Caribbean, also includes the Pacific coasts of Mexico, Central America and South America (at least as far south as Ecuador and its offshore islands e.g. Galapagos), and Brazil.

The Caribbean Environment Program (CEP)

BACKGROUND

The Regional Seas Program was initiated by UNEP in 1974. Since then, the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources, and has requested the development of regional action plans. Each regional action plan is formulated according to the needs of the Region as perceived by the governments concerned. It is designed to link assessment of the quality of the coastal and marine environment, and the causes of its deterioration, with activities for its management and development. The action plans promote the parallel development of regional legal agreements and of action-oriented program activities.

1. CAR/RCU–The Regional Co-ordinating Unit (RCU) of the United Nations Environment Programme (UNEP) through its Caribbean Environment Programme (CEP) in Kingston, Jamaica, is the regional contact point for ICRI.

UNEP's recognition of the environmental importance of coral reefs, as well as the great pressures on these and related ecosystems, has been demonstrated by the inclusion and encouragement of various measures to protect reefs in the regional action plans, as well as by undertaking global studies and assessments and by the publication of various reference manuals and directories relevant to coral reefs and coastal resources management. Furthermore, UNEP has also developed global initiatives such as the Global Program of Action (GPA) for the Protection of the Marine Environment from Land-based Activities which will further contribute to the conservation of coral reefs and their associated ecosystems.

The Caribbean Environment Program (CEP) is one of the twelve Regional Seas Programs of UNEP. It was established to provide a mechanism whereby the culturally, economically and politically diverse States and Territories of the Region could collectively address the protection of the marine and coastal resources of the Wider Caribbean which is the base for their economic development.

In 1981, the governments of the Wider Caribbean Region adopted the Action Plan of the Caribbean Environment Program (CEP) in recognition of the need to address, through regional cooperation, the environmental problems affecting the coastal and marine environment of the Region. The Action Plan emerged as a result of many years of work by government and non-government representatives of the Wider Caribbean community, under the aegis of the United Nations Environment Program.

In adopting the Action Plan, the governments of the Wider Caribbean Region created a forum for discussion and debate on issues of vital importance to achieve a balance between economic development and environmental protection (UNEP 1987). The Action Plan has the following objectives.

- To assist all countries of the Region, recognising the special situation of the smaller island countries.
- To coordinate international assistance activities.
- To strengthen existing national and sub-regional institutions.
- To provide technical cooperation in the use of the region's human, financial and natural resources.

THE CARTAGENA CONVENTION

In 1983, the Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (Cartagena Convention) was adopted in Cartagena, Colombia, as the legal framework for CEP. The text of the Convention was influenced to a great extent by the contents of Part XII of the UN Convention on the Law of the Sea. The Cartagena Convention sets forth general obligations for the Parties in regard to many areas of activity, including pollution from ships, the dumping of waste in the ocean, pollution from land-based sources and seabed activities, airborne pollution, specially protected areas, emergency cooperation, environmental impact assessment, scientific and technical cooperation and dispute resolution. The Cartagena Convention, which has been ratified by 21 governments of the Region, entered into force in 1986. This Convention has been supplemented by three Protocols:

1. Protocol Concerning Cooperation in Combating Oil Spills (adopted together with the Convention);
2. Protocol Concerning Specially Protected Areas and Wildlife (SPAW) (adopted in 1990); and
3. Protocol Concerning Pollution from Land-Based Sources and Activities (currently under negotiation for tentative adoption in late 1999).

ACTIVITIES OF CEP

The CEP, with its associated Action Plan, is still today the only environmental program that officially commits the governments of this vast and diverse Region to join together in the pursuit of the common objectives to protect and manage coastal and marine resources, and which has the unique distinction of being supported by the only environmental treaty for the Region: the Cartagena Convention. The Secretariat for CEP and the Cartagena Convention, and its Protocols, is the Regional Co-ordinating Unit (RCU) of UNEP in Kingston, Jamaica.

The CEP is currently organised into five regional programs: Overall Co-ordination and Common Costs (OCCC), Specially Protected Areas and Wildlife (SPAW), Assessment and Management (AMEP), Information Systems for the Management of Marine and Coastal Resources (CEPNET) and Education, Training and Awareness for the Management of Marine and Coastal Resources (ETA). Each regional program includes diverse activities, such as training workshops, courses, applied research, direct assistance through case studies in countries of the Region, formulation of management plans and regional guidelines, meetings of experts and others.

Overall Co-ordination and Common Costs (OCCC)

In order to provide cohesiveness to the various components of the Program, minimise duplication of effort and maximise project returns, the overall coordination of the Program's components is centralised and is undertaken by the Regional Co-ordinating Unit (RCU) in Kingston Jamaica. The RCU carries out the programmatic, administrative, financial and personnel functions related to the administration of the Action Plan and the Cartagena Convention and its Protocols.

Specially Protected Areas and Wildlife (SPAW)

The SPAW Regional Program was developed to support the implementation of the SPAW Protocol and assist governments of the Region with meeting the objectives set forth in the Protocol. The SPAW Protocol is an innovative legal agreement to facilitate regional cooperation and guide national actions to protect important ecosystems, and threatened and endangered species of national and regional concern. The Protocol responds to Article 10 of the Cartagena Convention and requires parties to take 'all appropriate measures' to protect and preserve 'rare or fragile ecosystems', as well as the 'habitats of depleted, threatened or endangered species' and to this end, establish specially protected areas (UNEP 1983).

There are three Annexes under the SPAW Protocol:

- Annex I (Flora): Fifty-six species of vascular plants;
- Annex II (Fauna): All species in the order Cetacea (whales and dolphins) and Sirenia (manatees), all species of the Phocidae family (monk seals), all six species of sea turtles, and 109 other species of fauna; and
- Annex III (Flora and Fauna): All species in the order of Gorgonacea (soft corals), Antipatharia (black coral) and Scleractinia (stony coral) and all species of the families of Stylasteridae (soft coral) and Milleporidae (fire coral). All species of mangroves, 36 species of vascular plants, including seagrasses and 30 other species of fauna.

Species in Annex I and Annex II require total protection while Annex III includes species of flora and fauna of regional importance which require maintenance at sustainable levels.

The SPAW Protocol has been referred to as 'arguably the most comprehensive regional wildlife protection treaty in the world – it is certainly the most comprehensive of its kind. In addition to the formal annexing requirements and the institutional structure that it establishes, its provisions on environmental impact assessment, planning and management regimes, and buffer zones, as well as the range of protection measures it envisages (including species recovery plans), reflect much of the best in modern thinking on wildlife protection and management' (Freestone 1990). SPAW provides a clear and well-organised framework for both regional coordination and national interventions over a wide range of activities.

The main objectives of the SPAW sub-program are: (1) to assist the governments of the Region with the implementation of the provisions of the SPAW Protocol; (2) to promote the SPAW Protocol at the regional and international levels in order to ensure proper coordination with other relevant biodiversity treaties and initiatives; (3) to promote the management of species of fauna and flora within the Region with the objective of preventing species from becoming endangered or threatened; and (4) to promote the value of the Region's biodiversity through the economic valuation of these natural resources. These objectives are met by activities implemented through the program which include:

- maintenance and updating of databases on protected areas, species and regional experts;

- strengthening of parks and protected areas, promotion of guidelines for protected area establishment, management and revenue generation, development of a network of marine protected areas, and development of a database of marine protected areas;
- training of trainers and protected area managers;
- conservation and sustainable use of major ecosystems of the Region which attempts to assist with the management of these resources on a sustainable basis through a holistic ecosystem approach. A major component of this activity is the United States Agency for International Development (USAID)/UNEP regional project on minimising the impacts of tourism on coastal resources in support of the regional Agenda Action of ICRI. Additionally, coordination and linkages to ICRI have been developed through this activity including coral reef monitoring, involvement of volunteers of dive operations, public awareness and education activities; and
- conservation of threatened and endangered species and development and promotion of regional guidelines for wildlife management. Major activities for sea turtle conservation have been implemented through the regional network WIDECAST. Conservation activities for manatees and migratory birds are also under implementation.

Assessment and Management of Environmental Pollution (AMEP)

The AMEP sub-program concerns assessment and management of environmental pollution. This program supports the activities required for the establishment and enforcement of the measures necessary to prevent, reduce and control marine pollution and to assist countries in the development of integrated environmental planning and management practices of coastal and marine areas. This program assists with the regionalisation of global agreements and initiatives such as Agenda 21 and Global Program of Action for the Protection of the Marine Environment from Land-based Activities (GPA). Program activities analyse and assess regional/sub-regional marine pollution problems and the institutional capacity for handling these problems, and propose recommendations for the mitigation of environmental impacts and institutional strengthening.

The main objectives of the AMEP sub-program are to support the implementation of the GPA, the Oil Spills Protocol and the protocol on Land-based Sources of Marine Pollution (LBSMP). Furthermore, it seeks to assist the countries of the region in integrated environmental planning and management related to the use of coastal and marine areas and their resources; and to assist in the development of guidelines regarding the application of regulations and economic steering instruments toward the establishment and enforcement of measures necessary to prevent, reduce and control marine pollution.

The land-based sources and activities protocol has annexes that address pollution from different specific sources. The first two annexes will deal with domestic wastewater and agricultural non-point sources of pollution. In order to assist the countries in developing these annexes, two overviews on the most appropriate technologies for domestic sewage treatment and Best Management Practices (BMPs) for agricultural non-point sources of pollution in the region have recently been completed.

Information Systems for the Management of Marine and Coastal Resources (CEPNET)

CEPNET provides a solid technical foundation and supporting infrastructure for the CEP and the RCU Secretariat including information management services, database development and maintenance, computer and network systems support, and associated technical training. CEPNET is instrumental in strengthening the role of the CAR/RCU and assisting the CEP in serving the needs of the focal points, non-government organisations, other stakeholders and the public at large in the areas of environmental information, technical cooperation and specialised consultation.

CEPNET is involved in other CEP sub-programs so that data and information is produced in an appropriate manner for further dissemination and utilisation in the region. CEP publications will be produced on an in-house 'print-on-demand' production basis with all technical reports and public documents put on the World Wide Web (WWW). This web page is updated regularly with urgent information and news, completed databases, publications and other appropriate material.

A CEPNET project funded by the Inter-American Development Bank (IDB) is being finalised and is in the process of developing an Internet-based Information Management System (IMS) for the Wider Caribbean Region. The CEPNET website includes information on CEP and its sub-programs, CEP Technical Reports, publications and databases and information about selected environmental issues relevant to the Wider Caribbean Region. A web-based Geographic Information System (GIS) and a customised query engine able to search metadata in relation to select Caribbean datasets are also on-line and continuously evolving. As the project progresses, the website is expected to become a clearing house for environmental information about the Region, encompassing the nodes from participating countries within the information network. The site is expected to become an important tool that can be used to search for data and information about Caribbean marine and coastal environments and about ongoing environmental projects in the Region. The address for the website is **http://www.cep.unep.org**

Education, Training and Awareness for the Management of Marine and Coastal Resources (ETA)

The main objectives of the ETA Regional Sub-Program are:

- to transform and improve educational systems for the integration of consistent and positive behaviour towards the environment, especially an understanding of the value and relevance of marine and coastal resources;
- to strengthen training programs at the national and regional levels, aimed at the improvement of technical and managerial skills of decision makers responsible for the management of marine and coastal resources; and
- to support the public awareness efforts of the media, community-based and non-government organisations geared towards the economic sectors and the general public for a better understanding of and a positive interaction with marine and coastal resources.

ETA program activities include: meetings of experts on education, training and awareness for the management of marine and coastal resources; publication and dissemination of multimedia educational resource materials on marine and coastal issues for primary and secondary school levels; strengthening of the Consortium of Universities for training in the management of marine and coastal resources; development of regional media centres for marine and coastal resource management; and establishment and operation of a training and technical cooperation program to support community initiatives for marine and coastal resource management.

International Coral Reef Initiative (ICRI) in the Wider Caribbean Region

The International Coral Reef Initiative (ICRI) was launched by a coalition of eight governments, five of which participate in CEP (France, Jamaica, Sweden, United States of America and United Kingdom). ICRI's international strategy is to mobilise the political will of governments and other partners for the conservation and sustainable use of coral reefs and related ecosystems. This strategy provided the basis for the convening of six regional meetings worldwide to identify priorities for action at international, regional and national levels. The Tropical Americas/Caribbean Region took the lead in this matter as the first regional workshop was undertaken in Jamaica 5–8 July 1995 at the Consultation on Coastal Resource Management in the Tropical Americas. Financial support was given by the United States Government, the Jamaican Government and the UNEP-CEP.

The Regional Agenda for Action of ICRI for the Tropical Americas/Caribbean

The Tropical Americas Region launched its participation in ICRI through the above-mentioned regional workshop. This was the first regional workshop to discuss regional and national opportunities for ICRI.

Recognition of coral reefs and related ecosystems as productive and biologically diverse marine ecosystems which are of global significance resulted in a call for immediate action to conserve and sustainably use coral reefs and related ecosystems at local, national, regional and international levels by diverse stakeholders. Of special concern was the recognition of the regional scale of degradation, the substantial decline of coral cover in some areas, and the devastating combined effects of human and natural disturbances. It was noted that without immediate action food security would be threatened, key economic growth sectors such as tourism would decline, jobs would be lost, beach and coastal erosion would accelerate and marine biodiversity would be irretrievably diminished.

The main products of the regional workshop were the Montego Bay Declaration and the Regional Agenda for Action.

THE MONTEGO BAY DECLARATION

The Montego Bay declaration states the following.

The participants of the Tropical Americas Workshop being concerned with the state of coral reefs and related ecosystems globally and regionally; being particularly concerned at the continuing rapid deterioration of reefs in our own region; recognising the immense ecological/biological and socio-economic value of these fragile marine resources in this region; being aware of the principles of sustainable development as articulate by Agenda 21, and being aware of the International Coral Reef Initiative Workshop, having taken place in the Philippines from May 29 to June 2, 1995 and the resulting *Call to Action* and *Framework for Action,* agree to:

- welcome ICRI in the Tropical Americas and endorse the ICRI *Call to Action* and *Framework for Action*;
- call on Governments and other potential ICRI partners to endorse the ICRI *Call to Action* and commit themselves to collaborate in implementing the ICRI *Framework for Action* in order to achieve conservation and sustainable use of these resources;
- call on Governments and other potential ICRI partners to endorse and implement the Agenda for Action of the Tropical Americas developed at this Consultation;
- call on Governments and other potential ICRI partners to institute immediate action to address the urgency of the threat to coral reefs and related ecosystems in our region, and to the communities that depend on these resources;
- call on Governments and other potential ICRI partners to establish local, national and joint regional actions, including at the regional level the incorporation of ICRI actions in intergovernmental organisations and other government and non-government regional associations;
- call on the ICRI partners to raise awareness of the global importance of the coral reefs and associated ecosystems at local, national, regional and international levels;
- call on ICRI government partners to establish national focal points for ICRI activities in order to foster local, national, and regional coral reef initiatives; and
- request that the UNEP/CEP agree to act as a regional contact point for the ICRI Tropical Americas Agenda for Action and to evaluate the region's progress on implementing the regional Agenda for Action by the end of 1996.

REGIONAL AGENDA FOR ACTION

The ICRI Framework and the Tropical America's Agenda for Action are intended to mobilise governments and the wide range of other stakeholders whose coordinated, vigorous and effective actions are required to sustain these fragile resources, and the communities that depend on them. The International Framework focuses on how the international community can support regional, national and local activities. The Tropical America's Agenda for Action consists of an evolving regional process outlining steps to provide an early basis for enhanced regional collaboration. The goals outlined are:

- to develop sustainable Integrated Coastal Zone Management (ICZM) through a coordinated and action-oriented institutional policy and legal framework which emphasises equity, empowerment and transparency;
- to achieve sustainable management and conservation of coastal and marine resources through targeted education and environmental awareness;

- to achieve sustainable development of Coastal Zone Management (CZM) through a partnership of public and private sectors, resource users, local communities, non-government organisations (NGOs), the scientific community and donor agencies;
- to improve management of coral reef and related ecosystems, management to optimise resource use and ensure healthy coral reef ecosystems, and public awareness on coral reef fisheries;
- to achieve the sustainable management of coastal and marine resources through the establishment and management of coastal and marine protected areas consistent with international law;
- to reduce through the ICZM process the land-based (point and non-point) sources of pollution reaching the coastal and marine environment of the Region;
- to utilise research and monitoring to facilitate better management of coastal and marine resources; and
- to improve regional and national capacity to generate and access funds for managing coastal resources on a sustainable basis.

Caribbean Environment Network (CEN) Project

A major project emanated from the ICRI Regional Workshop in Montego Bay in response to ICRI's Regional Agenda for Action and is being implemented through UNEP's Caribbean Environment Program (CEP). The Caribbean Environment Network (CEN) Project is an integral component of the sub-program of CEP on Specially Protected Areas and Wildlife (SPAW) and is a joint venture with the United States Agency for International Development (USAID) in Jamaica, which is the main donor agency. The Project was designed to focus on tourism, given the importance and scope of the industry in the Wider Caribbean Region and the close linkages with various marine and coastal habitats in the Caribbean. It is the goal of the CEN project to work towards breaking barriers among stakeholders and to provide a venue for alliances and partnership so as to promote tourism as an environmentally, economically and socially sustainable industry in the Wider Caribbean Region. The project aims at:

- improving environmental quality and the conservation of natural resources of the coastal and marine environment; and
- reducing environmental impacts of tourism on coastal and marine resources.

As part of the baseline information needed to guide the implementation of the activities of the project, a study on Coastal Tourism in the Wider Caribbean Region, its Impacts and Best Management Practices was carried out. A report was published and widely disseminated in the region during 1998 (CEP Technical Report No. 33). The report includes an overview of tourism and coastal resources degradation and detrimental practices of the tourism industry in the Wider Caribbean, costs and benefits of coastal resources, best management practices in coastal tourism and initiatives for mitigation of coastal resources degradation.

The CEN project consists of:

- training related to environmental aspects of tourism in the marine environment;
- demonstration pilot projects minimising the impacts of tourism in coastal areas; and
- public awareness and information networking.

The pilot demonstration project component includes:

- integrated coastal resources management in the Dominican Republic with special emphasis on tourist areas;
- rehabilitation of sand dunes in Anguilla; and
- improvement of quality of near-shore waters on the west coast of St. Lucia.

The training component includes courses in the following areas:

- water and solid waste management for the tourism industry;
- tourist facility design and siting; and
- Integrated Coastal Area Management (ICAM) and the tourism sector.

The training component included publication of three training manuals *(Integrated Coastal Management, Tourist Design Facilities and Waste Management).* These manuals will serve as valuable reference materials for wide dissemination and will complement and promote replicability of the training experience, not only throughout the Caribbean but other regions as well.

As a part of the information and networking component, support is being given to activities carried out by the Puerto Rico-based Caribbean Action for Sustainable Tourism (CAST) under the Caribbean Hotel Association (CHA). CAST is a major private-sector effort in implementing Agenda 21 for the tourism industry in the Caribbean. CAST seeks to educate and develop the practices of the Region's hoteliers. The Governing Council of CAST is composed of leading figures from the Hotel, Tourism, Manufacturing and Agricultural sectors. The main outputs produced by CAST under the CEN Project are:

- a Green Resources Directory which identifies a wide variety of environmental techniques, related products and services for improved management of tourism facilities;
- an Environmental Management Toolkit which is a volume with guidance on environment enhancement for hotels and health perspectives incorporated in cooperation with the Pan-American Health Organisation, and is published in English and Spanish;
- a Regional Environmental Action Plan for the tourism industry which focuses on hotels addressing steps to implement priorities of Agenda 21 within the Caribbean;
- a Caribbean Code of Conduct for Tourism is to be produced as a set of consolidated guidelines including those proposed by UNEP/Industry and Environment (UNEP/IE), the World Trade 7 Tourism Council (WTTC), the International Hotels Environment Initiative (IHEI) and their relationship to ISO 14000 standards for environmental management systems; and
- a Regional Overview of Best Practices employed in tourism facilities such as hotels, dive operators and marinas is on going, focusing on concrete case studies as examples of such practices.

Global Coral Reef Monitoring Network (GCRMN)

The GCRMN was established to tackle the problems of deterioration of coral reefs and to provide valid management data. The GCRMN's major product will be the facilitation of networks of people trained to monitor the progress of coral reefs over time. This will also provide knowledge and data on reef status and trends. The Inter-governmental Oceanographic Commission (IOC), UNEP and the International Union for the Conservation of nature (IUCN) have joined forces to co-sponsor the GCRMN. The GCRMN functions through 25-30 independent networks or nodes in six regions around the world, one of which is the Caribbean and Tropical Americas.

The Data Management Centre of CARICOMP (see Section 2.4) serves as the main node for the GCRMN in the Caribbean. The Centre will be the depository of coral reef monitoring data from the CARICOMP sites, as well as from other sites willing to participate in the global network. Although participation in the GCRMN by the Region has just begun, more active participation is expected as the Region's monitoring activities increase and coordination is improved. UNEP-CEP will continue to serve as a catalyst to ensure the Region's full participation in the GCRMN and its global database Reef Base, which is available on CD-ROM.

The Bahamas, Belize and Jamaica, working together in the Caribbean Planning for Climate Change Program (CPACC), have requested to join GCRMN as a node and this was proposed through CARICOMP. Close collaboration between GCRMN, CARICOMP and Reef Check is currently underway. Discussions were held with the French Environment Department on implementing GCRMN in French Departments and Territories and what role France may play. A meeting was held in Cancun, Mexico, 29 April-1 May 1998 to plan for the conservation and management of Mexican reefs. This meeting was supported by a wide group of both Mexican and US agencies interested in linkages to the GCRMN.

Caribbean Coastal Marine Productivity (CARICOMP)

Up until the early 1980s, studies on coral reefs, seagrasses and mangroves were separate disciplines. Then, in 1985, UNESCO convened a workshop on the interactions between these systems. At this meeting the idea of a Caribbean-wide research program was conceived and became known as the Caribbean Coastal Marine Productivity (CARICOMP) program. CARICOMP's major concerns are to measure regional differences in coastal productivity and to monitor coastal ecosystems for changes. Through its Caribbean-wide network it is able to monitor regional events such as coral bleaching and other diseases, and works to distinguish natural from anthropogenic impacts. Twenty-nine participating institutions from 22 countries have agreed to send data to the Centre for Marine Sciences at the University of the West Indies in Jamaica, where a database is held which will shortly be available for queries on the World Wide Web. This network will form the nucleus of the GCRMN in the Caribbean.

The CARICOMP program continued its basic Level 1 biophysical monitoring of mangroves, seagrasses and coral reefs and was extended at some locations in Level 2 by assessing coral reef fish abundance and the prevalence of algae on coral reefs. In September 1998 it will make a new survey to assess the prevalence of coral diseases. CARICOMP also plans to extend monitoring to the use of coastal biological resources by local communities. A preliminary assessment was conducted on seven Caribbean sites. In May 1998 a workshop was held at UWI, Mona, Jamaica on 'The use of natural resources at CARICOMP sites: monitoring, community-based management and socioeconomic/cultural studies'. This was funded through CARICOMP by the UNESCO/CSI program (Environment and Development in Coastal Regions and Small Islands), and brought together natural and social scientists from a number of countries in the Region. Three main questions were addressed:

1. What can social science contribute to our understanding of the dynamics of coastal resource use in the Caribbean?
2. How should community-based management be facilitated?
3. What kinds of data should be collected about resource use and resource-users?

CARICOMP reported results of its monitoring work from 1992 to 1995 at the 8th International Coral Reef Symposium held in Panama in the summer of 1996. Of particular relevance to ICRI are the papers on mangroves, turtle grass and coral reefs, as well as the monitoring of a disease affecting sea fans.

International Year of the Reef (IYOR)

The International Year of the Reef (IYOR) in 1997 was a global initiative and produced a major effort in the following areas:

- Capacity building for reef management;
- Outreach and education;
- Research patterns of degradation and their causes;
- Assessing the condition of coral reefs worldwide; and
- Leading sustainable management efforts for reefs.

IYOR provided a global context for national and regional efforts and promoted collaborative coordination between organisations and programs with common interests and aims in reef management and research. IYOR pursued the goals of ICRI, a partnership of nations and organisations seeking to implement Chapter 17 of Agenda 21 and other international conventions and agreements for the benefits of coral reefs and related ecosystems. Major activities of IYOR 1997 for the Caribbean and Tropical Americas Regions included the following.

- A brochure was produced entitled '25 things you can do to save Coral Reefs in the Wider Caribbean'. This was originally developed by the National Oceanographic and Atmospheric Agency (NOAA) in the United States and was translated into Spanish and French and adapted for the Region.
- Media packages were developed by the Caribbean Environment Program (CEP) of UNEP, produced in English, French and Spanish and widely disseminated throughout the Region.

- Several issues of the CEP newsletter (CEPNEWS), which is published in English, French and Spanish, were dedicated to IYOR issues and continue to carry updates on coral reef programs.
- Individual countries (e.g. Bahamas, Colombia, and Jamaica) developed national IYOR campaigns.
- An annotated selection of publications and materials that have been designated as 'tools' or 'toolkits' for coral reef management was prepared. Seventy-eight titles were listed under the headings of General, Integrated Coastal Management, Protected Areas, Technical Aspects, Processes and Methodologies.
- The Smithsonian Tropical Research Institute's exhibit 'Our Reefs: Caribbean Connections/Nuestros Arrecifes: Unidos por el Caribe' focuses on coastal environmental and societal conservation problems such as overfishing, excessive sediments and nutrients, and local actions drawn from around the Caribbean. It has had successful showings in the Caribbean starting with the opening at the Panama Coral Reef Symposium in summer 1996, at various sites throughout the Region in Panama, Florida (several sites), Honduras (three sites), Jamaica (three sites) and Puerto Rico (three sites). It is a very popular exhibit that draws large crowds.
- An IYOR environmental Dive Festival was hosted by the island of Bonaire in conjunction with the Coral Reef Alliance (CORAL) where divers from around the world converged for a week of educational seminars and diving with marine biologists, conservationists and other reef experts. Seminars were presented by the Centre for Marine Conservation REEF, the Divers Alert Network and the Bonaire Marine Park.
- The US Virgin Islands also had similar public outreach programs via public meetings and hearings, the production of a coral reef video and dissemination of new materials, while the British Virgin Islands focused on local community awareness to increase the information database in schools and libraries and to encourage young people to have respect for the environment.
- Puerto Rico celebrated the IYOR by convening a Working Conference through the Sea Grant Program of the University of Puerto Rico entitled 'Taking Action for Coral Reefs' held 6-8 November 1997. The conference reviewed the recommendations of the 1993 Colloquium on Global Aspects of Coral Reefs: health, hazards and history as they relate to the Wider Caribbean Region and to identify management options, establish action plans and working groups to set up pilot projects to protect reefs in the Puerto Rico and US Virgin Islands geographic area.

Reef Check

Reef Check is an initiative to bring together the dive industry, recreational divers and coral reef scientists to measure the health of the world's reefs. The results of the first global survey of the human impact on the world's coral reefs showed that the reefs continue to suffer damage due to human contact. Reef Check 1997 completed three hundred surveys and an expanded and improved Reef Check 1998 started on 1 April 1998. A list of Reef Check Teams and Survey Sites for the Caribbean has been extracted from a list provided by Gregor Hodgson of Reef Check. Major findings from the Reef Check exercises showed that lobsters were more common in the Caribbean Region than the other regions, although the numbers of lobsters, sea urchins and sea cucumbers had decreased remarkably in the Caribbean. Previous reports suggested that lobsters were once abundant on coral reefs everywhere and the major reduction in lobster populations which has been recorded on shallow Florida reefs over the past fifty years has been replicated throughout the tropics. Studies on fish showed that the number of species of butterflyfish in the Caribbean is ten times lower than in the Indo-pacific Region, and the results for parrotfish in the Caribbean were similar to those for butterflyfish. High abundance of encrusting sponges may be an indication of high nutrient levels or other problems and the percentage cover of sponges was not found to be high at any site surveyed. Thirty per cent of Caribbean sites had more than 5% encrusting sponge cover. The Reef Check data and information is also being fed into the global Reef Base database. Reef Check is regarded as the non-scientific and voluntary monitoring component of the GCRMN. More information on Reef Check is available at **http://www.ust.hk/~wwebrc/ReefCheck/reef.html**

ICRI Activities in the Wider Caribbean Region

The following account on progress and activities in the Wider Caribbean Region over the last two years is given under the four ICRI cornerstones:

- Integrated Management;
- Capacity Building;
- Research and Monitoring; and
- Performance Evaluation.

All the information was compiled from reports sent in by correspondents within each country (see Acknowledgements) or taken from existing relevant publications (see References). The cornerstone that generated the most activity was that of Capacity Building, while Performance Evaluation (Review) was the cornerstone for which the least amount of activity was reported. The following account does not include the full range of training, best practices and technical assistance activities developed under the USAID/UNEP CEN project which emanated from the ICRI Regional Agenda for Action.

INTEGRATED MANAGEMENT

The information is reported under sub-headings based on the guidelines from the ICRI secretariat. The topics covered include new measures to develop and adopt a culture of integrated coastal management (e.g. legal reform, institutional restructuring and management planning), new coastal management projects or programs, new cooperative activities among stakeholders, institutions and funding bodies (and their coordination and implementation) and priority actions. There is some overlap between the sections and so the section headings serve only as a guideline to the responses received.

Legal Reform, Institutional Restructuring and Management Planning

On 11 June 1997 the Government of Belize officially established the Belize Barrier Reef Reserve system as a World Heritage Site under the World Heritage Convention of UNESCO. On 5 June 1997 the Governments of Belize, Guatemala, Honduras and Mexico signed the Tulum Declaration which launched the Meso-American Caribbean Coral Reef Initiative. Through this they pledged their commitment to protect and ensure the sustainable use of the Barrier Reef of Belize, the largest barrier reef to be found in the Western Hemisphere.

In Grenada draft management plans and regulations for Marine Protected Areas, in support of the initiation of a System of Marine Parks, have been prepared and submitted to the Legal Affairs Department for Review.

St. Lucia, the largest wetland on the south-east coast, is now being co-managed and exclusive access rights have been granted to the Aupicon Charcoal and Agricultural Producers Group for charcoal production in this marine protected area.

Within Barbados there has been an attempt over the last five years to increase the culture of integrated coastal management. In 1992, the Barbados Government drafted a Coastal Zone Management Act aimed at strengthening the institutional capability of the Coastal Zone Management Unit (CZMU). This draft Act has gone through several revisions since that time and was presented to Parliament in August 1998. The CZMU is involved in a project aimed at developing a coastal zone management plan for the east coast of the island following on from those developed for the west and south coasts between 1991 and 1995. The Coastal Zone Management Project, which is a part of the Ministry of Agriculture and Fisheries in Belize, is funded by the UNDP and the GEF and was recently involved in the successful nomination of seven marine reserves as World Heritage Sites in December 1996. It has also encouraged the participation of the various stakeholders in the planning and management process by the formation of special committees, with a view to introducing the mechanism of full co-management. The Project has also encouraged coordination between the various agencies involved in coastal management through a Technical Committee that comprises representatives from the public sector, the NGO community, the private sector and the university.

In Jamaica one of the most important recent measures was the creation of the Council on Ocean and Coastal Zone Management in April 1998. This is an inter-sectoral coordinating committee, chaired by the Minister of State for Foreign Affairs and Foreign Trade, which reports directly to Cabinet. The Natural Resources Conservation Authority (NRCA) has written policy documents on the management of coral reefs and wetlands and coastal protected areas have been declared in Negril on the west coast and the Portland Bight on the south coast. The NRCA has also developed a coral reef management policy with input from scientists, managers and stakeholders and prepared a Jamaica Coral Reef Action Plan (JCRAP). Jamaica's Coral Reef Action Plan and Policy was developed by adapting ICRI's regional Agenda for Action to the local context and by inviting the public and private sectors, NGOs and other relevant stakeholders to comment and provide inputs. In Negril, the Negril Environmental Protection Area (NEPA) was initiated in October 1997 to better understand and effectively manage the land-based sources of nutrients fuelling the eutrophication of Negril's coastal waters which has resulted in reef degradation over the years.

In the United States Virgin Islands, the Department of Planning and Natural Resources and the Coastal Zone Management Unit require that sensitive construction site projects maintain responsible development practices and fund environmental impact monitoring. The Conservation Data Centre (CDC) has embarked on the preparation of a conservation plan for the Islands, recognising the entire land mass and coastal waters as a coastal zone.

As mentioned above, the Caribbean Environment Program (CEP) of UNEP is currently working with governments to finalise a legal Protocol to address land-based sources and activities of marine pollution. This is expected to be adopted in 1999. In support of this process two major overview studies were finalised. The first is entitled Appropriate Technology for Domestic Wastewater Control (CEP Technical Report No. 40) which gives an overview of different treatment technologies appropriate for the Caribbean Region with a literature review and fact sheets for different technologies as well as a methodology for selecting appropriate technologies. The second is entitled Best Management Practices for Agricultural Non-point Sources of Pollution (CEP Technical Report No. 41) and describes different agricultural non-point sources of pollution and different Best Management Practices (BMPs), including structural and non-structural BMPs as well as the socioeconomic factors involved in their implementation.

In collaboration with the World Travel and Tourism Council's Green Globe, the Caribbean Action for Sustainable Tourism (CAST) is promoting a certification program for environmental conservation for the hotel industry, similar to that of ISO 14000. This is expected to be another mechanism for gathering information and monitoring change.

A major activity of the SPAW program of UNEP's CEP in 1997 was the initiation of a network of marine protected areas (MPAs) for the Wider Caribbean Region which directly responds to the provisions in the SPAW Protocol of the Cartagena Convention. There are over two hundred and fifty marine protected areas, which have been established or proposed in the Wider Caribbean, but of these, only 30% are being properly managed. A regional workshop brought together managers of the MPAs to address common problems and to strengthen the management capabilities of the areas while enhancing conservation, protection and restoration of coastal and marine resources in the Region. This activity resulted from inter-government and expert consultations that have highlighted the importance of strengthening protected areas in the Wider Caribbean. More than 50 partners in marine protected area management attended the workshop, representing government, scientific and non-government organisations from 22 countries of the Wider Caribbean. The objectives of the meeting were to review and discuss strengths, resources and needs of marine protected areas in the Region, to review relevant precedents and experiences on MPA networking and initiate development of a sustainable platform for collaboration, sharing, communication and information exchange among MPAs in the Region. The meeting agreed on the need for an MPA network for the Region to be called 'CaMPAM' (Caribbean Marine Protected Areas Management). This is currently being developed in collaboration with MPAs, governments, regional and international organisations and other interested parties and being co-facilitated by Biscayne National Park in Florida, USA and UNEP-CEP.

Coastal Management Projects/Programs

One of the projects initiated by the US Virgin Islands Conservation Data Centre (CDC) is a natural community survey of terrestrial and marine benthic communities. When completed, this project will result in a complete flora and fauna list for each community type, a characterisation of those species with conservation concern, new GIS data sets and mapping terrestrial and benthic communities of the Territories. Locally initiated and executed integrated management has been demonstrated by the diving tourism community in Akumal, Mexico. The community is a model of entrepreneurs who have taken the initiative to create and actively support a local ecological/cultural conservation centre, install composting toilets and construct wetlands for nutrient retention, provide free beach access to the Mayan workforce and their families, fund hydrological and sea turtle research/remediation, and host university students who monitor local reefs. A new community project of local NGOs in the village of Puerto Morelos, Mexico was started to prevent a large hotel development project from clearing a major strip of mangrove forests which would have affected coral reefs nearby.

The Montego Bay Marine Park Trust (MBMPT) in Jamaica has two new projects that support coral reefs. These are the Coastal Water Improvement Project (CWIP) and the Ridge to Reef project, both of which are USAID initiatives in collaboration with the Government of Jamaica. They will be pursued at several sites other than Montego Bay, beginning in Negril. The MBMPT is also a part of a GEF funded project, Caribbean: Planning for Adaptation to Global Climate Change (CPACC), and are a part of Component 5: Coral Reef Monitoring for Climate Change. They are also involved in a World Bank sponsored project called Marine System Valuation: An Application to Coral Reef Systems in the Developing Tropics, from which papers have already been published. In other areas of Jamaica where marine protected areas are being planned (Discovery Bay, Portland Bight, Negril) and which have major artisanal fisheries, programs have been put in place to promote sustainable fishing practices such as the use of large-mesh traps and the banning of dynamite. It is important to note that although dynamite fishing is banned in most countries of the Region; it is a practice still often used in many countries.

Cooperation Among Stakeholders, Institutions and Funding Bodies

The World Bank has a small but growing pipeline of International Coastal Zone Management (ICZM) activities in the western Caribbean. Most of these are in the design stage or just about to begin implementation. One of these is a pilot project in the Mexican state of Veracruz that will be launched in 1999. The project has several components including Environmental and Coastal Resources management (US$6.9 million, 12% of total costs), Integrated Coastal Resource Management (US$1.9 million, 3.3% of total costs), Monitoring of Coastal Wetlands and Water Quality (US$2.6 million, 4.5% of total costs), and Environmental Planning and Assessment (US$0.9 million, 1.5% to total costs). Another new regional initiative by the World Bank is the Meso-American Barrier Reef System Initiative that is being developed with GEF support and the governments of the four countries involved (Mexico, Belize, Guatemala and Honduras) along with a number of NGOs.

The International Union for the Conservation of Nature (IUCN) has been working with the US National Park Service and UNEP on the regional protection of coastal habitats with the development of the Wider Caribbean Marine Protected Area Managers Network (CaMPAM). IUCN is also working to develop a Conservation Trust Fund for the Region and is involved in the organisation of the Gulf and Caribbean Fisheries Institute (GCFI) Workshop on Fisheries Management and Marine Protected Areas to be held in St. Croix in November 1998. Other major regional initiatives include the implementation of the regional UNEP/USAID CEN project which aims at reducing environmental impacts on coastal and marine ecosystems by the tourism industry, and the development of coordination efforts with the various coral reef monitoring groups in the region to explore collaboration and encourage linkages to and participation in the GCRMN.

In Barbados there are five demonstration projects that are being designed by the communities in consultation with the Government and each have participating stakeholder groups. The aim of these projects is to be community originated, developed and sustained as a means of improving the revenue generation for the community and to encourage the communities to feel that they are contributing to the sustainable use of the island's coastal resources. In Puerto Rico training activities have been developed through the Consortium of Caribbean Universities for Natural Resource Management (CCUNRM) which have been funded by UNEP and USAID under the CEN Project.

In 1997, in Jamaica, a sanctuary area to protect fish was created in the western part of Discovery Bay on the north coast of the island. The Discovery Bay Fisheries Reserve is operated by the Alloa Discovery Bay Fishermen's Association (DBFA) which employs rangers. A Reserve Planning Group acts as a management committee and includes representatives from DBFA, the Fisheries Improvement Program (FIP) of the University of the West Indies (UWI), the Discovery Bay Marine Laboratory, the Coastguard and other users of the Bay. Funding for the Reserve is provided by the Kaiser Jamaica Bauxite Company through a grant to the Centre for Marine Sciences at the UWI. Also in Jamaica, the Montego Bay Marine Park Trust (MBMPT) and the Environmental Watch Organisation (EWO) formed a merger to allow for a unified effort in dealing with environmental issues.

In the US Virgin Islands there has been much collaborative research between different agencies. The DPNR and the Virgin Islands Marine Advisory Service have installed pump-out stations for recreational boat sewage discharge, started a mobile pump-out project to service live-aboards, and have created an Implementation Plan for pump-out stations and a recreational vessel sewage disposal Management Plan. The Conservation Data Centre (CDC) and The Nature Conservancy (TNC) have developed a Rapid Ecological Assessment and Inventory of Marine and Terrestrial Organisms. The International Centre for Living Aquatic Resources Management (ICLARM) and the Eastern Caribbean Centre of the University of the Virgin Islands are collaborating on research between the US Virgin Islands and the British Virgin Islands on larval fish distribution and settlement patterns in these islands.

Priority Actions

The Centre for Marine Sciences at the UWI in Jamaica sees a need for education on the necessity of inter-sectoral collaboration, and a holistic, collaborative view of coastal affairs, as well as better planning rather than a free market for private developers. Another priority for Jamaica is the need for NGOs to work together instead of competing with each other for limited donor funds. The US Virgin Islands sees a need to apply the provisions of the Coastal Zone Management Act to the entire coastal zone, which includes all land areas and the territorial waters, and to coordinate agencies that develop plans for water quality and fisheries with the units that regulate development.

Several priority actions for Barbados include the passage of the Coastal Zone Management Act, the further strengthening of the CZMU, greater coordination with Government agencies and development and interpretation of the integrated management of coastal areas in a manner suitable for dissemination to the public.

The Caribbean Hotel Association (CHA) in Puerto Rico suggests that a system such as the Blue Flag system for beaches in Europe be considered for implementation in the Caribbean. Costa Rica has adopted a similar system in which all stakeholders have a vested interest in maintaining pristine beaches. Those beaches that are kept clean and healthy are the only ones that are promoted by the local Tourist Board on maps and promotional materials.

The CCUNRM in Puerto Rico sees an overpowering need in the Region for training and education in the modern approach of integrated coastal area management. Stronger efforts are needed in the establishment of interdisciplinary and multi-sectoral working groups for the analysis of coastal issues and for decision making. There is also a need in the tourism sector, which probably has the largest impact on the coral reefs, to enhance their capacity in the understanding of the ecological services and values and interconnections of the coastal ecosystems.

CAPACITY BUILDING

Under the cornerstone of capacity building, information has been grouped under sub-headings based on the guidelines. The areas of interest are new measures to enhance the capacity of individuals and institutions to manage coral reefs, the approaches that are being taken (e.g. training courses, technical advice), measures to strengthen public awareness programs and needs for priority action.

Enhancement of Individuals and Institutions

In addition to the media packages on IYOR prepared by CEP (Section 2.6) US agencies, UNEP-CAR/RCU and other institutions collaborated to publish a bilingual teachers' manual (English/Spanish) on Compilation of Activities for Middle School Students to promote coral reef conservation. This has been distributed throughout the Region. During 1998, UNEP-CEP provided assistance to Governments for the assessment and monitoring of coral reefs. In the Region the 8th International Coral Reef Symposium was held in Panama in the summer of 1996. Among the 36 Symposium sessions was one on the Status of Coral Reefs around the World, in which five of the fourteen papers submitted dealt with parts of the Caribbean, and a session on CARICOMP. A coral reef monitoring manual for governments has been initiated by CARICOMP that will include, and adapt as appropriate, relevant methods being utilised in the Region and will be compatible to the GCRMN efforts.

Capacity building has also taken place through the use of short training courses hosted by consultants or through allowing attendance overseas by staff of the CZMU in Barbados, which has included post graduate training overseas. Similarly the CZM Project in Belize has provided training to degree level of six officials in coastal management related fields, as well as six short-term fellowships and supported attendance of government officers at meetings. The Siwa-Ban Foundation in Belize has developed an ecological education program for SCUBA tour guides. The Fisheries Improvement Program (FIP) through the Centre for Marine Sciences (CMS) at the University of the West Indies (UWI), Jamaica, has been working with fishers in the vicinity of Discovery Bay to enhance their ability to manage coral reef fish stocks. This has been done by an education program, by extension of the mesh exchange program to other areas, by encouraging the formation of fishers' organisations and by assisting in the formation of protected areas.

In the Virgin Islands the Department of Planning and Natural Resources (DPNR) has hired persons specifically to carry out tasks associated with the Coral Reef Initiative. The Conservation Data Centre (CDC) is constructing data sets as part of the Rapid Ecological Assessment which will result in ready access to accurate data which should enhance the capabilities of those charged with the responsibility of managing the coral reefs. The Island Resources Foundation in the Virgin Islands is one of the oldest regional NGOs and they maintain five separate mailing lists via the Internet. These are the Caribbean Biodiversity Conservation, Environmental Working Group, Caribbean GIS users, the Virgin Islands Research Management Co-operative, and the Caribbean Consulting Group for Small Island Developing States Information Network. More information can be obtained from the website at **http://www.irf.org/**

A training course for MPA managers is tentatively planned for early 1999 as part of the UNEP-CEP and SPAW 'training of trainers' protected areas program. A comprehensive MPA database for the Region was finalised and distributed in CD-ROM format, in partnership with Environmental Solutions International (ESI), USA, the US Fisheries and Wildlife Service, UNEP-CEP and other partners.

The CPACC is investigating the possibility of combining two proposed training events into one workshop during March 1999. This will include training representatives from CPACC pilot countries in site selection and monitoring protocols and a data processing workshop. The workshop is aimed at ensuring consistency in the approach to coral reef monitoring activities in each of the pilot countries. Consideration is also being given to providing centralised data processing services through the Centre for Marine Sciences Data Management at the UWI in Jamaica. This service would provide the Bahamas and Belize with the option of having coral reef video data analysed and interpreted if in-country data analysis capacity is not available when the monitoring program begins in 1999.

Public Awareness and Education Programs

Many organisations and institutions have developed pamphlets for dissemination to the public or have received and disseminated pamphlets provided to them by international groups. Along with these have been community outreach efforts in the form of talks and school activities. Additionally, a number of useful publications were developed by the Caribbean Hotel Association (CHA) and the Caribbean Action for Sustainable Tourism (CAST) under the USAID/UNEP CEN project.

The UWI is introducing a new MSc course in Natural Resource Management, in which one of the specialisation streams will be in Coastal and Marine Resource Management and will be taught first at the campus in Barbados. In Puerto Rico the Co-operative Extension Service (ECS) sponsors public workshops and distributes literature related to improving coastal water quality. The CDC provides technical advice and student training on GIS issues and provides mapping support for other agencies. TNC provides information leaflets on minimising impacts on marine organisms and environments. VIMAS provides education brochures, school visits, videos and public educational programs and Reef Rangers involves school children in addressing local marine environment. Additionally, the DPNR has produced Coastal Zone Management and Coral Reef Educational Videos and have ongoing educational projects with schools while the F&W distributes marine awareness and fishing regulation pamphlets. Workshops on beach and dune management are being developed for tourism and natural resources department personnel. In the Dominican Republic a very successful program of workshops and inventory of coastal resources for tourism is under way in the Ministry of Agriculture.

Other institutions are working closely with teachers in local schools by providing them with teaching aids. This is being done by the MBMPT and the EWO in Jamaica, who have had training workshops for teachers and have established environmental watch clubs in five high schools. The CZMU in Barbados have developed pamphlets on the role and importance of coral reefs as near shore ecosystems for students and the public. The CZMU also provides lectures and participates in panel discussions on issues related to reef health and coastal resources management. The CZMU has also participated in radio and TV interviews, panel discussions, newspaper supplements, pamphlets for schools and the public and project summaries for NGOs.

A celebration of film produced in the Bahamas marine environment was organised by the Blue Hole Foundation and shown at a film festival. A Teachers Environmental Workshop was also held to upgrade knowledge on reef and mangrove environments, while a fisheries meeting to educate fishermen on eco-conscious fishing habits was coordinated by the Bahamas Environment Science and Technology Commission (BEST). Annual Reef Awareness Week in Florida was sponsored by REEF RELIEF and activities included a mooring buoy splicing party, environmental film festival, children's day and annual membership meeting. Sea World in Florida sponsored a regional poster contest and a Reef Photo Exhibit was also on display in Florida. In Texas, pamphlets created by first graders were handed out at various events while in the USVI the FKNMS sponsored an underwater mini festival and a travelling IYOR 8' x 10' exhibit in addition to a static exhibit.

As noted earlier, training courses on siting and design of tourism facilities were implemented. These courses were targeted at government planners from the Region with the aim of educating them as to the long term impacts of poorly designed coastal facilities. The workshop was delivered in both English and Spanish in collaboration with CAST, and a manual resulted from the training course. A decision was made to adapt the training manual for use in the private sector by hotel designers and architects. In collaboration with the Pan American Health Organisation (PAHO), CEN developed a one-week training course on the 'Operations and Maintenance of Waste Water Systems'. This course was targeted specifically at operators of Waste-Water Treatment Plants and reviewed several different types of systems and assisted operators in creating manuals for their own plants.

In the near future the World Bank, under the Meso-American Barrier Reef System Initiative, will be developing regional training programs in areas such as Marine Protected Areas Management, Fisheries Management, Zoning and EIAs and Codes of Conduct for Sustainable Tourism. This initiative identifies the need for both long-term and short-term technical training.

The Coral Reef Education in the Caribbean Project administered through the Caribbean Conservation Association (CCA) in Barbados and funded by the UK Department of the Environment, was set up to teach Caribbean primary school children the concepts of biodiversity using coral reefs as the example. The project has four main objectives which are: to increase student awareness of biodiversity and coral reefs as a resource through the development of resource packs for use in schools; to increase the capacity of teachers to introduce active learning and first-hand investigation into the school curriculum; to have positive impact on the preservation of coral reefs through the development of local school-based conservation projects; and to bring knowledge and understanding from Caribbean communities into the UK school environment. The work is to be carried out in four phases over two years and nine months and began in June 1998. In the Caribbean the target group is primary school students and in the UK it will be secondary school students.

Demarcation and mapping of a reef system and preparation of public education campaigns and staff training on the importance and benefits of reefs were carried out in Grenada on a living reef system and in Montserrat on an artificial reef system. Throughout 1997 monthly snorkelling and educational trips on the reefs were organised for school children by Ocean Watch Bahamas and numerous educational activities were organised by the Ministry of Education and Training (MOET). A coastal clean-up project was also organised by school children in the Bahamas, while Bahamian distance runners ran the New York Marathon with sponsorship towards the BREEF educational program for 1998.

Priority Actions

In Jamaica the CMS sees a need for encouragement and facilitation of community-based actions in a co-management framework through appropriate legislation and sympathetic action of other organisations including Government agencies. There is also a specific need for training at the Masters level (through the UWI) in Coastal Oceanography and the training and provision of jobs for technicians. The CZMU in Barbados sees a need for greater public relations regarding the coast, its sensitivity and how development can be incorporated and, in some cases, enhance the existing natural condition.

The Department of Planning and Natural Resources (DPNR) in the US Virgin Islands reports a need to closely integrate the actions of different departments and attain higher levels of staff training. Public awareness and education on the conservation and management of coral reefs and coastal resources has been an identified need in Puerto Rico and also by other organisations throughout the Region. It has been noted that education materials produced by various agencies and NGOs already exist but they need to be integrated in the regular curricula and disseminated to the communities and to tourists. It is also felt that although there are many courses on marine biology, marine sciences and tourism programs, close examination of the curricula or the topics covered indicate poor coverage or a total absence of the methods and strategies to achieve integrated coastal area management. As reported from Jamaica, the Puerto Rican agencies see a need to involve the local communities in the capacity building efforts, noting that local communities may be trained for monitoring and grassroots education actions. The Montego Bay Marine Park Trust (MBMPT) in Jamaica sees a need for NGOs to have people trained in coastal zone management and for the decentralisation of government agencies so that they are able to deal with island-wide issues. The CHA in Puerto Rico feels that further attention must be given to educating hoteliers as to proper management techniques for their beach, reef and mangrove systems. The CAST in Puerto Rico sees a need for territorial or master plans in many of the Caribbean nations as some countries have very well-delineated zoning and use plans and others have none.

Funding has been reported by many organisations and institutions to be a real problem. Although the Smithsonian Tropical Research Institute's travelling exhibit on coral reefs is popular wherever it goes, there are real costs that are incurred each time the display is moved which include shipping costs and maintenance. A long-term solution needs to be found if this display is to continue its successful educational trips.

RESEARCH AND MONITORING

The activities under the cornerstone of research and monitoring have been divided into subheadings based on the ICRI guidelines. These address the areas of new research and monitoring activities that have been established to assess the status of coral reefs, to evaluate the success of management and conservation actions and to develop more effective management practices, and whether or not these new activities address biological, physical, social, cultural and economic concerns. Information on the current status of coral reefs is also addressed as well as the priority actions needed to move forward towards more effective research and monitoring.

Reef Surveys

The worldwide Reefs at Risk survey, which was launched by the World Resources Institute (WRI), UNEP, the International Centre for Living Aquatic Resources Management (ICLARM) and the World Conservation Monitoring Centre (WCMC), also included the Caribbean. The report flags problem areas around the world where coral reef degradation might be expected to occur shortly given on-going human activity. Such degradation included major changes in the species composition and/or the productivity of coral reef communities, attributable to human disturbance. Reefs at Risk predicts potential threats to reefs associated with human activities, not actual reef condition, and provides the first ever detailed, map-based global assessment of potential threats and pressures to coral reefs. It marks a significant advance in understanding the condition of coral reefs and should help to stimulate further data gathering to improve subsequent reporting. The study notes that about 9% of the world's mapped reefs are found in the Wider Caribbean Region with most of the reefs being located along the Central American coast and off the Caribbean islands. In the Caribbean, the coral reefs of the Lesser Antilles are included among 11% of the world's coral reefs with high levels of reef fish biodiversity that are under high threat from human activities.

The threat modelling was done using a Geographic Information System (GIS) and is based upon 800 reef locations known to be degraded by human activity. Reefs at Risk generated specific results for the Caribbean. About 8% of the world's mapped reefs are found in the Caribbean and results indicate that 61% of reefs in the Region are at risk (29% at high risk and 32% at medium risk). Most reefs of the Greater Antilles (including Haiti, the Dominican Republic, Jamaica and Puerto Rico) and almost all the reefs of the Lesser Antilles, are at high risk. Reefs off the Bahamas, Yucatan Peninsula, Belize, Honduras and Nicaragua are at low risk from mapped human activities.

The CMS at the UWI in Jamaica reports on the success of their recent research and monitoring projects. The effectiveness of the fish-trap mesh exchange program at Discovery Bay in Jamaica, where small mesh sizes were exchanged for bigger sizes, was demonstrated by the analysis of catch data. The potential of the protected area at Discovery Bay to enhance adjacent fisheries is being studied in a collaborative project with the International Centre for Living Aquatic Resource Management. As part of the GEF-funded Caribbean: Planning for Adaptation to Climate Change (CPACC) a new coral reef monitoring initiative is being developed with a special view to assessing the effects of climate change. Participating institutions have been identified at various sites in Jamaica including Negril, Montego Bay, Discovery Bay, Port Antonio and Portland Bight. This is part of a three-nation project, including the Bahamas and Belize, while the data will be analysed and archived at the Data Management Centre of the Centre for Marine Sciences, UWI, in Jamaica. Monitoring will be carried out by the video transect method in Belize. The Negril Coral Reef Preservation Society (NCRPS) an NGO in Jamaica has an ongoing program of reef monitoring and the results of the first full year of monitoring will be presented at a workshop in October 1998. The three main objectives of the program were to:

1. assess spatial and temporal variability in dissolved nutrient concentration, salinity and chlorophyll;
2. quantification of the percentage cover of corals, algae sponges and gorgonians; and
3. to determine specific rates of net productivity of predominant reef macroalgae in order to estimate the net ecosystem production potential of the Negril reefs. The NCRPS has successfully identified and installed five permanent monitoring stations within the Negril Coral Reef Marine Park.

Reef surveys are being conducted Region-wide through a two-year monitoring program funded by the British Overseas Development Agency (ODA) in conjunction with British universities, and includes study sites in Montego Bay, Negril (Jamaica), Barbados, Belize and possibly in Cuba. The MBMPT in Jamaica is currently having dialogue with CARICOMP in an effort to become one of their monitoring sites and are currently running site-specific water quality monitoring in conjunction with the Government's National Water Commission (NWC). The NRCA in Jamaica has prepared an island-wide coral reef monitoring proposal which has been submitted for funding and is expected to start during the 1998/99 financial year.

The Eastern Caribbean Centre (ECC) and the Virgin Islands Marine Advisory Service (VIMAS) in the US Virgin Islands will incorporate the Atlantic and Gulf Reef Assessment (AGRA) protocol in the Virgin Islands as part of a Caribbean-wide rapid assessment of the condition of coral reefs. Funding is being sought to assess the effects of fishing pressure on coral reefs and fish populations and the effects of land-based sources of impact on coral reef habitats. Funding is also being sought to establish a baseline data set on the characteristics of essential spawning and nursery habitat for commercially important fish species. The DPNR has implemented a data collection program for coral reefs and their surrounding environments, and plans are also being developed to begin the assessment of the Territory's coral reefs and associated ecosystems. The ECC, VIMAS and the Virgin Islands National Park Service (VINP) have:

- engaged in monitoring the effects of land development on coral reef condition and the effects of fishing on coral reefs and associated fish populations;
- established and maintained long-term coral reef monitoring stations at several sites; and
- developed a coral reef monitoring project in the island of St. Croix which will eventually be extended to St. Thomas. In the US Virgin Islands six different organisations including academic, government and non-government bodies, are addressing biological, physical, social, cultural and economic concerns.

In Colombia, the Instituto de Investigaciones Marinas de Punta de Betín (INVEMAR) is starting a two-year funded project to design and implement the Sistema Nacional de Monitoreo de Arrecifes Coralinos en Colombia (SIMAC) which will be the national monitoring system for the coral reefs of Colombia. This will involve the establishment of sample monitoring stations for two years at three areas using a methodology similar to that of CARICOMP and continuing CARICOMP sites and experts in Colombia as well as involvement of volunteers through Reef Check. SIMAC will also assess main sources of land-based pollution for management measures. A workshop to discuss the strategies and inter-sectoral and participatory structure of SIMAC was held in October 1998. The preliminary development of SIMAC is also supported through UNEP/CEP and SIMAC and will develop linkages to the GCRMN through the regional CARICOMP node.

The most comprehensive monitoring program in St. Lucia is in the Soufriere Marine Management Area (SMMA) which is a collaborative program involving the Caribbean Natural Resources Institute (CANARI) and the largest diving operation on the island, Scuba St. Lucia. The program, which is supported by the United States government through UNEP-CEP, includes establishing a monitoring program in which diving instructors, SMMA staff and dive operators from other countries of the Region, will be trained to carry out much of the field work and contribute the information to the GCRMN. Additionally, Reef Check exercises will be conducted in St. Lucia and Jamaica.

In 1998 the Atlantic and Gulf Reef Assessment (AGRA) Workshop was held at the University of Miami with the major purpose of reviewing the Protocol for Rapid Assessment of the condition of coral reefs and to lay plans for beginning the evaluation of representative examples of Reefs of the Americas. Participants represented 21 countries and the major product of the Workshop was a revised Protocol for assessing reef condition. The applicability of the Protocol to a variety of different coral reefs will be verified by field tests. The results will be used to make necessary adjustments and produce a final version of the Protocol by October 1998. The revised Protocol will be posted at **http://coral.aoml.gov/agra**

Rapid assessment exercises were undertaken in Florida, the Gulf of Mexico, Bonaire and the Bahamas. Plans are to expand AGRA to other countries in the Region as required with the support of partners such as UNEP-CEP.

The Meso-American Barrier Reef System Initiative, funded by the World Bank, will carry a research and monitoring component which would be consistent with the technical capacity of the countries involved (Mexico, Belize, Guatemala and Honduras) to mount and maintain the effort and be compatible with other monitoring efforts in the Region to facilitate cross-country comparison and data sharing.

Reef Status

The results on reef status ranged from a decline in reef status over past surveys, through no observable change in reef status, to an improvement in various aspects of reef health. A CARICOMP survey in the Region showed that percentage cover by living corals on coral reefs (at 10 m depth) was disappointingly low. At many sites coral cover was known to have declined in years prior to these surveys. At 10 of the 18 sites, in seventeen countries, cover was less than 20% and the maximum was 43%. Long-term monitoring in the US Virgin Islands indicates a trend of decreasing coral abundance and increasing algal densities in addition to the discovery of several diseases which are affecting many coral species including the primary reef builders. Fish populations have declined considerably over the past two decades with several important groupers and snappers becoming commercially extinct. The status of coral reefs in the vicinity of Discovery Bay in Jamaica is being investigated. Since the last study in 1994, cover by living corals in shallow water has increased from 5–10%. However, these are opportunistic colonisers and only minor reef builders, unlike those that had built the north coast reefs prior to Hurricane Allen in 1980. Results of a year of monitoring the reefs in Negril, Jamaica by the NCRPS are consistent with management hypothesis that the recent trends away from corals and towards highly productive macroalgae has resulted, in part, from nutrient enrichment of the coastal water from land-based sources. In the Montego Bay Marine Park, Jamaica, studies have shown a coral cover of more than 70% while more recent studies have reported an average of 5%, and the reefs have declined over the years.

A decline in coral cover has also been reported from Belize through various monitoring programs. At Glover's Reef, cover has declined from 80% to 20% on patch reefs, and at Carrie Bow Caye cover has decreased from 30–35% to 12–21%. Much of this decline is attributed to disease, although nutrification, sedimentation, loss of grazing urchins, overfishing and tourism-based impacts may also be contributing factors. Threats to the reefs in Belize are documented in the State of the Coastal Zone Report 1995 that was published by the CZM project in 1996.

Countries in which there appears to have been no change in reef status include Colombia where the reefs appear to be stable after the decline of the 1980s. Monitoring and surveys at two stations in a national park have shown that coral cover has not changed during the last five years.

In Barbados surveys identified that approximately 55–60% of the fringing reefs of the west and south of Barbados are under critical stress, however over 80–90% of the island's bank reef systems are in healthy vibrant condition. The CZMU in Barbados also reports that some areas of the west and south coasts have shown a marked improvement in the coral recruitment due to an increase in the numbers of the algal-grazing black spiny urchin.

Coral Diseases, Bleaching and the Effects of El Niño

The occurrence of El Niño has resulted in warmer waters for many coral reef areas, which has caused bleaching in many reefs. Sustained sea temperatures in excess of 27–30°C lead to the loss of life-sustaining algae from the corals which causes the colour to be lost and the corals to turn white. This global phenomenon has been reported in the Caribbean Region. A mass bleaching was observed on patch reefs in the Bahia State in Brazil with up to 90% of some coral species being bleached. Similar reports have also been received from the Cayman Islands, the Bahamas, the Florida Keys, Belize, Jamaica the Yucatan coast of Mexico, Honduras, the Netherlands Antilles and the US Virgin Islands.

More information on coral reef diseases can be obtained from the Coral Disease Page on the World Wide Web at: **http://ourworld.compuserve.com/homepages/mccarty_and_peters/coraldis.html** Specific information on El Niño and its effects in the Caribbean can be obtained on: **http://coral.aoml.noaa.gov or http://manati.wwb.noaa.gov/orad**

The ICRI Secretariat also has an on-line State of the Reefs Report which takes a broad look at general patterns in the status and trends of the world's reef ecosystems, addresses the consequences of coral reef ecosystem degradation to human population, reviews some of the major existing management and research programs and makes recommendations for conserving these valuable resources. This can be found at:
http://www.ogp.noaa.gov/misc/coral/sor/

Priority Actions

Although there is a lot of research and monitoring by various organisations in the Region it is felt that there is very little interaction between scientists and managers. Long-term monitoring goals and funding by government and funding agencies is required to establish effective research and monitoring. Barbados sees the need for priority to be placed on ensuring that the five-year intensive reef monitoring work occurs for all sites identified, especially since commitment of funds has been difficult in the past. There is also a need to encourage other agencies to perform periodic monitoring (e.g. dive operators) in between the scheduled monitoring programs. The CMS at UWI, Jamaica, sees the need for: more research on coral reefs to discriminate anthropogenic from natural disturbances; continued and more extensive monitoring; and more inter-disciplinary research (for example, on how to involve local communities in resource management). The NCRPS in Negril, Jamaica, also sees a need for additional research and monitoring to better define the major land-based nutrient sources and transport pathways in order to increase the effectiveness of remedial action. This they hope to accomplish by installation of monitor wells and fine scale water quality monitoring networks to assess the importance of groundwater discharges. In St. Lucia priorities include the development of monitoring programs for management that use methods appropriate to local resources and capacity, and which address identified issues at the local scale. As with other countries, funding is also a priority and should be part of the budget of the local management agency. Funding has also been reported as a high priority for equipment and human resources to conduct research and monitoring in Montego Bay, Jamaica. There is a specific need for equipment and manpower to gather, store and analyse data. This has been difficult to achieve and has resulted in a shift in priority to public education rather than research and monitoring.

REVIEW (PERFORMANCE EVALUATION)

There were few responses to questions on review (performance evaluation) from individuals and organisations. Generally, persons felt that they did not know what was involved in review or performance evaluation, and had not seen it as an integral part of project design. Many said specifically that training in this area was required and would be welcomed.

Successful Reviews

Regular review and evaluation of projects and programs is seen by the World Bank as a fundamental aspect of any successful intervention, and is usually accommodated at the project level through evaluation or end-of-project reports. The World Bank now requires performance indicators to be built into the design of every project it finances. The World Bank's new project in the Caribbean, the Meso-American Barrier Reef System Initiative, will include a forum for periodic review and, through its monitoring program, a series of indicators to assess the success or otherwise of the regional program in achieving its objectives for conservation and sustainable use.

Based on the results of training sessions the CCUNRM feels that there is a need to involve local communities in their efforts especially in the areas of monitoring and grassroots education actions. In Belize the Coastal Zone Management (CZM) Project has yearly Project Performance Evaluation Reports since they are funded by the UNDP. The Montego Bay Marine Park, Jamaica has shown that mooring buoys have been effective in curtailing anchor damage. The NRCA in Jamaica has a Steering Committee for the Jamaica Coral Reef Action Plan (JCRAP) and it is expected that this committee will be involved in project monitoring and evaluation. Performance evaluation and the relevant indicators are part of the current management plan. Evaluation of a coral reef education program in Quintana Roo in 1997 was carried out. Input factors will most likely be related to management practices of water consumption, solid waste production, energy consumption and liquid waste management.

Performance evaluations and the relevant indicators are part of the management plan of the Montego Bay Marine Park in Jamaica and have shown that the mooring buoys installed some years ago have been effective in curtailing anchor damage to the reefs.

Performance Evaluation Requirements

The Caribbean Action for Sustainable Tourism (CAST) in Puerto Rico acknowledges that there is no system of monitoring and review for hoteliers on coastal systems, although a type of environmental auditing for hotels has been developed in Jamaica and Costa Rica. In the US Virgin Islands no performance evaluation has been developed. This has been recognised and will be implemented with the start of individual projects. The Coastal Zone Management Unit (CZMU) in Barbados has not initiated any performance evaluation and sees a need for institutional strengthening in regard to performance evaluation together with effective regulatory enforcement. They acknowledge that performance evaluation is a new area and would be interested in receiving training to do this. The Department of Planning and Natural Resources (DPNR) in the US Virgin Islands acknowledges that no performance evaluations have been developed but will be implemented with the start of individual projects.

ICRI COORDINATION

ICRI Endorsement

ICRI has received endorsement at the national and regional levels through governments as well as international and regional organisations and donors. The Department of Planning and Natural Resources (DPNR) in the US Virgin islands has hired a Geographic Information Systems specialist and a coordinator for the Coral Reef Initiative, and the gathering of background data, needs assessment and the prioritising of goals and objectives has begun. In the US Virgin Islands a point-of-contact has been designated and the Government stands ready to implement programs and policies to effectively participate in ICRI and GCRMN coordination and monitoring programs, but reports that major obstacles to higher levels of coordination with ICRI have been a lack of funding.

The World Bank supported the development of the Meso-American (Belize, Honduras, Guatemala, Mexico) coral reef action plan, organised a major international conference in Washington in 1997 to review major issues, supported coral reef economic valuation in Jamaica, and is supporting a number of coastal management actions and best tourism practices related to coral reefs in the Region. The US Government continues to support activities at the national and regional levels. Providing support to UNEP-CEP for coral reef related activities, USAID embarked in a major tourism best practices project (Section 2.2) and organised the first national and international meeting on coral reef management in 1998 in response to the US Executive Order of 1998 and the US Coral Reef Task Force. The Natural Resources Conservation Authority (NRCA) in Jamaica states that the Government of Jamaica is committed to ICRI as evidenced by its involvement in the early discussions on ICRI, and the hosting of the recent regional and international ICRI conferences. ICRI coordination at the national level is expected to be provided by the Jamaica Coral Reef Action Plan Steering Committee with a mandate from the Oceans and Coastal Zone Management Council.

Coral reef monitoring and watershed management assessment at the SMMA in St. Lucia is a UNEP-CEP project, and is the first ICRI-related activity in the country. It is also a component to the GCRMN. Coral reef monitoring through CARICOMP at 20 sites in 18 countries is providing an initial contribution to the GCRMN, and a network through which further monitoring can be organised. The Centre for Marine Sciences (CMS) at the UWI in Jamaica already manages the CARICOMP data and has offered to manage data for the GCRMN as a regional node, as mentioned before.

ICRI Coordination Required

Greater coordination seems to be required at both the national and regional levels. In Colombia, reef scientists have reported little knowledge of ICRI implementation or coordination. The CZMU in Barbados has no knowledge of any ICRI coordination efforts, while the CZM project in Belize states that the initiatives are not widely known nationally but several of the recommendations made in the ICRI Framework have been acted on by the project. The University of the Virgin Island reports not having enough information on ICRI activities to even evaluate the ICRI-related questions in the guidelines. The CMS in Jamaica suggests that the implementation of ICRI should continue to be stimulated and coordinated by the UNEP-CEP, working through diverse national contacts. In light of the large size of the Region, the many countries and territories, the different languages and the great number of institutions and organisations in the region, this would be a full-time job that would require additional funding in order to ensure greater coordination and wider dissemination of information.

Conclusions

The activities regarding coral reef assessment, management and education have been wide and varied throughout the Tropical Americas/Caribbean over the last two years and, considering the relatively short time frame, impressive in nature and numbers. However, given the status and threats of the reefs in the Region, much more remains to be done particularly as these fragile ecosystems are critical in sustaining activities such as tourism and fisheries on which the Caribbean economies are greatly dependent.

Many organisations, institutions and governments have followed on with the global activities initiated and have managed successful programs. Global initiatives such as the International Year of the Reef (IYOR) and the Global Coral Reef Monitoring Network (GCRMN) have generated wide interest and activities at both the national and regional levels. Specific regional programs have acted upon the framework established at global levels. An example is the Caribbean Coastal Marine Productivity (CARICOMP) which continues to be the single major coral reef monitoring program in the Region.

Of all the cornerstones listed in the guidelines, Integrated Management, Capacity Building and Research and Monitoring generated the most responses, in terms of attention to detail and number of projects and activities over the last two years. It must be said that Governments have been more responsive to the needs of environmental issues specifically with respect to legislation and policy. However, even though legislation may be in place, enforcement is still a problem and this aspect was not addressed in any of the reports received. A positive aspect is the cooperation between funding bodies both at the international and regional levels to support local projects and programs within individual countries.

In the area of Capacity Building most efforts were in the production of brochures, pamphlets, videos and other materials for general public awareness or for use in primary and secondary schools. Many institutions actively sought to upgrade the capabilities of staff through training courses, workshops and even tertiary level post-graduate training. However, there is still an overwhelming need throughout the Region for funding to continue upgrading staff capabilities. Additionally, it is also necessary to evaluate the effectiveness of the education and public awareness activities and to determine if these have influenced or changed behaviour patterns and management practices.

In the area of Research and Monitoring many countries and institutions clearly had good survey programs techniques in place and on-going research and monitoring programs over the last few years. The results under reef status showed a range in reef condition from visible deterioration of reefs, to no apparent change in reef status or condition in very few places to some improvement in reef condition over previous surveys. Again, a need was shown for funding to continue reef surveys, to implement new programs, for equipment to do surveys and for training of personnel, including dive operators, to assist in on-going surveys.

The Review cornerstone generated the least number of responses because the majority of institutions stated that they had no system of review or performance evaluation in place and requested specific training in this area if training opportunities were available. Those organisations that did have performance evaluation in place stated that their projects were successful in terms of their review criteria. Projects funded by international agencies must have an evaluation system and this is usually stipulated by the funding agency and produced by means of a monthly or end-of-project report. However, it must be recognised that, with only three years since the global launch of ICRI, it is difficult to have meaningful evaluations. Most projects initiated since the start of ICRI are still under implementation and a number of initiatives are still being developed.

With regard to ICRI coordination, a number of institutions reported not having sufficient knowledge of ICRI or its activities to be able to answer the guideline questions. Others reported knowledge of ICRI but stated that there was no active participation as they had limited funding available. There were many positive responses that ranged from participation in ICRI meetings, to communication with other institutions regarding ICRI, to the implementation of activities along the ICRI framework at the national level. A need was seen for more communication, including the appointing of ICRI representatives for each country and for these representatives to make themselves known to the various organisations and to be accountable for coordinating efforts.

Acknowledgements

Compiling a report like this, which includes many countries and institutions and the work that they have accomplished over the last two to three years, could only be done with the input from these countries and institutions through the personnel that represent them. Many persons were contacted throughout the region with requests for their inputs to ensure a complete regional report. As seen from the acknowledgements, a wide range of responses was received from countries and we thank the persons who took the time to prepare reports. However, many persons and institutions did not respond and so information may be lacking in some areas. We would like to thank and acknowledge all the persons, organisations and institutions that took time out of their busy schedules to answer our request to send in reports based on particular guidelines which were issued. Responses came in quickly by telephone, by fax and by e-mail and without these responses our report would not have been complete.

Laura Picard-Leach–Caribbean Conservation Association, Barbados
Leo Brewster–Coastal Zone Management Unit, Barbados
Alida Ortiz–Consortium of Caribbean Universities for Natural Resource Management, Puerto Rico
Kelly Robinson–Caribbean Action for Sustainable Tourism, Puerto Rico
Marea Hatziolos–The World Bank, USA
Judith Lang–University of Texas, USA
Allan Smith–CANARI, St. Lucia
Jaime Garzon-Ferreira–INVEMAR, Colombia
Dirk Bryant, Lauretta Burke, John McManus–World Resources Institute, USA
Richard Nemeth–Eastern Caribbean Centre, USVI
Mayra Suarez-Velez–Virgin Islands Marine Advisory Service, USVI
Dayle Barry–Conservation Data Centre, USVI
Robert Ginsburg–University of Miami, USA
Philip Kramer–University of Miami, USA

Peter Sale–University of Windsor, Canada
Robert Steneck–Darling Marine Centre, USA
Malden Miller, Jill Williams–Montego Bay Marine Park, Jamaica
John Waugh–International Union for the Conservation of Nature, USA
Janet Gibson–Coastal Zone Management Project, Belize
Bruce Potter–Island Resources Foundation, USVI
Mildred Lucas–Florida Institute of Oceanography, USA
Jeremy Woodley–Centre for Marine Sciences, Jamaica
Anthony McKenzie–Natural Resources Conservation Authority, Jamaica
Katy Thacker–Negril Coral Reef Preservation Society, Jamaica
Gregor Hodgson, Susie Geermans–Reef Check, Hong Kong
Leslie Walling–CPACC, Barbados

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PACIFIC: International Coral Reef Initiative (ICRI) Pacific activities

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Introduction

In December 1995, a Pacific Regional Workshop was coordinated by the South Pacific Regional Environment program (SPREP) in which Pacific Island countries, as a team, developed an ICRI Pacific Regional Action Strategy as well as a Pacific Framework of Action. Due to funding limitations, only three major activities were implemented under the umbrella of the ICRI Pacific Regional Strategy:

- implementation of the 1997 Pacific Year of the Coral Reef;
- 'Train-the-Trainers' Coral Reef Monitoring and Survey Workshops in support of the Global Coral Reef Monitoring Network (GCRMN); and
- development of a Regional Wetland Action Plan.

These three activities will be elaborated in detail in the following narration. However before I do that, I would like to briefly talk about what SPREP actually does as this will help create a clearer picture of SPREP's input into ICRI.

Pacific activities in support of ICRI

The ICRI Pacific Regional Strategy was developed by the Region in such a way that it is attuned to local conditions. However, because of funding constraints, SPREP was only able to implement three major activities. These will be discussed in detail in this report. Three activities, is that all? Well, these three activities involve all SPREP member countries in one way or another, and the time and effort taken to implement these three activities have been rather stressful at times. The 1997 Pacific Year of the Coral Reef (PYOCR) Campaign took one year to prepare for and another year to implement. For instance, a Regional Planning Meeting had to be held to plan the Campaign. Then there was the resource production in terms of posters, videos, fact sheets, stickers, etc. that needed to be designed, produced and distributed to all member countries. In addition, there was the review and funding of National Campaign Plans and coordination of the PYOCR Network to ensure that momentum of the Campaign implementation was kept up both at the regional and national levels. The development of the Regional Wetland Action Plan (RWAP) meant consultants had to 'zig-zag' around the vast region collecting information from national to local levels. In addition, this RWAP had to be reviewed and approved by member countries before it could be adopted. The Coral Reef Monitoring Workshops are enabling national trainers to hold similar workshops in their home regions, thus increasing capacity for member countries to manage and conserve their own reefs in a sustainable manner. In all of these activities, the member countries worked together as a regional team.

1. South Pacific Regional Environment Programme (SPREP)

1997 Pacific Year of the Coral Reef (PYOCR) Campaign

The 1997 Pacific Year of the Coral Reef (PYOCR) is a Region-wide education and awareness campaign. Part of the ICRI Pacific Regional Strategy, the Campaign is aimed at communicating the urgent need to conserve the coral reefs and related ecosystems of the Pacific Island Region. In July 1996, representatives from 18 countries developed a Regional Campaign Plan (RCP) for the 1997 PYOCR Campaign. This RCP is basically a checklist of activities supporting National Campaign activities. The RCP framework of action focuses on six key areas:

1. support to national and NGO campaign plans;
2. communication initiatives;
3. policy initiatives;
4. resource production;
5. reporting, monitoring and evaluation; and
6. interaction with the International Year of the Reef.

Activities under these six key areas have been driving the Campaign with SPREP support and complementary national activities implemented through National Campaign Plans (NCP). Each participating country has its own National Campaign Plan which is linked to the Regional Campaign Plan. It is the partnership between SPREP and participating countries that is responsible for the 1997 PYOCR Campaign's successes.

RCP FRAMEWORK OF ACTION

SPREP has implemented the Regional Campaign Plan under the following key areas. Implementation was made possible through funding assistance from the governments of Australia (AusAID) and New Zealand.

Support to National and NGO Campaign Plans

As stipulated under the RCP, SPREP support to national and NGO campaign plans amounted to an estimated US$65 000. This amount of money was given to participating countries through a Letter of Agreement between SPREP and the participating country for the purpose of implementing campaign activities such as the launch of National PYOCR campaigns. Fifteen of the eighteen National Campaigns were launched with assistance from SPREP.

Communication Initiatives

Information highlighting the campaign has been widely distributed through Factsheet No. 14, which outlines what the campaign is about and the biology, values, threats etc. facing coral reefs. The Campaign was promoted at every possible opportunity inlcuding at schools, church conventions, newsletters, forum meetings and especially at the following:

- Pacific Island News Association Conference, Vanuatu;
- International Coral Reef Initiative Coordinating Planning Committee Meeting, Canberra;
- Save the Seas Conference, Hawaii;
- 8th Pacific Science Inter Congress, Fiji;
- TCSP Marketing Workshop, Apia;
- 6th South Pacific Conference on Nature Conservation & Protected Areas, Federated States of Micronesia; and
- quarterly updates to the International Year of the Reef Website.

Travel to these meetings amounted to US$10 000 while communication to the PYOCR Network came to US$9000.

Policy Initiatives

SPREP secured endorsement of the 1997 PYOCR Campaign from SPC, South Pacific Forum and South Pacific Heads of Government. The Campaign has been supporting the GCRMN in securing funding for its activities.

Commencing this year, there will be six sub-regional 'Train-the-Trainers' types of workshops that will concentrate on enhancing community-based management and maintenance of marine reserves and coral reef resources. The first three sub-regional workshops will focus on training women, men and children on alternative environmentally friendly ways of generating income from their coral reefs through ecotourism. The next three sub-regional workshops will concentrate on training communities to manage and maintain their marine reserves. All six workshops concentrate on enhancing traditional and customary management systems that have somehow degraded with the passage of time. These workshops will assist in an integrated approach to policy development.

Resource Production

SPREP produced and distributed the following resource materials to assist member countries in their national activities.

Videos

- PYOCR Documentary video – ordinary people talking about coral reefs as well as other pertinent information about threats to reefs, how to conserve them, etc.
- PYOCR sing-along music video – a reggae pop song with underwater shots of beautiful coral reefs and different reef creatures singing the song.
- 'On the Reef' video – musical comedy featuring a triton shell, sea cucumber, octopus, crab and fish who must choose a song to represent them in the great reef band competition. Should the song be about the sea cucumber's reef-cleaning activities, triton's protection of the reef or the other contributions? No one can agree. Meanwhile, danger surrounds them.

Posters and other materials

- PYOCR poster – depicts an island with two identical twin mountains. The mountain on the left has a very badly degraded environment (from the upperlands to the lowlands down to the coral reefs) due to unfriendly environmental practices, while the mountain on the right side shows a pristine environment (from the upperlands down to the coral reefs) where people treat the environment with respect.
- Mangrove poster – fact sheet about mangroves.
- 'Protect our coral reefs, they are important to our way of life' poster – shows underwater picture of beautiful coral reefs.
- 'The Choice is yours' poster – shows two sides of the environment, the degraded and the pristine, and leaves it up to you to chose.
- Coral reefs in the South Pacific Handbook – a handbook about coral reefs that can be used as a teachers' guide.
- Coral reef Factsheet No. 14 – a simplified outline of what corals are, their values, threats they face and what one can do to care for coral reefs.
- PYOCR stickers – carrying the PYOCR campaign slogan and the logo that is basically the silhouette of the PYOCR poster depicting the island with the twin mountains.
- T-shirt – depicts the picture of the PYOCR poster on the back and campaign logo on the front pocket.
- Colouring sheets – A4 size depicting the PYOCR.
- 'On the Reef' – this handbook accompanies the video with the same title.
- Regional Campaign Plan (RCP) – this RCP was developed by the participating countries as a framework of action. It contains the Campaign slogan, key messages, and framework of action and outlines activities and support that SPREP will be providing to National Campaign plans. Included in the RCP are some papers providing National Coordinators with information on how to write media releases and interview methods, how to work with the media, how to plan launches, prize giving ceremonies, etc., and media contacts in and outside the Pacific Region.

The Coral Reef Kit is composed of each of the above items. Each National Coordinator gets a Coral Reef Kit with one additional item, their own National Campaign Plan. Resource materials were distributed in bulk to all 18 participating countries. The participating countries then put together their own Coral Reef Kits, which may include locally produced materials that may be in local languages. Thus Coral Reef Kits may differ from country to country depending on the sort of locally produced resource materials that are added to the resource materials provided by SPREP. These Kits are distributed to schools, libraries and other interest groups. The cost of producing the materials amounted to US$96 000 while distribution of the above resource materials to the 18 participating countries is estimated to be US$24 000. Note that these resource materials were produced both in English and French. Because some items were popular, they were reprinted and distributed more than once.

Reporting, Monitoring and Evaluation

The PYOCR Campaign Network is composed of representatives from each participating country. Every two or three weeks a 'chatty' fax update is sent to each participating country letting them know what is happening in each country: successes, mistakes and general things about coral reefs that may interest them. These fax updates, though chatty and cheerful, do carry serious information. Successes, failures and other important information are shared. The idea is that PYOCR network members are all friends working towards common goals, sharing our successes and mistakes along the way but helping each other as well. Continuity is also important. Regular communication ensures that you are never alone. You are always aware of what your other friends are doing, what you are supposed to be doing and basically, the regular communication keeps the momentum going. The name of the game is teamwork. All campaign efforts were achieved as a regional effort through national campaign activities. It is as a team that we have gained momentum and it is as a team that we should maintain this momentum. The cost of reporting and monitoring is included under Communications.

Interaction with the International Year of the Reef.

SPREP has been sending quarterly updates to the IYOR Website letting other regions know what we are up to and giving them the option to use our activities as samples. Unfortunately, our updates have been edited so sometimes the essence of what we do is lost. However, through the Website, the Caribbean region contacted us and subsequently they have adopted our Regional Campaign Plan together with our Campaign Slogan 'Coral Reefs: Their Health, Our Future', our Key messages, etc. Thus, it is pleasant to know that our work in the Pacific will be of use in other regions.

SUMMARY

Implementation of the RCP has been difficult at times with funding being the main limiting factor. Indeed, the Campaign started out with a zero budget, but through loans, fund raising and voluntary contributions, SPREP was able to raise funds (see Table 1) to implement some activities stipulated in the Regional Campaign Plan.

Table 1: Estimated cost of 1997 PYOCR Campaign

	US$
Regional Planning for the PYOCR Campaign	70 000
Resource Materials	96 000
Mailouts (Resource materials)	24 000
Communication	9 000
Travel	10 000
Support for National Launches (16 countries)	65 000
Regional Evaluation Meeting for the PYOCR	70 000
Total	344 000

CONSTRAINTS/LESSONS LEARNED

Table 2 outlines the major constraints and lessons learned from the 1997 Pacific Year of the Coral Reef Campaign. The items outlined in Table 2 are important points to take into consideration when planning any campaign.

Table 2: Constraints/Lessons learned

1	The campaign plan must be developed through the participatory process.
2	Funding is never enough.
3	Time – the campaign has to be planned at least one year ahead.
4	Linkages to private sector need strengthening.
5	Resource materials must be informative yet fun (i.e. musical videos that carry key messages).
6	Public awareness activities should involve everyone (i.e. theme competitions such as dancing, artwork, singing, etc.).
7	There must be a committed coordinator to make sure that communication or activities with, between or through the Campaign Network is regular, casual, lively yet informative and motivational.
8	The campaign is just a 'kick-start' to conservation.

Other limiting factors are as follows.

- **Mailing system** – the complicated mail-routing system in the region meant extra time and distance for resource materials to travel to reach participating countries. Thus, sometimes participating countries could not be part of agreed regional launches basically because the resource materials did not reach them in time for the agreed date.
- **Reporting** – reporting from participating countries was not regular or timely. Few national coordinators reported on time. Most reporting was by word of mouth. There was no indication of what was or was not implemented in regard to National Campaign Plans. This made it difficult to update the PYOCR Network, the IYOR Website, donors, etc.
- **Negligible cooperation and coordination** from other Pacific regional organisations – invitations and suggestions for linking of activities in support of the 1997 PYOCR Campaign received no responses.

Despite the limiting factors, implementation of the RCP has resulted in many success stories across the Pacific Island Region. Indeed, from country to country across the region, there is increased awareness about corals, i.e. that they are living communities, that they are slow growing and fragile, yet they provide bountiful goods and services that sustain our lives. Basic as this acquired information is, it has led to a host of positive action. For instance:

- 17 local villages in Samoa have taken it upon themselves to declare their reefs as marine reserves;
- in Guam, Fiji and the Solomon Islands, local dive operators are themselves teaching tourists and villagers about 'negative things not to do' and 'positive things you can do' for conserving coral reefs:
- in Vanuatu the use of *tabus* have increased to allow coral reefs and associated fish to rehabilitate and restock;
- in the Cook Islands, the use of *Ra'ui,* a traditional marine management system, has been re-introduced. The marine *Ra'ui* system involves a ban on harvesting seafood for a specified period of time. Four Ra'ui are in place for two years and a fifth, for six months;
- students in the Federated States of Micronesia, Marshall Islands, Palau and Guam are undertaking beach and reef cleanups; and
- in Samoa students have used their own school magazines to feature articles about the beauty and bounty of coral reefs.

Around the Region, there is positive action. Indeed, because of the increased awareness, people are more careful when walking, swimming, snorkelling or boating around coral reefs. This is leading to positive action around the Region.

The PYOCR goal *'to increase understanding, appreciation, support and immediate action for coral reef conservation and wise use'* is seen by SPREP to be successfully achieved at the regional level by the PYOCR campaign. The progress in achieving this goal at the national level will be evaluated under Agenda Item 7.

It is imperative that the awareness and interest in the coral reef conservation generated by the PYOCR Campaign at the local, national and regional levels is now built on to maintain the cultural, social and values for the peoples of the Pacific.

Can we say that the PYOCR produced a decrease in destructive and damaging activities to coral reefs? The answer is 'yes'. However, we do not know by how much.

Can we say that the PYOCR has significantly increased the conservation of coral reefs in the Region? Yes, we can definitely say that, but again we cannot say by how much.

But if we do not maintain the momentum that has been raised by the PYOCR in the coming years, our campaign efforts will have been wasted. Indeed, the PYOCR has given coral reefs a high profile and we must build on this to ensure the continued conservation of coral reefs in the Pacific.

Coral Reefs: Their Health, Our Future.

FOLLOW-UP ACTIVITIES

The 1997 PYOCR Campaign was only a 'kick-start' to coral reef conservation. Building on the positive action that germinated from the PYOCR Campaign, member countries have developed an 'Activity Plan for the Conservation of Coral Reefs in the Pacific Islands Region'. Other activities that SPREP is implementing as follow up activities to the PYOCR Campaign include:

- three sub-regional 'Train-the-Trainers' workshops for community-level ecotourism development as an alternative income generating activity;
- three sub-regional 'Train-the-Trainers' workshops for community-level management and maintenance of marine reserves;
- translation of coral reef public awareness resource materials into local languages;
- development of an Action Plan/Activity Plan for the Conservation of Coral Reefs in the Pacific Islands Region;
- implementation of a Regional Wetland Action Plan; and
- strengthening links with ICRI.

Regional Wetland Action Plan

The Regional Wetland Action Plan (RWAP) has been reviewed and adopted by member countries. However, due to funding constraints, it has not been implemented although successful campaign activities (theme competitions, school activities, etc.) used for the PYOCR campaign have also been used to raise awareness about mangrove areas. SPREP is currently working on a mangrove script for the development of a fun, yet informative and motivational mangrove video.

Coral Reef Survey and Monitoring Workshops in Support of GCRMN

There are many aspects to monitoring of coral reefs that benefit the Region. Firstly, the results of monitoring are ideal for raising awareness about the plight of reefs, especially if that knowledge is generated from within the country where it was gathered, and presented to the decision-makers and custodians of that country. Secondly, monitoring data is a prerequisite to the development of plans of management for coral reefs. Thirdly, monitoring can highlight those areas that need to be carefully managed. Fourthly, the monitoring can be done with one or two trained staff and some basic equipment and does not require the mobilisation of whole Departments. These are some of the reasons SPREP is strongly supportive of the Global Coral Reef Monitoring Network (GCRMN).

THE GLOBAL CORAL REEF MONITORING NETWORK

The GCRMN is a 'bottom-up' network that functions through sub-nodes in the Pacific Region. It aims to improve management and sustainable conservation of coral reefs by assessing status and trends in coral reefs and making that information available in a readily understandable format.

HISTORY OF THE PACIFIC ARM OF THE GCRMN

In October 1996, a circular was sent out to all SPREP members to gauge the interest in a GCRMN for the Pacific and sought answers to questions such as:

- What monitoring is happening in the countries?
- Which agencies are supporting and funding monitoring?
- What are the potential sub-nodes and countries that these nodes can assist?

Interest was shown from Cook Islands, French Polynesia, Palau, Papua New Guinea and Fiji. In May 1997, a second circular was sent out to invite participation in a special session of the GCRMN at the Pacific Inter Congress in Fiji.

PACIFIC INTER-CONGRESS MEETING OUTCOMES

The Pacific Inter-Congress special session helped paint a better picture of the interest and commitment to the GCRMN initiative. Three nodes were located.

1) Moorea, French Polynesia for predominantly atoll Polynesian countries including Kiribati, Cooks, Tuvalu, Niue, Tokelau, Samoa, Tonga and Wallis and Fatuna;
2) Guam for North West Pacific countries; and
3) Hawaii for US states and territories.

Other node structures being investigated for the South West Pacific countries include:

- University of the South Pacific and their campuses in the Solomon Islands and Kiribati;
- University of Papua New Guinea for PNG, Solomons and Vanuatu;
- ICLARM offices in the Solomons; and
- ORSTOM and Universite Francaise du Pacific in Noumea.

TRAINING INITIATIVES

Sub-regional and national training workshops in coral reef survey and monitoring techniques have been conducted in the Region since 1994 including the Cook Islands, Saipan, Papua New Guinea, Palau, Tonga, Fiji and FSM under the auspices of SPREP (refer to Table 3).

Formerly all training was conducted by Australian Institute of Marine Science (AIMS) staff. A 10-day intensive training course in GCRMN survey methods was conducted in March 1998 by AIMS for staff from the Marine Studies program at the University of the South Pacific and the College of Micronesia. As a result, participants are now taught by people from the Region who understand first-hand the problems and opportunities of working in these environments.

Table 3: Coral Reef Monitoring Workshops

REGIONAL	DATES
Cook Islands	23 Feb. to 11 Mar. 1994
Saipan, Northern Marianas Islands	6 Nov. to 17 Nov. 1995
Kingdom of Tonga	24 Nov. to 5 Dec. 1997
Orpheus Island	11 Mar. to 20 Mar. 1998
Federated States of Micronesia (FSM)	19 Oct. to 30 Oct. 1998
NATIONAL	
Papua New Guinea (PNG)	February 1996
Palau	1997

The methods taught at the workshop come from GCRMN techniques. The monitoring protocols of the GCRMN were adopted at the Pacific Region International Coral Reef Initiative meeting in December 1995 and endorsed at the 1997 Year of the Coral Reef Evaluation meeting in April this year.

Dependent on the availability of funds, there are follow-up national workshops and one-on-one training to address problems that trainees may have encountered in setting up and running their own monitoring programs.

A sub-regional 'Train-the-Trainer' mangrove-monitoring workshop is planned for 2000 for staff of government, non-government organisations and private industry, with equal participation by women and men.

GCRMN VILLAGE-LEVEL PILOT PROJECT

This project started in July 1998. It is coordinated by SPREP and funded by the US Government and involves the University of the South Pacific Marine Studies program, Department of Environment (Samoa) and Department of Fisheries (Samoa).

The objective will be to test the feasibility of a village-level coral reef monitoring program through the conduct of a pilot project in five Samoan villages. The project will link into and build upon the successfully established marine conservation areas developed through the Samoa Village Fisheries Management program. Investigations are underway to tie the project in with the recently initiated IUCN program for establishing MPAs in the Region.

FOLLOW-UP ACTIVITIES

Below are activities that SPREP will be undertaking in support of the GCRMN.

- SPREP will continue to assist the establishment of the GCRMN.
- SPREP will continue to support training activities in GCRMN methods.
- The GCRMN coordinator is to develop funding proposals to assist regional groupings of countries wishing to conduct monitoring.
- The GCRMN is to be developed as part of the GOOS strategy for the Pacific region (Pacific GOOS).
- Strategies for building up the GCRMN to be undertaken as part of the *Activity Plan for the Conservation of Coral Reefs* drafted at the recent 1997 Pacific Year of the Coral Reef Evaluation Meeting.
- SPREP is to investigate funding a pilot project to develop the socioeconomic component of the GCRMN.

Conclusion

As discussed earlier, due to funding constraints SPREP was only able to implement three activities under the ICRI Pacific Regional Strategy: The 1997 PYOCR Campaign, Development of a Regional Wetland Action Plan, and 'Train-the-Trainers' Coral Reef Research, Monitoring and Survey Workshops which are enabling countries to monitor and manage their own reefs.

These three efforts were monumental landmarks because of the time, money and effort contributed by the teams at the regional, national and local level that were united by their effort to raise awareness about the value of our coral reefs and the need to manage and conserve them sustainably. Positive results have germinated from these activities and we are still working as a team to nurture and build on these results to carry us into a future that contains all that we presently enjoy in our shared marine environment.

EAST ASIA: A review of actions for coral reefs in the East Asian Seas

Prepared by
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Overview of Coral Reef in the East Asian Seas Region

Regional Introduction

Due to the cross-boundary problems that occur with marine issues between adjacent countries and the similarity between the marine environmental issues of many countries, UNEP initiated thirteen Regional Seas Programmes throughout the world. Basically, these Regional Seas Programmes are to protect marine environments and sustain the use of their resources. The East Asian Seas Region consists of Australia, Cambodia, China, Indonesia, Korea, Malaysia, Philippines, Singapore, Thailand and Vietnam.

Some of the countries have small coastlines and relatively few islands but others, like the Philippines and Indonesia, have thousands of islands, a long coastline and much habitat suitable for coral reefs (Table 1). In this report, Australia is precluded from analysis. Table 1 shows a profile of the economies and populations of the Region characterised by fast GDP growth rate and high population. After 1995 the GDP rate slowed but this has not improved the health status of coral reefs.

Table 1: Economy and Population in the East Asian Seas Region.
Sources: a, b and c adapted from World Resource Institute (1998); d adapted from World Resource Institute (1994).

	1995 GDP[a] (million US$)	1998 Population[b] (thousand)	1985-95 Annual GDP Growth Rate[c] (%)	Length of coastal line[d] (km)
Cambodia	2 771	10 751	N/A	443
China	697 647	1 255 091	9.6	14 500
Indonesia	198 079	206 522	7.2	54 716
Korea	455 476	46 115	8.4	2 413
Malaysia	85 311	21 450	7.4	4 675
Philippines	74 180	72 164	3.4	22 540
Singapore	83 695	3 491	7.9	193
Thailand	167 056	59 612	9.0	3 219
Vietnam	20 351	77 896	6.3	3 444

The East Asian Seas Region is the centre of the world biodiversity for reef-forming corals. There are about 82 genera of corals, 17 seagrass species, 1114 molluscs species, and 29 marine mammals in the Regional Seas, of which the coral genera and mollusc species rank first among the world's Regional Seas (World Resources Institute 1998). These rich marine resources supply vital food products and raw materials for the industries of the adjacent countries.

1. East Asian Seas Regional Coordinating Unit (EAS/RCU), United Nations Environment Programme (UNEP)

The previously burgeoning economy and rapid population increase (Table 1) brought tremendous pressure on the coast and continues to pose threats on biodiversity and the marine environment. It is estimated that about 70% of the population of the Region live no more than 60 kilometres from the sea (World Resources Institute 1994), covering about 37.5% of the world's coastal population. In 1993–1995, the Region accounted for 27% of the world's average annual marine catch (World Resources Institute 1988).

Major marine environment problems are land-based pollution, marine habitat degradation, biodiversity decrease and over-exploitation of fisheries, as concluded by regional analysis. These outstanding problems are adversely effecting the integrity of coral reefs in the Region.

Status of and Threats to Coral Reefs in the EAS Region

The EAS Region is the global centre of diversity for coral reefs and covers more than 30% of the world's coral reef area. Approximately 70 hard coral genera occur in the vicinity of eastern Indonesia, the Philippines and the Spratly Islands, while 50 are present in other parts of the East Asian Seas. Indonesia and the Philippines account for a major portion of coral reef habitats in the Region. Reefs in both countries have an extraordinarily high level of diversity, each containing at least 2500 species of fish (UNEP 1996a). The coral reefs of the East Asian Seas support a rich assemblage of marine life. They provide the fish, molluscs and crustaceans on which many coastal communities depend and, with other coastal habitats, provide nutrients and breeding grounds for many commercial species (Chou 1995).

However, most reefs in the Region are either degraded already or in some way degraded. It is probable that about 10% of the ASEAN countries' reefs have been severely damaged and to reverse this declining status is difficult. Less than 20% of the reefs in the five participating ASEAN countries are in excellent condition (>75% live coral cover) (Chou et al. 1994).

According to the World Resources Institute, coral reefs of East Asia are the most threatened among any region. More than 80% are at risk, and over half (56%) are at high risk, primarily from coastal development and fishing-related pressures (Bryant et al. 1998). Studies show that most of the coral reefs of the Philippines, Sabah, Eastern Sumatra, Java, and Sulawesi were assessed at high potential threat from disturbance. Only 30% of reefs in the Philippines and Indonesia are in good or excellent condition as measured by live coral cover. Bryant et al. (1998) indicated that virtually all of the Philippines reefs, and 83% of Indonesia's reefs are at risk.

Among the reefs at risk identified by the World Resources Institute, the East Asian Seas Region covers four: the Southern Islands at Singapore; the Bolinao Reef Complex in the Philippines; Scarborough Reef in the eastern South China Sea; and Seribu Islands Reefs in the Java Sea of Indonesia (Bryant et al. 1998).

Coral bleaching has occurred in most countries in the Region. Though controversial, a rise in seawater temperature is a main cause. Other probable causes, such as excess turbidity, darkness, or cold, have been ruled out by field observations.

The major anthropogenic causes of degradation of coral and related ecosystems are coastal development, inland and sea-based pollution, over-exploitation, destructive fishing, coral mining and tourism. These causes are attributed to over-population and rapid economic growth combined with neglecting marine environmental protection in the Region.

The pollutants entering seawater are mainly unchecked emissions of urban sewage concentrating high levels of nutrients, sedimentation, pesticides and ship-based sources. It is noted that destructive fishing practices are widespread in the Region, and have seriously damaged many diverse coral reefs. More than 70% of the Philippines' 33 600 square kilometres of reef are in varying stages of deterioration, as is replicated in Indonesia where only 29% of the area's coral reefs are considered in good condition (Hatziolos et al. 1998). Sodium cyanide, pesticides, herbicides and explosives are major destructive fishing types in Indonesia.

A Review of Regional Actions Since the 1995 ICRI Meeting

Since 1995, EAS/RCU has taken coral reefs as a high priority and identified their significance for the East Asian Seas Region. It initiated a series of regional actions for protecting coral reefs and associated ecosystems. These actions directly addressed coral reef issues or incorporated coral reefs into project activities.

The regional actions consisted of various project activities in marine management information systems, pollution control, environment impact assessment, coastal zone management, etc. Most of them were participated in by all the member country governments, who translate regional plans and actions into activities in their own national plans and policy priorities.

Among activities, the International Coral Reef Initiative (ICRI) Regional Workshop for the East Asian Seas held in March 1996, specifically formulated actions for the Region's coral reefs. The workshop developed a strategy for protecting and sustainably using coral reefs in the East Asian Seas Region. The major proposed strategic activities are as follows (UNEP 1996b).

Integrated Management

- Strengthen policy and legislation for Integrated Coastal Management (ICM).
- Implement ICM programs.
- Provide access and equity in the use of the resources of coral reefs and related ecosystems.
- Reflect the economic and other values of coral reefs in decision-making.

Capacity Building

- Develop and strengthen public awareness and education.
- Enhance community participation in ICM.
- Strengthen institutional capacity for ICM.
- Promote regional cooperation for coordination of ICM policies and programs.
- Provide legal and enforcement measures.
- Provide networking capabilities.
- Provide databases.

Research and Monitoring

- Facilitate research and monitoring to support management programs.
- Develop a monitoring network.
- Coordinate research and monitoring methodology.
- Facilitate biodiversity research of the East Asian Seas.
- Coordinate recovery and rehabilitation attempts.

Mechanisms for Coordination, Implementation and Review of ICRI-related Activities

- Investigate mechanisms for coordination of ICRI activities.
- Investigate finance for the ICRI strategy.
- Investigate mechanisms for monitoring and evaluation.

These proposed strategies have been taken into account in the EAS Regional activities, in combination with the implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA), Transboundary Diagnostic Analysis for the South China Sea (TDA) and other regional projects.

Integrated Coastal Management

REGIONAL ACTIVITIES

Integrated Management of Watersheds in Relation to the Management and Conservation of Coastal and Marine (Nearshore) Areas of the East Asian SEAS Region: Phase I – Assessment of the Effects of Sediments, Nutrients and Pollutant Discharges on Wetlands, Seagrasses and Coral Reefs

This project was developed in response to the COBSEA-approved concept, linking the watershed activities to impacts on selected ecosystems such as wetlands, seagrasses and coral reefs. An overview of the state of coral reefs, seagrass beds and coastal wetlands in the ten countries was developed and was based on information concerning the status of watersheds and the sources of sediment, nutrients and pollution that affect coastal and marine environments.

The project represents the first step towards attaining a better understanding of the inter-linkages between land-based sources of sediments, nutrients and pollutants, their movement through watersheds and their impacts on the coastal and marine environment. More importantly, this overview embodies the realisation that terrestrial, freshwater and marine ecosystems in the EAS Region need to be considered and managed in an integrated way to make the development and catering of human demands more environmentally sound and sustainable. Phase I of this project was completed and the regional overview report was published and distributed.

Regional Programme of Action for the Protection of the Marine Environment of the East Asian Seas from the Effects of Land-based Activities

About 80% of marine pollution is caused by anthropogenic activities on land. In the Region, sedimentation, eutrophication and oil trigger adverse impacts posed by land-based activities such as dumping sewage and industrial wastes, agricultural and urban run-off and habitat modification.

Within the implementing framework of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA) in the Region, EAS/RCU formulated a regional report entitled 'Overview on the Land-based Sources and Activities Affecting the Marine Environment in the East Asia Seas'. During the Workshop on Implementation of the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities in the East Asian SEAS Region (1997, Australia), the national reports were reviewed by representatives from COBSEA countries. The workshop also developed a draft Regional Programme of Action for later enforcement of all actions. Later, a regional overview was written from national reports.

Produced through reviewing the land-based pollution sources in the Region, the Regional Programme of Action aims at preventing the degradation of the marine environment from land-based activities by facilitating the realisation of the duty of member countries to protect the marine environment. It recognises the priority sources of land-based pollution, as well as the need to work at the regional, sub-regional and national levels to simultaneously and most effectively address priorities of pollution sources.

The Regional Programme of Action summarises the proposed specific actions to mitigate the impacts of land-based activities on the marine environment. The priority issues identified are sewage and urban run-off, agricultural run-off, industrial waste and habitat modification. In addressing these, the regional legal arrangement, institutional restructuring and management planning were used as integrated management methods in each priority category.

The implementation of a Regional Programme of Action is being incorporated into the long-term plan of EAS/RCU. In addition, project proposals are being developed to establish and coordinate activities for controlling land-based pollution in the Region.

Formulation of a Transboundary Diagnostic Analysis (TDA) and Strategic Action Programme (SAP) for the South China Sea

The Indo-West Pacific marine biogeographic region, of which the South China Sea forms the focus, is acknowledged as the global centre of tropical, shallow-water marine biodiversity containing a great number of coral, mangrove, seagrass and associated species. However, marine diversity and productivity are increasingly threatened by anthropogenic activities on land and sea, including badly planned and managed coastal development leading to pollution, habitat destruction, degradation and over-exploitation of living resources.

This project was funded by a GEF Block B grant to analyse the state of the environment in the South China Sea, identify major problems and issues in the SCS and associated freshwater catchments, and prioritise these problems and issues. Regional pollution hot spots, major point sources and coastal areas subject to high pollutant loading are identified, and ecosystem and habitat degradation is assessed. The causes of and threats on pollution and ecosystem degradation are analysed by using causal chain analysis methods. The seven countries that participated in this project are Cambodia, China, Indonesia, Malaysia, Philippines, Thailand and Vietnam. Each country prepared a national transboundary diagnostic analysis on which the Regional TDA was based.

According to the preliminary ranking of major concerns and principal issues for the South China Sea, habitat loss is ranked first followed by over-exploitation, pollution and freshwater shortage. Mangroves and coral reefs are assessed as the most vulnerable ecosystems for the South China Sea (UNEP 1998). Based on the TDA, a Strategic Action Programme for the SCS was developed and will be submitted to GEF for funding the proposed actions in the Region.

ASSESSMENT OF REGIONAL ACTIVITIES

Regional coastal management activities contribute greatly to marine pollution control and resource maintenance for East Asian Seas by addressing pollution, resource degradation and other topical issues. These activities are supported by the expertise and financial resources from member countries, non-member country governments and international organisations. EAS/RCU, as the Secretariat of COBSEA and a Regional Coordinating Unit, plays an important role in coordinating regional management activities among member countries and mobilising the resources for regional actions.

Each member country of COBSEA reviews and approves, at annual meetings, the work plan for East Asian Seas to meet, with the national demand for addressing specific issues. The member countries are also committed to and assisted by EAS/RCU in incorporating regional actions for controlling land-based pollution and other integrated management strategies into their individual national policy and management plans, and benefitting from the project achievements, especially from capacity-building activities.

One of the shortcomings of these activities is that the implementation of strategic action plans is not timely.

Due to limited resources, the following important issues, even though they are among the highest priorities in the Region, are not addressed in regional work plans:

- over-exploitation of fisheries;
- destructive fishing, such as cyanide fishing and dynamite fishing;
- reduction of ecological impacts of coastal and marine tourism; and
- rehabilitation and restoration of degraded ecosystems, such as coral reefs and mangroves.

Urgent actions are badly needed to address these issues given their destructive and immediate threats to coral reefs and related ecosystems.

NATIONAL ACTIONS FOR CORAL REEFS

As a high priority, member countries participate in and support regional activities for protecting and sustainably using coral reef resources. They also take individual actions to protect coral reefs including institutional strengthening, development and implementation of national management strategies, legislation on integrated coastal management, planning and categorisation for MPAs, establishment of national parks, and specific integrated management projects at national, local and community levels.

National actions set up the concept of integration of coral reef habitat conservation and coastal development and planning, and this approach was used by some nations. Some national actions in the Region have sought and obtained widespread support in various modes from foreign governments, international organisations, NGOs, etc. Sponsored actions include capacity building in management projects and establishing marine parks and demonstration sites.

Apart from new actions that the countries put forward, they need to further address the coral reef deterioration. The countries still lack systematic national policies to promote integrated coastal development management and the regulations needed to enforce them.

Capacity Building

REGIONAL ACTIVITIES

Coastal and Marine Environment Management Information System

Supported by the Asian Development Bank (ADB), this project was a component of the project 'Coastal and Marine Environmental Management in the South China Sea'. It conducted a series of training courses on GIS applications in some countries. GIS stations, consisting of five sets of PC-based ArcInfo and ArcView software and hardware, were provided to each country to assist in developing a national coastal and marine environment database. This project also carried out suspended solids mapping of the South China Sea by using NOAA/AVHRR data.

Enhancement of the Public Awareness and Participation on Environmental Issues Related to Coastal and Marine Areas in the East Asian Seas Region – Phase I

This project was developed in cooperation with and funded by UNEP's Information and Public Affairs unit (IPA) through the Environment Fund for a total budget of US$98 000.

The implementation of the project was coordinated by the EAS/RCU and the national activities were done by government-nominated NGOs. The project, which adopted the theme of Save the East Asian Seas, was completed in November 1995. Project output was published as guidelines for the protection of the coastal and marine areas aimed at youth. In addition to the guidelines, five of the entries in the national poster competitions were also printed and distributed by the EAS/RCU.

The project was implemented in Indonesia, Malaysia, the Philippines, Singapore and Thailand. However, at the invitation of EAS/RCU, the Intergovernmental Maritime Organization (IMO) under a cooperative Memorandum of Understanding with UNEP and through the resources of its IMO/UNDP/GEF project on the Regional Programme for Marine Pollution Prevention and Management in the East Asian Seas Region, provided funds for the participation of Cambodia in the project.

Several activities that maintained the initial momentum of the project were generated including:

- the establishment of 'Save the East Asian Seas Clubs' in the schools in Singapore and a Regional Conference on the same theme;
- a national conference held in the Philippines; and
- a series of environmental camps for youth in Thailand.

An external evaluation of the project, undertaken by UNEP, recommended a phase II to the project which would be more focused and would involve all stakeholders including female, disabled and urban/rural youth not in the formal education system.

Training Workshops on the Biological Effects of Pollutants: East Asian Seas Region

This project was a series of training workshops carrying the objective of establishing a network of activities between scientists and research institutions of the countries of the Region. The project was funded from the resources of the UNEP Regional Office for Asia and the Pacific (UNEP/ROAP). A total budget of US$77 900 was provided for its implementation by the EAS/RCU.

The project activities consisted of two workshops: 'UNEP Workshop on Soft-Bottom Benthic Communities as Indicators of Pollutant-Induced Changes in the Marine Environment', and 'UNEP Workshop on Eutrophication in Tropical Marine Systems – the Impacts and Management of Nutrient Pollution'. The first workshop was designed to train scientists from countries of the Region in methodologies and techniques for assessing soft-bottom benthic communities and their responses to pollution impacts in the marine environment. The workshop focused on marine soft-bottom benthic communities, how these can be surveyed and monitored, and how their response to environmental change caused by pollutants makes them useful as bioindicators at species and community levels (Chou 1995).

The second workshop was designed to present a basic understanding of nutrient pollution issues in tropical systems, together with modern techniques and approaches to their management, and to establish a personal network of contacts so that technical issues facing COBSEA nations may be more easily resolved using networks of laboratories and experts operating in the Region. The workshop focused on nutrients in seawater, their biological effects in the water column and on coral reefs and the practical issues associated with managing pollution in order to reduce impacts (Ward 1996).

Development of Training Materials for Integrated Coastal Zone Management

The project, funded from the resources of the UNEP Regional Office for Asia and the Pacific (UNEP/ROAP), was implemented by the EAS/RCU on a total budget of US$95 000. The output of the project, Training Materials for Integrated Coastal Zone Management, was published and distributed as EAS/RCU's Technical Report Series No. 12, in which the coastal zone concept, uses and impacts, social and cultural systems, international environmental agreements, and ICZM implementation were addressed.

This project was carried out by James Cook University, Townsville, Australia and the Great Barrier Reef Marine Park Authority of Australia, with contributions from many experts and scientists in the Region.

ASSESSMENT ON REGIONAL ACTIVITIES

Capacity-building activities are an operational priority in the Regional work plans for the EAS. Public awareness enhancement, dissemination of educational materials, public campaigns, technical training courses, and training manuals for ICZM addressed the following issues:

- Global Information System (GIS) applications and mapping training;
- pollution impacts on marine ecosystems; and
- Integrated Coastal Zone Management training.

Training workshops are a major format for building the COBSEA member countries' capacity in understanding the scientific foundations of decision-making and developing national integrated management plans. These capacity-building activities used the expertise from a large number of scientists and experts throughout the Region, usually as trainers at workshops. At least 150 people were trained in related topics, mostly technicians and national scientists at operational level in coastal integrated management or who provided direct consultations to national and local governments and marine protection projects. These training courses strengthened the institutional capacity of member countries, and their products were disseminated at different levels within the countries.

One weakness of capacity-building activities is that, for some training courses, participants were not wisely chosen and the training goes no further. Also, because of national institutional changes, the skills and knowledge learned from the workshops were not applied to serve national decision-making activities and projects, hence lowering the effectiveness of workshops. This issue is expected to be addressed by informing member countries of the full activity objectives and planning activities through regional coordinating mechanisms so that the right participants are chosen.

Some essential aspects of integrated management actions and their enforcement were not addressed by the capacity building activities. High priorities are:

- public awareness and education on the significance of coral reefs and associated ecosystems, especially directed at the community level and stakeholders;
- giving information and knowledge on the environmental and economic importance of marine ecosystems to policy makers and the private sector;
- strengthening the capability of enforcement agencies to stopping destructive fishing;
- enhancing the national and local capacity in formulating and enforcing legal and economic measures for integrated management, e.g. the regulatory and economic instruments for stopping the use of cyanide and explosives; and
- building up regional capacity for monitoring coral reefs and related ecosystems.

NATIONAL ACTIVITIES

The countries in the Region, recognising the intrinsic significance of public support to and participation in integrated coastal development and resource management, have taken various measures to promulgate coral reef conservation through national plans and concrete projects.

In some countries, the activities designed to improve individual and institutional capacity are essential components of integrated coastal management projects at national, local and community levels. Other countries conducted public awareness raising plans by means of media campaigns, information distribution, establishment of partnerships among government and stakeholders and school environmental education. Of significance are the community-based efforts encouraging the reef users, local residents and private sector to voluntarily comply with regulations and management actions.

Training workshops were held in some countries in reef monitoring, research and investigations on corals, environmental impacts of destructive fishing, and reef management, usually with technical assistance from other countries that have expertise in these aspects of coral reef management.

Research and Monitoring

REGIONAL ACTIVITIES

Application of Methodologies for the Valuation of Environmental and Natural Resources with Particular Reference to Coastal and Marine Ecosystems: East Asian Seas

This project was funded from the resources of the UNEP's Environment and Economics Unit (UNEP/EEU) and implemented by the EAS/RCU. An intensive training workshop was held in Bali from 27 November to 1 December 1995 where 17 participants from nine countries of the Region attended (Singapore did not participate). The workshop discussed economic evaluation methods and their application in the Region. Representatives from each member country presented national cases of coastal and marine management with a focus on economic evaluation of resources.

The Second Symposium and Third General Assembly of the Association of Southeast Asian Marine Scientists (ASEAMS), 1995

UNEP sponsored the establishment of ASEAMS and supported it until 1996. A symposium in 1995 was sponsored by UNEP and papers covering a wide range of topics pertinent to the field of marine science including mapping, remote sensing technology, biology, ecology, pollution, legislation and management and the status and values of coral reefs, mangroves and seagrass beds in Indonesia, Malaysia, the Philippines, Singapore and Thailand were presented.

ASSESSMENT ON REGIONAL ACTIVITIES

The research and monitoring training activities coordinated by EAS/RCU were not fully developed on a regional scale. Though ASEAMS did a lot of research on coral reefs and related habitats for ASEAN members, there is no information database system and monitoring network for the whole Region. Regional management activities lack adequate and precise information and a scientific data foundation. The decision-makers are unable to get an accurate assessment on the status of coral reefs and related ecosystems.

Based on the research and monitoring projects, the status of coral reefs in the Region is not accurately understood and unable to be compared with previous reviews. Reef condition is not known accurately throughout the Region, though deterioration of reefs is often reported in the media and from research institutions.

Research that supports resource management and planning is essential for Regional actions. It should include methodology development, impact assessment, scientific criteria for establishing and managing MPAs and methods for stopping destructive fishing and ecotourism.

A monitoring network is imperative, at least for the assessment of the state of the marine, coastal, and associated freshwater environments, integrated coastal zone management, detection of marine pollution, assessment of marine biodiversity and assessment of remedial actions (Kirkman 1998).

NATIONAL ACTIVITIES

The countries in the Region vary greatly in researching and monitoring their coral reef habitats. Most countries lack a scientific monitoring system and GIS maps of coral reefs and related ecosystems, thus making the national coral inventory and status incomplete for decision making. In certain countries, basic research, e.g. inventory of coral reefs, is not carried out systematically while others have formulated or are formulating national programs to develop monitoring programs, set up monitoring networks and information maintenance. In some countries, there is sound understanding and smooth coordination between different government sectors and stakeholders.

Performance Evaluation

As a part of UNEP's Regional Seas Programme, all of the Regional activities coordinated by EAS/RCU have to comply with an evaluation procedure. This is a component of project management within UNEP. Each project must be monitored during its implementation and a self-evaluation report and terminal report must be formulated and submitted to relevant sponsors and UNEP. In these reports, performance and effectiveness of any project and other activities, and whether they have accomplished the designed objectives and outputs, must be assessed. The possible weaknesses and strengths are also presented to improve the design and implementation of future projects.

The member governments are committed to the implementation of the regional action programs at national, local and community levels. However, in the Region, there is no such mechanism for evaluating the performance of national plans in terms of whether the Regional actions have been carried out in these countries. There is no structure to precisely evaluate the environmental benefits produced from Regional actions on coral reefs and associated ecosystems. This is mainly because there is a lack of a regional, dynamic information database and monitoring network for comparing changes in coral reefs before and after action.

Further Actions for Addressing Regional Priorities

Definition of Priorities in the Region

Protecting marine and coastal environments for sustainable development will improve marine productivity and coastal residential quality. Based on assessment of regional marine issues, the following areas of priority need to be addressed through integrated management, capacity building and research and monitoring activities:

- land-based marine pollution control;
- illicit and destructive fishing practices, e.g. cyanide fishing, dynamite fishing;
- ecologically friendly coastal and marine tourism;
- restoration of degraded coastal and marine ecosystems;
- achieving sustainable fisheries; and
- Marine Protected Areas (MPAs).

Future Responses in the Region

The regional actions needed for conserving and sustainably using coral reefs and associated ecosystems are categorised following ICRI guidelines. These activities address the priority areas pragmatically and are identified in the regional review report and the long-term plan for the EAS/RCU (Kirkman 1998), the latter was formulated from objectively analysing the Region's demands for protecting its seas.

INTEGRATED COASTAL MANAGEMENT

1. Develop and implement GPA follow-ups in the Region. A project should be carried out as a demonstration site for the whole Region.
2. Implement the Strategic Action Programme (SAP) for the South China Sea. This project is expected to be supported by the Global Environmental Facility (GEF) in the category of international waters. A comprehensive and integrated action plan will be carried out among seven member countries.
3. Assist member countries in formulating and enforcing legal instruments and economic policy to prohibit illicit and destructive fishing activities, e.g. cyanide and explosive fishing, and where necessary, develop regional or sub-regional legal systems for this effort.
4. Assist member countries in sustainable coastal planning in tourism and recreational areas to minimise the adverse impacts on the marine environment and biodiversity.
5. Develop effective marine protected area systems including the preparation and implementation of management plans.
6. Develop and promote the use of appropriate environmentally friendly technologies in the conservation and sustainable use of coral reefs and related ecosystems.

CAPACITY BUILDING

1. Develop training programs in reef restoration and protection, and demonstrate the relationships between coral reefs, seagrass meadows and mangroves.
2. Provide training and public education for addressing cyanide and explosive fishing practices, media campaigns, pamphlet distribution, and community-based training could be options for action.
3. Develop and conduct a regional training program in Integrated Coastal Zone Management.
4. Conduct workshops on environmentally sound tourism.
5. Develop training workshop series for MPA managers and technical staff.

MONITORING AND RESEARCH

1. Establish a regional database and information system for marine environmental protection and management.
2. Develop a State of Environment report for the EAS.

3. Develop a collaborative, regional monitoring program for EAS, in which the condition of coral reefs, mangroves and seagrass would be assessed.
4. Based on 1. and 3., evaluate the state of coral reefs in the Region in the context of status and pressure and provide a scientific base for a proposal for action.
5. Conduct workshops to research and develop techniques for rehabilitating coral reefs and related ecosystems.
6. Research the impacts of destructive fishing practices on coral reefs.
7. Conduct workshops on legal tools and economic instruments for prohibiting destructive fishing.

Partnerships for East Asian Seas Actions

Collaboration Between EAS/RCU and ICRI

Given the management-oriented character of the ICRI system, EAS/RCU could be identified as the regional body to coordinate ICRI activities in the EAS Region and to promote coral reef and related ecosystems management and sustainable use. This will greatly strengthen the ICRI East Asian SEAS Regional Strategy through close cooperation among member countries and widely mobilise expertise and financial resources, both within the Region and from other international organisations and governments. A concrete plan could be developed for further actions on coral reef management in the Region.

Collaboration for Implementing Actions

There are many existing institutions and organisations that are working in various modes to protect the East Asian Seas. However, efficient collaboration and cooperation involving UN organisations, international NGOs, member governments, academic institutions, the private sector and individuals is not generally apparent. Active connections should be established when new actions are effectively carried out, for instance, a regional monitoring program should mobilise expertise as much as possible and actively collaborate with ReefBase, Reef Check, GCRMN and other resources and facilities to seek cost-effectiveness and consistency.

External Support for the Region's Coral Reefs

The economies of most countries in the EAS Region are still at various stages of development. External support is needed for both economic growth and improvement of environmental quality. Given the significance of coral reefs and related systems in the world, financial and technical support from the governments, NGOs, and private sector outside the Region is continually needed. Sometimes this kind of support is crucial to protect certain key marine ecosystems.

By means of information dissemination and problem identification, and for the purpose of global environmental benefits, EAS/RCU will continue to make efforts to promote any support from external resources in addition to those of the Region to meet the demand for coral reef conservation.

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Summary of National Actions for Coral Reefs[2]

Cambodia[3]

INTEGRATED COASTAL MANAGEMENT

Cambodia established the National Coastal Steering Committee in 1997 to coordinate coastal management through regular meetings of inter-ministries, coastal provincial governors and representatives from coastal projects, NGOs and international organisations. The Committee involves the Ministries of Environment (chairman), Agriculture, Fisheries and Forestry, Industry, Mines and Energy, Public Works and Transport, Rural Development, coastal provincial governments, the Cambodia Development Council, and some observers.

The Committee has a Coastal Coordinating Unit based in the Ministry of Environment. The committee is responsible for the overall direction of coastal projects and activities. All members should ensure the cooperation of their line ministries and provincial authorities. It also seeks to harmonise the activities of coastal projects with national development priorities in order to guide and advise on integrated coastal zone management. The committee consists of four Provincial Working Groups in the coastal provinces. Each technical working group is chaired by the Director of the Department of Environment and consists of officials from the Departments of Tourism; Industry, Mines and Energy; Rural Development; Public Works and Transport; and Agriculture, Forestry and Fisheries. The working groups are instrumental in identifying and prioritising coastal zone management problems and helping to define projects aimed at addressing these problems.

At recent meetings the National Coastal Steering Committee addressed the following issues:

- sustainable development of coastal and marine resources;
- proposals to prohibit and prevent all developments that cause negative environmental impacts on the coastal zone;
- proposals to the Ministry of Environment to issue and implement regulations and the Law on Environmental Protection and Natural Resource Management. This will facilitate the assistance of provinces and concerned institutions in contributing to environmental protection; and
- requests for the establishment of coastal zone coordinating committees at provincial levels, with participation from concerned institutions and organised at provincial levels in order to improve projects and facilitate implementation.

The Coastal Coordinating Unit (CCU) was created in 1996 as a part of the Ministry of Environment to help coordinate the activities relating to coastal and marine environmental management of Cambodia, CCU plays a very important role in assisting the National coastal steering committee during meetings and workshops. CCU primarily coordinates and cooperates with government institutions, international organisations, NGOs, and private industries related to coastal and marine project development. It promotes sustainable implementation of coastal and marine projects, and it provides information and advice on the positive and negative environmental impacts of coastal zone projects.

Currently the following projects are ongoing in Cambodia.

1. **Participatory Management of Mangrove Forest Resources Project (PMMR)** – Carried out in Koh Kong Province, this project is funded by the International Development Research Center (IDRC). It has strengthened links between the Koh Kong provincial government and community and village-level administration.
2. **Community Management and Alternative Livelihoods Project** – Funded by American Friends Service Committee (AFSC), this project is carried out in the Sre Ambel District.
3. **Capacity Building of Coastal Environmental Management Project** – Funded by DANIDA, the project uses an integrated management framework.

2. The Summary of National Actions for Coral Reefs was prepared by the member countries of COBSEA by answering the 'Questionnaire for Coral Reefs Actions Since 1996'. The Questionnaire was analysed by EAS/RCU according to the guidelines for Regional Reports developed by ICRI.

3. Prepared by the Ministry of Environment of Cambodia

4. **Environmental Impact Assessment legislation,** guidelines and framework within the Ministry of Environment, funded by ADB.
5. The establishment of two terrestrial national parks in the coastal zone. The projects focus on ranger training and establishing park facilities. Two national parks are being established funded by the EU and UNDP. Ream National Park in Sihanoukville includes areas of mangroves but no areas below high water. Bokor National Park is a mountainous national park whose boundary includes areas affected by tidal creeks.
6. Two coastal zone management projects are proposed by the ADB: one concerns fisheries management, the other is entitled Coastal and Marine Environmental Management in the South China Sea. This project has three main objectives: (i) preparation of a National Marine Protected Area System Plan, (ii) preparation of a national strategic coastal and marine environmental plan, and (iii) a demonstration project at the provincial level.

Actions Needed

- Develop a clear national policy for coastal resources management as well as for coral reefs.
- Develop adequate regulations for coral reef protection.
- Create an efficient and effective law enforcement mechanism.
- Develop skills in coral reef management with fisheries and environmental officials by promotion of training and awareness at national, provincial and local community levels.
- Strengthen monitoring systems through integrated coastal zone management.
- Promote the National Coastal Steering Committee through more responsibility of the overall direction for guidelines in participatory decision-making processes.

CAPACITY BUILDING

Capacity Building of Coastal Environmental Management Project supported by DANIDA has run one training course on coral reefs for 30 provincial officials. In addition, a study tour to Thailand was organised for 12 provincial officials to visit coral reefs and learn about coral reef management issues in Thailand. Future plans include training in fisheries management and water pollution.

Training in marine biology, training and funds for swimming, snorkelling and scuba diving, ongoing management and public awareness are needed for further actions.

RESEARCH AND MONITORING

Reef Check 1998 is planned for September. Reef Check will follow global standardised methods. Rapid assessment is likely to follow AIMS manta tow techniques with some potential modifications. This activity is part of a regionally coordinated initiative but is site-specific. The rapid assessment is project based and will be at a broader scale, including most of the islands off Cambodia and some assessment of the mainland corals.

Research and monitoring activities in Cambodia do not address biological, physical, social, cultural and economic concerns. There is no Cambodian coral reef scientist yet.

Nothing is known about the status of coral reefs in Cambodia but coral reefs exist in almost all the areas surrounding the inshore and offshore islands. Some of the reefs were found to be in bad condition due to natural sedimentation (Polowaii, an offshore island). Well-developed corals are found around Koh Rong, Koh Rongsanlem, Koh Thash, Koh Rusey, Koh Takiev, and Koh Ses islands (inshore) and Koh Tang, Koh Pring, and Koh Chlarm islands (offshore).

Bleaching was observed in some areas in May 1998 but no systematic surveys were made. Inshore areas are dominated by silt-tolerant massive species. There is greater species diversity on the offshore reefs in the Gulf of Thailand. Preliminary surveys of offshore reefs have identified approximately 50 species in 33 genera and 11 families in the Koh Tang area.

Actions Needed

- Prepare an inventory of coral reefs.
- Identify priority areas for research and survey.
- Establish an ecological monitoring program.
- Develop standards based on scientific information to ensure the protection of marine resources in particular coral reefs.
- Establish a comprehensive water quality monitoring program.
- Establish very strong communication between scientists and resources managers.
- Promote public awareness and capacity building.
- Establish a Marine Research Centre.

Korea[4]

Korea has no typical coral reef, being sited beyond the northern limit of stony corals (reef-building corals). Related ecosystems such as mangroves are also absent. However, the sea around Cheju Island (the biggest island in Korea, lying 141 km off the south-west coast of the Korean peninsula) and its surrounding islets contain many tropical and subtropical elements including coral reef inhabitants and specific soft coral communities. Cheju Island and its islets provide habitats for unique and diverse tropic flora and fauna as refuge. More than 45% of invertebrates on this island are tropical or subtropical species. In the case of coral, 97 species are reported from Cheju Island. Among them, 65 species including 23 hard coral species are found only in Cheju Island. The Tsushima warm current, a branch of the Kuroshio, originates in the tropics and mainly passes the southern part of the island, influencing the island and its islets. The current transports the elements of southern waters to the ambient water of this island. Presently human activities such as water pollution, land development and recreational activities have threatened these little-understood island coastal ecosystems. Conservation of these ecosystems is one of the key issues in Korean marine research.

INTEGRATED MANAGEMENT

The Integrated Coastal Management Law by the Ministry of Maritime Affairs and Fisheries, and the Wetland Conservation Law by both the Ministry of Maritime Affairs and Fisheries and the Ministry of Environment might be established this year. Some particular coastal ecosystems should be surveyed once every five years under the Wetland Conservation Law, if it is established. The Laws will also help develop the culture of integrated coastal management.

A national research project on integrated coastal management led to the establishment of the Integrated Coastal Management Law in Korea. If it is enacted, a lot of new coastal management projects and/or programs will begin.

Wetlands and associated habitats in Korea were artificially changed and lost their natural functions and integrity.

A network of several NGOs in Korea has cooperative activities amongst stakeholders, institutions and funding bodies to protect the coastal environment, especially wetlands.

CAPACITY BUILDING

No new measures have been taken specifically for coral reefs. The capacity of individuals and institutions to manage coastal zones including soft coral reefs might be enhanced under the two laws to be established.

The Laws have some articles to strengthen public awareness and education programs. Therefore the Laws should support the development, identification and dissemination of new materials, if those are established.

Two workshops on marine education to protect temperate coastal environments were organised by the Korea Ocean Research & Development Institute (KORDI) and NGOs in 1997 and 1998. The workshops were partly supported by the Ministry of Maritime Affairs and Fisheries and the Ministry of Environment. It will be much easier to hold workshops and similar activities to strengthen public awareness and education programs when the laws are enacted.

Action plans that support establishment of the two Laws are now needed.

4. Prepared by Environment and Science Division, Ministry of Foreign Affairs and Trade, Korea

RESEARCH AND MONITORING

A three-year project entitled 'Conservation of Biodiversity in Cheju Island' began this year. Research on biodiversity of marine life including soft corals on the island is being carried out by KORDI. This project is not site-specific and is based on part of a regionally coordinated initiative, but KORDI might provide the results for comparison on a regional or global scale.

The condition of soft corals on Cheju Island has gradually declined because there is no effective management of the area and the number of tourists visiting the coral is increasing. To overcome this attitude, regular meetings of stakeholders should aim to arrive at a compromise so that effective research and monitoring can be established.

Malaysia[5]

INTEGRATED MANAGEMENT

The Integrated Coastal Zone Management Project, coordinated under a State agency in Sabah is funded by the Danish Cooperation for Environment and Development. This project runs at both state and district levels. A document on the Coastal Profile of Sabah waters under this project is being prepared with the participation of representatives from the various agencies and stakeholders in the coastal zone. The representatives were organised in task forces for various sectors. The activities in the preparation of this document are coordinated by a management team at the state agency.

CAPACITY BUILDING

- One workshop on taxonomy of corals, coral reef fishes, and seagrasses for staff of local agencies was held in December 1996.
- One workshop on coral identification was conducted in September 1998.
- Funded by University Malaysia Sabah (UMS) Research Committee Grants, several projects were set up for undergraduates and postgraduates to conduct research on the following topics relating to corals:
  - recruitment of corals on damaged reefs;
  - investigation of effects of nutrients on harmful algal bloom;
  - the role of giant clams in coral recruitment; and
  - genetic population structure of a grouper, *Epinephelus tauvina.*
- National and local workshops were conducted on the following topics:
  - environmental consequences of the live fish trade (as part of the Workshop on the Aquaculture of Coral Reef Fishes and Fisheries), December 1996;
  - destructive fishing practices, April 1997; and
  - application of Limits of Acceptable Change at Tunku Abdul Rahman Marine Park, August 1997.
- A seminar on application of genetic markers to aquaculture and fisheries management in Southeast Asia was organised.

RESEARCH AND MONITORING

The Population Interdependencies in the South China Sea (PISCES) Project is a regional research project coordinated at the International Center for Living Aquatic Resources Management (ICLARM, Manila). The objective of the project is to find out whether marine organisms around the South China Sea belong to the same genetic population. The result of the project will be useful in defining the scale of management that is appropriate for marine organisms.

As part of a global survey of coral reefs, Reef Check is limited to two localities: Darvel Bay (Reef Check '98) and Semporna Reef Complex (Reef Check '99) on the east coastal of Sabah. This initiative came from the University of Hong Kong Science and Technology (c/o Dr Gregor Hodgson). The methodology is simple and standardised to allow comparable analysis at regional and global scales.

5. Prepared by Dr Annadel S. Cabanban, University of Malaysia Sabah. This information is NOT intended to replace the submission of the National Focal Point.

The monitoring of corals and coral reef fishes at Tunku Abdul Rahman Park follows the belt-transect method developed in the Region at the ASEAN-Australia Living Coastal Resources Project.

There is interaction between scientists and managers in management. This has come about by conducting training programs and cooperating in running workshops. Research on coral reefs and the organisms living in them should be focused on issues pertaining to management and to organisms that are currently exploited and of economic importance. Research grants to fund studies on the diversity and ecology of coral reefs should be facilitated through direct and smaller schemes. Larger schemes take too long in the preparation and costly in the process such that it may be too late for effecting management or rehabilitating damaged areas.

The Phillipines[6]

INTEGRATED MANAGEMENT

In February of 1998, an interagency governmental committee, coordinated by the DENR Environmental Management Bureau (EMB-DENR), came up with the Philippines' contribution to the Transboundary Diagnostic Analysis and Preliminary Framework of a Strategic Action Plan (SAP) for the East Asian Seas Region under the UNEP. This report includes an assessment of coastal management problems, detailed analysis of the root causes of issues such as coral reef degradation and fisheries over-exploitation, and recommendations for more effective management of coastal resources.

The DENR, with assistance from the United Nations Development Program, prepared a National Framework Plan for Marine Resources and Environmental Development and Management that spelled out the National Marine Policy into generalised policies, programs, and projects in coastal management and development. This program responded to the lack of a clear framework guiding the management and development of marine resources and coastal areas in the country.

The League of Municipalities (LMP), together with the Coastal Resource Management Project (CRMP), is sponsoring a nation-wide Best Coastal Management Programs Award. This award will provide recognition to outstanding efforts in community-based coastal management, thereby bolstering these endeavours and encouraging other local government units (LGUs) to develop their own long-term solutions to environmental problems in their coastal areas. The actions that the nominated municipalities and cities have undertaken include mangrove reforestation, artificial reef deployment, fish sanctuary establishment, community involvement, infrastructure development, and law enforcement strengthening.

An example of an ongoing national coastal management project is the DENR's Coastal Environment Program (CEP) initiated in 1993. The program aims to promote community-based sustainable use of resources in coastal areas by encouraging the use of environment-friendly technologies, providing livelihood opportunities to coastal communities, promoting equitable access to resources, and building DENR capacities in the management of coastal areas. The CEP is a nationwide effort, with 61 sites proposed all over the country, involving about 168 organisations from the government and non-government sectors. It mobilises financial and administrative resources from both public and private sectors, providing a way for various sectors to cooperate in the management of the community's coastal resources.

Another example is the Coastal Resources Management Project (CRMP), which primarily aims to achieve sustainable management of the fisheries resources in coastal waters in Palawan, Visayas and Mindoro. The components of the CB-CRMP are: community management of coastal resources for widespread implementation, local government capacity building, national agency policy implementation, information, education and communication, and special activities to enhance local and national capacity to support CB-CRM development implementation. The CRM Program employs a policy of co-management by involving the stakeholders, local authorities and the relevant social and economic sectors in planning, implementing and decision-making in coastal resource management.

6. Based on answers prepared by Prof. Porfirio Aliño, University of Philippines and Dr John W. McManus, ReefBase Project Leader, ICLARM

CB-CRMP often taps outside groups and organisations for research and community organising. Academic/research institutions such as Silliman University, University of the Philippines, and the Southeast Asian Fisheries Development Center (SEAFDEC) assist in providing baseline biophysical and socioeconomic data as well as recommendations for a management plan. The Haribon Community Extension and Research for Development (CERD) was also involved as a NGO.

The Integrated Coastal Management (ICM) takes on a planning perspective that is a broader coverage of the CRMP. For example, the Strategic Environmental Management Plan (SEMP) for the Batangas Bay Region covers the following key components: legal and institutional mechanisms, integrated policy and planning systems, integrated management systems and technical interventions, management and technical skills improvement, information base improvement, and sustainable financing development.

Actions Needed

It was recommended in the EMB-DENR Country Report for the Philippines (February 1998) that a Sustainable Marine and Aquatic Resources Utilization Program (SMARU) be established in the Philippines. This program will aim to sustain fisheries resource use and other resource extractive uses. In particular, the SMARU proposal recommended the regulation of fish harvests, the initiation of resource enhancement measures in overexploited areas, and the identification and establishment of strategic marine protected areas.

CAPACITY BUILDING

New measures include Institutionalisation of laws such as the NIPAS (National Protected Areas System) Act and the PDs 704 and 169 (now amended to RA 8550) through government-sponsored initiatives, and the implementation of government programs such as the DENR Coastal Environment Program (DENR-CEP) and the Fisheries Resources Management Project or FRMP. These government-led initiatives have benefited coastal managers in both the government and the private sector.

There is increased networking amongst NGOs, such as support for the Philippines Coral Reef Information Network (PhilReefs) which is a consortium of collaborators from government and NGOs, academe, research, foundations, private establishments and concerned individuals to initiate various local initiatives.

PhilReefs included two major activities. One is the establishment of the framework of a national coral reef database. This database is now accessible in the PhilReefs homepage maintained by the University of the Philippines Marine Science Institute. An accompanying product is a directory of Philippine coral reefs similar to that produced by the UNEP/IUCN (1988). PhilReefs is currently finalising the 'Atlas of Coral Reefs in the Philippines', the book and CD-ROM of which are still under preparation and are due for release at the end of 1998.

The other activity was Adapt-A-Reef Program in connection with International Year of Reef. The program culminated in the awarding of the Best Reef in the Philippines, giving recognition to the best managed reef in the country and to the management entity adopting that reef.

A National Training Program on Integrated Coastal Management (NTPICM), organised by the Rockefeller Brothers Fund together with government and NGO partners, funds education programs in coastal management. This is integrated with the DILG's Local Government Academy, which trains government personnel in coastal management.

The Community-Based Coastal Resource Management (CBCRM) School is the Local Government Academy's counterpart in the non-government sector. The School is involved in the grassroots-level training and education of local community members.

The International Institute of Rural Reconstruction recently came out with a three-volume publication entitled 'Participatory Methods in Community-Based Coastal Resource Management'. This sourcebook is intended to serve as a guide for coastal resource managers in implementing participatory and community-based policies.

The augmentation of the capacity of individuals and institutions to manage their coastal resources is an inherent part of many of the new coral reef management initiatives. One approach to capacity building is the facilitation of networking between government institutions, NGOs, and technical and financial supporters.

The new Fisheries Code of 1998 (RA 8550) replaces PD 704 (1974) in regulating fisheries exploitation in the country. The new fisheries law will hopefully favour fisherfolk, allow for local autonomy and take a conservation stance in coastal management. For instance, the new law provides for an expansion of the powers of municipal governments over coastal areas. Penalties for prohibited acts have increased and provisions for confiscation and forfeiture are provided.

Tertiary-level education in the marine sciences is the approach taken by the Commission on Higher Education (CHED), while the NTPICM established training courses in coastal management, expanding it to LGU managers.

CRMP's 'I-Love-the-Ocean' Movement was launched last February 1998 as part of the country's celebration of the International Year of the Ocean. Activities include a travelling exhibit, performances by entertainment personalities, etc.

Actions Needed

- Educate the personnel of the various levels of GOs and LGUs.
- Encourage institutions to efficiently utilise funds and sustain financial capacity after program phase-out.
- Acquire and maintain ships and equipment to assist government to manage resources.
- Initiate information and education campaigns.
- Conduct multi-sectoral consultations to tackle urgent needs and plan pro-actively for decisions and actions.
- Strengthen environmental awareness.
- Empower local communities to enable them to make decisions and plans on the use and conservation of living marine resources and to take part in implementing the plan.

In addition, a workshop sponsored by PhilReefs presented the following recommendations:

- coordination of available research outputs, training modules, and model cases to avoid duplication;
- adaptation of information for easy comprehension by, and to address the specific needs of, various target audiences;
- involvement of educated members of the public in the education of others; and
- assessment of the effectiveness of education and capacity-building programs, and implementation of appropriate actions.

Up until now, most of the coastal management activities in the country have been concentrated in the Visayas region and some parts of Mindanao in the South China Sea sector. To address this imbalance, capacity-building measures should be implemented in the Pacific seaboard side of the country as well. Coastal management activities as part of the IPAS areas in this region have only just begun, in places such as Siargao Island and the Palanan Wilderness Area.

RESEARCH AND MONITORING

The PhilReefs' Philippine Coral Reef Atlas mentioned above will provide an assessment of the extent and condition of the reef resources in the country. This contribution is also being incorporated in ReefBase.

Other research initiatives at the UP-MSI include the compilation of country-wide data on the various perceived reasons for coral reef degradation. UP-MSI is also documenting recent coral bleaching incidents reported to be widespread in Northern Luzon, especially in Bolinao. Additional data on coral bleaching and other causes of coral deaths from other study sites in the country are being obtained through the PhilReefs network.

Research on coral transplantation was done by the UP-MSI, Silliman University, and the UP Visayas. Monitoring and evaluation of several marine protected areas is being conducted by the UP-MSI, US-AID CRMP, and others.

Likewise, an evaluation and assessment of the state of coastal management in the Philippines was conducted by Uychiaco et al. Coastal managers from 13 political regions of the country were polled on the state of coastal management in the Philippines. Uychiaco et al.'s review assessed coastal management and conservation actions based on management policies and goals, environmental problems and enhancements, quality-of-life problems and enhancements, etc.

Aside from the report on the nationwide status of coral reefs by Gomez et al. (1994), there is no nationwide monitoring effort. An assessment of the state of the country's reefs cannot be done because of the lack of nationwide monitoring. The only sites where data have been consistently collected for a number of years are Bolinao, Puerto Galera, El Nido, Tubbataha, Apo Island, Sumilon, and Balicasag (the figures from the last three sites are mainly on fisheries resources rather than coral cover). It is encouraging to note, however, that there was an increase in the number of marine protected areas (MPAs) set up in the country. According to the DENR, the Philippines now has more than 160 established MPAs, but unfortunately the actual extent of protection in those sites is not certain. Some reports peg the actual number of working MPAs at only 15–20. One must also take into account that despite the increase in MPAs, the percentage of reefs under threat has also gone up.

Actions Needed

The EMB-DENR Country Report for the Philippines (Feb. 1998) established the following priority actions in research and monitoring.

- Establish adaptive management mechanisms in the monitoring of resource uses and their enhancement.
- Identify appropriate indicators of the impact or effectiveness of harvest regulations and other management interventions through question-oriented research and applications for resource management.
- Clarify management decisions based on monitoring and evaluation feedback.
- Uychiaco et al. summarised the recommendations for research activities as follows:
  - initial identification of priority issues and areas for improvement;
  - setting up of a standard-format coastal management information system;
  - establishment of benchmarks for environmental health, human quality of life, and carrying capacity from nationwide data;
  - quantification of the effects of stress (e.g. overfishing) on the environment and on people;
  - monitoring and evaluation of the effectiveness of management initiatives such as livelihood programs and marine protected areas; and
  - On-site development of local researchers and dissemination of research output to management implementors.

Thailand[7]

INTEGRATED COASTAL MANAGEMENT

Thailand formulated its National Coral Reef Management Strategy out of the recognition that a significant national effort has to be launched to reverse trends in habitat degradation. The national strategy provides the policy framework and the means to realise this vision of the future.

In formulating the National Coral Reef Management Strategy and in selecting measures and actions to implement policies, the Government of Thailand has recognised the following principles.

1. Maintain a balance in the integrity and variety of coral reef uses.
2. Consider both national economic priorities and local needs.
3. Rely on both regulatory and non-regulatory measures to achieve management objectives.
4. Create incentives for coral reef management.
5. Aim for a cooperative management approach.
6. Make management decisions based on the best available data on reef condition, uses and carrying capacity.

CAPACITY BUILDING

Recognising that public support is essential for any successful resource management initiative, public awareness, education, and participation programs play a fundamental role in building such support. Much progress was made in Thailand through media campaigns that raised public awareness of the value and fragile nature of coral reefs. Having gained public attention, there is now an opportunity to broaden public education and participation efforts to encompass more issues and practical solutions. Informed reef users are more likely to voluntarily comply with regulations. Enhanced appreciation and understanding among decision makers, the private sector, and local residents leads to active involvement and other tangible contributions to reef management.

The Government of Thailand will use measures to implement this policy such as expanded public awareness campaigns, support for voluntary action groups, and school curriculum development.

Launch National and Local Public Information Campaigns

Large segments of the general public and selected target groups are now aware of the value of Thailand's coral reefs as a result of the media coverage of recent years. Education and public participation campaigns have largely focused on the physical damage caused to reefs by recreational use. There is a need to broaden and accelerate information campaigns to reinforce the favourable context for coral reef management.

Broadened national educational campaigns will help sustain media, public and political attention to the most urgent reef protection issues. Local information campaigns, using the most appropriate communication techniques and networks, will reach target groups such as fishermen and business. These efforts will set the stage for demonstrations in reef management, and enhance voluntary compliance with regulations of the national strategy.
At the national level, the OEPP will expand its ongoing information campaign to disseminate increasingly more focused information on the impacts of coastal development on coral reefs. In addition to addressing anchor damage, education messages will include the prevention of damage from pollution and solid waste disposal. Brochures, booklets and media coverage will be directed at specialised audiences such as resource users, tourism businesses and the industrial sector. The Tourism Authority of Thailand, national news media and Thai non-government organisations (NGOs) will be directly involved in implementing the campaign.

Technical assistance and funds will be made available for organising education events and producing materials at the provincial and local levels. Educators at local community colleges and regional universities, Thai NGOs and the provincial governments will be responsible for establishing priorities and appropriate themes for these local campaigns.

7. Based on the answers prepared by Office of Environmental Policy and Planning (OEPP), Thailand

Encourage Volunteer, User, Private Sector and General Public Participation in Reef Management

Community organisations, special interest groups, and the private sector have an inherent interest in becoming involved in some aspects of coral reef management. There is a need to encourage and guide public participation so that volunteer efforts are effective and directed towards priority issues.

The OEPP and the Royal Forestry Department will help create cooperative partnerships among government and community groups, universities, and the private sector, to enable the active participation of the Thai people in reef management initiatives. These partnerships will take the form of joint ventures, corporate donations, volunteer action and other ways of mobilising people and funds for conservation.

Technical assistance, documentation and assistance in locating funds will be provided to community groups, NGOs and other organisations wanting to take an active role in reef management. Technical assistance will include short-term training, public workshops, extension and advisory services for organising cleanup campaigns, installing mooring buoys and signs, planning reef-watch programs, and other field operations. Information brochures, maps and other documentation will be made available to volunteer groups.

This measure will gradually create a context and means that favour volunteer public action in support of the national strategy. Active public participation in the practical aspects of reef management is expected to create a sense of local and national stewardship. By developing new skills and knowledge within special interest groups, this measure is also likely to reduce demands on government staff and funds.

Incorporate Coral Reef Conservation into the School Environmental Education Curricula

Experience with a pilot program in Phuket has shown that there is a keen interest among educators in adding environmental topics such as coral reefs and other coastal habitats into school curricula. These topics are timely and offer excellent opportunities for multidisciplinary classroom activities.

Over time, this measure will give Thai educators practical experience in incorporating environmental education topics into formal curricula. Innovative and relevant classroom activities will help to give youth a sense of national pride in their natural heritage, and to generate interest in resource management careers.

Coral Reef Management (CRM) Initiatives Programme in Thailand for the International Year of Reef

CRM has implemented the following community-based activities to support the activities of the International Year of Reef.

- **Mooring buoy installation** – Twenty permanent mooring buoys were installed as a demonstration at Parong and nearby Hae Island, both are popular diving and snorkelling sites. Installation followed a training workshop for local divers who had volunteered to assist OEPP, the Department of Fisheries, the National Park Division and the Harbor Department in installing buoys. The objective of the workshop was to train local groups in procedures for selection of appropriate sites, equipment operation, and buoy installation.
- **Signs** – Thirteen signs promoting the wise use and conservation of coral reefs were installed in intensively used coral reef sites. This action was successful in demonstrating how the private sector can work with government to achieve habitat management objectives.
- **Community events** – Several community events that drew attention to coral reefs were sponsored and hosted by the Thailand Government. These included a 'crown-of-thorns day' in November 1997 and the second 'Coral Reef Day' in April 1997.
- **Promotion activities** – These included the production of a coral reef poster, TV spots, interviews with local citizens, and extensive newspaper and magazine coverage.

- **Coral reef curriculum** – A coral reef curriculum was produced by the Teachers' College in cooperation with local primary schools. It incorporates information and classroom activities on coral reefs into the standard science curriculum for grades 4 to 6. This curriculum, the first environmental education packet produced in Phuket by a local group, was tested in several urban and rural schools and was revised to incorporate the suggestions of local teachers.
- **Coral reef protection diorama at the National Aquarium** – CRM provided design advice and funding for the construction of a permanent coral reef exhibit at the Aquarium. The exhibit will be seen by several thousand foreign and Thai tourists that visit the Aquarium every year.
- **Coral reef protection brochures** – CRM and the American Woman's Club of Thailand produced a brochure entitled 'Thailand's Underwater Gardens', which describes Thailand's coral reefs and what citizens can do to protect them.
- **Other local training activities** – Several training workshops were conducted in coral reef sites for tour boat operators and guides: coastal management volunteers (mainly local business owners in the tourism industry), and the local Youth Club.

RESEARCH AND MONITORING

Research and monitoring of coral reefs and the installation of mooring buoys to prevent anchor damage on coral reefs have been carried out since the beginning of the Coastal Resource Management Project in 1987. Between 1996 and 1998, 163 mooring buoys were installed in the coral resort areas along the coast of Thailand including Phuket, Phangnga, Suratthani, Chonburi, Chanthaburi and Trad. More durable types of the mooring buoys were developed for medium and large ships and nine of them were installed around Samui Island for experimental purposes.

As Thailand's tourism sector and coastal infrastructure continue to expand in the next decade, dramatic changes are expected in coastal land-use patterns and resource uses. These changes are likely to affect conditions for coral reefs, particularly water quality. Nationwide monitoring and assessment of reef condition and use can help detect emerging problems and issues in different regions of the country. There is a consequent need to put in place the cooperative agreements between agencies, and with academic institutions, for carrying out a national monitoring program.

Until now, much of the information on coral reef condition and uses has been contained in scientific reports that were not readily available or interpreted by resource managers within local and central government agencies. There is a widespread need to make this information available in a form that is useful for policy and habitat management purposes.

The purpose of the National Coral Reef Monitoring Program will establish a nationwide baseline of information on reef condition, economic uses, and sources of damage. The baseline data will be periodically updated through a cooperative effort involving central and provincial governments, universities and volunteer organisations.

Concerned agencies and cooperating academic institutions will agree on a standardised protocol for monitoring reef condition based on the recommendations of the ASEAN-Australia Cooperative Program in Marine Science and similar programs established worldwide. Parameters for monitoring reef condition and evidence of human-induced damage will include environmental parameters, surveys of benthic organisms and records of damage from crown-of-thorns, pollution, breakage, disease and bleaching.

Concerned agencies and cooperating academic institutions will formally establish a network of permanent monitoring stations in the Andaman Sea and the Gulf of Thailand. The scientific reserves designated under the Fisheries Act will serve as control sites, providing areas of minimally disturbed reef communities. Funds will be made available for the systematic collection of monitoring data on reef condition, a responsibility that will be shared among government agencies and academic institutions.

The Department of Fisheries will assume lead responsibility for compiling monitoring data on reef condition. The department will establish a centralised geographic database for all major reef groups. It will compile, maintain and distribute detailed maps of reef locations. The information will be used to undertake periodic analyses of nationwide status and trends in coral reef habitat.

The OEPP and the National Park Division will undertake a pilot program to identify key parameters and practical guidelines for monitoring reef uses with the participation of local volunteer groups and the private sector. The National Park Division will assume responsibility for maintaining data on reef-dependent uses and benefits within marine national parks. Periodic assessments of trends will be undertaken.

The OEPP will increasingly rely on the results of site-specific monitoring to assess the effects of coastal development on coral reefs. Impact studies will be used by the OEPP as a basis of discussion with permitting agencies and proponents on the need for improved mitigation measures.

Vietnam[8]

Since the Vietnam country report was presented at the Second Regional Workshop for the East Asian Seas, Okinawa, Japan in 1997, more actions were implemented to study and manage coral reefs and related ecosystems.

MANAGEMENT

After much discussion between governors, scientists and consultants, the list of proposed Marine Protected Areas (MPAs) was published by the National Environment Agency (NEA) and IUCN. Most of the MPAs are based around coral reefs and this was the first time that MPAs were included in the system of protected areas and natural reserves in Vietnam. MPAs are listed in Table 1.

The level of studies and management are different in the MPAs. The managers of Con Dao National Park have good cooperation with international and inland scientists, and local governors to increase activities for forest protection and marine conservation. Another model to manage MPAs was conducted in Binh Thuan province. The Cu Lao Cau MPA is protected by guards of the Department of Fishery Protection under guidance from scientists from the Institute of Oceanography and Department of Science, Technology and Environment of the province.

8. Prepared by Dr Vo Si Tuan, Institute of Oceanography, Vietnam

Table 1: Marine Protected Areas in Vietnam

NAME OF MPA	PROPOSED CATEGORY	PROVINCE
Bach Long Vi	Habitat Management	Hai Phong
Cat Ba	Marine Park	Hai Phong
Con Co	Natural Reserve	Quang Tri
Ly Son	Habitat Management	Quang Ngai
Nam Du	Natural Reserve	Kien Giang
Phu Qui	Habitat Management	Binh Thuan
Co To	Natural Reserve	Quang Ninh
Tho Chu	Habitat Management	Kien Giang
Ngoc Hien tidal marsh	Natural Reserve	Ca Mau
Con Dao	Marine Park	Ba Ria-Vung Tau
Cu Lao Cau	Natural Reserve	Binh Thuan
Hon Mun-Bich Dam	Marine Park	Khanh Hoa
An Thoi	Managed Resource Protected	Kien Giang
Truon So (Spratly)	Natural Reserves & Resource Management	Khanh Hoa
Hai Van-Son Tra	Habitat Management	Thua Thien-Hue

At the national level, the WWF and the Institute for Environment and Sustainable Development of Hong Kong University of Science and Technology (IESD/HKUST) combined with the NEA to organise a workshop on coastal biodiversity conservation at Hanoi, 4-6 November 1997. The workshop focused on policy and technical problems concerned with ICM biodiversity and designed marine conservation strategy in Vietnam.

Some demonstration sites through ICM are needed as soon as possible with suitable mechanisms to establish good cooperation and coordination among policy makers, managers, scientists and communities.

CAPACITY BUILDING

The following training courses were conducted in 1997/98.

- Training Workshop on Management of MPAs in Vietnam, Nha Trang, 4-17 September 1997, organised by INTROMARC, Australia
- Coral Reef Monitoring Training Course, Nha Trang, 26 May-6 June 1997, AMSAT/AusAID/CZERMP, Australia
- 4th Training Course on Marine Environment Management, SIDA/CSCMOSTE/NIO, Nha Trang, 29 July-3 August 1998
- Other training courses on seagrass and mangrove management were also conducted in Hai Phon and Nha Trang under the support of AMSAT/AusAID/CZERMP, Australia.

Enhancements of facilities to study coral reefs were as follows.

- Ten sets of diving equipment were bought for the Institute of Oceanography (Nha Trang and Hai Phong). They were funded by AMSAT/AusAID/CZERMP, Australia.
- Two sets of diving equipment and one air compressor were funded by DANIDA for Con Dao National Park.
- An underwater camera and video were procured for the Institute of Oceanography (Nha Trang and Hai Phong) by government funding and International cooperation.

Education initiatives were as follows.

- Community education on marine conservation is assisted by the Marine Museum of Institute of Oceanography at Nha Trang.
- On the occasion of International Year of the Ocean, some educational materials were developed, including a short video film on coral reefs in Vietnam.

Actions needed

- Conduct more training for local managers to implement the ICM effectively and to develop a MPA system.
- Support scientific institutions to strengthen education programs for communities.

RESEARCH AND MONITORING

- New coral reef areas around Hon Me islands (Thanh Hoa province) were studied and Son Tra island (Thua Thien-Hue province). The surveys were funded by the government.
- The project on biodiversity conservation at Con Dao islands was funded by DANIDA and coordinated by IESD/HKUST to study the impacts of Typhoon Linda on coral reefs and seagrass beds, and the potential impacts of a fishing port. There was also a component on improving environmental monitoring and assessment.
- Studies have been undertaken on the ecological importance and the scientific baseline for management of a MPA at Cu Lao Cau.
- An experiment is underway to restore endangered species of coral reefs at MPAs at Hon Mun-Bich Dam and Cu Lao Cau.
- Delegates have been attending the Reef Check program since 1998 and coral reef monitoring sites have been set up at Con Dao, Cu Lao Cau and Hon Mun islands.
- A pilot project for MPA at Hon Mun has been developed by IUCN with funding from the World Bank. This project forms the Asian component of a much larger international project to implement a global representative system of MPAs.

Actions needed

- Support is needed to set up a monitoring system on coral reefs and related ecosystems.
- Scientific information is required on the status, human impact, rehabilitation potential of coral reefs and related ecosystems in the demonstration sites of ICM and MPAs.
- GIS application for coral reef mapping should be utilised.

SOUTH ASIA: A review of the progress in implementation of management actions for the conservation and sustainable development of coral reef ecosystems in South Asia

ITMEMS 1998 Proceedings

Prepared by
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Introduction

This report draws its information mainly from the 'South Asia Regional Report on the Issues and Activities Associated with Coral Reefs and Related Ecosystems' by White and Rajasuriya (1995), the 'Integrated Coastal Management: South Asia' (Brown 1997) and from workshop proceedings of the Regional Workshop on the Conservation and Sustainable Management of Coral Reefs (Hoon 1997) and the Integrated Reef Resources Management in the Maldives (Nickerson & Maniku 1997). More recent developments on new management initiatives and training have been included. Individual scientists in South Asia have also been consulted to obtain information on new initiatives within their countries.

The major coral reefs in South Asia are in the Lakshadweep, the Maldives and Chagos archipelagos. Extensive fringing coral reefs occur around Andaman and Nicobar Islands. Mainland India has two widely separated areas of reef development: in the north-west (Gulf of Kutch) and south-east (Gulf of Mannar). Isolated patch reefs are also known to occur along the western coast of India. In India coral reef development is largely inhibited by massive freshwater and sediment input. In the north-west, cold upwellings may affect the growth and condition of corals (Scheer 1984; Stoddart 1971). In Bangladesh coral reefs at St. Martin's Island are eroding due to high loads of sediment, action of cyclones, storm surges and human activities. Coral reef development is poor in Pakistan although isolated coral patches are found to a depth of 20 m (Kazmi & Kazmi 1997). The best coral reefs in the Indian Ocean are reported to be in the Chagos Archipelago, which is a British Territory (White & Rajasuriya 1995). However, there is a dearth of information on the current status of reefs from this location. Many fringing and offshore patch reefs are found around Sri Lanka with extensive coral reefs in the Gulf of Mannar (Rajasuriya et al. 1995). Most coral reefs in South Asia have been adversely affected by the recent event of coral bleaching in mid-1998. Extensive damage to reefs has been reported from the Maldives, Lakshadweep, Andaman Islands, Sri Lanka and the Gulf of Mannar region of India. Information is lacking on the impact of bleaching from other locations such as St. Martin's Island in Bangladesh, Gulf of Kutch in India and the Chagos Archipelago.

Coral mining, increased sedimentation, destructive fishing methods, uncontrolled harvesting, increased pressure from tourism and pollution continue to degrade reefs in South Asia. This is mainly due to the rapid increase in coastal populations, lack of employment opportunities, alternative sources of employment, material and trained manpower to implement existing laws and regulations as well as to establish and manage marine protected areas. The status of reefs within protected and other areas have been summarised in Tables 1 and 2.

1. National Aquatic Resources Research and Development Agency, Sri Lanka
2. Ministry of Fisheries, Agriculture and Marine Resources, Maldives
3. Department of Ocean Development, India
4. Global coral Reef Monitoring Network, South Asia Programme

An important development in coral reef conservation and management in the South Asian region was the establishment of the Global Coral Reef Monitoring Network (GCRMN) South Asia in July 1997 by the International Coral Reef Initiative (ICRI). A regional coordinator and individual country coordinators for India, the Maldives and Sri Lanka were appointed to facilitate monitoring, training, networking and management of coral reefs in South Asia. The country coordinators are attached to government organisations namely The Department of Ocean Development (DoD) in India, The Ministry of Fisheries and Agriculture (MFA) in the Maldives and The National Aquatic Resources Research and Development Agency (NARA) in Sri Lanka. The GCRMN South Asia is supported jointly by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, Department for International Development (DFID) of UK, The World Conservation Union (IUCN) and The United Nations Environment Programme (UNEP). The South Asia Co-operative Environment Programme (SACEP), which is the secretariat for the South Asian Regional Seas Programme of UNEP, is the focal point for ICRI activities in the South Asian Region. A summary of new ICM initiatives and capacity building is given in Tables 3 and 5.

Through the GCRMN program several meetings and a workshop have been held for the purpose of planning future activities in monitoring, training and management of coral reef resources. Two regional training workshops on biophysical and socio-economic monitoring have been held in 1998 in the Maldives and Lakshadweep respectively. Pilot monitoring exercises have been carried out in the Maldives and the Gulf of Mannar region in India on the condition of coral reefs and on the socio-economic status of local communities. Furthermore, a number of activities have been planned for the future where pilot monitoring exercises will be carried out in India, Andamans and Lakshadweep, the Maldives and Sri Lanka. Research and monitoring on coral reefs have been summarised in Table 4.

In addition there are separate developments within individual countries on integrated coastal zone (ICM) management. In Sri Lanka, a new ICM program has been launched in the south-eastern coastal belt with financial assistance from Germany and from the Asian Development Bank (ADB). Another ICM program to be funded by the ADB is being developed for the west and southern coasts of Sri Lanka to prevent the degradation of critical habitats. In the Maldives a workshop was held in 1997 on the Integrated Reef Resources Management (IRRM) with the assistance of the Bay of Bengal Programme (BOBP). In India financial assistance from the World Bank has been obtained to develop management plans for selected critical habitats including coral reefs. The Australian Government has pledged support for capacity building in the Maldives. In Bangladesh the government has developed appropriate national law for the conservation and management of critical habitats and five projects have been initiated, but many of these are for the conservation of mangroves and wetlands. The IUCN has planned to develop a Marine and Coastal Protected Area in Pakistan and conservation laws for critical habitats are now being drafted under the Biodiversity Action Plan. Individual countries have also introduced new laws and management action plans with an aim to arrest the degradation of critical habitats in the marine environment and their resources.

Awareness building has been increased in South Asia, particularly in 1997 during the International Year of the Coral Reefs and in 1998 for the Year of the Ocean, through workshops and media. The environment as a subject has been introduced into school curricula in India, the Maldives, Sri Lanka and Bangladesh.

Status of Reefs

Bangladesh

St. Martin's Island, also known as 'Narikel Jinjira Island', is the only coral reef area in Bangladesh. Coral cover is generally low (4-10%). There are also extensive algae and seagrass beds. Reef condition is poor due to the high level of sedimentation, cyclones and storm surges and fluctuations in salinity caused by freshwater input from major rivers. Physical damage to corals continues due to human activities, resulting in heavy damage to the living sections of the reef. Among these, coral mining for construction is the main cause of reef damage (White & Rajasuriya 1995; Mollah 1997). In addition, destructive fishing methods, collection for souvenirs, boat anchoring, pollution and tourist activities threaten the survival of corals around St. Martin's Island (Mollah 1997). However, there are yet undisturbed areas on St. Martin's Island that have been identified for maximum protection. There is no information on coral bleaching for Bangladesh.

Chagos

Chagos is located in the southernmost part of the Chagos-Laccadive chain of atolls. All these atolls and submerged banks have actively growing reefs which include the largest expanse of undisturbed reefs in the Indian Ocean, as well as some of the richest. The inaccessibility and uninhabited nature of the islands (except Diego Garcia) protect the archipelago. Currently there is no legal protection for the reefs although the Corbett Action Plan for Protected Areas of the Indo-Malayan Realm has identified Chagos as an area with marine conservation needs (Thorsell 1985; UNEP/IUCN 1988). It is not known to what extent the coral reefs in Chagos Archipelago were damaged due to the increase of sea surface temperatures in 1998.

India

India has coral reefs in widely scattered locations from the Gulf of Kutch in the north-west, the Gulf of Mannar and Palk Bay to the Lakshadweep Islands and the Islands of Andaman and Nicobar (ENVIS 1998; White & Rajasuriya 1995). Patchy outcrops and deep-water formations can be found along the western coast.

Coral reefs off the mainland coast of India continue to be exploited for extraction of lime, reef fisheries and collection of ornamental shells, sea fans, seaweed, sea cucumbers, spiny lobsters and sea horses (Hoon 1997). Pollution from agricultural and industrial run-off, pesticides and oil pollution adds to the degradation of mainland reefs. But the most significant impact may be due to sedimentation, which is very high in the Gulf of Kutch area as well as in the Bay of Bengal area. In recent years sedimentation and pollution have increased in coastal waters due to increasing discharge from land.

In the Gulf of Mannar and Palk Bay area coral and sand extraction are persistent problems. Some coral reefs off Tuticorin in the Gulf of Mannar are reported to have disappeared completely due to coral mining (Devaraj 1997). Similar impacts can be seen in the Gulf of Kutch area. Coral reefs of India have also been adversely affected by the crown-of-thorns starfish (*Acanthaster planci*) and from other causes such as the white band disease and boring organisms (Devaraj 1997). The recent event of coral bleaching had adversely affected shallow reefs in the Gulf of Mannar, Lakshadweep and Andaman Islands. There is no information on coral bleaching in the Gulf of Kutch in the north-western coast of India.

The Maldives

Extensive coral reefs in good condition are found throughout the Maldives (White & Rajasuriya 1995; Brown 1997). Although coral was used as the main material for construction it is being gradually phased out. The current trend is to use cement blocks for construction instead of coral (Naseer 1997). However increased use of reef resources and development activities continue to have a negative impact on some reef areas. The increase of sea surface temperatures in 1998 had caused extensive bleaching and had destroyed large areas of shallow water coral reefs throughout the archipelago.

Pakistan

Corals in Pakistan are not well developed due to unfavourable environmental conditions for coral growth. Living coral colonies are found as isolated small patches on hard substrates (UNEP/IUCN 1988). Live corals have been recorded at several locations along the coast to a depth of 20 m (Kazmi & Kazmi 1997). Local fishermen in Pakistan collect corals to be used in traditional Islamic medicine. Land-based pollution, sewage, industrial effluents, sedimentation and dredging appear to be the main problems for the reefs in Pakistan's coastal waters. Destructive fishing methods contribute to the degradation of the marine environment near Churna Island (Kazmi & Kazmi 1997).

Sri Lanka

Sri Lanka has coral, sandstone and rocky reef habitats. Reefs are mostly fringing or offshore patch reefs. The reefs in best condition are the offshore reefs. Live coral cover on some patch reefs as well as undamaged nearshore reefs exceeds 50% (Rajasuriya & White 1995). Many other nearshore reefs have a low coral cover due to damage caused by human activities and sedimentation (Rajasuriya et al. 1995; Rajasuriya & White 1995).

Many coral reefs in Sri Lanka have been severely degraded by human-induced damage. In addition, reefs in the north-west and the east coast are under threat from periodic infestations of the crown-of-thorns starfish (De Bruin 1972; Rajasuriya & Rathnapriya 1994). Coral mining in the sea, increasing amounts of sediment due to poor land use practices and destructive fishing methods, boat anchoring, tourism related activities, uncontrolled harvesting and pollution continue to cause damage to reefs (Rajasuriya et al. 1995; Rajasuriya & Wood 1997). The recent event of coral bleaching had destroyed large areas of corals in shallow water along much of the coastline.

Coral Bleaching in South Asia

Coral reefs in all the major tropical oceans of the world were adversely affected during 1997/98. This event coincided with climate changes and a strong El Niño event. In South Asia extensive areas of coral reefs were damaged during the months of April and May 1998 due to elevated sea surface temperatures. For example, the sea surface temperature along the southern and western coastal waters of Sri Lanka had increased to about 35°C during daytime which is approximately 5°C higher than the normal sea surface temperature during daytime. The increase in sea surface temperatures, that lasted for about 1-2 months, resulted in unprecedented coral bleaching in a number of countries in South Asia. The impact was observed at different locations at slightly different time frames. Available information indicates that there was extensive bleaching of corals in the Maldives, Lakshadweep, Sri Lanka, Gulf of Mannar and in Andaman and Nicobar Islands. It is not known whether coral reefs in other areas in South Asia (Gulf of Kutch and Chagos Archipelago)have been similarly affected.

During a survey conducted in September 1998 in the East Coast of Sri Lanka, bleached corals were observed at a depth of 42 m. In the Maldives bleaching has been reported up to a depth of 30 m. The most severe impact of bleaching was observed on shallow coral reefs (up to 10 m depth) consisting of branching and tabulate *Acropora* spp. Most of these bleached colonies were severely damaged and died within two to three weeks. Turf and filamentous algae now cover the dead coral areas. In addition to hard corals, many other organisms such as sea anemones and soft corals that contain zooxanthellae were bleached. The shallow coral reefs of Hikkaduwa and Bar Reef Marine Sanctuaries in Sri Lanka were both affected adversely. Nearly 90% of the living corals were bleached and destroyed. Butterflyfish and other coral-dependent species have been reduced drastically in the damaged areas. A recent (October 1998) survey of a reef patch at the Bar Reef Marine Sanctuary in Sri Lanka revealed that there were only two butterflyfish in an area of 500 square metres (Rajasuriya, in prep.).

Bleaching of corals has been variable depending on the location, depth, and condition of the corals prior to bleaching and sometimes on the species. In Sri Lanka, coral species *Montipora aequituberculata* and *Montipora digitata* were hardly affected. A number of species of columnar (e.g. *Psammacora digitata)* and massive (e.g. *Diploastrea heliopora*) corals were only partially bleached. The impact of bleaching has been similar in the Region with branching and tabulate corals being most vulnerable (Rajasuriya, in prep. and pers. comm.).

There are also some coral reef areas that have not been affected, probably due to temperature changes caused by local currents and nearby deep water. Corals have not been bleached in Trincomalee on the north-east coast of Sri Lanka where a canyon more than 1000 metres deep exists close to the shore. In the Maldives some pinnacle reefs situated in deep channels along the rims of atolls have not been bleached to the same degree as fringing reefs within the atolls.

In the Gulf of Mannar, on the south-east coast of India, 85% of corals were bleached in May-June 1998 (Venkataraman & Jeyabaskaran, in prep.). A subsequent survey revealed that 72.6% were dead (Kumaragura, in prep.). Surveys in the Andaman Islands in May 1998 recorded 65-80% having bleached in different areas. Repeat surveys in September revealed that coral mortality was in excess of 50%. Surviving taxa included *Porites* spp., *Platygyra* spp., *Favites* spp. and *Fungia* spp. (Soundarajan, in prep.). A survey in the shallow lagoons in Lakshadweep found that 74% of live corals were wholly or partially bleached (Arthur & Madhusan, in prep.). A survey of an outer reef slope of Lakshadweep in September found that live coral cover was less than 5% on a reef previously known to divers for its abundant coral cover.

Recovery of some of the bleached corals has been observed in Sri Lanka and the Maldives. Massive coral colonies began to regain their colour about two to three months after the initial bleaching and many have now recovered completely (personal observations and communication). Branching *Acropora formosa* has also begun to recover along the southern coast of Sri Lanka. However it may take several years or decades for the coral reefs to regain their former status. The damage caused by this event was much greater than any human impact on corals and coral reefs, however the recovery of the damaged reefs may ultimately depend on the ability to control chronic problems such as high levels of sedimentation and destructive fishing practices.

Integrated Management

Bangladesh

Integrated coastal management initiatives in Bangladesh concentrate mainly on mangrove and wetland areas. St. Martin's Island has been identified as a location that needs protection under the National Conservation Strategy and a zoning plan has been proposed as a tool for the management of resources and human activities. The Ministry of Environment and Forest (MoEF) is executing the conservation program with technical support from the IUCN of Bangladesh. Baseline information has been gathered and resource inventories have been prepared through the 'Survey of Fauna, Flora and Base Map Preparation' projects. With support of the Bay of Bengal Programme (BOBP), Bangladesh has developed integrated resources management plans for the sustainable management of coastal fisheries. The *Bangladesh Environment Conservation Act of 1995* covers all legislative aspects pertaining to the coastal zone.

Community-based ecotourism has been recommended for St. Martin's Island particularly to cater for the needs of the growing local tourist industry. Seven areas have been subjected to a preliminary assessment. The proposed action plan for the management of the Island provides environmental guidelines for conservation of coral reefs and tourism development. There is a need for a central agency to coordinate the activities of different projects. The government of Bangladesh has endorsed the Integrated Coastal Zone Management (ICZM) approach which has been specifically included in the National Conservation Strategy (NCS) and the National Environment Management Action Plan (NEMAP) through which the government has implemented the following projects:

- Coastal Green Belt Project;
- Integrated Sunderban Management Project.;
- National Conservation Strategy (NCS) Implementation Project-1 (NCSIP-1);
- Coastal and Wetland Biodiversity Management Project; and
- Sustainable Environment Management Project (SEMP).

India

Management and conservation of coral reefs in India are included as key activities in the National Conservation Strategy and Policy Document (1992) and the Environmental Action Plan (1993). The conservation and management of coral reef resources is within the purview of the Ministry of Environment and Forests (MoEF) which is developing an Action Plan to manage coral reefs. The National Committee, constituted for the conservation and management of wetlands, mangroves and coral reefs in 1986, advises the government on policy issues related to conservation and management of coral reefs (Hoon 1997).

Steering committees have been set up for the formulation and implementation of action plans. Management plans for the Gulf of Kutch Marine National Park and Sanctuary were prepared in 1994 but their implementation is yet to pick up momentum. There has been some recovery of damaged corals in the Gulf of Kutch, which has been attributed to enforcement of laws to stop mangrove cutting and coral mining. The management of coral reefs in Andaman and Nicobar Islands is carried out by the Ministry of Environment and Forestry which is now preparing a management plan for the biosphere reserves in the Gulf of Mannar, Andaman and Nicobar Islands (Hoon 1997). The Wandur National Marine Park is reportedly well managed where entry for tourists is restricted to only Redskin and Jolly Boy Islands. A management plan is being developed for Lakshadweep and environment and wildlife wardens have been appointed for each of the inhabited islands.

The *Wildlife Protection Act of 1972* provides legislation for the establishment of protected areas and for the protection of marine species although corals are not included in it. Corals are included under the jurisdiction of the State Wildlife Department only when they are within a protected area. The Coastal Regulation Zone Notification 1991 under the *Ministry of Environment and Forestry Act of 1986* offers the only legal protection for all coral reefs.

Several locations have been identified and recommended to be declared as National Marine Parks or Protected Areas. These are the south-western half of the Little Andaman Islands, wanting a National Park to provide protection to turtle nesting beaches and Giant Robber Crabs, Great and Little Nicobar Islands and several locations in the Laccadive Islands. There are also proposals to amalgamate some of the smaller protected areas such as individual island sanctuaries (Kumar 1997). Development activities in Laccadive Islands are restricted through the Coastal Regulation Zone Notification 1991 (Ramachandran & Varma 1997).

An NGO in Andamans, the Andaman and Nicobar Environment Team (ANET), has been working in conjunction with the UK-based NGO, Flora and Fauna International (FFI) with funding from the UK Darwin Initiative for the Survival of Species, to develop management plans for three proposed protected areas using a community participatory approach. Two of these areas, namely Ritchie's Archipelago and Havelock Island, contain coral reef resources.

In November 1998 a Project Development Facility (PDF) Block B project under Global Environmental Facility (GEF) will be initiated to assist India in developing coastal conservation and management plans for the Andaman and Nicobar Islands. These projects would include activities such as identification of threats, ecological inventorization, stakeholder participation and co-financing options. In July 1998 a PDF Block B project under the GEF was completed by the MS Swaminathan Research Foundation on behalf of the MoEF. The resulting proposal is for a sustainable development and coastal biological diversity conservation initiative in the Gulf of Mannar. It seeks to strengthen management practices and introduce new community management and sustainable development alternatives. A World Bank funded project called the Coastal and Marine Area Management has identified 11 sites with critical habitats for integrated coastal management.

Area-based management action plans for management of coral reefs and mangroves have been developed however integrated management of these areas has not been realised. Although the government is actively considering alternative employment for the user community of coral reef resources, this has not yet been finalised. A major obstacle to management lies with the fact that officers involved in coastal management are constantly moved to other tasks and thus there is a need to conduct training programs periodically to educate new personnel in coastal management.

The Maldives

Most environmental issues in the Maldives are of recent (except for coral mining) origin and can be attributed directly to tourism-related development, increased use of reef resources and infrastructure development. Modifications of beaches, dredging for sand, lack of building setbacks and poor solid waste disposal methods are all prevalent (Shepherd 1995).

The Ministry of Planning, Human Resources and Environment (MPHRE) has jurisdiction over most environmental concerns related to island development. The Ministry of Tourism regulates tourism development and provides guidelines for the use of islands. The Ministry of Fisheries and Agriculture regulates all fisheries activities. The *Environmental Protection and Preservation Act* of the Maldives, approved in 1993, provides a good legal basis for protecting the atoll environment. Nevertheless, enforcement is difficult and many illegal practices continue (Shepherd 1995). It is also difficult to enforce regulations on the use of reef resources due to the lack of trained personnel and facilities (Ali 1997). A comprehensive program for the management of reef resources needs to be developed.

The marine protected areas are managed jointly by the Ministry of Tourism, Ministry of Fisheries and Agriculture, Ministry of Atolls Administration and MPHRE. Based on the recommendations of the Marine Research Section of the Ministry of Fisheries and Agriculture, 15 dive sites were declared as protected areas in 1995 by the Ministry of Planning, Human Resources and Environment (MFA 1995). The Integrated Reef Resources Management (IRRM) program has identified four areas (Vaavu, Meemu, Faafu and Dhaalu atolls) for integrated coastal resource management in which Marine Protected Areas will be established. Other priority areas for integrated management include managing coral mining,

implementing regulations on setbacks, jetty and resort construction, sewage outfalls, implementing regulations on waste disposal and exploitation of threatened species.

Several programs have been initiated since 1995 to improve management of the coastal resources and communities. The main activities under these programs are the establishment of an Environmental Research Unit at Villingili and Coastal Zone Mapping to monitor erosion problems in Baa Atoll and other selected inhabited islands. A GEF-funded coastal zone management project under the Ministry of Planning, Human Resources and Environment (MPHRE) has been initiated. A National Biodiversity Strategy and Action Plan with the support of the UNDP is under preparation. A number of Integrated Atoll Development Projects are being carried out at selected atolls to improve resource management. Initial work is being done to develop a GIS information base to enhance the capabilities for better, Integrated Reef Resources Management (IRRM) that could be applied throughout the country.

The need to integrate biophysical and socioeconomic research has become an important aspect in integrated management. Environmental awareness has been increased among the island communities and school children with the use of the electronic media and the radio service. These techniques have been used to educate and inform the public of laws and regulations pertaining to environmental protection. In addition the Marine Research Section has been conducting seminars to educate the youth on matters pertaining to the environment and to increase environmental awareness.

Pakistan

In Pakistan there are several organisations that conduct research and are involved in the management of coastal resources. Some of the important organisations are the National Institute of Oceanography, Zoological Survey Department, Environmental and Urban Affairs Division, Port Trusts and Shipping Divisions and various departments of the University of Karachi. In addition NGOs such as the WWF and IUCN contribute to research and management.

The IUCN has planned to develop a project for Marine and Coastal Protected Areas through which a detailed and systematic survey of corals is expected in the future. The Biodiversity Action Plan will also address the problems of coastal resources and their proper management. There is an urgent need for training in coastal resources management and to declare protected areas in order to arrest further degradation of coastal habitats (Kazmi & Kazmi 1997).

Sri Lanka

Sri Lanka has a number of laws to protect its coastal resources. The primary legislation that controls the management of coral reefs is: the *Coast Conservation Act of 1981,* its amendments and the Coastal Zone Management Plan (1990 and 1997) it mandates; the *National Environmental Act of 1980* and amendments; the Fauna and Flora Protection Ordinance of 1937 and its amendments; the *Fisheries and Aquatic Resources Act 1996* and the *National Aquatic Resources Research and Development Agency Act of 1981* and its amendment. The only coral reefs that have legal protection are the Hikkaduwa Marine Sanctuary (1979) and the Bar Reef Marine Sanctuary (1992) which are declared under the Fauna and Flora Protection Ordinance of the Department of Wild Life Conservation. Resource use management plans have been prepared for both sanctuaries (Hikkaduwa Special Area Management and Sanctuary Management Committee 1996; Dayaratne et al 1997). On 14 August 1998 the Hikkaduwa Marine Sanctuary was upgraded to a Nature Reserve under Section 2 of the Fauna and Flora Protection Ordinance. The Hikkaduwa Marine Sanctuary is now called the Hikkaduwa Nature Reserve. The purpose of upgrading the former sanctuary to a Nature Reserve was to improve the implementation of regulations within this protected area.

Integrated coastal zone management has been practised in Sri Lanka. Two Special Area management projects at Hikkaduwa Marine Sanctuary and Rekawa Lagoon have been important projects (1992-1996) in the practice of Integrated Coastal Zone Management. These projects were completed in 1996 and Special Area Management Plans have been prepared. Two new Integrated Coastal Zone Management Projects commenced in 1998 in the south-eastern coastal area with financial assistance from the German Government and the Asian Development Bank (ADB). Another ICM management project is being planned, with financial support from ADB, to address problems in coastal resource use, development of fishery harbours and coastal erosion.

A revised Coastal Zone Management Plan of 1991 has been published and 23 sites have been identified for ICM and Special Area Management Projects (CCD 1997).

New initiatives by the National Aquatic Resources Research and Development Agency (NARA) and the Ministry of Fisheries and Aquatic Resources Development have encouraged and assisted the ornamental fish collectors to form associations in order to facilitate management of this sector.

A new three-year research project titled 'Management of Marine Aquarium Fisheries and Conservation of Coral Reef Biodiversity in Sri Lanka' was initiated in late 1995 by the Marine Conservation Society of UK and NARA with financial assistance from the Darwin Initiative of UK for the Survival of Species. This project involved the ornamental fish collectors in the data collection on harvested reef organisms and socioeconomic aspects of the collectors. Two handbooks were prepared through this project: 'A Handbook on Protected Marine Species' for the quick identification of protected species and on 'Conservation Matters' on coral reefs (Wood & Rajasuriya 1995; Rajasuriya & Wood 1997).

A licensing program for all fisheries activities has been introduced under the new *Fisheries and Aquatic Resources Act of 1996* and is now being implemented by the Ministry of Fisheries and Aquatic Resources Development. However a number of regulations for fishing activities are yet to be passed by the Parliament.

Even though fisheries management has been practised in Sri Lanka for many years participation of fishermen in community-based coastal resource management is very poor. Poverty, lack of job opportunities and the absence of alternative sources of income makes it difficult to implement conservation laws and regulations.

The Zonation Plan for the coral reef area within the Hikkaduwa Marine Sanctuary was implemented in early 1997. During the implementation 25 local youths were mobilised to provide assistance. They were also given a two-day introductory course in snorkelling and basic reef ecology as well as a training course in first aid and life saving. They also assisted in a reef cleanup operation (De Silva 1997).

A new project has been developed to enhance the capabilities of the Department of Wildlife Conservation to manage protected areas (including marine protected areas) with funding from the Asian Development Bank. This project is scheduled to commence in late 1999 and continue for a period of seven years.

Research and Monitoring

Bangladesh

The National Conservation Strategy Implementation Project-1 (NCSIP-1) has conducted a study to assess the current status of coral resources in the south-eastern coast of Bangladesh and identified major natural and anthropogenic threats to future sustainable use of the coral resources. An Integrated Coastal Area Management Programme and a research and monitoring unit are necessary to improve management of the coastal resources. Training is required in research and management of coastal ecosystems and protected areas.

India

The Central Marine Fisheries Research Institute at Mandapam and Cochin has carried out pioneering studies on coral reef ecosystems in India (Pillai 1983). Ongoing research projects include production of a national atlas of Indian coral reefs from satellite imagery by the Remote-Sensing Group of the Space Applications Centre, Ahmedabad (1997), and a multi-institution project of the Department of Ocean Development on prospecting for bio-active molecules with pharmaceutical potential.

In the Andaman Islands, the Central Agricultural Research Institute (CARI) in Port Blair has recently undertaken quantitative surveys of bleaching impacts. The Zoological Survey of India (ZSI) has completed taxonomic studies on coral-associated fauna (1994-1998) and soft corals (1995-1998). Ongoing studies in the Andaman Islands by ZSI include studies on marine sponges, echinoderms, poisonous fishes and commercial fishes. WWF India has undertaken a survey of coral reef fishes under the Biodiversity Hot Spots Programme in association with the Society for Andamans and Nicobar Environment (SANE).

In 1996 with funding from the MoEF, the Goa University completed a taxonomic and ecological survey of intertidal reef areas in Lakshadweep, mainly around Agatti Island. National Institute of Oceanography (NIO) has an ongoing study into coral diseases, in particular black-band disease and its causative factors, and has completed a study on nitrogen cycling in coral reef systems.

In the Gulf of Mannar, Madurai-Kamaraj University (MKU) has completed research projects on the ecology of ornamental fishes for marine resources assessment as a program of the Department of Ocean Development (DoD). A study on coral reef ecology has been carried out for the MoEF. Another project is collecting quantitative data on ornamental fishes for development of a GIS on ICZM in Tamil Nadu. The Zoological Survey of India (ZSI) has undertaken a survey of benthic organisms in the intertidal region of 21 islands in the Gulf of Mannar for the development of a GIS-based information system for critical coastal habitats in India. Annamalai University has undertaken studies into faunal diversity, ecology of cryptic fauna, planktonic productivity, commercial fishes and the use of crabs (Trapezia spp.) as a bio-indicator of coral reef health.

The only recent studies carried out in the Gulf of Kutch are by the ZSI on coral-associated fauna (1993-1997) and an EIA study on corals of the Gulf of Kutch (1996-1997).

The Maldives

The Marine Research Section conducts the bulk of research on coral reefs. These include reef monitoring including permanent sites, impact of crown-of-thorns starfish infestations, reef fisheries, population dynamics of sea turtles and other associated reef fauna. Socioeconomic studies are carried out through different projects that assess the condition of island communities. The Environmental Research Unit (ERU) of MHPRE has initiated monitoring of beach dynamics countrywide with special emphasis on Raa and Baa Atolls. There is a need to improve applied research in order to obtain information necessary for management. The Marine Research Section with assistance from the BOBP has begun to develop indicators for assessing biological diversity through the Integrated Reef Resources Management Programme for long-term monitoring of reef-associated resources. Meteorology data are also fully incorporated into various monitoring programs for assessing and mitigating disasters during the monsoon periods.

A pilot monitoring exercise on the status of coral reefs has just been completed at selected sites with financial support through the GCRMN South Asia program.

The data collected through different monitoring programs are regularly channelled into the relevant Ministries and government departments for the management of marine resources and island communities.

Pakistan

In Pakistan the Marine Reference Collection and Resources Centre, established in 1969 at the University of Karachi, conducts most of the research on marine organisms. However, corals have not been studied to the same extent as other invertebrates such as molluscs, crustaceans and echinoderms.

Sri Lanka

Research and monitoring of coral reefs in Sri Lanka are being carried out mainly by the National Aquatic Resources Research and Development Agency (NARA) which is the national organisation with the mandate to carry out research and monitoring of coral reef ecosystems. This research program which has been active since 1985, studies the status of reefs and their biodiversity (Rajasuriya et al. 1995). NARA also monitors the physical oceanographic conditions at selected reef sites and in coastal lagoons and estuaries. A study on the seasonal changes in zooplankton and coral growth of a branching *Acropora* sp. was carried out by the University of Colombo at the Hikkaduwa Marine Sanctuary (Ekaratne 1997). NARA gave initial assistance to this project.

Coral reef research in Sri Lanka is supported mainly by the Swedish Government through the Swedish International Development Agency (Sida) and the Swedish Agency for Research Co-operation in Developing Countries (SAREC). The Sida/SAREC has been supporting coral reef research since 1986. The Sida/SAREC Marine Science Programme supports a much wider range of activities in addition to coral reef research such as coastal resources research on lagoons, water quality, coastal fisheries and environmental impacts of aquaculture. NARA carried out a five-year project on fisheries and coral reefs in the north-western Sri Lanka with financial assistance from Sida/SAREC Marine Science Programme. A management strategy for the Bar Reef Marine Sanctuary and coastal fisheries in the buffer zone and its environs has been developed. (Rajasuriya et al. 1995; Dayaratne et al. 1997).

A research project supported by the Darwin Initiative of UK titled 'The Management of Marine Aquarium Fisheries and Conservation of Coral Reef Biodiversity in Sri Lanka' is being carried out by the Marine Conservation Society of UK and the National Aquatic Resources Research and Development Agency. This project is now in its final stages and will address issues and provide necessary information for the sustainable utilisation of coral reef organisms in the marine ornamental fisheries industry.

Pilot monitoring exercises on the socioeconomic status of the coastal communities and surveying of selected coral reef locations have been planned for the near future under the GCRMN pilot studies.

The monitoring program of NARA continues with regular monitoring of selected inshore and offshore reef areas. This information is supplied to other government organisations such as the Department of Coast Conservation and the Department of Wildlife Conservation to utilise in management of protected areas and Special Area Management sites. In addition, information is utilised by the Ministry of Fisheries and Aquatic Resources Development to formulate regulations and manage fisheries activities.

NARA is also carrying out a project to build artificial reefs in the southern coastal areas with funding from the local government. Through this project several small artificial reef modules made of concrete have been deployed.

A project to map the biodiversity on a nearshore reef in Colombo was completed in 1997 by two Colombo-based dive clubs. This project was supported through the GEF small grants program of the UNDP.

Reef Check

The Department of Science, Technology and Environment (DST) of Lakshadweep, in association with the Global Coral Reef Monitoring Network (GCRMN South Asia), undertook the first ever Reef Check survey in India, at Kadmat Island, Lakshadweep from 29 September to 2 October 1998. Live coral cover at the survey site, which was reportedly in excess of 80 to 90% before April 1998, has reduced to less than 5% cover following the bleaching event in 1998. In Sri Lanka the Reef Check was carried out at Pigeon Island in Trincomalee by NARA in association with the Sri Lanka Sub-Aqua Club. There were no bleached corals in Trincomalee. A survey carried out in the southern coast in August revealed that the Hikkaduwa Marine Sanctuary had lost more than 90% of its live coral. However, due to the south-west monsoon, the timing set for the Reef Check does not permit for Sri Lanka to survey the west and the southern coast. The reef areas in the east coast are not easily accessible due to the security situation in the country. In the Maldives, Reef Check was carried out by the Marine Research Section and the recreational dive organisations.

Capacity Building

Bangladesh

Through the activities of the National Conservation Strategy Implementation Project-1, environmental education has been incorporated into the school curriculum and general environmental conservation awareness has been increased in Bangladesh. In addition several training programs have been held for middle level managers, government officials and for NGOs. However there is a need for special training courses to develop human resources in order to manage coral reefs and associated coastal habitats.

India

Seven individuals in biophysical monitoring and twelve individuals in socioeconomic monitoring have been trained under the GCRMN training workshops held in May and October 1998 respectively. Individuals have also been trained in marine protected area management at a workshop organised by SACEP, which was held in the Maldives in September 1998.

The Department of Science, Technology and Environment conduct periodic awareness programs for the education of the general public on the value and conservation of the marine environment.

In December 1998 Indian coral reef researchers will participate in a coral taxonomy workshop in the Andaman Islands. Six coral reef scientists in India will receive training in scuba diving and care of equipment in November 1998 in order to enhance the in-water coral reef monitoring skills. Both these training programs will be conducted under the GCRMN South Asia training program.

The International Ocean Institute (IOI) in India conducts periodic training courses on the management of coastal and offshore living and non-living resources.

A number of other research projects that have been planned and are underway contain capacity building components. Training in community participatory research on data collection is being carried out by the BOBP. A major initiative on training in integrated management of coral reefs is planned for the year 2001 under the Indian Coral Reef Monitoring Network (ICRMN) program of the Department of Ocean Development.

The Maldives[5]

In the Maldives training has been given in coral reef and coastal zone management to personnel of the Marine Research Section. National training courses have been initiated to train staff at the Atoll Administration offices in basic map-reading techniques, beach profiling and coastal zone management. The Ministry of Fisheries and Agriculture and Ministry of Planning, Human Resources and Environment (MPHRE) have identified areas for capacity building for better management of protected areas.

A GEF-funded coastal zone management project is being prepared through MPHRE, mainly focusing on capacity building. This project will provide training to employees of government departments in coastal engineering, coastal zone management, environmental economics, GIS applications and CZM.

A project, with assistance from Australia (AusAID), will be initiated in 1999 to combine activities carried out under various departments and to develop capacity for better management. This project aims to combine a number of activities carried out by different departments in the conservation and management of protected areas. Students following courses in fisheries sciences are invited regularly to participate in workshops and seminars at the national level.

Training in biophysical monitoring techniques was provided to personnel of the MRS and MPHRE through a GCRMN South Asia training program held in 1998. A total of five individuals in biophysical monitoring and three individuals in socioeconomic monitoring have been trained. Training was also provided through SACEP on the management of marine protected areas. To enhance awareness and participation of the coastal communities it is important to develop and strengthen non-governmental organisations to form a link between the government and the island communities.

Pakistan

Capacity building for coral reef resource management has not been initiated in Pakistan. Training in coastal zone management was recommended for government officials at the regional workshop of IUCN/WWF and the government on the Biodiversity Action Plan.

A delegate from Pakistan participated in a SACEP-organised workshop on marine protected area management held in the Maldives in 1998.

Sri Lanka

In Sri Lanka, training has been provided mainly through the support of international donor organisations to personnel in the government departments that are directly involved in the management and conservation of coral reef resources (e.g. Department of Coast Conservation, The National Aquatic Resources Research and Development Agency, Ministry of Fisheries and Aquatic Resources Development, Department of Wildlife Conservation). These training programs have ranged from Special Area Management to Coastal Zone Management with emphasis on the prevention and management of marine pollution.

The Swedish Government, through the ongoing Sida/SAREC Marine Science Programme, assists the National Aquatic Resources Research and Development Agency to develop its research and management capabilities on coral reef conservation and management as well as on coastal fisheries, physical oceanography, environmental sciences and in integrated coastal zone management. There have been other in-country training programs and workshops on coastal resource management and Environmental Impact Assessment (EIA) studies organised by the University of Peradeniya in collaboration with the Department of Coast Conservation and the Central Environmental Authority.

5. Since 11 November 1998, changes have been made within the government structure of the Republic of the Maldives whereby the Environmental Affairs have been integrated within the newly established Ministry of Home Affairs, housing and the Environment. The Marine Research Section of the Ministry of Fisheries and Agriculture is now an autonomous body named as the Marine Research Centre that has the mandate for research, development and provision for advice to the Ministry of Fisheries, Agriculture and Marine Resources.

Capacity building in biophysical and socioeconomic monitoring of coral reefs has been enhanced through workshops organised by the GCRMN South Asia component in 1997 and 1998. Four individuals on biophysical monitoring techniques and five individuals on socio-economic monitoring techniques have been trained through these workshops. In addition two individuals from government departments have been trained in Marine Park management through a SACEP organised workshop held in the Maldives in 1998.

The Ministry of Forestry and Environment, together with the World Bank and IUCN has provided financial assistance to implement the 'Biodiversity Skills Enhancement Project' through a university based NGO: the March for Conservation. Through this program several workshops on the taxonomy of selected marine species have been held to train individuals from universities, government departments and NGOs.

An NGO, the Sri Lanka Sub-Aqua Club, has also contributed in training individuals and school children in underwater exploration and in carrying out a GEF funded biodiversity-mapping program on a reef near Colombo. This NGO was also responsible for developing underwater skills of personnel in the Department of Wildlife Conservation, attached to the Hikkaduwa Marine Sanctuary.

Although many individuals from government departments, universities and NGOs have been trained in coastal resources management and conservation, a more cohesive program is required at a national level to utilise the available expertise and to implement recommendations that have arisen from several studies and management plans developed for the conservation and management of coral reefs and associated ecosystems.

Performance Evaluation of Coral Reef Management in South Asia

In Bangladesh management is very low or absent and coral reefs around St. Martin's Island continue to degrade. Implementation of laws and regulations is extremely difficult due to the lack of resources, alternative employment and trained personnel.

In mainland India the level of active conservation of coral reefs has remained low due to coral reef issues having had, until recently, a relatively low profile by comparison with other conservation and natural resource issues. There has been a consequent lack of trained, dedicated manpower for managing coral reef-related resources and protected areas. Management regimes in the three marine national parks, namely Gulf of Mannar, Gulf of Kutch and Andamans (Wandur), have been relatively successful in suppressing major anthropogenic causes of degradation such as coral mining. However, less overt sources of degradation, including nutrient loading and sedimentation, continue to erode the condition of reef environments. In recent years, the level of management activity in these areas has aimed more at routine enforcement of existing legislation than at actively confronting these issues in an integrated manner. Nonetheless, this situation is changing. The profile of, and priority accorded to, coral reef and other coastal resource issues has increased significantly amongst key government departments resulting in the forthcoming project-based initiatives highlighted earlier.

Even though Environmental Impact Assessments (EIAs) have become mandatory for all development projects in the Maldives, it has been difficult to fully implement this regulation. Regular monitoring is also not carried out at the development sites. However monitoring of the status of reefs is being carried out although, due to the extent of the area involved, it is difficult to monitor with the existing number of reef researchers in the Marine Research Section. It is also difficult to fully implement some of the existing laws on coral mining and other reef-related fisheries due to lack of manpower resources. However, the implementation of laws and regulations is better in the Maldives when compared to other countries in South Asia except for the Chagos Archipelago which is generally well protected due to the presence of the US Navy base at Diego Garcia and the absence of natives.

In Pakistan there is increasing awareness of the need to conserve coastal resources although there is no significant reef area. There are plans to develop marine protected areas for Pakistan with the help of the IUCN.

Coral reef management in Sri Lanka is poor although there are government departments that have the mandate to manage and conserve reef resources (Rajasuriya et al. 1995; Rajasuriya & White 1995; De Silva 1997). A number of projects carried out in the past have resulted in publications containing management plans and action plans such as 'The Puttalam/Mundel Estuarine System and Associated Coastal Waters' (1997), 'Coastal 2000: A Resource Management Strategy for Sri Lanka's Coastal Region' (1992), the 'Coastal Zone Management Plan' (1991 and 1997), the 'Special Area Management Plan for Hikkaduwa Marine Sanctuary and Environs' (1996) and the 'Special Area Management Plan for Rekawa Lagoon' (1996). However, most of the conservation actions recommended in these plans have not been implemented.

The Special Area Management Projects carried out at Hikkaduwa Marine Sanctuary and the Rekawa lagoon have not been sustained after the projects were completed in 1996. These two areas have now begun to revert back to their former status. At Hikkaduwa the coral reef is heavily damaged by Glass Bottom boats, fishing crafts, pollution, sediment and tourist pressure. At present there is one ranger and two guards to look after the sanctuary. Two of the guards trained in snorkelling and scuba diving have now been transferred to look after terrestrial parks. Therefore the management and protection of the reef is minimal or non-existent (De Silva 1997). Due to the absence of buoy, float line and anchor chain maintenance, the zones demarcated under the implementation stage of the Special Areas Management (SAM) plan are no longer present in the sea. As a result, glass-bottom boats and visitors (De Silva 1997) damage corals within the protected zones. No solutions have been found for the disposal of solid and liquid waste from the hotels and guesthouses within the sanctuary area. All the garbage from the hotels and the Hikkaduwa town is being dumped inland on the banks of a canal that leads into the sea within the sanctuary. As a result, part of this garbage ends up in the sea during periods of heavy rain.

Although coral mining in the sea at Rekawa was successfully controlled during the period of the SAM program, the local people have again commenced coral mining in the area.

Although the Bar Reef Marine Sanctuary was declared in the year 1992, no positive steps have been taken to safeguard the coral reefs within the sanctuary. Fishing activities that are damaging to the coral reefs continue unabated although laws have been strengthened and fines have been increased for offences. Implementation of these laws is difficult due to lack of alternative employment, trained personnel, financial resources and equipment.

Further, offenders are often released with a very small fine and therefore imposing fines is no longer a deterrent to some of those involved in illegal activities. This is particularly a problem with regard to coral mining in the sea where apprehended miners are released with low fines. Therefore coral mining continues today despite the actions taken by the Department of Coast Conservation to control and arrest mining activities in the sea. A similar situation exists with regard to blast fishing where organised groups are involved.

Although community-based fisheries organisations have been in existence for a long time, community participation in fisheries management is very poor. As a result it has not been possible to arrest environmentally damaging fishing methods such as the use of Bottom Set Nets to harvest spiny lobsters and reef fish (Rajasuriya et al. 1995). Poverty, lack of job opportunities and the absence of alternative mechanisms for livelihood makes it difficult to implement conservation laws and regulations with regard to fisheries activities.

In South Asia there is a clear upward trend in reef management and conservation of coral reef resources although it is a slow process due to lack of resources for proper management, poverty, lack of alternative sources of employment and ignorance. However, an increase in awareness, allocation of resources and the setting up of special research units is a clear indication that many governments are willing to increase their capabilities in the management and conservation of coral reef resources. Conservation of coral reefs is also a stated policy in resource management plans in all of the coastal states in South Asia. More coordination is necessary between various departments and among donor organisations who sometimes tend to duplicate efforts in coastal management initiatives.

Global Coral Reef Monitoring Network (GCRMN) Coordination

The GCRMN South Asia was established in July 1997 with some US$250 000 of funding provided by the UK Dept for International Development (DFID). The program was initially scheduled to last for an 18-month period up to 31 December 1998 and was recently extended to 31 March 1999.

This program is managed by the Intergovernmental Oceanographic Commission (IOC) of UNESCO, based in Paris, in association with national counterpart organisations in three countries: India, the Maldives and Sri Lanka. Alongside this, each participating country in South Asia has appointed a government-level GCRMN National Coordinator attached to the following organisations:

- Department of Ocean Development (DoD), India;
- National Aquatic Research Agency (NARA), Sri Lanka; and
- Ministry of Fisheries & Agriculture, the Maldives.

The funds provided by DFID were specifically for:

- establishment of a regional GCRMN office in Colombo, Sri Lanka;
- regional training in monitoring methodologies;
- one or more pilot monitoring exercises in the region; and
- production of a long-term coral reef monitoring action plan for South Asia.

Several project activities undertaken in the past 12 months, or planned in the near future, are detailed below.

Obstacles Encountered

There have been only relatively minor obstacles to the process of initiating regional coordination for the GCRMN program. Participation by relevant institutions has been positive and progress in implementing training and pilot field exercises has been good. Nonetheless, potential obstacles to longer-term implementation of coral reef monitoring activities have come to light.

Foremost is the shortage of skilled personnel available for in-water fieldwork. In the Maldives and Sri Lanka skilled personnel are present but are few in numbers. The institutional priority given to coral reef monitoring appears to be on an upward trend in both countries, at least allowing existing researchers to devote themselves to relevant activities. But this does not entirely solve the problem. In India a reasonable number of researchers are available but are often in centralised institutes and relevant skills and experience are limited, particularly in regard to quantitative underwater survey work, use of Scuba equipment, and taxonomy. Capacity in these areas should be enhanced as a result of training provided under the GCRMN program in 1988 (see below) and training planned under the forthcoming Indian Government projects.

The shortage of personnel is part of a wider prevailing problem of limited resources available for logistically demanding fieldwork. The limitations extend to the lack of field research stations, research boats and diving equipment. This is serious in a region where most important reef areas are located far away from central research institutions such as in Lakshadweep, the Maldives, the Andamans and the Gulf of Mannar.

One partial approach to the problem would be to strengthen the relationship between government research bodies and NGO groups, especially local ones. Relevant skills such as scuba diving and taxonomy, and motivation for coral reef work do exist to some degree in the NGO sector. Yet mechanisms do not always exist easily to integrate NGO capacity into national level programs. Also NGOs act independently of such programs and often take opposing views to the government's efforts to balance development and solve problems of coastal communities, which can further deter efforts to develop constructive relationships between the two sectors.

On a broader level, it is probably useful to involve some local groups in reef monitoring activities under the supervision of coral reef specialists. This fits with the GCRMN concept of a monitoring 'network', providing an umbrella framework involving a diverse array of participation. In theory this can alleviate both personnel and logistical problems, however it also brings to the fore other potential obstacles such as training provision and data quality management.

On these latter points, the GCRMN South Asia program has been relatively successful to date in delivering relevant training to appropriate individuals. However, development of a non-complex data management system for coral reef data, which can feed information directly to management initiatives, remains an outstanding and high priority in South Asia.

Problematic communications with the Andaman Islands and the security situation in extensive parts of the coastline in Sri Lanka constitute two other more specific problems for which there may not be any immediate solution.

New Activities Initiated as a Direct Result of, or Developed within the Framework of the GCRMN

The following activities have been, or are imminently to be, funded through the GCRMN South Asia program since July 1997.

- In December 1997, a regional planning workshop was held at the Hikkaduwa Marine Sanctuary, Sri Lanka. The workshop was attended by representatives from India (6), the Maldives (4) and Sri Lanka (10). Participants endorsed and planned the proposed program of training and pilot activities summarised above. A full workshop report will be published by UNESCO.
- In May 1998, a regional training workshop on coral reef survey methods was held in the Maldives, lasting 12 days. The workshop was attended by trainees from India (7), the Maldives (5) and Sri Lanka (4). A training team of three specialists from the Maldives, Thailand and Sri Lanka provided training in benthic survey and fish census techniques. A full workshop report will be published by UNESCO.
- In September 1998, a second 12-day regional training workshop on monitoring socioeconomic parameters for coral reef management was held at Kadmat Island Lakshadweep. The workshop was attended by trainees from India (12), Sri Lanka (6) and the Maldives (3) in addition to a 6-person training team. The focus was on participatory and community-based approaches to monitoring socioeconomic parameters relevant to coral reef management. A full workshop report will be published by UNESCO.
- During August–October 1998, a pilot monitoring exercise was undertaken in the Maldives by the Marine Research Section (MRS), Ministry of Fisheries and Agriculture. The objectives of the exercise were to gather baseline data on benthic composition and reef fish populations in six atolls, to assess the impact of the bleaching event in May 1998, and to contribute to the planning of a long-term coral reef Monitoring Action Plan (MAP) for the Maldives. A final report is pending in November 1998.

- During September–November 1998, a second pilot exercise has been implemented in the Gulf of Mannar, India, by Madurai-Kamaraj University in association with a local development NGO, SPEECH. In addition to biophysical surveys, a socioeconomic component was also conducted, mainly with a view to assessing the scope for using a community participatory approach in monitoring socioeconomic parameters for coral reef management. A report is pending in November 1998.
- In September 1998 a Reef Check survey was undertaken at Kadmat Island, Lakshadweep through the Department of Science, Technology and Environment, Lakshadweep, including provision of training to local research assistants by the GCRMN Regional Coordinator.
- In November 1998, six Indian coral reef researchers are receiving training in scuba diving and scuba equipment care in Lakshadweep, India.
- In November–December 1998, a multi-disciplinary pilot monitoring exercise will be conducted in two coral reef areas in Sri Lanka through the University of Colombo in association with the Coast Conservation Dept (CCD), the National Aquatic Resources Agency (NARA) and University of Ruhuna. The emphasis will be on assessing the value and feasibility of using participatory approaches to monitor socioeconomic parameters relevant to coral reef management. A final report will be due at the end of January 1999.
- In December 1998, six to seven Indian coral reef researchers will participate in a 12-day training course in field identification of scleractinian corals in the Andaman Islands.
- In January–February 1999 a pilot monitoring activity will be undertaken in Lakshadweep, India through the Department of Science, Technology and Environment, Lakshadweep with technical assistance from the National Institute of Oceanography, Goa. The exercise will involve training in survey techniques for local research assistants, and collection of baseline data, probably at Kadmat Island.

Future Plans for GCRMN Activities

It is anticipated that by the end of March 1999, coral reef Monitoring Action Plans (MAPs) for each major coral reef area in South Asia will have been devised and ratified by relevant government bodies and research institutions. Preparation of the MAPs is a national government-level activity supported by the regional GCRMN program. The MAPs will provide a blueprint for annual, longitudinal monitoring of coral reefs and of related resource-use activities. They will hopefully also cement in place the required national government support to relevant research institutions for these activities.

Looking beyond March 1999, the three countries participating in GCRMN South Asia have formally sought support from IOC-UNESCO to secure a second phase of the regional level GCRMN program, probably lasting two years from April 1999. The focus of a second phase would be on data management through development of a national level coral reef database program. Related activities would include making the databases operational in each country and providing training in analysis, interpretation and presentation of data. There would also be continuation of pilot-level training and implementation of socioeconomic monitoring activities, linked where possible into national coral reef resource management programs. More broadly, a second phase would promote implementation of the MAPs, and institutionalise monitoring activities. IOC-UNESCO is supportive of a second phase and is actively pursuing donor provision.

ICRI Coordination

At an ICRI Workshop for the South Asian Region, SACEP, as the Secretariat for the South Asian Regional Seas Programme was designated to act as the ICRI Focal Point for South Asia. Since then SACEP has actively participated in the promotion of ICRI activities and those determined in the Male Workshop. SACEP has also actively participated as a Committee member of the ICRI CPC.

A significant activity under this program was the formulation of a Training Course on Integrated Management of Coastal and Marine Protected Areas in South Asia. Funding for the activity was secured by SACEP from the Government of Norway. The goal of the course was to train potential and actual middle level coastal and marine protected area managers in the coastal nations of the SACEP region in the concepts, tools and processes of integrated coastal and marine protected areas management. The course included components on:

- coastal and marine ecosystems and ecological processes;
- state of the environment reporting – key indicators for management;
- stakeholder involvement in management of coastal and marine protected areas 'what' – 'why', 'when' and 'how';
- planning for coastal and marine protected areas;
- environmental impact assessment in coastal and marine protected areas;
- tools for coastal and marine protected areas management; and
- programing for operational management of coastal and marine protected areas.

SACEP commissioned the Great Barrier Reef Marine Park Authority (GBRMPA) to develop the Modules of the Training Course as per decisions taken at the Steering Committee Meeting and be the Course Coordinators for the Training Course. The first Training Course in a series of two was conducted from 3 to 10 September 1998 in the Maldives. All the marine member states of SACEP were represented at this Training Session. In addition to inputs from GBRMPA, resource persons were also drawn from the best available expertise in the region. The GCRMN Representative for South Asia also participated. The course was very well presented and well accepted by the participants. The trainers, in their report to SACEP, have suggested certain modifications for a more effective course which SACEP hopes to conduct in the first quarter of 1999.

Future Needs and Directions

There are many initiatives in the Region that are actively supporting programs for strengthening the capabilities of government departments and research units to manage coastal resources. There are ongoing programs in India, the Maldives and Sri Lanka. The development of a regional GCRMN program in South Asia, which has been partly stimulated by ICRI activities, is a positive step and has enhanced the capacity building in the Region.

However, although there are a number of other, welcome, national-level coral reef management initiatives in the Region, it is not clear whether many of them are fully integrated into, or guided by, the ICRI *Framework for Action*. This situation might be improved if resources were available to appoint a full-time program officer responsible for regional ICRI coordination. Such an officer could be based at SACEP (the ICRI focal point for South Asia) and would be available to promote ICRI principles to relevant national government and donor-led project preparation activities. SACEP has played a sincere and active role in ICRI to date, however it does not currently have adequate specialist personnel resources and finances to independently support this kind of active promotion of the ICRI framework.

Research and management have to be improved in the Region. Through training, workshop data collection and processing need to be standardised. Standardisation of data collection is being improved under the GCRMN South Asia training workshops. More emphasis is required in socioeconomic monitoring as this component is lacking in many countries and is a major obstacle in the development of management plans.

Management plans should be developed on a sound database, particularly the socioeconomic aspects as many plans fail to address this component adequately and this results in problems at the stage of implementation.

Substantial support is required for governments to improve their capabilities in law enforcement at least within existing protected areas. One area that can be addressed through ICRI is the training component required for Marine Park management. Resources available within the Region, supported by expertise from outside the Region, could be used to train a wider group of individuals in Marine Park management.

Acknowledgements

We wish to thank the following individuals for their invaluable contribution to this report: Mr S. M. Munjurul Hannan Khan (Bangladesh); Dr E. V. Muley, Dr M. V. M. Wafar, Dr K. Venkataraman, Dr R. Soundararajan (India); and Mr Prasantha Dias Abeygunawardene (SACEP). We also wish to thank UNESCO/IOC, UNEP, DFID, GCRMN, ICRI and SACEP for assisting the South Asia Region. Any errors or opinions stated in the report remain the responsibility of the authors.

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Table 1: Status of protected and unprotected coral reef areas in South Asia

COUNTRY	LOCATIONS/ PROTECTED AREAS	MANAGEMENT STATUS	CURRENT THREATS
BANGLADESH	St. Martin's Island (Identified for maximum protection)	No management at present. Action plan has been proposed.	Coral mining, Sedimentation, Mangrove cutting, Pollution, Souvenir collection, Tourism, Boat anchoring
CHAGOS	No protected areas at present. (Protection has been recommended.)	Well protected due to the absence of natives and the presence of a military base at Diego Garcia.	Fishing pressure on the outer reefs.
INDIA (Mainland)	Gulf of Kutch Marine National Park	Inadequate protection	Sedimentation, Coral mining, Mangrove cutting, Sand mining, Population pressure, Commercial shell collection, Fisheries, Industrial development
	Gulf of Mannar Biosphere Reserve	Inadequate protection Zoning has been recommended for educational, scientific and recreational activities.	A management plan is being developed. Coral mining, Sand mining, Pollution, Sedimentation, Fisheries
	Reefs outside protected areas	Very weak or none	Sedimentation, Coral mining, Mangrove cutting, Sand mining, Population pressure Pollution, Fisheries. Industrial development
ANDAMANS (India)	Wandur Marine National Park (Mahatma Gandhi Marine National Park)	Coral reef resources are relatively well protected within the Park.	Sedimentation, Souvenir collection, Tourism, Crown-of-thorns
	Reefs outside protected areas	Weak implementation of laws	Sedimentation due to dredging and logging, Sand mining, Erosion, Crown-of-thorns, Tourism, Pollution
NICOBAR (India)	All of the protected areas are terrestrial. None include coral reef habitats. (Several sites have been proposed.)	Weak	Sedimentation, Crown-of-thorns

Table 1: (Continued)

COUNTRY	LOCATIONS/ PROTECTED AREAS	MANAGEMENT STATUS	CURRENT THREATS
LAKSHADWEEP (India)	One declared National Park Several sites have been proposed.	Relatively well regulated tourism activities Other activities by locals are not well regulated.	Coral mining, Sedimentation and coral destruction due to dredging, Population pressures
GULF OF KUTCH (India)	National Marine Park	Management Plan being prepared.	Coral mining, Sediment, Mangrove damage, Fishing
MALDIVES	15 sites have been protected.	Well managed	No known threats at present
	Reefs outside protected areas	Relatively well managed (Island resorts manage their own reef areas.) Laws and Regulations are implemented. Many marine species are banned from export and harvesting is regulated.	Dredging and construction, Sewage
PAKISTAN	No protected areas at present	None. IUCN and the BAP have identified the need for a Marine and Coastal Protected Area Project.	Sedimentation, Coral collection for medicinal purposes, Tourism
SRI LANKA	Hikkaduwa Nature Reserve (former Hik. Marine Sanctuary)	Poor to non-existent	Sedimentation, Pollution, Boat anchors, Glass bottom boats, Pollution, Tourism
	Bar Reef Marine Sanctuary	No management	Fishing, Crown-of-thorns
	Reefs outside protected areas	Implementation of laws and regulations is very weak or non-existent. Several species are banned from collection and export. There are size regulations for spiny lobsters.	Coral mining, Sedimentation, Destructive and uncontrolled fishing activities and excessive harvesting

Table 2: Status of reefs in South Asia (update from 1995)

BANGLADESH	INDIA	MALDIVES	PAKISTAN	SRI LANKA
Major human impacts such as coral mining, collection for souvenirs, pollution, increased sedimentation due to mangrove destruction and siltation from major rivers continue. Reefs around St. Martin's Island continue to degrade. It is not known whether coral reefs were bleached in St. Martin's Island.	Damaging activities including coral mining, souvenir hunting destructive fishing, pollution, and increased sedimentation continue to degrade reefs. Recent bleaching event of 1998 has caused extensive damage to reefs in the Gulf of Mannar region, Lakshadweep and Andaman Islands. It is not known whether coral reefs were bleached in Nicobar and Gulf of Kutch areas.	Human activities are relatively well managed except some development activities where EIA and monitoring has not been adhered to according to laws. Recent bleaching event has caused extensive damage to coral reefs in many atolls. Bleaching has caused the shallow reefs to lose almost 90% of their live coral cover. Bleaching was observed at a depth of about 30 m. The corals that were completely destroyed were mainly the branching and tabulate *Acropora* spp., *Echinopora* spp. and *Pocillopora* spp. Dredging for boat harbours and reclamation for development causes reef damage and increased sediment.	No new information. Very little has been investigated.	Damaging activities such as coral mining, souvenir hunting, excessive uncontrolled harvesting, destructive fishing practices, tourism impact, pollution, and increased sedimentation continue to degrade reefs. Recent bleaching event has caused extensive damage to coral reefs. Shallow fringing reefs have lost nearly 90% of their living corals. Bleached corals were observed at a depth of 42 m on the east coast of Sri Lanka. The corals that were completely destroyed were mainly the branching and tabulate *Acropora* spp., *Echinopora* spp. and *Pocillopora* spp. Corals of the fringing reef around the Pigeon Islands in Trincomalee on the north-east coast were not bleached whilst at Batticoloa on the east coast they were affected.

Table 3: New initiatives and laws in coral reef conservation and management in South Asia

BANGLADESH	INDIA	MALDIVES	PAKISTAN	SRI LANKA
Government has endorsed the ICM approach to management. Five conservation and management programs have been initiated through the National Conservation Strategy and National Environment Management Action Plan. But most are mangrove and wetland protection programs. Maximum protection has been proposed for the coral reefs of St. Martin's Island	An Action Plan for the management of coral reefs in Andaman, Nicobar Islands and Gulf of Mannar reefs is being prepared. Little Andaman, Great and Little Nicobar, and sections of Lakshadweep Islands have been identified for protection. A program called the Coastal & Marine Area Management Program with World Bank funding has identified 11 sites with critical habitats for ICM.	Integrated Reef Resources Management (IRRM) has identified four new areas (Vaavu, Meemu, Faafu, Dhaalu Atolls) for marine protected areas. Establishment of Environmental Research Unit at Villingili. Coastal Zone mapping project at Baa and Raa Atolls. GEF funded CZM project initiated through Ministry of Planning, Human Resources and Environment. National Biodiversity Strategy & Action Plan, and Integrated Atoll Development Project are under preparation	IUCN has planned to develop Marine & Coastal Protected Areas. Biodiversity Action Plan is being developed. Systematic surveys of coral reefs are expected in the near future through the implementation of the above plans.	Revised Coastal Zone Management Plan (1997) prepared. *New Fisheries and Aquatic Resources Act (1996)* passed. Two ICM projects with ADB and GTZ funding initiated in 1998 in the south-eastern coastal belt. 23 sites have been recommended for SAM planning under the new CZM Plan. Management Plans prepared for Bar Reef Marine Sanctuary, Hikkaduwa Marine Sanctuary and Rekawa Lagoon on the south coast. Upgraded Hikkaduwa Marine Sanctuary to a Nature Reserve on 14 August 1998. Proposal being developed by NARA for the declaration of a Fishery Protected Area at Great and Little Basses Reefs in the south east. Three-year study was initiated in late 1995 with support from the Darwin Initiative of UK jointly executed by NARA and Marine Conservation Society of UK for better management of marine ornamental fish sector. (Workshops have been held for the ornamental fish collectors.). Two handbooks have been prepared to promote better management. Continued support from Sida/SAREC Marine Science program for NARA in coral reef research for improved management up to the year 2000. Preparation of the National Biodiversity Conservation Action Plan.

Table 4: Research and Monitoring programs and new (*) activities initiated after 1995

BANGLADESH	INDIA	MALDIVES	PAKISTAN	SRI LANKA
A study has been conducted through the National Conservation Strategy Implementation Project-1 to assess the current status of coral reef resources in the south-east coast of Bangladesh. (New programs of research for better management of coral resources have not been initiated.)	The University of Goa carries out research in Lakshadweep, and the Madurai Kamaraj University, the National Institute of Oceanography and The Zoological Survey of India are conducting field studies on reefs in the Gulf of Mannar region. The Central Agricultural Research Institute studies the Andaman Islands. The above studies /surveys have been limited to very shallow nearshore areas. Offshore surveys will be improved in the near future with improved scuba diving capabilities provided through training programs of the GCRMN. (*) Pilot monitoring exercise on biophysical monitoring completed in a section of the Gulf of Mannar reefs.	The MRS conducts the bulk of the research, ongoing projects/ programs include monitoring status at selected permanent sites, impact of COTS, population dynamics of sea turtles and selected reef fish resources including demersal fisheries. Taxonomy of reef fishes. (*) MRS, with assistance from BOBP, has begun to develop indicators for assessing biological diversity through the IRRM program. (*) Socioeconomic studies are being carried out at selected sites to assess the status of island communities. (*) Pilot monitoring exercise on biophysical monitoring completed through activities of the GCRMN.	The Marine Reference Collection and Resources Centre at the University of Karachi conducts most of the research on marine life in Pakistan. However, reefs have not been investigated or studied compared to other countries. Therefore hardly any information is available on reef resources. (New programs of research for better management of coral resources have not been initiated.)	NARA carries out the bulk of the research, ongoing programs include monitoring status of inshore and offshore reefs at selected sites, and at permanent sites in the southern coast, impact of COTS, monitoring and assessing the impact of (*) coral bleaching and monitoring the recovery of corals. (*) Monitoring includes the use of underwater video techniques. (*) Studies on the abundance and species diversity of species utilised in the marine ornamental fish export trade with support from the Darwin Initiative of UK. (*) A socioeconomic study has just been completed through this same project. Abundance and species diversity of corals, reef fish and other resources such as demersal fisheries, spiny lobsters, other selected invertebrates and flora. (*) Sea surface temperatures and wave height are being monitored by NARA at selected sites on the south and west coasts including a lagoon. (*) A study to estimate the rates of sedimentation at the Hikkaduwa Marine Sanctuary has been initiated by the Oceanography unit of NARA. Studies of zooplankton and coral settlement at the Hikkaduwa Marine Sanctuary were completed by the University of Colombo in 1997. (*) Pilot monitoring exercises on socioeconomic and biophysical monitoring planned under the activities of the GCRMN.

Table 5: Capacity building in coral reef management (activities initiated after 1995)

BANGLADESH	INDIA	MALDIVES	PAKISTAN	SRI LANKA
Several training programs were held for middle level managers, government officials and NGOs on management. Environmental education has been incorporated into school curriculums. BOBP is providing assistance to the government sector in capacity building in coastal fisheries management, institutional strengthening and awareness building. Training was given by SACEP on the management of Marine Protected Areas in 1998.	BOBP is assisting the government in capacity building in coastal fisheries, management, institutional strengthening and awareness building. Training has been given in biophysical and socioeconomic monitoring on coral reefs and coastal communities through the GCRMN. Scuba diving training has been planned through the GCRMN. Training was given by SACEP on the management of Marine Protected Areas in 1998. A long-term training program has been planned under ICRMN and is expected to commence in the year 2001.	Training was given to MRS staff in coral reef and coastal management. Staff of Atoll Administration were trained in basic map reading for better management of reef areas. An AusAID project will commence in 1999 to train more staff in coral reef management. Students following courses in fisheries sciences are involved in workshops and seminars at national level for reef and island management. BOBP is assisting in capacity building for participatory management for selected sites through the IRRM program. Training was given in biophysical and socioeconomic monitoring on coral reefs and coastal communities through the GCRMN. Training was given by SACEP on the management of Marine Protected Areas in 1998.	No programs have been initiated in capacity building for the management of coral reefs. Training was given by SACEP on the management of Marine Protected Areas in 1998.	Training was provided to officials of several government departments in Special Area Management (SAM), ICM and Marine Pollution Prevention and management of Marine Protected Areas through various programs including Sida/SAREC, USAID, UNDP, UNEP, IMO, SACEP. Taxonomy in selected groups of marine organisms was provided to officials of government departments, universities and NGOs through the Biodiversity Skills Enhancement Project of IUCN and Ministry of Environment and Forestry through the March for Conservation. Training was given to wardens of the Hikkaduwa Marine Sanctuary by NARA and the Sri Lanka Sub-Aqua Club. Basic training in reef protection and identification of selected marine organisms given in 1997 to 25 local youths from the Hikkaduwa Marine Sanctuary area. Training was given in reef monitoring under the NARA/MCS ornamental fishery Project to the Sri Lanka Sub-Aqua Club. Training was given in biophysical and socioeconomic monitoring on coral reefs and coastal communities through the GCRMN.

EAST AFRICA: Coral reef programs of eastern Africa and the Western Indian Ocean

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ITMEMS 1998 Proceedings

Introduction

This report gives an updated description of the coral reef and associated ecosystem programs of the Eastern African mainland states, which include the nations of Somalia, Kenya, mainland Tanzania, Zanzibar and Mozambique as well as the Western Indian Ocean island states of Comoros, Madagascar, Mauritius, Reunion and Seychelles.

The Eastern African mainland countries have similar histories and ecological profiles including the following.

- All the nations of this region are classified as developing countries.
- All have rapidly growing coastal populations. It is estimated for example that 75% of Mozambique's population lives within 40 km of the coast.
- The countries have diverse political histories: 1) Somalia is still at war; 2) Kenya recently held its first multiparty elections; 3) Tanzania just emerged from a socialist system into a market economy; and 4) Mozambique is recovering from a long civil war (1976-1992). Often the political system is key to the distribution and utilisation of natural resources in these countries.
- The countries all have similar marine ecosystems including coral reefs, mangroves and seagrass beds, where mainly subsistence level utilisation occurs.

All countries of the region cover a wide range of political and economic development. All states are heavily dependent on their coastal environments as sources of food, income and employment. Rapidly expanding coastal populations, as well as increasing industrial and agricultural activities, are potential sources of pollution that threaten the sustainability of coastal and marine ecosystems and their associated resources (UNEP/IMS/FAO/Sida 1998).

The coastline of the Eastern African and Western Indian Ocean islands region is an area rich in natural marine resources and of breathtaking scenic beauty, with pristine beaches of coral, estuaries, mangroves, lagoons and several beautiful islands rich in biodiversity. The coastal environment is being threatened by pollution, habitat destruction and the pressure from growing coastal populations, tourism and urbanisation.

The climate is generally tropical to sub-humid. The two monsoon seasons have a major influence on wind direction and strength, air temperature and rainfall. They also influence the coastal currents.

The coastal ecosystems of the region are generally rich in natural resources and highly productive. Important habitats include mangroves, coral reefs and seagrass beds, which sustain a great diversity of marine life and are important food sources for most coastal communities. The ecosystems are greatly interdependent, and the integrity of each ecosystem is dependent on the health and influence of adjacent ecosystems. For example, nutrients, sediment and organic matter are interchanged between coral reef and mangrove ecosystems. Mangroves are also nursery grounds for a variety of fish, some of which mature in coral reefs and seagrass meadows.

The economies of all countries in the region benefit from reef fisheries as well as reef related tourism. Artisanal fisheries, mostly in reefs, seagrass and associated platform environments, represent more than 95% of the total marine fish catch, (UNEP/IMS/FAO/Sida 1998). For example, more than 60% of the fish species caught in Tanzania are caught in or around coral reefs (Francis and Muhando 1996). For many coastal communities, mangroves are the primary source of timber, firewood, charcoal and a variety of other forest products. Consequently, mangroves as well as coral reefs are under increasing pressure from expanding coastal populations.

The destruction of coastal habitats by the expanding coastal populations has lead to the degradation of interdependent coastal ecosystems and reduced productivity. For example, reductions in mangrove cover has reduced fish spawning, leading to reduced catches with both social and economic implications, especially for artisanal fishers (FAO/IMS/Sida 1999). Both coral reefs and mangroves are among the most biologically diverse ecosystems and greatly at risk. The rapid expansion of coastal populations and consequentially increased loads of domestic sewage, agricultural run-off and industrial effluents to the marine environment represents a significant threat to the coral reefs of the Region.

In general, the mechanisms to manage coastal resources are poor and management programs are often sectoral and implemented within weak institutional frameworks with poor coordination between different sectors (FAO/IMS/Sida 1999).

Somalia

Introduction

Somalia has the longest coastline of the Eastern African mainland states stretching 3000 km from the north coast bordering the Gulf of Aden to the east coast that opens to the Indian Ocean. Reef growth is inhibited by seasonal cold upwelling in the northern and Gulf of Aden region. Fringing reefs occur from Adale southward to the Kenya border with a major break at Mogadishu (UNEP/IUCN 1988). The coral reefs and associated ecosystems of Somalia are the least understood in the region with earlier descriptions being limited in scope and scale. A recent resource survey conducted in the Saardin Islands, Gulf of Aden under the IUCN/EU Somali natural resources program for example recorded flourishing and diverse coral reefs comparable to reefs in other parts of the Western Indian Ocean in an area previously believed to harbor poor reef growth.

Mangroves occur in creeks along the coast of southern Somalia and in isolated stands in the north coast of Somalia and south of Kismayo as part of a more extensive mangrove forest that extends into the Boni and Dodori reserves of Kenya. Seagrass beds have been reported along the south coast of Somalia from Adale to Chamboni (UNEP 1987) but in general the distribution of seagrass beds in Somalia is poorly documented. Sea turtles including the green, hawksbill, ridley and leatherback and dugongs have been reported in Somali waters.

Resource Extraction

Artisanal fishing has been going on for centuries in Somalia. During the drought of 1973-1974 the government resettled many nomads and trained them in fishing and provided them with equipment. The government also encouraged and supported the development of fishing cooperatives. Much of this administrative structure has now broken down due to the ongoing civil war.

Reliable estimates of the fisheries stocks of Somalia are difficult to get although estimates indicate a highly productive system. According to Stromme (1987), the annual level of production maybe as high as 150 000 tonnes. Exactly how much of this production comes from coral reefs and associated ecosystems is difficult to tell. Artisanal fishing targets sharks, spiny lobsters, tuna and grouper. Fishing takes place all year round in motorised wooden boats with a crew of up to 10 men. Commercial fishing has also been undertaken for decades in Somalia targeting crustaceans, and demersal fish. Several countries including Italian, Greek, Egyptian and Japanese companies were given concessions by the Somali government for trawling of pelagic and demersal stocks. Currently Russian, South Korean, Taiwanese and Italian vessels are trawling illegally in Somali waters.

Marine turtles were traditionally harvested in Somalia including the green turtle and the hawksbill turtle. Previous records indicate a high number of turtles in Somali waters with artisanal fishermen catching roughly 2-3 turtles a day in the coastal towns of Kismayo, Brava and Merca (UNEP 1987) a very high uptake. There is no published information on harvesting of sea turtles therefore making it difficult to estimate the sustainability of this activity.

Information on the harvesting of mangroves is not available though it is clear that mangroves are utilised for scaffolding and roof support in buildings and boat construction. It is speculated that these mangroves come from Lamu (Kenya). Mangrove poles sold at Kismayo are harvested from south of Kismayo, but apparently much of the trade originates from Lamu where larger poles are available.

Management

At present there is no functional government in Somalia, hence resource extraction is unregulated. In the past the Department of Fisheries under the Ministry of Marine Transport and Ports regulated fisheries. There are also no marine protected areas in Somalia and with the present political instability there appears to be no initiatives to manage coral reefs and associated ecosystems at present. A community initiative to settle Somali refugees, Somalia Community Service, is interested in conservation activities (Salm et al. 1997). There was no specific agency to manage protected areas and several Ministries had jurisdiction over marine resources including the Ministry of Livestock, Forestry and Range, the Ministry of Marine Transport and Ports, the Ministry of Fisheries and the Ministry of Tourism. This structure is likely to be retained when a functional government is reinstated in Somalia. Unfortunately the overlap in jurisdiction will cause problems in the management of any marine resources.

Capacity Building and ICRI Coordination

The ongoing civil war in Somalia has made it difficult to develop any programs to manage reefs and associated ecosystems. Somalia at present has no capacity to manage or monitor any marine resource use since. Any legislative or regulatory authority that exists is largely ineffective.

Kenya

Introduction

The Kenyan coastline is approximately 500 km long, with a well-developed fringing reef system except where major rivers (Tana and Athi Sabaki) discharge into the Indian Ocean (Hamilton and Brakel 1984). Additionally, patch reefs occur in Malindi and Kiunga in the north and Shimoni in the south on the Kenya Tanzania border. Coral reefs are the predominant marine ecosystem in terms of ecology and economy but seagrass beds and mangrove forests also contribute to the economy of the coastal communities. Seagrass beds are usually associated with reefs growing in the shallow lagoons between the shore and reef lagoons as well as in the shallow bays, Ungwana and in the shallow channels of drowned river beds (creeks). Mangrove forests are well developed in the Lamu archipelago where 70% of the total mangrove cover of Kenya occurs. Coral reefs are poorly developed towards the north due to the influence of the cool waters from the Somali upwelling. In general, the coral communities are similar to other parts of the Western Indian Ocean (Hamilton and Brakel 1984), dominated by Porites assemblages in calm waters and Acropora assemblages in high energy waters.

Table 1: Studies on coral reefs and other associated communities

COMMUNITY	NO. SPECIES/GENERA	REFERENCE
Scleractinian corals	140 species 55 genera 183 species 55 genera	Hamilton & Brakel 1984 Lemmens 1993
Finfish	350 species	Samoilys 1988
Mangroves	9 species	Issac & Issac 1968
Algae	277 species	Issac 1968
Seagrass	12 species	Moorjani & Simpson 1988
Gastropods	135 species	McClanahan 1989
Sea urchins	12 species	Clark & Rowe 1971
Sea turtles	5 species	Frazier 1975
Marine mammals	1 species	Pertet & Thorsell 1980

The distribution and diversity of scleractinian corals has mainly been studied in the Malindi-Watamu reef complex, where 183 species and 59 genera were identified. Reef edges and deeper reefs as well as soft corals, coralline algae and other reef building species have received less attention. Kenya has a rich and diverse fauna of seagrass and algae (Issac 1968; Moorjani and Simpson 1988) attributed to the heterogeneous benthic habitat and the wide tidal range. The coral reef finfish fauna has received less attention with the few existing studies indicating high species diversity and finfish communities similar to other reefs in the western Indian Ocean (Table 1). Additionally all nine species of mangrove found in east Africa occur in Kenya. There is a general north to south increase in coral reef diversity, with Tanzanian reefs having a higher diversity of gastropods (Yaninek 1978).

Resource Extraction and Tourism

Currently, fishing, gleaning, mangrove harvesting and tourism are the main direct uses of coral reefs and associated ecosystems in Kenya. Artisanal fishing is the most common resource extraction activity in coral reefs, seagrass beds and mangrove creeks. An estimated 2000-5000 fishers are involved and dugout canoes are the main type of vessel (Fisheries Department, pers. comm.). Gear includes basket (madema) and fence traps (uzio), handlines, pull and gill nets and spear guns (Table 2).

Table 2: Artisanal fishing activities on the coast of Kenya

FISHING GEAR	FISHING ACTIVITY
1. Spear guns	A rudimentary gun made from wood with sharpened metal rod, and a mask made of window glass with metal and rubber sides is used. Spear fishing is restricted to shallow reef areas and seagrass beds in marine reserves.
2. Basket traps (madema)	Basket traps are baited with seaweeds, urchins or trash fish, and usually set in seagrass beds or channels in the reef and mangroves.
3. Fence traps (uzio)	Fence traps are constructed from shore to the shallow seagrass areas at headlands in a funnel shape guiding fish into the ends as the tide rises.
4. Hook and line	Fishers use small canoes to get the reef edge or channels in the reef and fish with hook and line baited with shrimp, squid or octopii.
5. Beat seining	A weighted net is set out in a U-shape and the water is beaten to scare fish into the net. Considerable damage to coral is caused and this type of fishing is discouraged in marine reserves.
6. Gill netting	Gill nets with a stretched mesh size of 2.5" (often much less) are used. However, in most reserves these nets are discouraged for inhibiting sustainable fishing.
7. Gleaning	Marine snails, sea cucumbers, oysters and octopii are the main organisms collected, usually during low tide in the intertidal lagoons, reef flats and mangroves.

The fishers of Lamu are traditionally more sophisticated and use sail and engine-powered boats (Mashua and Dhows) with seine, gill and drift nets, troll-lines and long-lines. The catch is mainly composed of Lethrinids, Acanthurids, Scarids, Siganids, Carangids, sharks and rays. Additionally, transient fishers including fishers from Pemba often fish an area on a seasonal basis, sometimes for a specific resource i.e. lobsters or sea cucumbers. Fishers have recently started using SCUBA for sea cucumbers due to sea cucumber scarcity in shallow areas.

Gleaning for sea cucumbers, crabs, octopii, molluscs and bait fish and aquarium fish is carried out in shallow seagrass beds and reefs at low tide. Men carry out most fishing activities but women are involved during the processing by frying the fish for sale at the village level. Commercial fishing includes fourteen commercial trawlers that have been licensed to fish for prawns and fish in the Ungwana Bay and the Tana delta, as well as sports fishing.

The fisheries resources of the Kenyan coast are poorly documented with annual estimates from the fisheries department ranging between 6000 to 9000 tonnes from 1983 to1992 (Fig. 3.1). Approximately 80% of the marine fish catch is demersal mainly from shallow coastal waters and reefs, the remainder is caught offshore by sports or commercial fishing vessels. An FAO commissioned study of the marine fisheries sector of Kenya estimated an artisanal catch of approximately 10 000 tonnes at a productivity of 5.5 tons/km^2/yr. This would indicate that this is an over-exploited fishery using the FAO fisheries rule-of-thumb for a multi-species/multi-gear fishery. Additionally, annual yearly yields reported for Kenya are variable at 2.6 to 13.3 tons/km^2/yr reported for Kisite in southern Kenya, 12.9 tons/km^2/yr for reefs at Kilifi and 10.5 to 12 tons/km^2/yr for Diani. These yields are greater than the maximum sustainable yields of 5 tons/km^2/yr suggested by FAO.

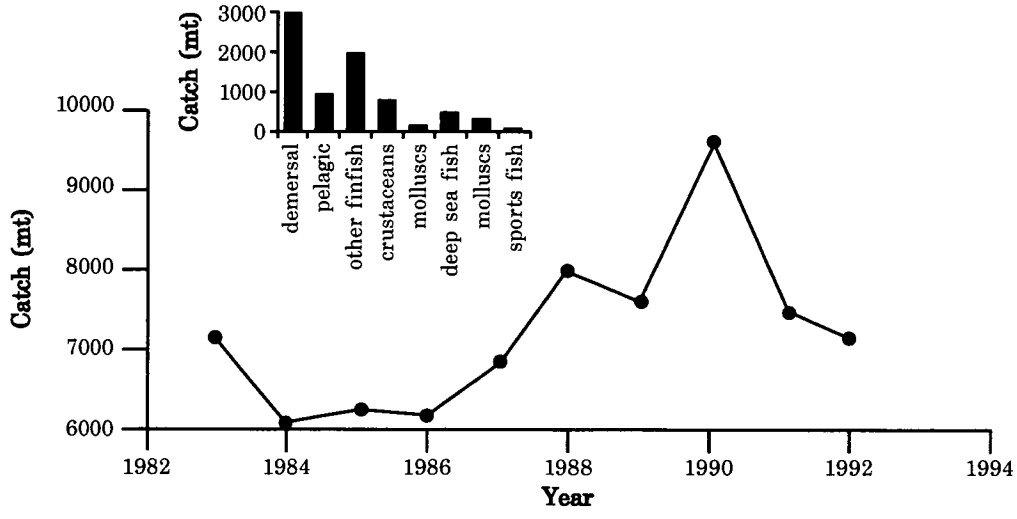

Figure 1: Total catch of fish, molluscs and crustaceans from the Kenya coast. Inset is the distribution of the catch on an annual basis from 1988 to 1992. (Source: Fisheries Department)

Mangrove cover in Kenya is estimated at 52980 ha with Lamu district having 68% of the total cover and the most productive stands (Figure 2a). Mangrove exploitation has been going on for centuries along the East Coast of Africa with most of the harvesting going for export to the Middle East.

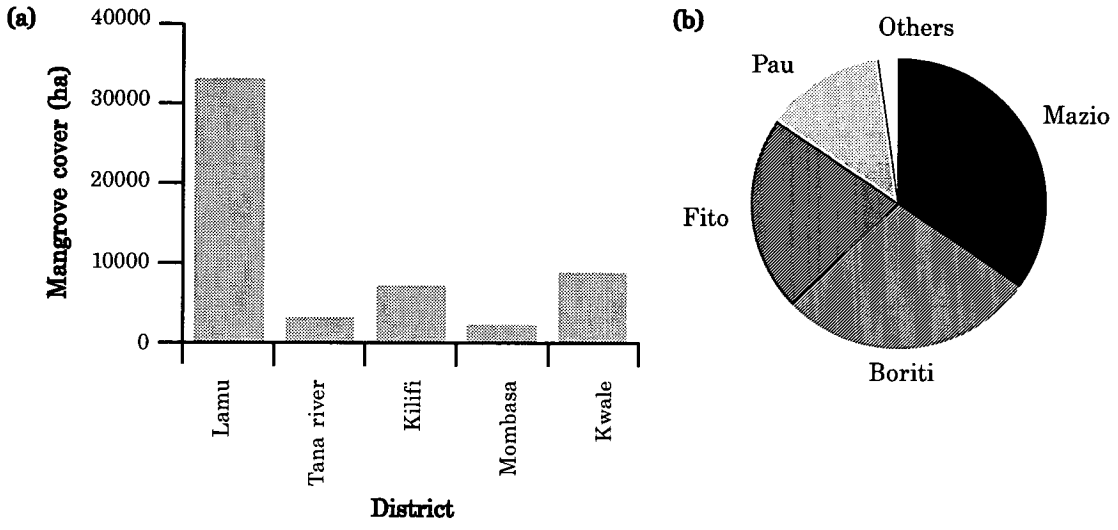

Figure 2: (a) The distribution of mangroves along the coast of Kenya and (b) the percentage of the total harvest by mangrove size in diameter (Fito are <6 cm, Mazio range between 6.1 and 9.0 cm and Boriti range between 9.1 and 13.0 cm). (Source: Forestry Department)

Mangrove export was banned in 1982 but there has been a lot of pressure by mangrove licensees to lift the ban. Currently mangroves are exploited for building material for domestic and commercial purposes (especially hotels), fencing and firewood. *Rhizophora mucronata* (Mkoko) is the most popular mangrove species due to its straight shape and resistance to termites. *Ceriops tagal* (Mkandaa) and *Bruguiera gymnorrhiza* (Muia) are also popular as they have fast growth rates. Mangrove poles of the Mazio (6.1-9.0 cm) diameter size class dominates the market followed by Boriti (9.1-13.0cm) (Figure 2b).

TOURISM

Until recently tourism was the major foreign exchange earner for Kenya with 75% of all tourists (~200 000 visitors) visiting Kenya spending a few days at the coast. There are 412 hotels (~30 800 beds) along the prime beaches of Malindi, Watamu, Bamburi and Diani, all adjacent to fringing reefs. Additionally there are numerous cottages, apartments and private houses that cater for the local market and low-cost visitors. Tourism is poorly developed in Shimoni in the south and the Lamu/Kiunga area in the north. The development of tourism has been very rapid and uncontrolled leading to a great demand for marine resources including fish, shellfish and molluscs and mangroves for building, ultimately causing the over-exploitation of these resources. Most of the recreational activities are also concentrated around reefs. Glass bottom boats, sailing, goggling and SCUBA diving are the major activities (Table 3). Few hotels have installed sewage treatment plants, most depending on cesspits and soakage pits, raising the risk of underground seepage to the adjacent reefs and seagrass beds.

Table 3: Tourist-based activities within marine protected area in Kenya

ACTIVITIES	REMARKS
1. Glass bottom boat tours	Tourists and local residents hire these boats to go to the coral garden. Goggling is often involved. A daily fee is charged in MPAs.
2. SCUBA diving	Tourists and locals are taken to the reef edge, wrecks and caves for SCUBA, usually by companies affiliated with hotels. This activity requires a daily park fee in MPAs.
3. Goggling	Visitors to the park who swim from shore to the reef using goggles are charged a daily fee.
4. Sailing	Modern and traditional sailboats, including dhows and ngalawas, ply the waters of MPAs either for tourist or fishing purposes.
5. Windsurfing	Tourists and locals can windsurf in MPAs without paying a fee.
6. Jet skiing	Several hotels have watersports desks that hire out jet skis. MPA managers by legal notice restrict the area and time for this activity.

Management and Its Effectiveness

The coral reefs and associated ecosystems of Kenya fall under the jurisdiction of several government departments (Table 4). The Fisheries department has jurisdiction over all fishing activities, the forestry department has jurisdiction over all forestry resources including mangrove trees and the Kenya Wildlife Service manages all biodiversity resources within national reserves and national parks and wildlife outside parks and reserves. Other departments with interests in marine resources include the Kenya Marine and Fisheries Research Institute (KMFRI) and the Coast Development Authority (CDA) who monitor resources and developments that affect these resources at the coast.

Table 4: Government departments, their responsibilities and legislation with jurisdiction over coral reefs and related ecosystems

DEPARTMENT	MINISTRY	RESPONSIBILITY AND CAPACITY
Fisheries Department	Environment and Natural Resources	Licensing, enforcement and monitoring of catches, protection of sea turtles
Kenya Wildlife Service	Office of the President	Conservation of all fauna and flora in parks and reserves and wildlife outside parks
Forestry Department	Environment and Natural Resources	Licensing of forestry products and management of forest reserves
Kenya Marine & Fisheries Research Institute	Research Technical Training & Technology	Research monitoring of marine and freshwater habitats and resources
Coast Development Authority	Rural Development	Development of the welfare of rural communities

The Fisheries Department has landing bases along the entire coastline that are manned by a fisheries officer who monitors the catch and submits reports at the district and provincial levels. Ideally, data are compiled at these levels and sent to the headquarters in Nairobi. Inadequate resources and skills has led to lack of commitment and hence poor monitoring of fisheries activities making it difficult to develop management strategies for any fishery. Although no long-term data are available on any fisheries stocks, there is sufficient information to show that at the very least the marine artisanal fishery is over-exploited in unprotected reefs (McClanahan and Obura 1995; Watson et al. 1996). Artisanal fishing in Kenya has a dramatic effect on reefs including:

- A reduction in fish biomass and sizes (Fig. 3a): protected reefs averaged 800-2000 kg/ha while unprotected reefs average about 100 kg/ha (McClanahan et al., in press (a)). Comparisons between reserves where restricted fishing is allowed and parks where fishing is prohibited also show large differences in commercially important species (Figure 3b).

- Changes in reef community structure due to the reduction of the predators and competitors of sea urchins, which has caused an increase in sea urchins, especially Echinometra mathaei an aggressive bio-eroder as recorded in Diani.

- The Fisheries Department also has no capacity, including surveillance vessels and training, to monitor commercial trawlers that are restricted by law to 10 km from shore but are frequently seen within 1 km offshore. Trawlers are perceived by the local fishing communities as the major culprits in the reduced fisheries catches and the prime danger to turtles in Kenya.

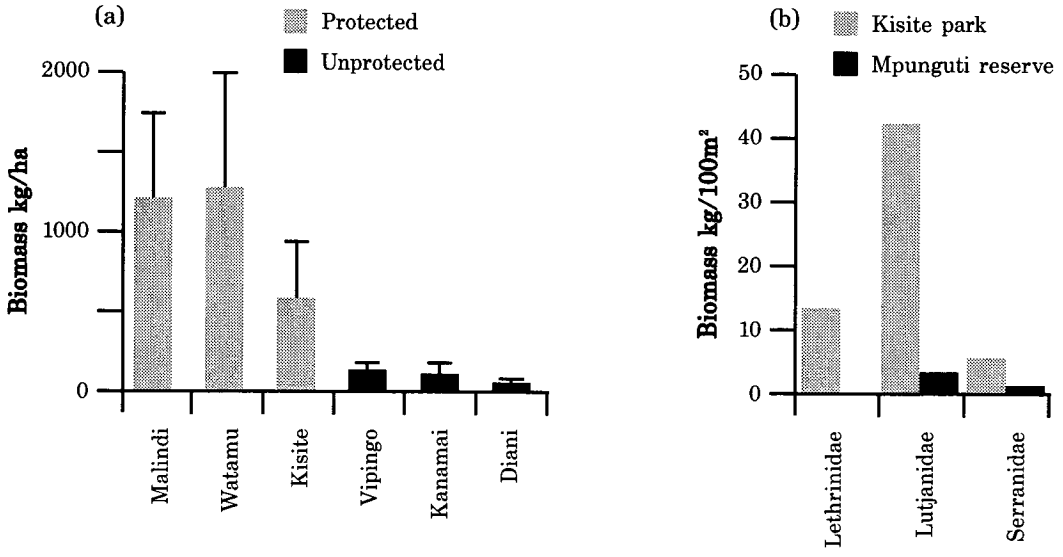

Figure 3: Biomass of finfish in protected versus unprotected areas. (Source: Coral Reef Conservation Project database)

The Forestry Department is equally under-funded and under-skilled. Ideally all products from mangrove forests are supposed to be checked by forest guards posted at landing points along the coast. Traditionally, forest guards also assessed the stock at cutting sites for recommendations to district and provincial forestry officer for future licences. Currently forest guards have no resources to monitor the stock, putting in doubt the basis for issuing licenses.

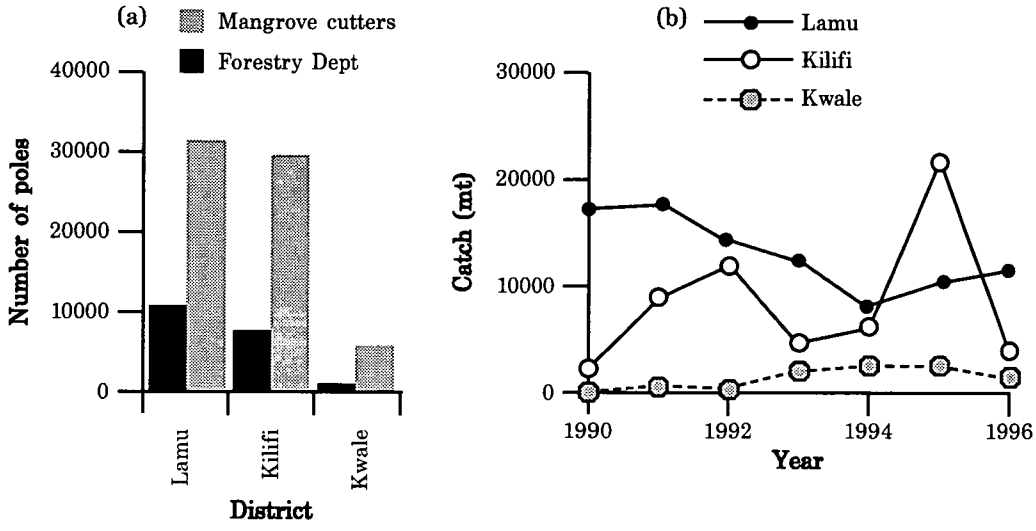

Figure 4: Mangrove harvest (a) estimates in three districts in Kenya as reported by Forestry Department and mangrove cutters and (b) the number of scores traded in the three districts between 1990 and 1996 (Source: Forestry Department)

Several factors indicate that mangrove resources are over exploited:

- Discrepancies between mangrove cover estimates by the Forestry Department of resource survey and remote sensing and the Forestry Department (52 980 versus 64 427 ha).
- Discrepancies between forest department estimates of harvest and estimates from mangrove cutters (Fig. 4a), with mangrove cutters estimating more than double the number of poles recorded by Forestry Department. More than 50% of the trade in mangroves comes from Lamu district and much of the trade using the century old dhow routes to the Middle East is centred in Lamu, which leads to speculation about potential illegal export of mangrove poles from this area.
- There has been a steady decline since 1990 of harvest over the years except for 1995 when ~20 000 poles were harvested from Kwale district (Fig. 4b).
- The low quality of mangrove products from Kenya compared to other east African countries, including Tanzania, probably because the parent stock is of low quality (Luvanda et al. 1997).

There is an urgent need to ascertain the standing stock and quality of mangrove before any ban can be lifted. The ban was originally imposed because inadequate mechanisms to monitor the export trade were in place. To date these mechanism have not been developed.

Kenya has the oldest managed MPAs in the region, which are administered by the Kenya Wildlife Service. The MPAs of Kenya include four Marine National Parks (Malindi, Watamu, Mombasa and Kisite) and six Marine National Reserves (Kiunga, Malindi, Watamu, Mombasa, Diani-Chale and Mpunguti) (Table 5). In all cases, marine national parks are adjacent to (Kisite) or encompassed within marine reserves (Watamu, Malindi, Mombasa). Additionally, Watamu and Kiunga Marine National Reserves are Biosphere Reserves under the UNESCO Man and the Biosphere System. Fishing and all other forms of extraction are prohibited in marine national parks and only fishing using traditional and non-destructive gears and techniques are allowed in marine national reserves. Managers of MPAs may limit the type of gear and the area of fishing through zoning by posting legal notices.

Table 5: The Marine Protected Areas of Kenya

MPA	GAZETTED	SIZE	LOCATION
Kiunga Marine National Reserve	1979, Biosphere status 1980	25 sq. km	Lamu district
Malindi Marine National Park and Reserve	1968, Biosphere status 1979	Park: 6.3 sq. km Reserve: 165 sq. km	Kilifi district
Watamu Marine National Park and Reserve	1968, Biosphere status 1979	Park: 10 sq. km Reserve: 10 sq. km	Kilifi district
Mombasa Marine National Park and Reserve	1986	Park: 10 sq. km Reserve: 190 sq. km	Mombasa district
Diani-Chale Marine National Reserve	1995	250 sq. km	Kwale district
Kisite Mpunguti Marine National Park and Reserve	1978	Park: 28 sq. km Reserve: 11sq km	Kwale district

Wind surfing, jet skiing, sailing, SCUBA and dolphin watching in traditional and modern craft are all common tourist activities. In most parks daily entry fees and annual boat fees are collected by park rangers, except in the Mombasa Marine Park and Reserve where a partnership with adjacent hotels allows daily access to the park and reserve for US$0.5 per bed per night.

There is sufficient evidence to show that Kenya's marine parks are effective in protecting coral reef communities with higher hard coral cover in marine parks, larger and higher diversities of finfish, fewer sea urchins (Fig. 5) and greater topographic complexity. Parks are managed by wardens with a cadre of trained and armed rangers responsible for maintaining security, collecting revenue and maintaining facilities, especially moorings and monitoring. In the last few years with the reduction in tourism, resources for daily operations have decreased markedly thus increasing the threat of encroachment by artisanal fishers as documented in Watamu and dynamite fishing on the Kenya-Tanzania border as recorded in Kisite.

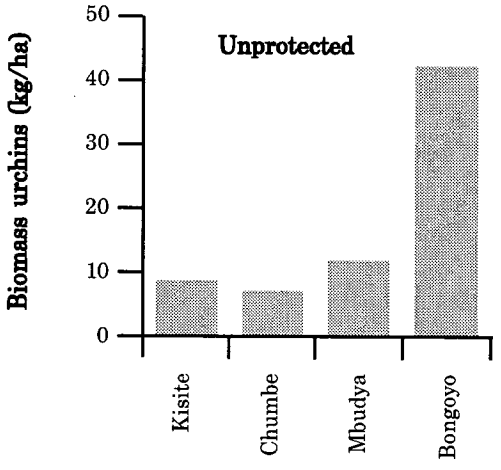

Figure 5: Biomass of sea urchins (kg/ha) in protected (Kisite Kenya and Chumbe Zanzibar) and unprotected areas (Bongoyo and Mbudya, Tanzania). (Source: Coral Reef Conservation Project Database)

Threats to Kenyan Coral Reefs and Associated Ecosystems

The main threats to Kenya's reefs are similar to those found in the rest of the region and they fall into the following main categories.

- Over-exploitation of marine resources fuelled by the increase in the coastal population. Fisheries products including finfish, octopii, sea cucumbers and lobsters are all showing signs of overexploitation. Illegal exploitation of sea turtles that are valued by the Bajuni people of northern Kenya and overexploitation of mangroves also pose a serious threat to these species.
- Destructive methods of fishing, especially beach seining which causes extensive damage to coral and seagrass beds, octopii gleaning and fishing for aquarium fish which cause breaking up of coral, and on the Kenya-Tanzania border dynamite fishing has been recorded on Mako-Kokwe reef inside the marine reserve.
- Poor land-use practices, especially cultivation along river beds, have caused the increase of sedimentation and is a threat in the Malindi and Watamu areas.
- Tourism-related activities, including collection of marine curios such as shells, seastars and coral, cause depletion of these resources.
- Pollution from land-based activities is also proving to be a threat in Watamu where algal cover has increased in some reefs.

Integrated Management

In the past, biodiversity conservation and management of natural resources in Kenya has tended to emphasise the international and scientific values and benefits of biodiversity. However, many Kenyans depend to a very large degree on biological resources at the subsistence level, especially coastal communities, making these resources very vulnerable to over-exploitation. Given this overwhelming dependence on biological resources, it has become increasingly clear that new strategies incorporating local and national interests must be developed. At the national level, there is a new awareness that sustainable economic development and biodiversity are intricately linked and, as a signatory to the Convention on Biological Diversity, the government of Kenya has shown its commitment to biodiversity conservation. Within institutions mandated to manage natural resources including KWS, Fisheries Department and Forestry Department, more and more emphasis is being put on integration of communities and other stakeholders in management. These three institutions are in the process of drafting new policies or have already submitted new policies to parliament that address a more integrated way of management. However, the framework within which integrated and collaborative management can work at the national level is lacking.

Table 6: Projects and activities in coral reefs and associated ecosystems in Kenya

ACTIVITY	INSTITUTION	FUNDING
Integrated Coastal Area Management pilot project	Coast Development Authority Kenya Wildlife Service Kenya Marine & Fisheries Research Institute Fisheries Department Others	UNEP EAF5 USAID
Wetlands training and management	KWS Netherlands Wetlands Program	Netherlands Government
Research and Monitoring	Coral Reef Conservation Project KWS KMFRI	USAID Swedish aid agency Netherlands Government
Management	KWS Fisheries Department Forestry Department Coast Development Authority	German Government through IUCN Netherlands Government WWF
Public Awareness	KWS Wildlife clubs of Kenya	Netherlands Government Japanese Government

There is a great diversity of initiatives and institutions involved in coral reef activities in Kenya (Table 6). These include government departments, international and local NGOs and universities. The activities are varied and targeted often to sites or groups with no national coordination. The National Environmental Secretariat has drafted a National Environmental Plan but the secretariat is relatively weak with little coordination skills and this draft plan has not been endorsed by any institution. Departments are forced to develop other means of cooperation, depending on MOUs and MOAs. KWS for example has MOUs with the Coast Development Authority (1994), Kenya Marine Fisheries Research Institute (1995), Forestry Department (1994), wildlife clubs of Kenya, Fisheries Department (pending) and the National Museums of Kenya (pending). WWF is assisting KWS in a pilot project of community-based management in the Kiunga Marine National Reserve. In Kisite a pilot project to develop stakeholder participation in MPA management is under experimentation with technical assistance from IUCN.

Capacity Building and Information

Kenya has several institutes of higher learning specialising in marine studies including Nairobi and Moi University. Several donor-funded projects provide training, including the Coral Reef Conservation Project (CRCP) which has a hands-on regional training internship program. The Kenya-Belgium project has conducted two training courses in Kenya on tropical marine ecosystems. The KWS Naivasha training institute has trained all MPA managers and rangers in Kenya in basic marine ecology, swimming and SCUBA, and basic monitoring techniques. This is the first time that MPA managers and their staff have basic knowledge on the ecosystems that they manage. Several important workshops have been held including an ICZM symposium, a workshop on the Coral reefs of the Western Indian Ocean and a regional TED workshop.

Many programs develop awareness materials e.g. KWS Netherlands program is funding a resource and visitor centre in Malindi and has also funded the production of posters and brochures. Additionally, the Wildlife Clubs of Kenya in collaboration with KWS conduct awareness programs on marine resources in primary and secondary schools throughout the coast. The regional centre for information RECOSCIX, based at KMFRI in Mombasa, is the only regional information centre that continues to distribute marine information to the region and plays a crucial role in updating scientists on recent research findings.

Despite the diversity of activities, many of these programs are not based on any assessment of training needs either in the country or the region and there is an urgent need to assess the current regional capacity in coral reef studies and develop programs to address these needs. There is also often no follow-up to assess the effectiveness of the training and the usefulness of the training material usually because many of the programs are short-term and externally funded. In order to develop adequate capacity in the country, the universities and the KWS Naivasha training institute need to work closely together to design appropriate programs that become part of the normal curriculum and that can be upgraded every year. Additionally, marine sciences need to be addressed at the primary and secondary level where this is currently lacking.

Research and Monitoring

Several institutions and projects carry out research on coral reefs and associated ecosystems in Kenya (Table 6). The Coral Reef Conservation project, working closely with the KMFRI and KWS, has carried out a long-term program of monitoring the finfish, urchins and benthic substrate of protected and unprotected sites for the last 10 years (McClanahan et al., in press (a)). CRCP also carries out studies on different management practices including sea urchin and algal removal (McClanahan et al. 1995). The KWS Netherlands Wetlands program has funded the development of park-based monitoring, including turtle nesting and mortality and basic water quality assessments. Additionally, a national wetlands database is in the process of being implemented which will include shallow coastal areas. Training of marine monitoring rangers in simple transect and quadrate techniques has just been completed prior to instituting a monitoring program for key sites in the MPAs. Information on the communities that utilise marine resources is scanty. CRCP regularly collects fisheries data from landing sites in Mombasa and Diani. Glaesel (1997) studied the fishing community at Diani and Mombasa.

There is a need for managers to start working more closely together with scientists. Additionally, simple park-based monitoring practices need to be developed. Once managers start using data collected by scientists, then the gap between managers and scientists will not be so large.

ICRI and GCRMN Coordination

Despite Kenyan participation in both the Dumaguete and Seychelles ICRI conferences, an action plan has not been developed at the national level to implement ICRI. The main obstacle has been lack of funds and lack of commitment by the relevant institutions to devote time to ICRI. ICRI activities continue in Kenya but in an uncoordinated manner and with no central lead agency. The relevant institutions to further ICRI are the KWS and the KMFRI in collaboration with the Fisheries Department, the Forestry Department, the Coral Reef Conservation Project (CRCP) and the Coast Development Authority (CDA).

Mainland Tanzania and Zanzibar

Introduction

The Tanzania coastline is approximately 800 km long from the Ruvuma River on the Tanzania-Mozambique border, moving north to Tanga at the Kenya-Tanzania border. There are four coastal regions – Tanga, Dar es Salaam, Lindi and Mtwara. The northern part of Tanzania includes the mainland areas of Tanga, Bagamoyo and Dar es Salaam, also the oceanic islands of Pemba and continental islands of Unguja, which make up the state of Zanzibar. In the Tanga area, numerous patch reefs occur in waters 25 m deep (inner patch reefs) and up to the continental shelf (outer patch reefs). Fringing reefs and seagrass beds broken up by bays and river estuaries including the river Pangani, border the mainland coast. Fringing reefs are also well developed along the seaward sides of Bongoyo Island, Fungu Yasin sandbank and Mbudya Island, which make up the Dar es Salaam marine reserve system. Scattered coral developments and a fringing reef surround Unguja Island on the eastern coast and northern and southern extremities.

South of Dar es Salaam, Mafia Island has an outer reef that extends southward to the Songo Songo archipelago. This reef borders the mainland southward to the Ruvuma delta on the Tanzania-Mozambique border, broken in places by deep-water channels rivers and bays. North of Mafia Island coral reef development is restricted to a few offshore islands due to the turbid waters of the Rufiji River. Seagrass beds occur in the shallow waters around Mafia, Songo Songo archipelago and in the sheltered bays of the southern coastline from Kilwa Kivunje to Mtwara. Mangroves are concentrated in the Ruvuma delta that supports the largest area of estuarine mangrove forest in East Africa.

Table 7: Studies on coral reefs and other associated communities

COMMUNITY	NO. SPECIES/GENERA	REFERENCE
Scleractinian corals	88 species, 51 genera	Hamilton 1975; Hamilton & Brakel 1984; Darwall & Guard, in press
Finfish	400 species	Horrill & Ngoile 1991
Mangrove	9 species	Semesi 1998
Algae	154 species	Horrill & Ngoile 1991; Darwall & Guard, in press
Seagrass	12 species	Darwall & Guard, in press
Gastropods	135 species	Kayombo 1989; Brown 1996
Sea turtles	5 species	Frazier 1975

The distribution and diversity of coral reef communities along the Tanzanian coast is similar to reefs found in other parts of the region (Tables 1 and 7). Coral assemblages are dominated by *Acropora,* but *Galaxea* is a characteristic feature of patch reefs (Hamilton 1975), *Pachyseris* is dominant on lower reef slopes and the fungid *Halomitra pileus* forms large aggregations on some reef slopes. Surveys of coral distribution in the Tanga area revealed increased genera from coastal patch reefs to outer reefs (Horrill and Ngoile 1991). Surveys of the distribution and diversity of reef fish are limited but the most comprehensive survey recorded 400 species on Mafia Island. The species of mangrove, seagrasses, algae and gastropods are also similar to records from other parts of the region.

Resource Use and Tourism

The coral reefs of Tanzania are used in a number of ways by local communities and the private sector. Fishing for finfish is the major activity but fishing for sharks and rays, octopii, sea cucumbers, lobsters, shells (for the curio and export trade) are also important economic activities. Additionally, coral mining for lime production and building, harvesting of mangroves for construction and firewood, and recently mariculture of seaweeds *Euchema spp.* are all undertaken in the shallow inshore waters.

Artisanal fishing in inshore shallow areas dominates the fishing industry in Tanzania. Individuals or pairs of fishermen use small sailboats (Ngalawa) and dugout canoes. Gear types are similar to those used in Kenya (Table 2) including seine and gill nets, handlines, traps and spear guns. Tanzanian fishermen are considered to be more sophisticated than Kenyan fishermen with organised crews manning sail powered, and more recently, outboard engine powered wooden vessels of different sizes (Mashua and Dhows). These crews use troll-lines, long-lines and shark nets, and fish in deeper waters. Pressure on marine resources has unfortunately led to the adoption of more 'efficient' gear techniques including smaller mesh nets, explosives and poisons which are very destructive.

Catch estimates from 1975 to 1993 (McClanahan et. al., in press (b)) ranges between 25 000 to 57 000 mt per year and fishing effort has doubled in the last 20 years. Traditionally, women participated as gleaners of shallow reef lagoons and reef flats while men built boats and fished offshore. In recent times seaweed farming has attracted many women and today 90% of the seaweed farmers are women.

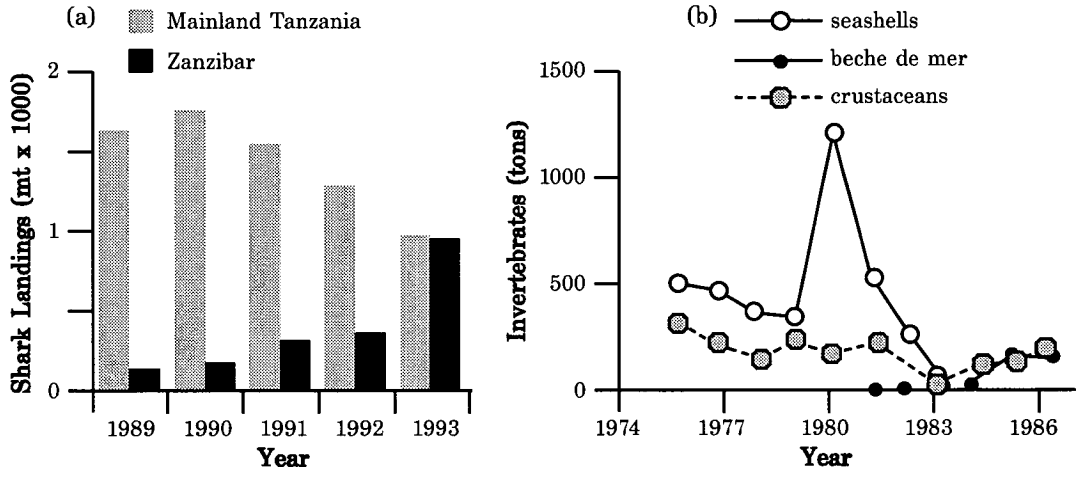

Figure 6: (a) Catch of sharks landed in mainland Tanzania and Zanzibar and (b) invertebrate catch in mainland Tanzania (Source: Fisheries Department)

The shark and ray fishery also employs many artisanal fishers working in teams full time. Shark nets are bottom set in 10–25 m of water in seagrass beds, areas of coral rubble and deep channels (Figure 6a). The invertebrate fishery (Figure 6b) includes octopii and sea cucumbers (mainly for export), the lobster fishery which is mainly opportunistic for the local and tourist market, and the prawn fishery for export. Sea cucumbers are currently harvested with SCUBA because the stocks in shallow waters have been over-exploited. The prawn fishery is well organised and controlled by business enterprises in Dar es Salaam who provide boats, engines, cooling facilities and transport to the fishers. Eighty per cent of the prawn catch comes from the Rufiji delta ~7000 ton/year.

Mangrove cover in Tanzania is estimated at 55 000 ha and are all classified as forest reserves. The Rufiji delta has the largest stand of mangroves on the entire East African coast and accounts for 50% of mangrove cover in Tanzania (Banyika 1986). Other important areas include Mwanza, Tanga, and the mouths of the Wami, Ruvu, Matandu and Ruvuma rivers. Islands such as Mbegani, Kunduchi, Latham, Kisiju, Kivinje, Kilwa and Mafia also have important mangrove stands (Semesi 1998; Figure 7). Direct uses of mangroves include building poles, firewood and charcoal and timber for boat and building construction. Other extractive uses include tannins, honey and beeswax. Unfortunately, extensive areas of mangroves have also been cleared for salt production and agriculture, especially in the Rufiji and Ruvuma deltas.

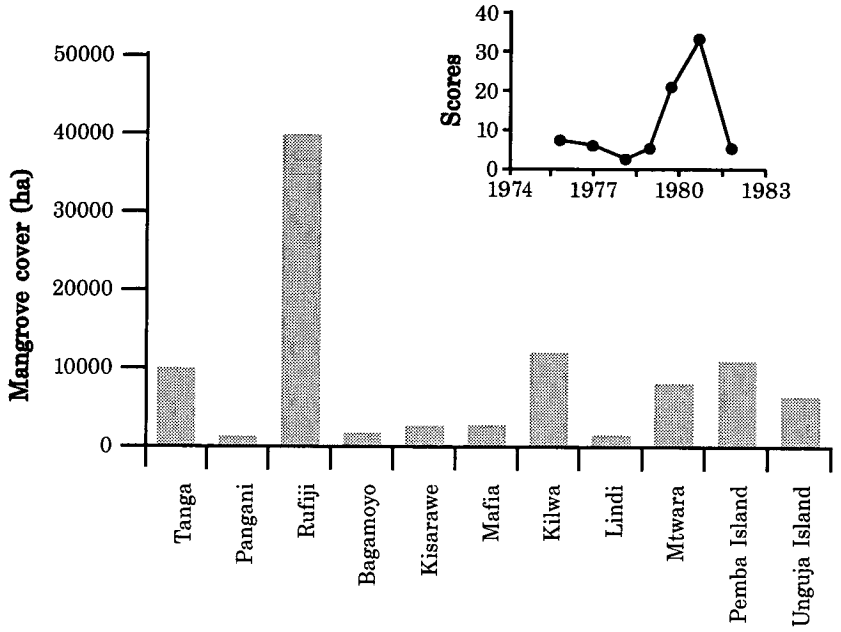

Figure 7: The distribution of mangroves in Tanzania and Zanzibar – inset shows mangrove trade from 1976 to 1982

Live coral is harvested in Tanzania from shallow reefs at low tide. *Porites* and other dense corals are preferred and are used directly for building or burnt in kilns to produce white lime which is used as a cement substitute or as a white wash. Unfortunately, live coral is preferred over ancient coral because it produces higher quality lime. An estimated 950 mt has been mined around Mafia Island since 1985 (Anderson and Ngazi 1995).

Coastal tourism is not highly developed along the Tanzanian coastline. However, with the liberalisation of the economy, a rapid increase in the number of visitors is expected. The number of tourists visiting Tanzania decreased markedly after the closure of the Kenya Tanzania border in 1977 because many tourists use Nairobi as the entry point to East Africa. Between 1993 and 1994, the number of visitors to Tanzania has increased the most rapidly in the region. It is estimated that approximately 40% of the total number of visitors to Tanzania visit the coastal zone. The Tanzania Tourist Corporation owns ~15 tourist class hotels (~2500 beds). There are also a few foreign owned hotels. There is a rapid development of recreational use of the reefs of Pemba and Unguja for tourism. SCUBA diving and deep-sea fishing companies are mainly based in Kenya and charter two to three-day excursions to Pemba because infrastructural support is more developed in Kenya.

Management and its Effectiveness

The resources of coral reefs and associated ecosystems of Tanzania are unfortunately managed by several departments often with overlapping jurisdiction at national, regional and local levels (Table 8). At the national level, the most important ministry is the Ministry for Tourism Natural Resources and Environment with the divisions of Tourism, Fisheries, Environment, and Forestry and Beekeeping.

The Department of Fisheries (*Fisheries Act 1970*) is responsible for management of all marine waters from the mean high-water mark to national territorial waters. The Fisheries Act provides for the protection, conservation development, regulation and control of fish, fish products, aquatic flora and fauna and products thereof (Rumisha 1995). At the district level, district fisheries officers are responsible for checking for implementing fisheries plans and checking hygienic condition of fish for export. These officers however are employed by district authorities from the Ministry of Local Government and Cooperative Development. This multi-employer character of the fisheries administration, despite the highly enabling law and lack of equipment and funds, contributes to the low level of management.

Table 8: The government institutions and agencies responsible for marine resources in Tanzania

ADMINISTRATIVE LEVEL	MINISTRY, DIVISION OR OFFICE
National level	Ministry of Tourism, Natural Resources and Environment
	• Division of Tourism
	• Division of Fisheries
	• Division of Environment
	• Division of Forestry and Beekeeping
	Ministry of Trade and Industry
	Ministry of Lands, Housing and Urban Development
	National Planning Commission
	Ministry of Energy, Water and Mineral Resources
	National Environmental Management Council
Regional level	Regional Development office
	Natural resources office
	Land office
	Health office
	Trade and Industry office
	Energy, water and mineral resources office
	District development office
Local level	District development office
	District natural resources office
	• Fisheries
	• Forestry
	District lands office
	District council
	District administrative office
	Village councils

Jurisdiction for mangroves falls under the Division of Forestry even though mangroves occur above and below the mean high-water mark. All mangrove forests are classified as reserves under the Forest Ordinance of 1957. However, the Ministry of Trade and Industry can issue licenses to develop terrestrial land within coastal areas hence the issuing of licenses for salt pond production in mangrove areas. There are also local level initiatives that further complicate management. Despite the divisions responsible for the coastal resources being in one ministry, there has been little coordination of often conflicting activities and usually no environmental impact assessment is carried out. The lack of coordination has resulted in a lack of accountability, inability to respond to changes and failure to partition responsibilities between institutions especially in the management of the eight marine reserves in Tanzania (Table 9).

Table 9: Marine protected areas of mainland Tanzania and Zanzibar

MAINLAND TANZANIA	ZANZIBAR
Dar es Salaam Reserve designated in 1981	Chumbe Island Coral Park (1994)
• Mbudya Marine Reserve	
• Bongoyo Marine Reserve	
• Pangavini Marine Reserve	
• Fungu Yasini Marine Reserve	
Mafia Island National Marine Park (designated in 1995)	
• Chole Bay Marine Reserves	
• Tutia Marine Reserve	
Maziwi Island Marine Reserve	
Tanga Coral Gardens Marine Reserves	

The few studies that have been carried out on Tanzanian reefs show that there is over-exploitation of the finfish fishery (McClanahan et al., in press (b)) and potential over-exploitation of the shark fishery (Barnett 1997) and the sea cucumber fishery (Darwall and Guard, in press). Recent research in Dar es Salaam (McClanahan et. al., in press (b)) showed that the reefs were characterised by low fish abundance (200 kg/ha) with small-bodied damselfish and wrasses being the most abundant fish. There was also a negative relationship between sea urchins and fish biomass, which are replacing the fish herbivores such as parrotfish and surgeonfish. Studies in Tanga (Horrill et al. 1996) showed that there were low abundances of commercially important families such as snappers, grunts and groupers. Comparison between the number of fishers and the catch of selected resident coral reef fish between 1971 and 1992 in Dar es Salaam showed that the optimum level of production (700 mt for 1150 fishers) has been surpassed (McClanahan et al. 1998). This trend was also found in Tanga and Zanzibar where total production is kept constant by a combination of increasing effort and higher catches of sardines and Indian mackerel (Jiddawi et al. 1991).

The Fisheries Department is also responsible for enforcing fisheries regulations but has proved totally inadequate in controlling dynamite fishing. Despite the fact that dynamite fishing is illegal in Tanzania, it is very common. Frontier recorded 441 blasts within a two month period in southern Tanzania (Frontier, unpublished records) and a high percentage of the catch in some landing sites consists of fish caught from blast fishing (~60% in Mnazi Bay). Occasionally fishers are arrested but the fines are minimal. Unfortunately blast fishing has only been brought under control in a few reefs including the Mafia Marine Park and in Tanga, by projects undertaken by international NGOs. The sea cucumber fishery is also showing signs of over-exploitation as evidenced by smaller sizes in the catch and the collapse of the fishery in some areas including Mtwara.

The marine reserves of Tanzania fall under the administration of several of the divisions within the Ministry of Tourism, Natural Resources and Environment which has led to a lack of enforcement of reserve regulations. Marine reserves were established in 1981 under the Wildlife Conservation Act (1974) (Kudoja 1985). Despite Tanzania having eight marine reserves none of these are currently under any form of management. Chole Bay and Tutia marine reserves have recently been incorporated in the Mafia Island Marine Park, the only marine national park in Tanzania. Lack of suitable boats, outboard engines and trained personnel are often sited as the main reason for lack of enforcement of reserve regulations. The lack of enforcement of reserve regulations has caused drastic changes in the community structure of unprotected reefs. A comparative study (McClanahan et al. in press (b)) of the Kisite park (protected since 1978) and Chumbe coral reef park (protected since 1994) and the Dar es Salaam reserves of Mbudya and Bongoyo which have received no protection revealed, on average, a 70% difference in key coral reef fish and increase in urchin biomass. There is also concern that mangrove harvesting is having a detrimental effect on the ecology of the Tanzanian coast. The removal of mangroves along the Rufiji has caused increased sedimentation, putting the reefs of Mafia Park at risk (Andrews, pers. comm.). The management of mangroves suffers similar problems to reefs with mangrove resources falling under several different ministries, each with a conflicting agenda including trade (salt ponds), agriculture (rice farming) and fisheries (aquaculture). This conflict between different management agencies became clear recently when permission for a large-scale prawn aquaculture project in the Rufiji delta was authorised despite resistance from several government agencies and local communities.

Threats to Tanzanian Reefs and Associated Ecosystems

The main threats to Tanzanian reefs fall into the following main categories organised in order of importance.

1. Destructive methods of fishing pose the greatest danger to reefs in Tanzania. Dynamite fishing causes extensive damage to coral apart from killing fish that are not targeted for the market.
2. Over-exploitation of marine resources driven by the increase in the coastal population poses a danger to fisheries products including finfish, octopii, sea cucumbers and lobsters as well as mangroves. Illegal exploitation of sea turtles that are protected under the fisheries also poses a danger.
3. Poor land-use practices especially cultivation along river beds and removal of large areas of mangrove have caused the increase of sedimentation posing a danger to inshore habitats including coral reefs and seagrass beds.
4. Tourism-related activities including collection of marine curios such as shells, seastars and coral pose a danger.
5. Pollution from land-based activities is also proving to be a threat in Watamu where algal cover has increased on some reefs.

Integrated Management

The concept of integrated management has been introduced in Tanzania and Zanzibar through several donor-funded projects that have varying management strategies. In Tanga a collaborative management program, funded by Irish Aid, includes the district administration and local communities; in Menai bay a WWF funded project includes the central government and local communities; and in Chumbe Coral Park the private sector is involved. The successes and failures of these projects will provide important lessons in the region of the most effective management and conservation strategies.

Capacity Building and Information

The University of Dar es Salaam and the Institute of Marine Sciences (IMS) provide training in marine sciences. SIDA/SAREC has funded training courses for the region coordinated by IMS since 1988 including resource and pollution assessment. Most of the research and management projects in Tanzania develop awareness materials and training packages but they are usually site or project based. As in Kenya, training is usually project based and no assessment of training needs, either in the country or the Region, has been carried out. There is also the need to assess the effectiveness of the training and the usefulness of the training material in order to improve capacity building in marine sciences.

Research and Monitoring

The University of Dar es Salaam and IMS are the main institutions in Tanzania and Zanzibar carrying out research on coral reefs and associated ecosystems. Currently programs include mapping of coral reefs around Unguja and Pemba, studies on restoration and resource inventories of Tanzania. The Tanga project carries out regular monitoring of marine resources in the area that includes fishers recording their catches. Frontier Tanzania has carried out resource surveys in southern Tanzania from Songo Songo archipelago to Dar es Salaam and Mafia Island. The main constraint with regards to research and monitoring is the lack of funds and trained personnel in management institutions including the fisheries and forestry departments. Hence no regular monitoring of the national marine resources is carried out. Efforts should be made to design simple and inexpensive methods of collecting resource data that can be used to make informed management decisions.

ICRI and GCRMN Coordination

Tanzania participated in the Seychelles ICRI Symposium, where a decision was made to share the scientific and monitoring role of the Eastern African mainland states between IMS (Zanzibar) and KMFRI (Kenya). Under the SIDA/Sarec funded project for marine sciences, these two institutions have shared the role of coordinating training courses. Providing funding to develop and implement long-term monitoring programs coordinated by these institutions should enhance this relationship.

Mozambique

Introduction

Mozambique has a 2700 km long coastline dominated by estuarine habitats defined by the numerous rivers that empty into the Indian Ocean. The distribution of coastal habitats including mangroves, seagrass beds, coral reefs, sand dunes and numerous island archipelagoes combine to make this shoreline the most complex along the east coast of Africa. The distribution of coral reefs and associated ecosystems is poorly documented (Table 5.1). Reefs have been recorded in the Quirimbass archipelago in northern Mozambique where patch reefs are common on the western sides of islands. Reefs are restricted however by fresh water input from numerous rivers (Whittington et al. 1997). The Mozambique islands at the entrance of the Mozambique Bay have submerged reefs (Fonseca 1996) while the Primeiras and Segundas archipelago have fringing reefs on the eastern sides of the islands but are restricted by cold water upwelling from the Mozambique channel (Tinley 1971; Whittington and Heasman 1997).

In the Bazaruto archipelago, patch reefs occur on the eastern and southeastern shores of the islands (Dutton and Zolho 1989) and back reefs are characterised by high cover of *Porites* and *Acropora* thickets. Offshore islands and fringing reefs also occur on the northeastern shores of Bazaruto Island where high hard coral and soft coral cover has been recorded. Fringing reefs have also been reported along the shores of Inhaca and Portuguese Islands in southern Mozambique and patch reefs have been reported offshore in 15 m of water along the eastern shores (Boshoff 1981; Nestler et al. 1984; Salm 1976). Coral assemblages where soft corals dominate occur from Ponta do Oura to Cabo de Santa Maira in southern Mozambique (Robertson et al. 1996).

Table 10: Studies on coral reefs and associated habitats

COMMON NAME	NO. SPECIES/GENERA	REFERENCE
Hard corals	160 species, 50 genera	Rodrigues 1996; Whittington et al. 1997
Soft corals	27 species	Benayahu & Schleyer 1996
Finfish	300 species	Fonseca 1996; Whittington et al. 1997
Gastropods	155 species, 39 genera	Dutton & Zolho 1989
Sea turtles	5 species	Fonseca 1996
Dugong	1 species	Magane 1996; UNEP/IUCN 1988

Information on the distribution of seagrass beds and mangrove forests is more limited. Seagrass beds are associated with most of the archipelagos between the islands and the mainland and support turtles and dugongs. Mangroves cover approximately half of the Mozambique coastline (~500 000 ha, Tinley 1971).

Resource Extraction and Gleaning

The fisheries sector contributes three per cent of the GNP of Mozambique. The marine fisheries resources of Mozambique are estimated at 30 000 mt/yr, including finfish, crustaceans and mollusks (Figure 8). The marine fisheries sector is classified into:

- artisanal fishers who operate on foot, 3–10 m canoes or boats powered by sail or motor. It is estimated that there are 83 000 artisanal fishers composed mainly of communities displaced to coastal areas as a result of the war. Gear includes handlines, beach seines, drift gillnets, and bottom gillnets. Locally made fish traps, spears and gleaning for crabs, sea cucumbers and molluscs is also widely practised in reef lagoons, seagrass beds and mangrove channels;
- semi-industrial fishing operate on 10–20 m motor boats mainly trawling for prawns and demersal fish for domestic use in the bays and areas close to the coast; and
- the industrial sector concentrates on prawn fishing in the Sofala banks and extract shallow and deep water prawns, lobsters, crayfish and fish primarily for export.

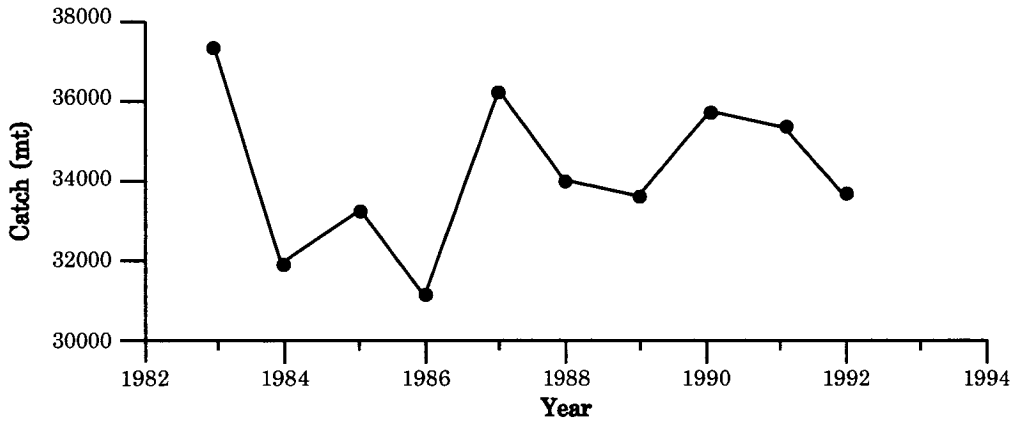

Figure 8: Total catch of fish, crustaceans and molluscs combined in metric tonnes from Mozambique between 1983 and 1992 (Source: FAO 1994)

Additionally, mangrove cutting for building and firewood, shell collection for food and the curio trade, octopii, sea cucumber and crab collection are also carried out on a subsistence level.

Sports fishing has increased in Mozambique over the last few years. Most of the fishermen are from South Africa and target bonito, tuna, mackerel, bonefish and billfish. With the conclusion of the civil war and the development of tourist facilities, Bazaruto Island has become a popular sport-fishing destination.

Tourism

The coastal tourism sector is currently poorly developed in Mozambique but is expected to develop rapidly as infrastructure destroyed during the war is rehabilitated. Currently tourism consists of visiting yachts, sports fishermen and backpackers. Snorkeling, SCUBA diving, big game fishing and sight-seeing are the main attractions. There are well-established tourist facilities on the islands of Magaruque, Benguerua and Bazaruto. Bazaruto is also a popular cruise ship destination from South Africa. The Ponta do Ouro and Cabo de Santa Mariam areas have been identified in the National Tourism Policy as a primary focal area for tourism development.

Management and Its Effectiveness

The coral reefs and associated ecosystems of Mozambique fall under the jurisdiction of several government institutions with mandates that are unclear or overlapping and conflicting making it difficult to effectively manage natural resources (Table 11). The National Directorate of Forestry and Wildlife is responsible for the conservation and management of forestry (including mangroves), wildlife (including fisheries) resources and protected areas. Other departments with interests in marine resources include the Fisheries Research Institute and the Small Scale Fisheries Development Institute who monitor resources and developments that affect these resources. The National Directorate of Tourism is responsible for tourism development and the National Maritime Directorate is responsible for controlling coastal and marine areas and assists in enforcement in areas outside protected areas.

Table 11: Government institutions involved in the protection and management coral reefs and associated ecosystems in Mozambique (Source: Modified from Rodrigues et al. 1998)

INSTITUTION	RESEARCH	PLANNING	MANAGEMENT
Ministry of Coordination of Environment Affairs	X	X	X
University of Eduardo Mondlane	X		X
Ministry of Agriculture and Fisheries			
- National Directorate of Forestry & Wildlife	X	X	X
- Fisheries Research Institute	X		
- Small Scale Fisheries Development Institute	X	X	
Ministry of Transport and Communications			X
- National Marine Directorate	X		
- Maritime Administration			
Ministry of Commerce and Tourism			
- National Directorate of Tourism		X	X
- Department of Commerce	X	X	
Ministry of State Administration	X		
Ministry of Industry and Energy	X		

As in the other eastern African countries, Mozambique has enabling laws to protect and manage marine resources but has low capacity in terms of skills and funds to manage these resources. Coral reefs are protected within the Inhaca and Portuguese Island reserves and Bazaruto National Park. Coastal reserves and parks including Pomene and Maputo afford protection to dugongs and turtles. The extension of Bazaruto National Park and Maputo reserve are currently under consideration by the government. There is currently little information to ascertain whether the current protected areas are effectively managed.

Threats

The rapid increase in the coastal population and the increase in the rate of development of the coastal zone of Mozambique have increased the danger of over-exploitation and destructive exploitation of the coastal resources. The main threats to the coral reefs and associated ecosystems include:

- over-exploitation of marine resources including finfish, octopii, sea cucumbers and crabs. Illegal exploitation of sea turtles and localised intensive cutting of mangroves, especially around population centres, also poses a serious threat to these species;
- destructive methods of fishing, especially beach seining, which cause extensive damage to coral and seagrass beds;
- tourism-related activities, including collection of marine curios such as shells and coral, cause depletion of these resources;
- pollution from land-based activities is a major threat in Mozambique due to the numerous rivers; and
- damage from cyclones and hurricanes also threatens coral reefs in Mozambique.

Integrated Management

Mozambique has a national master plan, the National Environmental Management Program (NEMP), which includes a national coastal zone management program. The program, which is currently under preparation, will comprise a National Coral Reef Management Program that aims to collect information on the coral reefs of Mozambique for effective resource management. Currently Mozambique has the least expertise and capacity to deal with marine resources in the region. Under the EAF5 project, a coastal profile of Xai Xai has been completed and a rapid assessment training exercise, which included both biophysical and socioeconomic parameters, was also conducted in Xai Xai.

Currently ICZM training courses for local and regional coastal managers are conducted at the Secretariat for coastal area management (SEACAM) based in Maputo and funded primarily by the Swedish government. Additionally, an integrated development plan that takes into consideration the local community for the Inhaca and the Portuguese Islands was completed in 1990 although the Mozambique government has not yet officially approved it. MICOA is coordinating the development of management plans for the Quirimbass with the assistance of Frontier-Mozambique, and the National directorate for forestry and wildlife and WWF are currently implementing a program funded by the EU for Bazaruto that includes the involvement of local communities.

Capacity Building, Research and Monitoring

The University of Eduardo Mondlane is the only institution of higher learning that has training in marine resources in Mozambique. The University manages the Inhaca and Portuguese Islands reserve where a marine biological station is situated. Most of the studies on coral reefs in Mozambique have been based in this area where studies have been carried out since 1951. Recently, SEACAM has conducted courses on coastal zone management. In general however, the training capacity in Mozambique is weak.

There are several institutions involved in research activities in Mozambique (Table 11). Much of the research however is geared towards collecting baseline information for the development of management plans. No long-term monitoring programs have been developed although records of the Inhaca and Portuguese Island reefs date back to 1935 and descriptions of the coral fauna of these reefs have recently been compiled. There is an urgent need to improve capacity within the educational and management institutions for effective management of coral reefs and associated ecosystems.

ICRI and GCRMN Coordination

Currently there are no GCRMN activities in Mozambique. There are institutions including MICOA, the Fisheries Research Institute, the Eduardo Mondlane University and DNFFB that could develop the capacity to carry out monitoring and other ICRI activities. Lack of funds and capacity have been the main constraints. However, awareness of coral reef issues, research and training are all increasing in the country.

Western Indian Ocean Island States

Introduction

The western Indian Ocean island states comprise the following five states: Comoros, Madagascar, Mauritius, Rèunion Island and Seychelles. The islands of Rèunion, Comoros and Mauritius are essentially volcanic while those of the Seychelles are granitic. Wider continental shelves feature in Seychelles and western Madagascar.

The Regional Environment Program of the Indian Ocean Commission

The overall objective of the Regional Environment Program of the Indian Ocean Commission (REP-IOC/EU) is to promote a regional policy for the sustainable management of the natural resources in the five member states: Comoros, Madagascar, Mauritius, Rèunion Island and Seychelles.

In particular, the program provides support for national policies on Integrated Coastal Zone Management (ICZM), which encourages the development of a coherent global approach to the management of natural resources in these island states. The main orientations for the REP-IOC/EU for 1998 include interventions at both the political level (framework agreements, conventions, etc.) and the operational and technical levels (training activities, pilot operations, reef monitoring, etc.).

They cover three main themes:

- the definition, validation and application of the framework for the regional policy on sustainable development (RPSD) through the management of the coral ecosystems (reef theme) and the prevention of poisoning by seafoods (ecotoxicology theme);
- the setting up and operating of priority regional networks around the central unifying themes of the reefs and ecotoxicology; and
- the application of the principles underlying ICZM to environmental audits, concrete pilot operations or specific actions having a regional bias (reef monitoring, etc.).

More specifically, the implementation of a Regional Action Plan (RAP) is one of the main themes for the REP-IOC/EU. Defining priority action areas for implementation within the framework during the existence of the REP-IOC/EU (1995-1999) has thus been made possible with the unanimous agreement among all the partners of the COI.

Reef monitoring is one of the priority actions of the RAP through its reef theme, since all five member states have coral reefs and are confronted daily with the problems connected to the integrated management of their coastlines. The data gained through the implementation of a reef monitoring program will provide very important tools to assist in the decision-making process, which can be used in the most sensitive and vulnerable priority areas in ecological terms.

The Reef Monitoring Program

The coral reefs are subject to increasing pressure, in particular from human activity. As a result, the need to monitor these ecosystems in both time and space has become a major priority for the COI countries. In fact, they represent a unifying theme for the region which in itself justifies the need to develop a reef monitoring program through a regional reef network. The reef can then become, through its associated themes, a clearly defined example of integrated management for the REP-IOC/EU and its various partners, be they institutional, private or community organisations.

At the regional level, the REP-IOC/EU has developed a reef monitoring program based on a methodological handbook entitled *Survey of the Health of the Coral Reefs in the South-west Indian Ocean (Suivi de l'ètat de santè des recifs coralliens,* Conand, Bigot, Chabanet & Quod 1998) and a specialised database. The methodologies used conform to the overall principles and methods of the GCRMN (Global Coral Reef Monitoring Network). However, they have been adapted to the specific context of the southwest Indian Ocean.

The originality of the regional guide can be attributed to several factors:

- the way several complementary methodologies for follow-up have been meshed together;
- the use of new environmental parameters for follow-up;
- the exploration of new areas in the reefs (e.g. the reef flats); and
- the introduction of scenarios which evolve depending on the available resources (human, material, etc.).

The ARMDES-COI database has been devised to enable the recording and a simplified analysis of the data collected following the protocols described in the COI guide and in the *Survey Manual of Tropical Marine Resources* (English et al. 1994). Using the interfaces in the AIMS database, the ARMDES-COI base has been simplified and adapted to the specific contexts of the countries concerned in accordance with the methodological manual on reef monitoring. This database, which has been translated to French, is designed to be compatible with the GCRMN database. Its evolutionary structure allows for the design and integration of new modules for data processing.

The reef-monitoring program is one of the fundamental projects undertaken in 1998 by the COI countries. Its different elements have been brought together in a regional reef network (a sub-node in the GCRMN) which includes both the on-site operational level of activities (national focal points), and decision-making and policy-making levels (concept of 'servers'). This reef network completes an existing network for the countries on the East African coast (sub-node for Eastern Africa).

The COI 1998 Report on Coral Reefs

The preparation of a regional reef report on the theme Survey of the Health of the Coral Reefs is one of the main outputs from the REP-COI/EU for 1998.

At the regional level, this work is part of the preparations for the effective launching of the IOC regional reef network for which the 'monitoring of the coral reefs' initiative is one of the pivots. At the international level, it is part of the preparations for the Townsville meeting (ITMEMS '98) and contributes to the setting-up of the Global Coral Reef Monitoring Network (GCRMN).

It gives concrete expression to the willingness to present the political, methodological and technical approach (through the preliminary results) used in the Indian Ocean region and the desire to officially register as a recognised partner in the GCRMN.

On the technical side, the 1998 reef report:

1. gives a complete assessment of the evolution and present situation of the COI regional network and its different national components.

   The national reef networks have gradually joined together in a regional network which is today completely functional and operational. In this context, the concepts of 'national servers' and 'focal points' have evolved throughout 1998. The follow-up networks for the reefs have been restructured in each country around their focal points. The focal points act as the operational and technical links between the actors on the ground, while the national servers provide the administrative and political links between the networks (control, protocols concerning exchange of data, etc.).

   Today, the COI regional network is one of the sub-nodes of the GCRMN in the Indian Ocean region, in accordance with the recommendations of the ICRI Regional Workshop for the Western Indian Ocean and Eastern Africa, held in Seychelles 1996. However, despite the promising results obtained so far, the very recent installation of the new network renders it rather difficult to effectively consider it in the global context of the different world networks (Reef Check, AGRA, CARICOMP, etc.) for the year 1998. The Townsville meeting should make the COI network known and lay the foundations for its recognition at the international level.

2. makes possible the presentation of the first results obtained through the monitoring stations that were set up in each COI country in 1998. More than 24 stations have been set up and followed systematically during the past year:
   - 4 stations in Comoros (Grand Comoros, West Coast);
   - 4 stations in Seychelles (MahÈ, East and West Coasts);
   - 8 stations in Madagascar (North-west, East and South-west Coasts);
   - 4 stations in Mauritius (East and West Coasts); and
   - 4 stations in RÈunion Island (West Coast).

   Numerous synthetic results have been obtained using the follow-up parameters described in the COI methodological manual (coral layers, algues, abiotic substrata, abundance in ichthyologic populations, etc.). The number of monitoring stations should gradually increase over the next few years, depending on the resources available in each country. The base data from 1998 are essential for the reef monitoring program, since this initiative is defined in both space and time (setting up of a comparative database).

3. enables the definition of future orientations and concrete proposals to be implemented within the framework of the 1999 Regional Action Plan for Coral Reefs, in order to ensure the continuity of the COI network, its increase in strength and its effective utilisation in ICZM. These proposals, some of which will be implemented with the financial support of the Global Environment Fund (GEF), also include:
   - administrative and political procedures (definition of protocols, conventions);
   - complementary training initiatives (knowledge of terrain, database, diving); and
   - promotion and advertising initiatives (creation of attractive products, such as CD-ROM, handbooks, website).

Conclusions

The 1998 results for the regional initiative 'Follow-up on the Health of the Coral Reefs in the South-West Indian Ocean' are considered very satisfactory.

The setting-up of the COI regional network and its outputs are the concrete results of numerous initiatives (technical workshops, training programs, political initiatives, etc.) which have been carried out for over two years in the Region (ICRI, Seychelles 1996, Nosy Be 1997, Tulèar 1998, Mauritius 1998). The present results obtained give concrete form to the commitments made by the various partners in these different meetings. Their importance, in terms of the actual functioning of the network and its products (training, technical results), are themselves weighty arguments in favour of pursuing this initiative on its existing base. It

is, however, too early to envisage a direct use of these results within the framework of ICZM. Their use will become more meaningful in the years to come.

'The Coral Reefs Monitoring' constitutes in the short term an important tool for information and assistance in the decision-making process in the COI countries, inasmuch as the restoration of the reef ecosystem must be linked to objectives for the economy, public health and the conservation of biodiversity. The continuity of the COI regional reef network is, therefore, essential for the promotion of a regional environment policy based on the Integrated Coastal Zone Management of the islands in the southwest area of the Indian Ocean.

Acknowledgements

This report was prepared with the assistance of many institutions and individuals and we are grateful to them all. We would like to especially thank the Directors of the Kenya Marine Fisheries Research Institute, Mombasa; Institute of Marine Sciences, Zanzibar and The Directorate for Coordination of Environmental affairs, Maputo for their institutions contribution to earlier drafts of this report. To Dr T. R. McClanahan we are most grateful for information from the Coral Reef Conservation Project's database. To UNEP for sponsorship to present the main findings of this report at the International Tropical Marine Ecosystems Management Symposium in Townsville, Australia, November 1998.

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CASE STUDIES

SESSION 3: Fisheries and Protected Areas

Chair: Nancy Foster
Rapporteurs: Andrew Smith, Lakaseru Boyke
Presenters: John Robertson, Andre Uychiaoco, Juan Bezaury

Effectiveness of Temporary Reef Closures to Replenish Reef Fish Stocks in the Great Barrier Reef

John Robertson1

Abstract

This paper will evaluate the process by which a reef closure was implemented and managed over a three and a half-year period with the sole objective to replenish fish stocks. The case study will describe how the management agency responded to requests by community groups (including recreational and commercial fishers) to close the reef, the community's involvement in the management of the closure, and the effectiveness of the closure in meeting its primary objective. The study will describe how the replenishment phase occurred extremely well until a major difficulty arose in implementing workable strategies for the reopening of the reef to fishing. The level of fish stocks soon after opening the reef was not what many community groups had hoped for. The case study will describe the lessons learned in using temporary reef closures to replenish reef fish stocks and possible mechanisms to satisfy all community expectations from the planning phase of a closure.

Bramble Reef

Bramble Reef is a large inner shelf reef in the Central Great Barrier Reef. It is the closest mid-shelf reef to the coast in the area and attracts a significant amount of fishing from the local port of Lucinda, 38 km westward. It was previously zoned General Use B which allowed all forms of fishing except trawling.

Bramble Reef was closed to bottom fishing in January 1992 in response to community concerns that the reef was being overfished. Ironically, underwater surveys found that the reef was no lower in fish density than the other surrounding reefs and that it has an historic reputation among fishermen for poor bottom fishing. In the 1985 zoning of the Central Section of the Great Barrier Reef Marine Park (GBRMP), a large number of public representations said they fish the reef and that it was important ground for mackerel.

1. Great Barrier Reef Marine Park Authority, Australia

PROCESS OF DECLARATION AS A CLOSED AREA

When the replenishment of reef fish stocks on Bramble Reef was first mentioned, the Great Barrier Reef Marine Park Authority (GBRMPA) considered whether closure was the most appropriate action. Certainly closure was a strategy that had worked well to replenish reef fish stocks at one other location in the Marine Park i.e. Boult Reef (Beinssen 1989). There was little doubt that the three and a half-year closure of Boult Reef resulted in a significant replenishment of stocks of commercially important species. Catch rate and average size of fish were much greater than the nearby reefs that had not been closed. As such, the Authority concluded that a closure of Bramble Reef would be responding to public concern and result in a possible increase in fish stocks and decrease damage to reef living resources.

As management closure options, GBRMPA considered limiting fishing by: (i) the components involved in the fishery; (ii) time or season-based closure; or (iii) complete or part area closure. GBRMPA considered that closure to all sectors was the only equitable way to proceed and closing the whole reef was the only enforceable method.

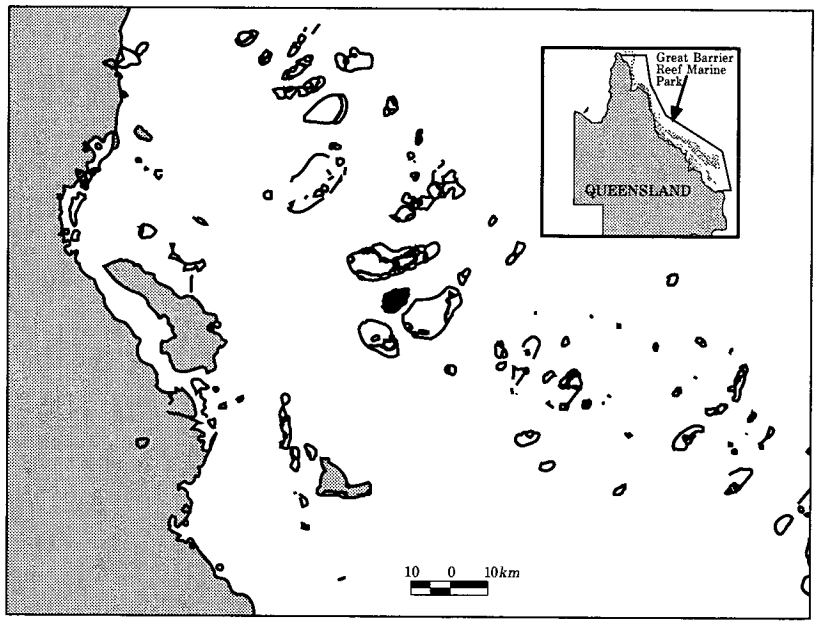

Figure 1: Bramble Reef replenishment area in the central Great Barrier Reef Marine Park

The notion of a closure was publicised in the local media in May 1990. GBRMPA advertised in May 1991 for representations on the decision to designate Bramble Reef as a replenishment area. The summary of the responses was that although opinions on the proposal were evenly divided, virtually all respondents strongly supported some form of closure and many put alternative proposals for consideration. Some of the concerns raised included:

- the impact of the proposed closure on nearby indigenous community, particularly on turtle hunting;
- the potential transfer of fishing pressure to surrounding reefs;
- management measures should be equitable between sectors;
- now boats have to travel further to fish other reefs;
- policing of the closure would be a problem;
- seasonal closures should be considered rather than a longer term closure; and
- opening strategies need to be considered now as *'Can't see any benefit of the closure if 90% of fish are taken within 2 weeks of reopening'.*

The Authority thought seasonal closures cumbersome and not consistent with the Central Section zoning plans. It also thought that seasonal closures was something that fisheries managers do, not GBRMPA. The Authority publicly stated that:

The designation of a Replenishment Area will provide a positive response (with public relations benefits) to a public and managed perception that Bramble Reef is over-fished and, provided the reopening is effectively managed, should result in an increase in fish stocks and improvement in recreational fishing experiences.

INDEPENDENT MONITORING OF FISH STOCKS

The closure was not implemented straightaway but deferred for a year until January 1992 when a baseline preclosure underwater census of the fish populations was taken. The baseline underwater survey of Bramble Reef and three control reefs showed that Bramble Reef had a lower density of coral trout per transect (although the densities were not significantly lower) than John Brewer and Lodestone Reef. For the control reefs, densities appear to have changed little in the last eight years and for Bramble Reef, although the results of previous surveys are not as conclusive, densities may have declined over the same period

From 1992, annual underwater surveys were conducted in the May/June period. The surveys were designed to assess whether the fish densities on Bramble Reef had changed as a result of closure compared to the baseline surveys in 1991, and if so, to what extent in relation to the control reefs, and the amount of Year One cohort that had settled on the reef that year. This would give some idea of the future contribution of the fishable stock. The surveys would give some indication of whether the closure was working to replenish fish stocks and whether the closure needed to be changed in any manner.

The management of the day-to-day activities of the closure, such as enforcement and surveillance using boats and surveillance aircraft, was the responsibility of the day-to-day management agencies. It was reported that there was some level of illegal fishing occurring in the early period of the closure.

ESTABLISHMENT OF A CONSULTATIVE COMMITTEE

To involve the community in the implementation and management of the closure, the Bramble Reef Replenishment Area Consultative Committee was established with the following representation:

- local tackle shop owner;
- local Sport Fishing Club representative;
- local Commercial Fishing representative;
- Townsville Fishing Club representative;
- local Department of Environment and Heritage representative;
- local Department of Primary Industries representative;
- Palm Island Aboriginal Council representative;
- GBRMPA representatives from the Education and Information, and Research and Monitoring Sections, and the Commercial Fishing Consultant;
- local Tourist Association representative;
- enforcement and Surveillance representative; and
- chaired by GBRMPA.

The role of the committee was to furnish advice to GBRMPA in respect of matters relating to the Bramble Reef Replenishment Area. The advice related to:

- information on community attitude to the closure;
- communication between the community and the Authority about the closure;
- strategies to manage the closure;
- strategies for reopening the Bramble Reef after the closure; and
- strategies for future replenishment area closures.

The committee met twice a year in the local coastal town adjacent to the reef. Each year the committee would discuss the findings of the underwater surveys and discuss the management arrangements for the reef.

DETERMINING REOPENING STRATEGIES

It was understood from the very beginning that the reopening strategies were going to be difficult. Discussions on reopening strategies commenced two and a half years before the reopening occurred. In February 1993, a meeting was held to discuss reopening strategies. It was conceived even then that, rather than an 'open slather policy', some form of regulation would be needed. Bag limits, minimum sizes, special fishing permits and restrictions on certain fishing sectors were all proposed. The Authority was looking for a solution that is fair to all.

The Committee also recognised there was a need to check public perception of the closure. In order to stimulate public understanding, education and involvement in the process, the Authority sought public input on how the reef should be reopened. The public was told that the matters that needed careful consideration included:

- timing of the closure;
- possible post-opening controls such as reducing the area on the reef available for fishing, and/or limits on the number who fish, the species caught, the gear methods used, or the season;
- duration of any restrictions (i.e. phased-in reopening controls, or not);
- management agency activities;
- monitoring fishing and stocks after reopening; and
- zoning implications.

One such submission reiterated the problem for the Authority.

> I have given the reopening some amount of thought and had discussions with any number of interested parties and, unfortunately, am at a loss as to a satisfactory solution to the dilemma. I am loath to suggest it, but I believe another monster has been created.

It was clear that, given there was little information of how to undertake a reef reopening to fishing, the exercise was best to be treated as an experiment. It was acknowledged that very few additional restrictions could be applied as it would not be possible to police them. The reef would require continued monitoring and the possibility of further closures on a seasonal basis.

On 27 October 1993, a scientific perspective on managing the reopening of Bramble Reef was discussed in a meeting with coral reef fish biologists. There was general agreement that if the demersal fishery at Bramble Reef was based on coral trout, there was little biological justification for continuing the closure. The group conceded that maintaining the closure was less of a biological problem and more of a social problem. The scientific meeting concluded that the reef remained closed for an extra year, allowing red throat sweetlip to increase in numbers and coral trout recruits extra time to grow to legal size.

In February 1994, the BRRAAC met again to consider reopening options. Some members believed that it was difficult to define reopening strategies before having a management objective. The committee felt that the reopening strategy should be based on five important criteria:

1. scientifically-based management objectives;
2. prescribed and recorded level of fish take;
3. socially just resource allocation;
4. resources allocated to their highest value use; and
5. broad community acceptance and high compliance levels achieved through the operations of the Committee, public education and media publicity.

It was agreed that a management objective for the reef opening needed to be clearly defined and performance measures developed. The committee developed the following management objective:

- To have ecologically sustainable use of the demersal fish stocks of Bramble Reef.

As a performance standard the following was proposed:

- Maintain adult coral trout population density at X fish/hectare (+ a) for front reef habitats and Y fish/hectare (± b) for back reef habitats. These densities were to be measured via underwater visual census.

Having defined the management objectives, the issues of level of sustainable take and allocation to fishers were to be addressed. To enable this the committee felt that, based on current Bramble Reef studies and approximations from previous research such as Boult Reef, the following questions required consideration and modeling.

- What is the coral trout population of Bramble Reef?
- What is the ecologically sustainable fishing take from this population that still allows maintenance of the desired adult population density?
- What amount of fishing effort produces this sustainable level of fishing mortality? This will be influenced by a range of variables including fish catchability, which is higher in the spawning season.
- What amount of effort can be safely allowed (application of the precautionary principle), how should this be allocated and managed e.g. spawning season closure; partitioning of recreational and commercial fishers; separate management restriction on each sector?

The questions posed were very difficult to answer. Options and methods for reopening were considered and the pros and cons of each were debated. Strategies for reopening were then considered.

1. Exclude either commercial or recreational fishers .
2. Restrict commercial or recreational fishers:
   - Odd/even days
   - Odd/even boat number .
   - Balloted permits
3. Explore closure scenarios:
   - Zone section of reef i.e. split reef
   - Seasonal spawning closure
   - Ongoing six month open /closed
   - Daytime closures
   - Weekend closure
4. Impose gear restrictions.
5. Introduce limits on the gear used.
6. Impose catch Restrictions:
   - Specific bag limit
   - Special size limits.
7. Rotate replenishment areas.
8. Extend the closure.
9. Open it and do nothing.

Obviously there will be arguments for and against each of these options. Enforcement costs, community consent and support and precedent for future closures will need to be taken into account. In the end a combination of these options will have to be applied and the result will hopefully be one of a low-cost, permanent arrangement.

THE REOPENING

Baseline surveys of fish species targeted by commercial and recreational fishers, and of other important reef species, were made at twelve sites on Bramble Reef and at twelve sites on three adjacent reefs prior to the replenishment closure (Ayling and Ayling 1997). Similar underwater surveys of reef fish stocks have been made annually on these reefs since 1991 to assess the effect of reef closure on the abundance of the reef fish populations. Concern that fishing pressure was being transferred from Bramble Reef to three adjacent reefs following the replenishment closure resulted in the annual surveys being extended to include three additional reefs in 1993. Bramble reef was reopened to fishing in July 1995. The reef was surveyed two months following reopening in response to reports of heavy fishing pressure. The reef has been surveyed every year since the time of reopening.

The mean densities of legal size coral trout (*Plectropomus leopardus,* the major fished species) had increased markedly on all four originally surveyed reefs over the first 2.5 years of the closure period on Bramble Reef (Figure 2a). On Bramble Reef itself, the mean densities were three times higher than had occurred in the baseline surveys in 1991. The three additional reefs that were included in the program in 1993 showed similar patterns and supported similar densities. At this time, it was found that the densities of legal coral trout were not significantly higher than that of the controls. The consistent increase in abundance of coral trout on all reefs was driven substantially by a strong cohort of settlement in 1992 and a smaller recruitment thereafter (Figure 2b). Population densities dropped on the six control reefs by 16-44% after May 1994 as a result of reductions of 31-57% in the densities of legal sized *P. leopardus.* Such drops would be consistent with the harvest of the strong 1992 cohort, which would have been entering the fishery in 1994. Over the final twelve months of the Bramble Reef closure, the legal size coral trout continued to increase on Bramble Reef to over 4.5 times that recorded during the baseline surveys in 1991. At the time of the reopening of Bramble Reef, the densities of legal size coral trout were over twice the grand mean from the six controls.

Commercial and recreational fishing pressure was extremely high on Bramble Reef in the first eight weeks following the reopening (Mapstone et al. 1996). Adult coral trout densities were reduced by almost 60% over that time, back to the level recorded on the controls. The density on all six controls also continued to decline and the grand mean of 15.9 coral trout per hectare was about half that recorded during the peak density period 15 months earlier. This decline continued, both on Bramble Reef and the controls, in the first year following reopening, with legal size coral trout densities being similar to those recorded during the baseline survey. At that stage densities on Bramble Reef were only 20% of those prior to reef reopening. Legal sized coral trout densities in 1997 on Bramble Reef and the control reef were similar to those recorded in 1996. No similar effects were observed for the other targeted species.

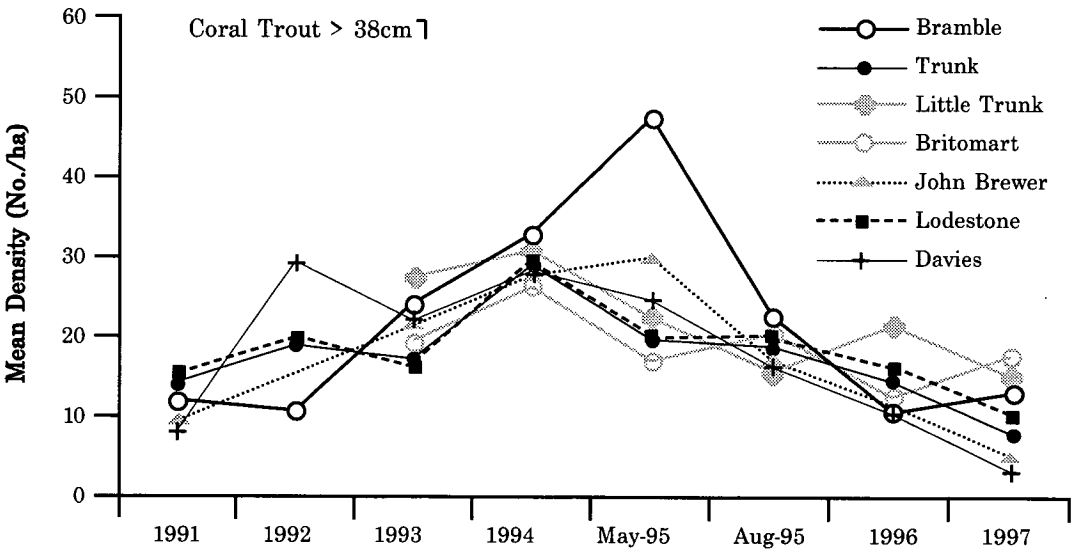

Figure 2a: Mean densities of legal size (>38m TL) *Plectropomus leopardus* on Bramble Reef and control reefs from 1991 to 1997

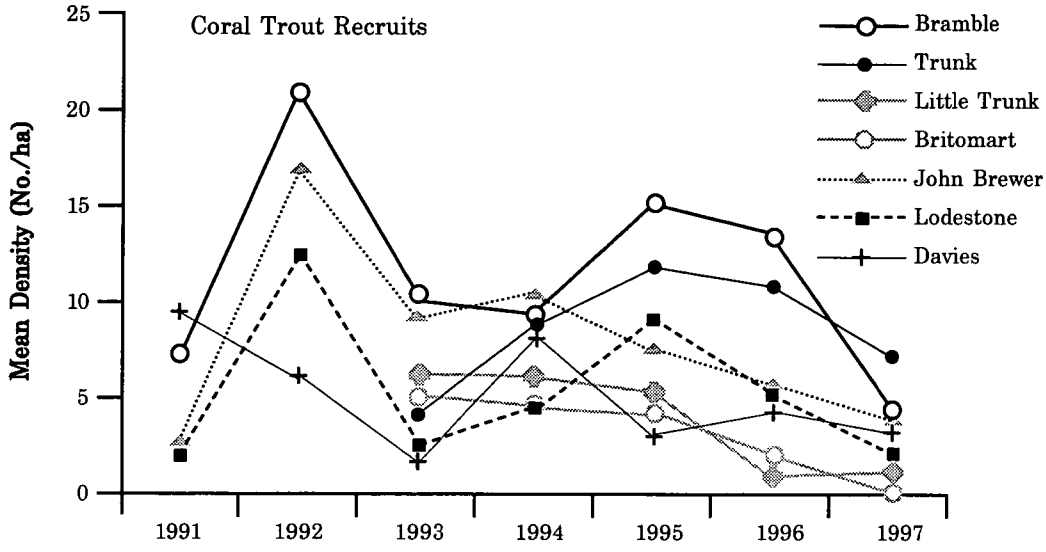

Figure 2b: Mean densities of *Plectropomus leopardus* 0+ recruits on Bramble Reef and control reefs from 1991 to 1997.

Lessons Learned

- Bramble Reef was a good model of replenishment closure implementation and management.
- Response to community concerns and the involvement of the community went remarkably well.
- A multi-representative consultative committee provides an effective mechanism for community involvement and provision of advice. The committee maintained a sense of ownership of, and responsibility for, the closure. The process engendered a strong commitment by not only the representatives but all members in the local area. Diversity of stakeholder representation was important in the management of closure and in negotiations of reopening strategies.
- Annual underwater monitoring of fish stocks was very necessary to detect inter-annual change in fish stocks. Timely information was required for decision making by management committees and also for education of the public. Information on fishing activity and community perceptions following reopening is important for changes in resource allocation.
- Replenishment closures can be very effective but it is important to assess inter-annual recruitment variability that results in increased fish stocks regionally and can overshadow any effect of closure. The true benefit of the Bramble Reef closure only became evident in the last year.
- Dissemination of the monitoring information to all stakeholders is very important in terms of public education and consensus in decision making. The monitoring clearly illustrated the enormous inter-annual variability in recruitment and that recruitment pulses have the ability to dramatically influence fish abundance over large areas.
- Recruitment monitoring may have substantial forecasting potential for coral reef fish stocks. Forecasting may allow fisheries management agencies to adjust annual fish catch accordingly.
- Not all fish species will respond in a similar fashion, so one must be particular about the species for which the closure is designed.

- A long-term vision and management objective(s) need to be explicitly stated. Some committee members were disenchanted with the outcome, some weren't. The effectiveness of the management model broke down in that no explicit, longer-term vision was ever established by the committee. Too much focus was placed on deriving potential management strategies without first clearly defining the desired goal, specific management objectives and performance criteria. Management objectives and performance criteria were initially attempted but were too vague and never completed. The process may also have been too complex for many on the committee to comprehend and should have been better facilitated. The performance criteria were also based on environmental performance criteria and failed to recognise the social values of the closure.
- Management objectives should have a regional perspective and integrate other management arrangements that apply to the region. Bramble Reef was a single reef in a multi-reef complex. If greater consideration had been given to the reef's regional significance and more explicit consideration of integrating the fisheries and marine park management regulations existing in the area, the derivation of management objectives would have been simpler. Many reopening strategies were discounted because they were seen to be too difficult politically to implement.
- Management strategy evaluation should be attempted based on available information and seen as a long-term process. Management strategy evaluation could have been attempted based on the information at hand and the information gained from other reef openings. The research program immediately following reopening should have part of the larger management strategy. With continual monitoring and review, the management approach could have been adjusted. A longer-term management evaluation process would have been highly educational for managers and stakeholders.

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Monitoring and Evaluation of Reef Protected Areas by Local Fishers in the Philippines: Tightening the Adaptive Management Cycle

A. J. Uychiaoco[1], S. J. Green[2], M. T. dela Cruz[3], H. O. Arceo[1] and P.M. Aliño[1]

Abstract

Initiatives to: (1) introduce simplified coastal resource monitoring methods to fisher communities in Eastern Samar and Bohol; (2) empirically evaluate the effectiveness of marine reserves for the rehabilitation of reef trophic function disrupted by overfishing; and (3) boost coordination between and among reef scientists and coastal managers nationwide, came together into a 3-year participatory protected reef monitoring and evaluation training program in five Philippine reef sites. Monitoring by local communities tightens the adaptive management cycle by conferring the functions of both management and its evaluation into one group. In addition to the NGOs, POs (people's organisations, i.e. grassroots organisations as they are known in the Philippines) and the university initially involved, the effort has also been able to attract various other complementary groups and thus fosters mutual accountability.

Criteria for project pilot sites were drawn up, potential sites were visited (e.g. for potential for visible improvement within the 3-year project period) and possible participants interviewed (e.g. for organisational capability to disseminate lessons and training to the adjacent areas). Various reef-monitoring methods (GCRMN, Reef Check, etc.) were reviewed, simplified and field tested leaving mainly manta tow surveying, snorkelling fish visual census, and fish catch monitoring. Initial data summarisation and graphing exercises (using actual data) after two years of joint monitoring revealed similar trends (though values differed) between scientist-collected and community-collected data.

Experiences show that, initially, participatory resource monitoring and evaluation takes more time as coordination, training and standardisation is limited to areas of certain characteristics (e.g. good visibility, shallower depth) and is inappropriate for certain parameters to be monitored (e.g. fine-detailed benthic work and chemical pollutants). However, it also results in greater efficiency and complementation in the use of resources, much greater insights into related variables (e.g. information on reserve violations, data on weekly fish catch, etc.), quicker management response to monitoring observations and technical advice, and potentially greater sustainability.

Five cases show that monitoring by communities is not just an exercise or a token gesture to community participation, but can be an actual force for improved management (though this depends on good links with active management activities outside the monitoring effort *per se*).

Philippine Context

A recent review of coastal management initiatives in the Philippines (Uychiaoco et al., in press) revealed that the most commonly-reported biophysical problem being addressed by coastal managers is destructive fishing, overfishing and low catch. The most commonly-reported socioeconomic problem being addressed is poor law enforcement. On the other hand, the most popular solutions being implemented are environmental education, regulation of fishing (especially through fish sanctuaries) and community organising. The increased level of environmental awareness and the enactment of the Local Government Code in 1991 (whereby the responsibility of environmental protection and management was devolved to the local government units–specifically the municipalities and provinces) resulted in the rapid increase in the number of small fish sanctuaries. However, many of these fish sanctuaries are not being monitored due to the lack of local technical skills in reef monitoring.

1. Marine Science Institute, University of the Philippines

2. DENR/US-AID Coastal Resources Management Project formerly with the Volunteer Service Overseas & Bohol Integrated Development Foundation Inc.

3. Guiuan Development Foundation Inc. & University of the Philippines in the Visayas – Tacloban College

Project Inception

The second and third authors introduced participatory coastal underwater assessment and monitoring in seven municipalities in Eastern Samar and three municipalities in Bohol. These initiatives were begun in 1995 to help address the need for sustainable monitoring and in early 1996 to keep post-Marine Protected Area (MPA) establishment interest among the fishers. At about the same time, the University of Philippines (UP) Marine Science Institute began twin programs to: (1) to institutionalise an information network (PhilReefs) to improve cooperation between and among coastal managers and reef scientists locally and nationwide; and (2) evaluate the effectiveness of reef management through correlating coastal management (social, economic and political) with biophysical conditions (Uychiaoco et al. 1999). The latter was a pilot study for a dissertation to explore the effectiveness of marine reserves for the recovery of reef trophic function disrupted by overfishing.

The three institutions found out they were all interested in participatory monitoring when the senior author began looking for study sites and called for interested local partners in the network newsletter. The two NGOs were chosen as partners for their early initiatives in (and presumably commitment to) participatory monitoring and for their capability to disseminate lessons to surrounding areas. In 1997, the UP Marine Science Institute: (1) refined the technical bases of the Samar and Bohol methods; (2) formalised a three-year participatory protected-reef monitoring and evaluation on-the-job training program; and (3) expanded pilot sites to the municipalities of Bolinao (Pangasinan) and Sibulan (Negros Oriental) under the auspices of the UNDP GEF-Small Grants Program and the DENR/US-AID CRM Project respectively. The three original objectives (training, fish sanctuary evaluation and networking) became the sub-components of the consolidated effort. Adaptive management of the protected area became the overall objective.

The participatory monitoring activity facilitates the sharing of scientific and indigenous knowledge. Empowering the local communities to monitor the resources that they use also consolidates both management and its evaluation into one group. This results in management that is much more responsive to changes in the local situation. Working together with other sectors (e.g. government, NGOs, POs, academe) also fosters collaboration on other management activities and engenders mutual accountability.

The five specific sites were chosen on the basis of: (1) their potential for visible improvement within three years i.e. with little other threats (e.g. siltation) to mask the effects of decreasing harvest (in order to better promote MPAs); (2) the presence of strong and willing community organisations (to be involved in day-to-day MPA management); and (3) the local teams' (people's organisation and NGO) potential for multiplying the experience to adjacent areas later on.

Monitoring and Evaluation Methods

Various monitoring methods (e.g. the Global Coral Reef Monitoring Network (English et al. 1994), Reef Check, ReefBase's Aquanaut (McManus et al.), etc.) were reviewed.

1. manta tows [annual];
2. snorkelling fish visual census (identification to family level only) [1/seasonal];
3. benthos belt transects [annual];
4. weekly fish catch monitoring (date, fishing grounds, #fishers, #hours, fish types, kilograms); and
5. Diadema urchin and crown-of-thorns starfish counts

were the methods first selected for introduction.

Participants were encouraged to share their own monitoring methods and/or suggest improvements to the introduced methods. All these methods were done by the scientific team in parallel with the community teams for a comparison between SCUBA and snorkelling and for standardisation across sites.

The most progress was achieved with fish visual census. The data form (translated to the local language), data summarisation form, outputs for the community billboard and the graph from the scientist-collected data are shown in Figures 1-4 respectively.

The benthos belt transect was later dropped from the methods to be used by the fishers because it was perceived that it took too much time to collect the data relative to its direct relevance to the fishers' lives. Instead, estimates of more invertebrate types and semi-quantitative estimates of (mostly) human pressures are being put into place. Piscivorous fish density, herbivorous fish density, coral to algal cover ratio and kilogram catch per fisher-hour (per fishing gear type) were chosen as the indicators of management effectiveness.

Management Action

Post-monitoring discussion of the observations were able to reveal or confirm directions for improved management action. Follow-up by the local teams resulted in the following advances.

1. In the village of Lomboy (province of Bohol), local fishers felt that the catch of nearby fish corrals was increasing even though catch (in the area near the sanctuary) remained low for all other fishing gear types. Documentation and confirmation of this through participatory monitoring encouraged them to lobby the municipal government to remove adjacent fish corrals. The corrals were just recently removed.
2. Villagers of Cabacongan (province of Bohol) formed a *Bantay Dagat* ('Sea Watch') group to apprehend commercial fishing boats (prohibited within 15 km of the shore) and have been able to ward off or catch many violators since.
3. In the village of Camanga (province of Eastern Samar), more frequent field activities for the monitoring per se has led to more active protection of the sanctuary even when the development workers are not around. Fish corrals in the immediate area are said to have become profitable again. The municipal government has also allocated a monthly budget for the fishers' monitoring and surveillance activities. The community recently won the Best Managed Marine Reserve award when it competed against ten other reserves throughout seven municipalities in Eastern Samar.
4. Slow, or lack of improvement of, monitoring sites in Cangmating (province of Negros Oriental) and Bolinao (province of Pangasinan) exposed weaknesses in the local development organisation and grassroots organisation respectively (which are now being addressed).

Networking

After giving the small-scale fishers a head start, other groups (such as the Department of Environment and Natural Resources, other universities, other NGOs, etc.) are now also being invited to join the activities. These other groups will hopefully take on the finer-scale benthos monitoring (point-intercept transects) and be more enduring (than the current project personnel) members of the local monitoring teams.

This initiative was fostered by and helps support the Coral Reef Information Network of the Philippines (PhilReefs) agenda to standardise monitoring methods across the country and to better integrate science and management. After this pilot test, we will be aiming to replicate this system in at least one site per political region in the Philippines.

Conclusion

These cases show that monitoring by communities is not just an exercise or a token gesture to community participation but can be an actual force for improved management (though this depends on good links with active management activities outside the monitoring effort *per se*).

Lessons Learned and Recommendations

STAKEHOLDER PARTNERSHIPS, COMMUNITY PARTICIPATION AND CAPACITY BUILDING

- Snorkellers can help monitor too.
- Monitoring by communities helps keeps interest going after MPA establishment.
- Monitoring (e.g. fisheries) also aids surveillance (and if reports of violations are followed up can also lead to greater compliance with laws).
- Monitoring itself helps educate those carrying out the monitoring: 'seeing for oneself' is very effective in changing attitudes and catalysing action.
- Select newly-established/enforced community reserves at first to better ensure observable changes and interest.
- Select sites that as much as possible have only one human stress factor that can actually be addressed by concurrent management actions.
- Participatory monitoring facilitates sharing of indigenous (draws from a longer history) and scientific (draws from a more global experience) knowledge.
- Stability of monitoring team members helps.
- While the team effort makes standardisation more difficult, biases are also balanced by having many observers.
- Select local partner groups that can supervise the effort in between visits.
- Time spent by the community on monitoring (approx. 1-2 days, 3 times/year for field activities and 2 hrs/month for catch monitoring) should reflect commitment to their children's future rather than to a scientific exercise or external program.
- Try to encourage participation with learning opportunities and the honour of public service rather than unsustainable external material rewards.
- Highlight special skills of fishers (free diving and fish identification).
- Help increase the capability of local government personnel, development organisations (e.g. especially socio- eco- focused NGOs), local school staff, etc. too.
- The work strengthens the organisational capability of the team and its parent organisation.
- Fishers can actually do the data summarisation and graphing themselves.
- The monitoring activities and the posting of results on billboards helps educate others and helps advocate for the MPA.
- Participatory monitoring results in greater openness to technical inputs and quicker management response.
- Participatory monitoring takes more time, limited to certain areas and parameters, but generally makes more efficient use of resources and is potentially more sustainable.
- Provide sufficient time for feedback, discussions and implications for management action.
- Plan for at least three years so trainers can walk the communities through observing the changes.
- Formal evaluation of the training is important.
- Monitoring expenses may be obtained from user fees.
- Monitoring by communities is not just an exercise or a token gesture to community participation but can be an actual force for improved management.

INFORMATION FOR MANAGEMENT (INCLUDING MONITORING)

- Monitoring design must potentially be able to discriminate natural from human (positive or negative) causes, i.e. set-up controls.
- Methods should be powerful enough to detect real changes of significance to the local area otherwise interest may be lost and local management will not find the activity useful. (Positive changes can encourage sustaining management while negative changes can be used to spur on improvements in management.)
- Try to collect co-variables early on.
- Use more concrete measures rather than 'high', 'moderate' and 'low'.
- Monitoring by scientists (more objective, less frequent, more comparable to other sites) and monitoring by the fisher communities (captures anecdotal events, more frequent, less standardised) are complementary.

- Various members of heterogeneous teams (non-diver fishers–fish census and fish catch; government divers–benthos transects, etc.) are each suited to various complementary monitoring tasks.
- Adapt ideas from the various monitoring schemes available as appropriate to the situation–thereby taking advantage of their complementary features (e.g. GCRMN: manta tow; Reef Check: invertebrates; both: family level fish census; other adapted methods: fish catch monitoring and semi-quantitative yet objective measures of stresses)–without losing compatibility with at least one scheme.

INTEGRATED MANAGEMENT AND LINKAGES

- Select sites: in line with national priorities (e.g. representative of a particular ecosystem/area); strategic (e.g. one area of significance per region/biogeographic zone, node for MPA network) and consider existing zoning plans (e.g. pick an area targeted for protection).
- Make sure to link up with organisations actually able to implement (or facilitate) management actions on the ground (as recommended by monitoring results).
- Select partners and sites with a view to their potential for multiplying/disseminating the initiative.
- Networking various groups encourages mutual accountability.
- Share experiences and lessons among the various teams (e.g. informally through stories, workshops, contests, etc.).
- The usually uncontroversial nature of monitoring provides an activity around which relationships among various groups can be built and fosters collaboration on other management activities (e.g. enforcement).
- Institutionalisation/appropriations from the local government can go a long way towards sustaining this inexpensive monitoring as well as giving prestige to the monitoring team.
- Feed information into the national (e.g. PhilReefs)/regional database for larger-scale planning to generate trends (e.g. determine which are the most effective techniques) and detect other emergent properties–which, of course, must be periodically fed back to the local areas.

Acknowledgements

Local development partners in Bolinao and Negros Oriental are the Marine Environment and Resources Foundation Inc. and the Negros Oriental Environment and Natural Resources Management Division (the ENRMD is not the same as the DENR) respectively. People's organisation partners are the Lomboy Farmers, Fishers and Carpenters Association (LFFCA, Calape in Bohol), Cabacongan Small Fisherfolk Association (Loon in Bohol), Camanga Fisherfolk Association and Salcedo Coastal Zone Management Council (Salcedo in Eastern Samar), Kaisaka (Bolinao in Pangasinan) and St. Joseph's Fishermen's Association (Cangmating, Sibulan in Negros Oriental).

This work was funded by the University of the Philippines Center for Integrative and Development Studies and Marine Science Institute, Department of Environment and Natural Resources/US-AID Coastal Resources Management Project and the UNDP GEF-Small Grants Program.

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FISH TRANSECT

Adapted from: English et al., Reef Check, McManus et al.

Reef/Site Name:

Municipality & Province:

Transect No.:

Dimensions of fish transect:

Habitat: Date:

Observer:

Fill-in the number of fishes counted within the belt transect.

Family	Species	Counts per size class			
		1-10 cm	11-20 cm	21-30 cm	Specify sizes for > 30 cm
EPINEPHELINAE					
groupers; lapu-lapu	Barramundi Cod				
LUTJANIDAE					
snappers					
HAEMULIDAE					
sweetlips; grunts; lipte					
LETHRINIDAE					
emperors; katambak					
CARANGIDAE					
jacks; trevallies; talakitok					
CAESIONIDAE					
fusiliers; dalagang bukid					
NEMIPTERIDAE					
spinecheeks					
MULLIDAE					
goatfishes; timbongan					
BALISTIDAE					
triggerfishes; pakol					
CHAETODONTIDAE					
butterflyfishes; alibangbang					
POMACANTHIDAE					
anglefishes; adlo					
LABRIDAE					
wrasses; labayan	Humphead wrasse				
SCARIDAE					
parrotfishes; molmol	Bumphead parrotfish				
ACANTHURIDAE					
surgeonfish; indangan					
SIGANIDAE					
rabbitfishes; kitong; danggit					
POMACENTRIDAE					
damselfishes; pata					
ANTHIINAE					
fairy basslets					
OTHERS					
sharks, rays, turtles, etc.					
Apogonidae					
Kyphosidae					
Monacanthidae					
Zanclus cornutus					

Figure 1: The data form (translated to the local language)

Zone/Sector	Gawas sa Sibulan Reserve								Sulod sa Sibulan Reserve							
Time	Oct. 1998								Oct. 1998							
Transect#	1	2	7	8					3	4	5	6				
Fish types/groups	Sub-total						Total	Std.	Sub-total						Total	Std.
kapal/palata/tigabon	73	18	55				146	36.5	96	132	100	121			449	112.25
m.botbot	7	4		2		13	3.25	4	5						9	2.25
labayan/ipos2/tawiod	20	15	14	4		53	13.25	16	18	3					37	9.25
tambod	2		1		3	0.75		2							2	0.5
timbungan/hinok	1	9			10	2.5	2	10	12	15					39	9.75
kabinhi	3	2	2		7	1.75	1	3	9						13	3.25
talambago/kitong	2	22				24	6	5	38	66					109	27.25
mungit/bagis/indangan								4	7	26	26				63	15.75
pisos2/layagmoros			4		4	1	2	8	17	13					40	10
mol2/kuyog2/bongalbog	3	5	10		18	4.5	6	75	12	34					127	31.75
pugot			3		3	0.75	8	3		4					15	3.75
galot/lapu2			2		2	0.5	2								2	0.5
manilan-on									2	7					9	2.25
dapat									1						1	0.25
poscan		70			70	17.5			100						100	25
Lalagan/katambak									1	39	8				48	12
Solid										25	21				46	11.5
Lambos2			2		2	0.5										

Figure 2: Data summarisation form

Zone/Sector	Sulod ng Sibulan Marine Reserve (inside)			Gawas ng Sibulan Marine Reserve (outside)		
Time	May 1998	October 1998		May 1998	October 1998	
Fish types/group						
Galot/Lapulapu						
Timbongan						
Hulukihok/ solid						
Indangan						
Tabangko						
Ilak/ Manilan-on						
Danggit/ Kitong						
Kuyogkuyog/ Molmol						
Katambak/ Lalagan						
Pisos-pisos						

1-5 = 6-25 = 26-125 = 126-625 = 626 & up =

Figure 3: Outputs for the Community Billboard

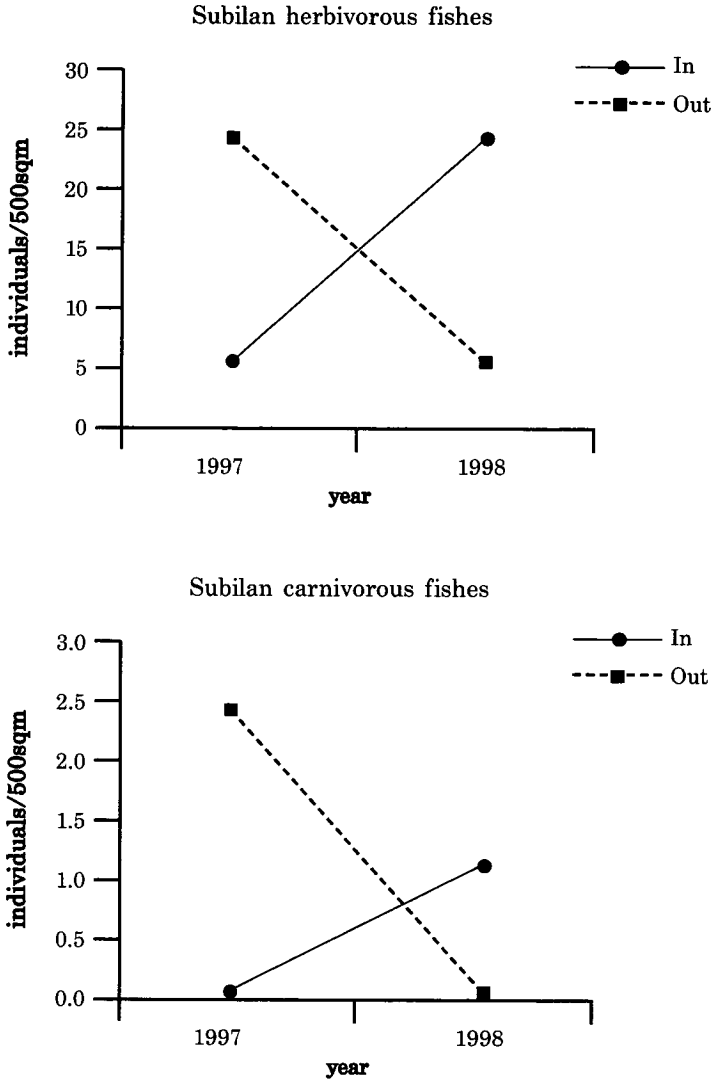

Figure 4. The Graph from The Scientist-Collected Data

Participatory Coastal and Marine Management in Quintana Roo, Mexico

Juan Bezaury Creel[1], Carlos Lopez Sántos[2], Jennifer McCann[3], Concepci–n Molina Islas[2], Jorge Carranza[2], Pamela Rubinoff[3], Townsend Goddard[3], Don Robadue[3] and Lynne Hale[3]

Abstract

The Quintana Roo coastal ecosystem is characterised by extensive coastal wetlands, a fringing reef that develops between 0.5 and 1.5 km offshore and vast seagrass beds in the adjacent reef lagoon. While protected areas and Ecological Planning Ordinances have not specifically been designed as Integrated Coastal Zone Management (ICZM)[4] tools, this paper demonstrates that they can be used to provide an important foundation for a statewide ICZM program in Quintana Roo. These environmental policy tools have been extensively used along the coast of this state to promote inter-governmental and public participation, establish important vertical and horizontal linkages and balance conservation and development. The paper presents a brief case study of a community-based ICZM program in Xcalak to demonstrate the efficacy of these tools. A voluntary best management practices guide designed for developers to complement ongoing government regulations provides a second example. A statewide ICZM strategy could benefit from these existing resource management programs, and complement emerging international agendas such as the Mesoamerican Caribbean Coral Reefs Initiative.

A Regional Vision

REGIONAL DESCRIPTION

Quintana Roo is blessed with rich coastal biological diversity and habitats including extensive mangrove, lagoon and coral reef systems. Mexican officials, NGOs and the private sector value the biological and economic benefits of these areas and have taken action to protect critical resources while also allowing for development in coastal areas. Within the context of this environment, the economic development pressures are tremendous. The tourism mecca of Cancun, located at the northern end of this coast, houses over 22 000 hotel rooms in only 20 kilometres of coastline. In just 25 years Cancun has grown to a population of over 350 000 as people move to the area to take advantage of the employment opportunities offered by this development. Cancun with its southern expansion, which extends to the archaeological site of Tulum and the popular dive destination of Cozumel, generate one third of Mexico's tourism revenues. Tourism is slowly developing along the southern coastline of Quintana Roo on the Costa Maya that borders Belize to the south. Although this area is still lacking in basic infrastructure, the government has made a concerted effort to initiate tourism development here. The Sian Ka'an Biosphere Reserve, the largest protected area in the state, is located between the northern and southern segments of the Mexican Caribbean coastline.

1. The Nature Conservancy
2. Amigos di Sian Ka'an A.C.
3. Coastal Resources Center, University of Rhode Island

4. An approach to integrated multi-sectoral resource planning and management for coastal resources has been widely discussed over the last two decades, resulting in the terms Integrated Coastal Zone Management (ICZM), Integrated Coastal Area Management (ICAM), Integrated Marine and Coastal Area Management (IMCAM) or more recently (ICM) Integrated Coastal Management. In general these all refer to the same set of strategies and methodologies used in coastal environments which incorporate management of natural resources, conservation of biodiversity, maximization of socioeconomic benefits and protection of life and property from natural hazards, all within a participatory environment that includes all stakeholders and fits the institutional and organizational environment of the regions involved, including political and administrative structures, economic conditions, cultural patterns and social traditions.

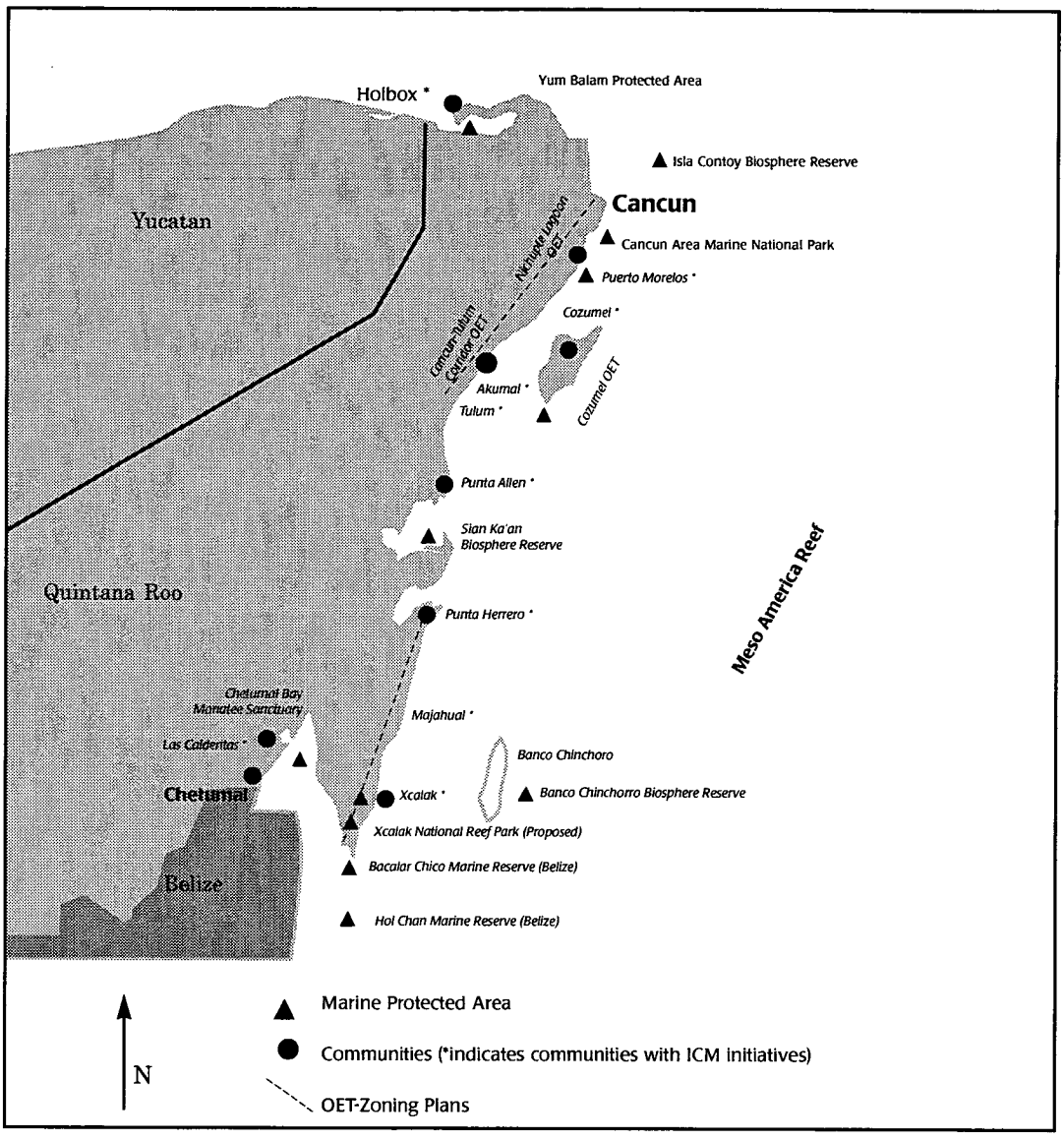

Figure 1: Environmental policy tools being utilised in Quintana Roo Protected Areas and Ecological Zoning Programs

Cancun's infrastructure is luring investors to begin to develop resorts along the still pristine northernmost coast of Quintana Roo. Growth will likely continue in this area, especially in light of the fact that the existing and proposed Ecological Zoning Programs allow for over 200 000 additional rooms in the Cancun-Tulum corridor and 15–20 000 hotel rooms along the Costa Maya. There is a general understanding in the state that tourism is linked to healthy and productive natural resources. A robust management program that involves all stakeholders is essential in order to ensure that the resources have a chance to survive all of the proposed development.

USING ENVIRONMENTAL POLICY TOOLS: PROMOTING INTRA-SECTORAL AND PUBLIC PARTICIPATION

Environmental policy tools, such as Ecological Zoning Programs (Programas de Ordenamiento Ecológico del Territorio – OET) and Protected Areas, have been used to encourage social participation in natural resource management. Recently the Federal Government of Mexico has expressed an understanding of the effectiveness of and need for public participation. Mexican Environmental Law (Articles 157 to 159) now states that 'the Federal Government will promote co-responsible participation of society in planning, executing, evaluating and overseeing compliance on environmental and natural resources policy. Many of these tools are currently being used in Quintana Roo and provide a foundation for ICZM practices (Figure 1).

Ecological Zoning Programs (OETs)

An Ecological Zoning Program (OET) allows for the establishment of land and water use regulations and is theoretically applicable to all land/water use related issues dealt with by all government agencies at the Federal, State and Municipal levels. The OET process is meant to consider environmental, social and economic issues. Once approved by all appropriate parties, all other plans must be consistent and conform to the OET regulations. Four types of OETs are considered in the Ecology Law: general (National level); regional (all or part of one or more states); local (municipalities); and marine (Federal Jurisdiction).

While not designed as such, OETs have the potential of becoming the main tool to unify diverse criteria and convoke the different actors that need to be involved in an Integrated Coastal Zone Management (ICZM) strategy. Intergovernmental and non-governmental cooperating bodies (commissions, committees, etc.) must actively participate and 'buy-in' to all stages of the OET process, including design, implementation, compliance and review to safeguard their effectiveness. If this process were to occur in coastal areas, it would substantially contribute to a national ICZM strategy.

Cancun Tulum Touristic Corridor – the First Mexican OET

In 1989 when Cancun was starting to expand southward towards Tulum, the OET had only recently been adopted into law. Federal environmental and tourism agencies, the state government and the two municipal governments were required by the President of Mexico to work jointly to complete this zoning document. As is the case in most land-use planning processes, completing the technical requirements was easier than reaching consensus about how much and where development would occur. These important details had to be acceptable to the different levels of government and the diverse array of stakeholders. In 1994, after more then six years of technical and political work, the first Mexican OET was published in the Official Register. Developers protested this action since the final (and only) official public consensus building meeting had been oriented mainly to suit the governmental, academic and environmental voices.

In this case, stakeholder participation came too late into the OET process and represented only a token effort to include the public. This generated so many problems that developers adopted an 'easier to beg for forgiveness than ask for permission' philosophy. Neither developers, nor environmentalists or government agencies were happy with the many legal and practical loopholes in the OET. Many parties requested a revision of the OET, calling for increased stakeholder participation. In response, the Subcommission for Ecological Ordinances was established in 1996 as a forum where the agencies from the three levels of government might discuss the revision of the OET. Since then over 20 meetings have been held with participation from 80 representatives from government agencies, the private and social sector, academic institutions, environmental organisations, trade guilds and concerned citizens. Although this achievement may appear insignificant in societies that have a longstanding tradition of the participatory process, it is certainly a major step for Mexico where vertical decision has been the norm. Government agencies will determine the final shape of the OET, but this participatory approach will help to develop a more balanced and potentially more effective document and management regime.

Nichupte Coastal Lagoon System OET

In the mid 1980s, the process to develop an OET for the Nichupte Coastal Lagoon System was initiated due to public outcry. Cancun's citizens and environmental organisations were outraged by the filling of a large mangrove forest for a commercial subdivision. Bad odours and signs of eutrophication due to already illegal sewage discharges were a focus of concern. These issues were of both environmental and economic concern. The Nichupte Lagoon System was one of the major tourist attractions in Cancun. The Municipal Government organised the Subcommittee for the Protection of the Nichupté Lagoon System to facilitate a participatory process. The Subcommittee still continues to oversee the implementation of the Nichupte OET, promotes a Clean Waters Program for the year 2000 and consults with many governmental agencies in the permitting process for coastal activities. Its 65 members, representing a wide array of stakeholders, state and municipal agencies, the private and social sector, academic institutions, environmental groups and trade guilds, meet regularly to discuss related issues.

Volunteer groups are developed to carry out specific technical or supervisory tasks. Results from these task forces are later discussed and voted within the Subcommittee. Tasks may include: reviewing environmental impact statements to determine if they comply with the OET; providing social support for blocking illegal sewage pipes that drain into the lagoon or designing and promoting the Federal Decree for the Costa Occidental de Isla Mujeres, Punta Cancún and Punta Nizuc National Park. These volunteer groups or commissions exist only until the completion of the respective tasks.

This environmental policy tool still has its problems. Developers consider OETs as investment disincentives. Environmentalists feel that the government has not provided enough political will to enforce the still imperfect provisions contained within them. Both sides could be considered correct. In any event, they have provided the basis of two very important and very rich experiences on intragovernmental and public participation in coastal conservation and development issues that need to be consolidated and multiplied.

Protected Areas

Protected areas constitute an important part of the Mexican strategy to protect biodiversity. Protected areas in Mexico are conceptualised to a certain extent as multiple use zones, where activities are limited by the thresholds imposed by sustainable use of natural resources. In this respect, protected areas are not isolated from the national economy. Rather, these areas enhance and consolidate Mexico's economy within the limits imposed by the need to conserve environmental conditions.

This situation has generated certain confusion, when it is assumed that Mexican marine protected areas are 'de facto' no-take zones. Protected area management plans might restrict fishing activities in certain no-take zones. However, these no-take zones can also be created outside of protected areas through different legal provisions: either the Ecology Law (Article 97) dedicated to the establishment of nurseries, breeding facilities and 'species reserves' for aquatic flora and fauna, or through the Fisheries Law 'fisheries reserves and refuge zones'. Fisheries management issues have brought another very important array of participants into the protected area stakeholder process. Fishermen and their trade guild organisations, along with the federal and state fisheries agencies, have their own dynamic regulatory structure. These actors only superficially participate in OET-related issues.

In order to promote interagency and public participation into the protected area management strategy, the Mexican Government has instituted participatory consultative bodies: Technical Advisory Committees (TAC), Planning Councils and Consultative Councils for protected areas. While these three bodies have different names, their purpose is exactly the same: to assist the management of protected areas through a consensus-building processes.

The number of coastal and marine protected areas in the State of Quintana Roo has grown tremendously over the last four years. Almost all of these sites have an operative structure and a management plan, and all of them have experimented to some degree with participatory resource management issues. A short description of the individual protected areas helps to understand this recent, but important trend.

- **Yum Balam Flora and Fauna Protection Area** was established in 1994 by the local Mayan community. Although still lacking a management plan and an administrative structure, the Consultative Council has been promoting sustainable development projects within the area. The Council has been quite successful at channelling government funds into natural resource management-based community development projects.

- **Isla Contoy National Park** was established in 1961 and initially protected only the island proper. In 1997 the Park was re-categorised and expanded to include the surrounding marine areas. A management plan and administrative structure is in place. The Technical Advisory Committee (TAC) actively participates in management decisions such as: authorising guided tours; developing income-generating activities; and researching and managing an experimental season for ballyhoo (*Hemiramphus spp.*), a baitfish used in sportfishing. The beneficiaries pay for the research component of the fishery.

- **Costa Occidental de Isla Mujeres Punta Cancún y Punta Nizuc National Park** was established in 1973 and re-categorised and expanded in 1996. The original decree covered only fisheries and pollution issues. The Planning Council that stemmed from the Reef Commission formed by the Subcommittee for the Protection of the Nichupté Lagoon System oversees the management of the Park. A two-year participatory process resulted in a management plan. Funding has been provided by a trust fund established by the tour operators that work within the Park. One example of an issue that the Council successfully resolved is seen in the reduction of 'wave runners' in the Punta Nizuc Park polygon to decrease their negative impact on the environment.

- **Arrecife de Puerto Morelos National Park** was established in 1998 as a result of a community-driven process. The Park still lacks a management plan and an administrative structure. Although its Technical Advisory Committee has not been formally established, the community meets regularly to discuss issues such as fundraising for the management plan and limiting the number of tour operators who are allowed to provide the service within the Park.

- **Arrecifes de Cozumel National Park** was established in 1980 and re-categorised and expanded in 1996, since the original decree dealt only with fisheries and pollution issues. A management plan and administrative structure is in place and the greater part of this cost is being paid by a trust fund established by the tour operators that work within the Park. The Planning Council has been very active and the recently concluded management plan for the Park was designed with the participation and involvement of all stakeholders.

- **Sian Ka'an Biosphere Reserve** was established in 1986 and expanded in 1997 to include portions of the adjacent coral reefs. A management plan and administrative structure are in place. The concept of participatory management for Mexican protected areas was originally experimented in Sian Ka'an. A Representative Council (Consejo de Representantes) was created in 1983 to promote the establishment of the reserve and define its first management plan. Unfortunately the idea was too 'radical' for its time and the Council was disbanded by the Federal and State Governments in 1987. In 1992 the Council was re-established as a Technical Advisory Committee. Some important decisions taken by these bodies include a self-imposed ban on harvesting 'chit' palm (*Thrinax radiata*) a palm used for the construction of lobster traps – within Sian Ka'an until research was carried out to determine the sustainability of this practice. Since a very slow recruitment rate to adulthood was observed, the ban was kept in place. The Council has also prohibited the use of SCUBA to catch lobster on the reef and put severe restrictions on the use of nets in Ascension Bay.

- **Banco Chinchorro Biosphere Reserve** was established in 1996. The TAC, representing government and resource users, was formalised in late 1998 and will have a leading role in designing the management plan. In 1997 the three fishing cooperatives that use the Bank petitioned the Federal Government to establish a two-year ban on the capture of Queen Conch (*Strombus gigas*). The cooperatives believed that by establishing a ban they could alleviate some of the stress on the declining species and reduce the number of pirate fishers. Unfortunately the Government did not respond positively, since resources for enforcing the ban were not available.

Although these experiences imply that significant advances have been made towards local stakeholder participation in resource management decisions, it is important to recognise that this concept is in its infancy. There are still important forces that support an authoritarian decision-making process. In addition, a great deal of stakeholder training and capacity development needs to take place in order to be able to achieve positive and long-lasting results from the public participation process.

A Case Study of Xcalak and the Mayan Coast of Quintana Roo

The small fishing village of Xcalak at the Southern end of Quintana Roo has been the site of a three-year collaborative project of Amigos de Sian Ka'an, A.C. (ASK), the University of Rhode Island's Coastal Resources Center (URI-CRC) and members of the Xcalak community. A brief case study of this site will demonstrate the utility of Protected Areas and Ecological Zoning Programs (OET) as policy tools for promoting intragovernmental and public participation in Quintana Roo. The Xcalak model is a community-based project that has yielded impressive results. The Xcalakeños have employed these two tools as a means for protecting their own resources, connecting their community to a wide array of stakeholders, including government sectors, and establishing a foundation for future resource management strategies. This case study will also introduce the greater significance of these resource management programs in supporting a movement to statewide ICZM in Quintana Roo.

XCALAK SITE DESCRIPTION AND BACKGROUND INFORMATION

The Xcalak peninsula is located at the extreme southern end of Quintana Roo, adjacent to the border of Belize and that country's Bacalar Chico Marine Reserve. This peninsula contains some of the least developed coastal areas in Mexico, including dense mangrove forests, large lagoons and exceptional coral reefs. The fishing village of Xcalak is the only significant settlement in this area, with a total of 285 inhabitants. Founded in 1900, Xcalak is considered to be one of the first important ports in the Western Caribbean. Coconut farming was the primary industry until 1955 when hurricane Janet throttled this coastline, known today as the Costa Maya. Since then, the Xcalakeños have relied on fishing, and to a growing extent tourism, to sustain their population. For both industries, the economic structure of Xcalak continues to be closely tied to the health of the area's natural endowments.

During the mid-1990s two important developments lead the village of Xcalak to take action to protect their natural resource base. First, fishermen became increasingly concerned about declining fish catch along their coast. Fishermen perceived that they were spending more time fishing and that overall catch was reduced and individual fish were smaller. Second, the state government informed the village that the Costa Maya had been targeted for tourism development. The community of Xcalak realised that it must be proactive and participate in the planning of the community's development to ensure that coastal resources were protected and local benefits were realised.

The community requested assistance from the federal and state governments to improve fisheries management and promote low-impact tourism development strategies. At the same time, the Xcalak community requested assistance from Amigos de Sian Ka'an, A.C. who was establishing a relationship with the University of Rhode Island's Coastal Resources Center. The URI-CRC, ASK and Xcalak community partnership initiated a program to introduce community-based Integrated Coastal Zone Management along the southern coast of Quintana Roo.

THE XCALAK COMMUNITY COMMITTEE AND THE PARTICIPATORY PROCESS

One of the most significant results to emerge from the partnership between ASK, URI-CRC and the Xcalak community was the decision to establish a 17 000 hectare Marine Protected Area (MPA) in the form of a national park. The Xcalakeños reasoned that forming a 'Xcalak Reefs National Park' would protect coastal resources while allowing low-impact tourism development. Members of the Xcalak community visited the neighbouring Hol Chan Marine Reserve in Belize to discuss marine protected area issues with staff and the local community. Shortly thereafter members of the Xcalak community formed the Xcalak Community Committee (XCC) to coordinate the movement towards establishing their own protected area.

The XCC has fostered public participation by hosting and participating in ASK/URI-CRC workshops on ecotourism and tourism management. Xcalakeños have participated in every aspect of the proposal to designate the national park and meanwhile have established a no-take zone adjacent to the town, through an agreement among the fishermen. The XCC has continually held public meetings to gain the community's input on protected area management strategies. Local knowledge and hands-on assistance were important elements in preparing an evaluation for the national park proposal, including biological, social, cultural and economic concerns. The formation of the XCC and the ensuing movement towards establishing the Xcalak National Reef Park reinforced the desire for and practice of participatory management.

The Costa Maya Programa Odenamiento Ecológico del Territorio (OET) is a federal/state level ecological zoning program which includes the Xcalak peninsula. Members of the XCC participated in the OET meetings and consultative process to ensure that the proposed national park will be incorporated into this larger zoning effort. Through this process the XCC has expanded its role in the statewide planning process. Intergovernmental collaboration has increased through work with municipal, state and national agencies to ensure that the Xcalak Reefs National Park conforms to the goals and criteria of the various agencies.

VOLUNTARY USE OF 'BEST MANAGEMENT PRACTICES'

Given the challenges of implementing and enforcing these new regulatory initiatives, ASK and URI-CRC have developed a voluntary tool for promoting low impact practices for tourism infrastructure development (Normas Practicas). While developers often feel that regulations are disincentives for their investment growth, this Normas Practicas manual outlines practical design and construction methods to reduce long-term cost to both the environment and their investment. Measures such as siting structures behind dunes, maintaining natural vegetation cover and constructing wetlands for wastewater treatment, help to maintain the natural function of the underlying ecosystems while minimising run-off and pollution to nearshore coastal waters.

In working with the private sector, these voluntary actions are seen as a tool for sustainable development. The partnerships being developed with investors aim to promote both the near-term benefits to the reefs and coastal ecosystems as well as the long-term economic benefits from reduced storm damage, lower treatment costs and increased potential for sustainable tourism. Voluntary compliance is an important aspect of this program, and establishes the basis for incentive and certification programs (such as Green Globe). Under these certification programs, hotels and industries are encouraged to practise environmentally sound management systems in exchange for cost savings and enhanced marketing potential for their establishments.

While the private sector has been a major target for these practices, the government sector has also seen the benefits of incorporating these practical measures into the OET as basis for sound planning and development. These practical guidelines will provide government officials and environmental advocates with a tool within the regulatory framework to promote long-term sustainable development. This initiative, along with the promotion of voluntary compliance by the private sector, will complement the ecological ordinances and the protected areas in Quintana Roo. Together they provide essential steps towards integrated coastal management.

Results and Lessons Learned

To complement their work in the planning process, the Xcalak Community Committee has produced several important products. First, the XCC developed and published a Community Strategy, a document that codifies the community's goals for development and outlines a process for achieving those goals. Second, the XCC completed a tourism strategy, a document that establishes a community plan to promote and regulate low-impact tourism development. Third, the XCC submitted a final proposal to the appropriate government agencies to create the Xcalak Reefs National Park. These three products send a clear message to government officials that Xcalak is committed to playing an active role in conserving and managing the natural resources of that area.

The Xcalak model offers some valuable lessons learned for promoting public and intragovernmental participation. First, in mobilising for a protected area, the Xcalak community clarified and articulated its goals and objectives, fostered an unprecedented participatory process and became engaged in the larger state planning initiatives. The formation of the XCC and its ensuing work in these areas created vertical linkages between the local community, the local, state and national governments and a wide array of other stakeholders. These linkages are essential for any statewide ICZM effort in Quintana Roo.

Plans are underway to replicate the Xcalak model in other coastal communities in Quintana Roo. Expanding the Xcalak model into additional Quintana Roo communities will give more momentum to a statewide ICZM initiative. Additional communities will add to an increasingly large portion of the coastline under some form of resource management program.

Finally, connections were made between Xcalak and Bacalar Chico that support international collaboration in larger ICZM initiatives such as the Mesoamerican Reef Initiative. The Xcalak Reefs National Park, when officially designated, will complement the Bacalar Chico Marine Reserve to form a large area of the Mesoamerican Caribbean Coral Reef, which falls under a coastal management initiative.

TRANSFERABLE LESSONS

In summary, some of the transferable lessons learned for local and regional coastal initiatives include the following.

- Existing environmental policy tools can be used to initiate 'experiments' with intergovernmental and public participatory processes, which can later evolve into legally established tools. Lack of specific instruments should not deter public and private stakeholder participation. It is better to begin working with available tools and provide a legal framework after the process has been tested. With the public support gained through the initial process, giving legal definition to the programs should be much easier.
- Protected area programs can facilitate the development of intergovernmental and public participation processes because they provide manageable pilot projects with a specific geographic scope with a defined set of conservation objectives.
- Intergovernmental and public participatory processes should be kept focused and simple in their infancy. This is especially important in cultures where participation in public policy issues is new. Participatory capacity will be built faster by tackling common issues across stakeholder groups (e.g. deal with fisheries separate from tourism). Once these initial issues have been internally resolved they can be brought together to a joint forum and modified if needed. By this time stakeholders from each side will have a clearer view of their own issue and will be able to focus on the other side of the issue.
- Using on-site examples to demonstrate positive and negative impacts of regulatory measures can promote and enhance the participatory process.
- Public participation makes regulatory processes slower in the short term, but more durable in the long term.
- No-take zones should only be established when the capacity exists to enforce and monitor these areas. Community established no-take zones should initially be created with a modest scope to increase the factors for implementation success. Once these programs are locally proven to work and provide an important service, they can expand to encompass larger and more remote areas.

Conclusions

Although the Mexican National Environmental Plan 1995–2000 includes environmental protection of coastal zones as a strategy and priority action, an Integrated Coastal Zone Management (ICZM) strategy has not been explicitly proposed. Nevertheless, opportunities for establishing an experimental strategy are present along Mexico's Caribbean coast, since almost one half of this coastal strip is already actively involved with multi-governmental and public participatory bodies that address natural resource management decisions.

Other ICZM-related structures based on the National Waters Law, such as the Watershed Councils (Consejos de Cuenca) and National Waters Reserves (Reservas de Aguas Nacionales) and their participatory governing bodies also provide a potential mechanism for ICZM. Applicable lessons derived from the ICZM strategy that is being implemented in the adjacent coast of Belize could also be utilised to inform and complement a Mexican strategy. Consolidating these existing experiences into a unified strategy could initially constitute Mexico's best opportunity to establish an ICZM strategy for an 11 000 kilometre long coastline.

There is also international support towards the development of an integrated strategy. On 5 June 1997, the 'Tulum Declaration' was signed by the First Minister of Belize and the Presidents of Honduras, Guatemala and Mexico, to establish the 'Mesoamerican Caribbean Coral Reef Systems Initiative'. The goal of this initiative is to promote conservation and sustainable use of coral reef systems shared by these four nations. An action plan has been designed to jointly promote effort such as scientific research, management, monitoring, and education among others to treat this shared environment as one ecosystem. This initiative offers a framework for perhaps the most viable and transcendental opportunity on the planet for carrying out a multinational conservation effort. Coral reefs can not be isolated and will not be protected until the complete array of socio-biological coastal processes is taken into consideration. Corals could constitute the 'flagship', 'umbrella species' or 'charismatic microfauna' that could allow for the adoption of an experimental Integrated Coastal Zone Management strategy in Mexico. This will permit not only the conservation and sustainable use of coral reefs, but also that of other coastal ecosystems and species.

Session 3 Report: Fisheries and Protected Areas

Introduction

Coral reefs and associated seagrass and mangrove habitats provide fisheries resources that are critical for local subsistence in many countries and for world food security. Reefs contain over 4000 species of fishes as well as edible invertebrates and algae. Nearly one billion people in Asia alone depend on these resources for food. Despite this importance, overfishing is widespread and threatens these resources around the world. In 1997 and 1998 Reef Check revealed overfishing of high-value species in most areas surveyed. In many countries, removal of high-value species has been followed by progressive overfishing of lower-value fishes.

Increasingly, marine protected areas (MPAs), including 'no-take' fisheries zones, are being looked to as one mechanism to help address problems of fisheries management on coral reefs. Session 3 presented three case studies addressing implications of MPAs for fisheries management. Break-out sessions looked at these issues in the context of the four major categories of the ICRI Call to Action: integrated management, coordination and linkages; stakeholder partnerships and community participation; public awareness and education, including capacity building; and data and information for management. In addition to the specific areas addressed by the session, recommendations also included broader ideas, including development of an internet-based coral reef clearinghouse mechanism and the call for the development of national coral reef initiatives and action plans–ideally prepared in time for the 10th Coral Reef Symposium in Bali in 2000.

MAJOR RECOMMENDATION

Marine protected areas (MPAs) have the potential to play a much bigger role in the successful management and sustainable use of fisheries resources on coral reefs and associated ecosystems. In particular, participatory development of no-take zones and protection of essential fisheries habitat in the context of an ecosystem management approach should be encouraged, where appropriate, at both the community level and for larger areas.

Integrated Management, Coordination and Linkages

The morning's presentations highlighted the following general themes and recommendations.

1. MPAs and their application to fisheries management should build upon existing organisations and structures (no need to wait for perfect structure).
2. The importance of zoning. Management of MPAs or fisheries no-take areas needs to relate to the larger multiple use areas and ecosystem.
3. Sites and partners should be selected with a view to enhancing replicability and resulting in a multiplier effect.
4. Set clear and obtainable objectives.
5. Select target (e.g. fisheries species or habitats) and keep objectives simple.
6. Develop clear performance measures (environmental and social).
7. Ensure there is a long-term vision.
8. Fisheries and MPA management must be coordinated.
9. Enforcement capacity is essential and depends on stakeholder and community participation.

INTEGRATION: FISHERIES AND MPAs

- MPAs can have variable impacts on fisheries. Effective no-take fisheries zones can provide adult fishes for fisheries in surrounding areas and, if large enough, can also provide a reservoir of spawning individuals for whole regions. MPAs can also protect essential habitats for fisheries species (e.g. spawning or nursery areas) while conserving associated biodiversity.
- MPAs are not equivalent to fisheries management, however, they can contribute to fisheries management. MPAs may be set up for many different purposes. Even those MPAs specifically identified as fisheries management tools do not necessarily obviate the need for additional gear restrictions, temporary closures, or other traditional fisheries management approaches. Those MPAs that are set up for fisheries

management purposes must be set up in close cooperation with the fishers and their goals must be clearly explained.

- Traditional fisheries measures on coral reefs have not always been successful – a new look at it to improve management may be needed.
- Everything must be integrated, i.e. all stakeholders in all areas need to be included.
- Both MPA and fisheries management need to address multiple goals – environmental, social, economic, and political. To be successful, they need acceptance and legitimacy, i.e. they require a shared vision. The overall goal should aim for maximum sustainable social benefit – not just maximum sustainable fisheries yield.

INTEGRATED MANAGEMENT

- Consultation is a key to ensure that community needs and objectives are integrated within management.
- MPAs can form an important component of an ecosystem approach to management by conserving and restoring species, values and functions of areas, and integrating and managing human activities within a larger geographic context.
- Statements of sustainability need to be translated into tangible actions.
- Legal and jurisdictional issues need to be clarified.
- Approaches at both local and national levels need to be unified.
- Fisheries management needs to be harmonised with MPA management.
- There is a need to consider associated ecosystems. In many cases, for example, seagrasses or mangroves provide critical habitat for important coral reef species including fisheries species.
- Design MPAs with clear objectives in mind. For example, fisheries management is not necessarily the same as coral reef management.
- Raise awareness of the need to implement and combine integrated coastal management and integrated watershed management. MPAs need to be implemented in this rationalised context of land and sea space use.
- Each country should have a coral reef plan.
- There is a need for all countries to engage all stakeholders
- Bottom-up effective consultation is needed.

RECOMMENDATIONS

1 Develop National Coral Reef Initiatives (CRIs) and Coral Reef Action Plans

Ideally, national coral reef initiatives would be vertically integrated from the village level to the national level and horizontally between all uses. CRIs would be targeted for the types of country that have it and those that do not. National CRIs should support provincial/state CRIs that facilitate stakeholder and community participation. Stakeholder committees are critical in order to implement CRIs effectively.

Q: How can ICRI facilitate it?
A: Increase coordination and cooperation, and targeted networking by:

- building on success and lessons learned; and
- targeted CRI with framework for countries with commonality, that other countries can pick up on.

Goals:

- National CRIs and action plans should be set up by Bali, or show some progress by Bali.
- Documents on ICRI should be collected on a website before the Symposium in Bali in 2000.
- Comments to ICRI secretariat, i.e. lessons learned, are to be collated for Bali.

Devise multi-level evaluation criteria for CRIs that depend on:

- the country; and
- whether it is a national or local CRI.

(ICRI could help coordinate common criteria.)
There is a need to consider traditional/cultural norms with national CRIs incorporating the traditional values.

2 ICRI Secretariat to manage an internet forum or clearing house mechanism.

In order to facilitate networking, exchange of information, data and case studies, the ICRI Secretariat could manage a coral reef information clearing house mechanism along the lines of existing World Bank Global Electronic Forums.

3 Emphasise an ecosystem-based approach.

Stakeholder Partnerships and Community Participation

Each of the case studies stressed the importance of stakeholder and community participation. These themes were amplified in the second break-out group (with many commonalties with the third break-out group on education).

- It is essential that the community is involved (in **active** participation) throughout the whole process, from the initial stages, i.e. assessment ⇒ planning ⇒ implementation ⇒ monitoring + assessment.
- A consultative framework can facilitate this process.
- MPAs can serve as a focus to facilitate public participation in broader environmental and social issues.
- Keep the process simple, focused and as transparent as possible.
- Site visits and ample time are necessary.
- Beware of over-consultation.
- Work/build on existing groups/institutions/structures where possible.
- Leadership should be possible at village level.
- Timely technical advice to ensure continuity.
- Recognise boundaries in which communities are working.
- Involve local administrative bodies.
- Recognise the political arena.
- Define:
  - participation
  - community
  - stakeholders.
- Use multi-disciplinary teams, using local expertise, facilitators, etc.
- Use culturally appropriate approaches. These will vary from country to country and often from village to village.
- Explore macro and micro levels of participation.
- Fishermen may not know about the problems.
- The concept of projects, i.e. three-year cycles, is created by the donors, whereas the community thinks day-to-day and long term. Long-term (and flexible) projects (>5 years) are likely to have greater success.
- Need to be responsive to the community.
- Trust takes time.
- Ensure expectations met/bargaining.
- Early success or clear signals can help to ensure continued community interest and buy-in.
- Don't be over-ambitious.
- Agree on threats.
- Accountability of donors and others.

Public Awareness and Education, including Capacity-Building

There is a need:

- for clear awareness and understanding by community and all stakeholders;
- for timely provision of information and enough time for feedback and discussion;
- site visits and/or practical experience e.g. seeing is believing! (In addition to in-person visits, other approaches can be utilised, including non-written media such as videos.);
- to establish baseline information/data on public awareness of all stakeholder groups;
- for clearly established management objectives;
- to target each group at an appropriate level with specific/relevant approaches;
- for coordination, collaboration, communication (local, regional, national, international. Learn from others' experiences by networking;
- for regular and ongoing review and evaluation of effectiveness of awareness;
- to foster self-help;
- to be able to provide follow-up to awareness campaigns, e.g. capacity building, self-help, management assistance;
- to use simple and fun approaches or methods for awareness-raising;
- to foster sense of 'ownership 'and hence responsibility;
- for the campaign to provide all management options and implications; and
- to not focus on one specific approach, e.g. MPAs are not the only solution in relation to fisheries.

Data and Information for Management

The morning's case study presentations highlighted several general themes. There is a need for:

1. socioeconomic data and monitoring;
2. monitoring that can show changes;
3. relevance to community;
4. controls to show change and variability;
5. monitoring fish – recruits and adults;
6. annual (or more frequent) monitoring; and
7. involving community and users (fishers) in monitoring.

MANAGEMENT PURPOSES

Data collection and monitoring need to address the management purpose of the MPA. The following are several of the major categories of MPA management purposes, all of which have implications for fisheries management:

- biodiversity conservation;
- subsistence;
- commercial activities;
- recreational activities; and
- ecosystem management.

MPA DATA REQUIREMENTS

What are the basic data that need to be collected?

Socio-Economic Data

1. Awareness – level of understanding of basic biology of the systems, impacts of fishing, alternatives, purposes of MPAs, etc.
2. Attitudes
3. Behaviour – including which groups are involved in destructive fishing practices, illegal practices, etc.

Fishing and Biophysical Data

1. Demonstrate benefits:
   - Are there more fish inside the no-take zone? (Fisheries independent measures)
   - Catch and effort/unit area from fished areas (Fisheries dependent measures)
2. Certain data need to address species-specific characteristics.
3. There is a need for identification of essential habitat for fisheries species (e.g. recruitment, juvenile and spawning habitats may be different from adult habitat and may need special protection).
4. Fisheries addressed include organisms other than just fishes. There is increasing concern over trade in live corals.
5. There is a need to support and incorporate traditional fisheries data sources and approaches, and to be able to apply these to MPA issues-e.g. to address mobile fishers who raid community MPAs.

Characteristics of Data

1. Quality of monitoring data – data need to be credible.
2. Acceptance – information needs to be acceptable to the community and the stakeholders.
3. Relevance – data must be relevant to the users.
4. Importance of developing baseline data.
5. Socioeconomic data (baseline) of community and their perceptions:
   - awareness information to be quantified;
   - changes in attitudes/behaviour/actions;
   - data to be collected parallel to changes in the ecosystem; and
   - build trust with users.

OTHER IMPORTANT MPA DATA CONSIDERATIONS

1. **Importance of placing the MPA in the ecosystem context.** For example, MPAs may need to include inter-reef areas, both as a buffer zone around the reef + buffer zones, and in order to capture the dependence of reef organisms on processes in the surrounding areas. Trawling is a critical issue in inter-reef areas, which may be very rich in biodiversity.

2. **Size of MPAs.** Appropriate size will be dependent upon the purpose of the MPA. For example, community reserves may be OK as small areas that provide spill-over fishing benefits to a community. Reserves to provide spawning populations as a source of larvae to affect the whole stock, however, may require much larger areas (models suggest up to 50% of currently fished area) as well as practical factors such as the area that can be successfully monitored, or that is socially acceptable.

3. **Shape and distribution.** A series of smaller MPAs may be networked along coasts or over a larger region to provide sources of larvae for fisheries on reefs throughout the Region.

4. **There is a need for exploring novel approaches to data collection and monitoring,** e.g. using school children as a resource combining data collection and education.

5. **There is a need to ensure coordination and communication** among researchers, managers, and stakeholders on monitoring goals, approaches and implementation.

SESSION 4: Pollution Control

Chair: Jatna Supriatna
Rapporteurs: B. Subramanian, Karen Koltes
Presenters: Sheriden Morris, Billy D. Causey, Manuel Alepuz

Water Quality Management Initiative: The Great Barrier Reef Marine Park Authority

Sheriden Morris

Introduction

It is an ambitious task for any marine management agency to attempt to influence coastal development and land management. While the potential for coastal catchments to impact on the integrity of nearshore marine environments is apparent to marine managers, the concept is still foreign to many land managers. Decreasing water quality associated with non-point source pollution is considered one of the greatest future threats to the Great Barrier Reef (GBR). However, without controlling legislation, the management tools of trade are limited to education and extension. The approach is an assertive, targeted extension program combined with a focused, applied research program to answer the 'so what' management questions.

This case study examines current coastal development adjacent to the Great Barrier Reef World Heritage Area (GBRWHA) and presents the Great Barrier Reef Marine Park Authority's (GBRMPA) coastal management initiative. It offers an opportunity to assess the success of presenting such an initiative to a culture that is only just becoming aware of dwindling natural resources. There is a pressing need for proactive resource management in this time of rapidly changing technology that affords new mechanisms for resource exploitation.

Review of the Issue

The Great Barrier Reef (GBR) extends for 2300 km along the coast of Queensland, Australia. The catchments adjacent to the GBR are dominated by the grazing industry on the upland and the sugar industry on the coastal regions. The barrier formed by the outer-reef complex creates a nearshore lagoon, hence the cumulative impacts of nutrient and sediment discharges from the mainland are contained within the GBR lagoon.

A nutrient budget developed for the whole of the GBR found that riverine input contributes about 44% of the nitrogen and 55% of the phosphorus while sewage only contributes 3% and 4–12% respectively.

Since pre-European times there has been an estimated 3–5 fold increase in discharge into the GBR lagoon. It is estimated that 15 million tonnes of sediment, 77 000 tonnes of nitrogen and 11 000 tonnes of phosphorus enter the lagoon annually. During the last 40–50 years, deforestation, agricultural expansion, hydrological modification and urbanisation have significantly increased along the coast. During this period there have been changes in agricultural production technology with an exponential increase in nitrogenous fertiliser use, particularly in the coastal sugar production region. Within the same period, in the upland grazing regions, British breeds of cattle have given way to the drought-hardy African breeds such as the Brahman. This management change resulted in improved production efficiency and an ability to maintain stocking numbers in a drought situation, hence increasing the potential for land/pasture degradation and erosion. There have also been expansions in the horticultural and cotton industries that have an inherent potential for high nutrient and sediment losses on a per hectare basis if sustainable management techniques are not practised.

There has been a 70–80% loss of permanent and ephemeral coastal wetlands in most catchments since pre-European times; much of the loss has occurred in the last fifty years. The drainage of these wetlands not only represents the loss of habitat but also impedes the function of the flood plain as a sediment trap, subsequently amplifying the sediment loadings to the marine environment.

Urbanisation of the coastal strip adjacent to the GBR is a developing issue as this area sponsors one of the fastest urban growth rates of anywhere in Australia.

When the recent history of land use in the catchments adjacent to the GBR is overlaid by the weathered and fragile nature of most of the Australian soils and the characteristic droughts and intense flooding rains of this region, then the potential for water quality degradation of the nearshore marine environment is obvious.

The 'How'—Water Quality Management Strategy

It is well recognised by the Great Barrier Reef Marine Park Authority that its ability to achieve its goal to maintain/improve water quality relies heavily on an informed and supportive general public, especially those groups that regularly use the reef for commercial or recreational purposes as well as those whose activities impact on it.

In terms of water quality management, one of the greatest problems facing GBRMPA is the limited jurisdiction over land-use activities. Use of any federal legislation in this regard encompasses constitutional issues between the State and the Commonwealth. Therefore, the Authority has been active in developing cooperative mechanisms to establish an integrated 'catchment to reef' water quality strategy that promotes sustainable land-use practices at a regional and local level. The 25 Year Strategic Plan for the Great Barrier Reef World Heritage Area recognises the importance of integrated planning, management and extension for conservation across geographical and jurisdictional boundaries.

Many Australian and overseas natural resource management agencies support the view that the implementation of a well-designed education and extension program is the most important method for effective, long-term resource management. These education programs must be supported by effective legislation and compliance mechanisms.

The ability of the Authority to fulfil its mandate for conservation, and to assist the development, of the resources of the Great Barrier Reef for economic, scientific, recreational and aesthetic purposes relies on informed stakeholders.

Applied Research

Answering the 'so what' questions of management is a huge task for any research group. The emphasis on issues is constantly shifting with changes in the political landscape. The Authority has focused its research program to:

- identify areas and ecosystems in World Heritage Areas affected/degraded by water pollution;
- identify and prioritise the sources of marine pollution;
- assess trends in the condition of water quality and marine ecosystems;
- identify socioeconomic factors affecting water quality management;
- assess the effectiveness of water quality management;
- investigate grazing management practices which minimise soil erosion; and
- investigate the use of bioremediation to clean up oiled mangrove and saltmarsh environments.

The research is designed to address issues and develop remedial actions. In general, the water quality management strategy has been constrained by the absence of scientific data on the impacts of terrestrial run-off on the Great Barrier Reef World Heritage Area. Yet, coastal development and expansion can happen at a great speed regardless of the availability of scientific data. Management decisions in this instance must rely upon the 'precautionary principle' and common sense.

The Extension Process

The extension program aims to: increase awareness of stakeholders of potential downstream effects; solicit and note stakeholders' beliefs and comments; and facilitate the development of workable strategies to reduce undesirable terrestrial inputs into the GBRWHA. The value of face-to-face contact should not be underestimated as a highly effective tool to achieve these outcomes.

The approach is also to promote and support current community-based initiatives such as Landcare and Integrated Catchment Management which act to increase the awareness of sustainable agriculture at a grassroots level. Integrated Catchment Management is a community approach to the management of natural resources at a whole-catchment level. These catchment management committees consist of representatives of stakeholder groups within the catchment. In addition individual agreements with agricultural industries adjacent to the Great Barrier Reef are negotiated to minimise pollutant run-off into the GBRWHA.

Strategic agreements are also negotiated with local governments to minimise sewage discharge and stormwater run-off.

This extension strategy relies on consistency between State and Federal legislative policy with regards to appropriate water quality standards. Legislation for agricultural management is currently a voluntary Code of Practice that is captured by the Environmental Protection Act and has generic guidelines for agricultural production.

Identification of stakeholders, as opposed to target groups, is essential for the extension process to occur. An informed extension process is crucial, as agricultural producers make individual management decisions that can significantly influence the amount of nutrient and sediment entering the river system. An informed decision can substantially reduce the downstream effect of the production activity. For example, a sugar cane producer in Innisfail can make a decision as to whether he uses a 'Green cane trash blanket zero tillage' system or a conventional burn and cultivate system. The green cane trash blanket means he will contribute about 5–15 tonnes of sediment per hectare per year to the river system. If he uses the conventional method he could contribute between 150 and a massive 400 tonnes of soil per hectare per year. This makes his individual decision significant. Similarly, a grazier can decide the stocking rate and when destocking occurs in times of drought. These decisions will dictate the amount of soil loss from the property during the next major storm event.

Adoption/Acceptance

There are currently conflicting expectations among water resource stakeholders and no general agreement on the value of the marine ecosystem. As a result, resources continue to decline and conflict continues to increase, e.g. coastal wetlands are the target area for sugar industry expansion and are also the fisheries breeding and nursery grounds.

There has been variable acceptance of the water quality issues amongst agricultural producers. There has also been varying adoption of new technology related to sustainable production. Where adoption has an obvious short-term financial benefit, then adoption generally occurs. Where the techniques are dollar neutral or benefits are long-term the adoption is predictably retarded.

Landholder commitment to sustainable agriculture is understandably dictated by the immediate dollar. Unfortunately, production efficiencies have often increased at the expense of the ecosystem. Prices have remained the same or dropped over the last ten years while costs on average have increased 20% (ABARE, 1996). This simply means the resource is pushed harder. Therefore, the user-pays principle for environmental management is constantly under threat.

Community-based strategies are constrained by the availability of information supplied by relevant agencies. The development of local 'Best Practices' relies on the interaction between technology and socially-defined standards that involve an acceptable change to natural conditions. The technology involves a trade-off between cost and effectiveness and acceptable risk. Therefore a healthy cross-section of both scientific and indigenous information is required to allow an informed decision to be made by the stakeholder representatives. The dominance of community groups by minority interest groups can impede the flow of information and the development of broadly acceptable management strategies. It has therefore been essential to extend information outside the formal channels to achieve the adoption of processes that protect downstream water quality.

The growing recognition of state and local government agencies and of industry stakeholder groups of their responsibility to the downstream marine environment and the incorporation of the GBRMPA's requirements in land-use planning considerations is testimony to the success of the water quality management strategy. Retrospective changes to previous agricultural and urban development may occur in the generation time.

Practical Lessons Learned

Lessons learned are obviously an ongoing process. The following are just a few of the lessons learned by GBRMPA's water quality group and offer an insight into some of the management problems.

- Without direct jurisdiction, the capacity of GBRMPA to influence catchment development is limited in the short term. However, research and education appears to offer some management success for the future.
- The short-term economic gain for a select few will dictate the form and speed of catchment development.
- Ongoing research and monitoring can be used to abrogate the responsibility to manage sustainably.
- Research into cumulative impacts requires further development.
- There is a necessity to negotiate the issues on a face-to-face basis with land managers and developers.
- Without political will, enforcement of existing legislation is weak and often ineffective.
- Predictive mechanisms used to determine future impacts currently lack credibility and community support.

RECOMMENDATIONS

- Legislation and policy must be flexible to account for changes in technology.
- Marine management agencies need to become involved early in the policy and project development stage.
- Utilise research as an extension and education tool and involve the target group in this process.
- Link monitoring into a feedback management loop with workable compliance mechanisms.
- Engage downstream industries.
- Engage the general community through non-government organisations.
- Don't assume that land-use managers will necessarily act upon credible scientific outcomes.

Conclusion

Water quality is an issue that transcends the traditional boundaries of marine management, and requires an innovative and dedicated approach. Without legislative jurisdiction over the catchments adjacent to the Great Barrier Reef, the Great Barrier Reef Marine Park Authority must rely on cooperative arrangements with all levels of government and stakeholders to achieve water quality management goals. Applied research, extension and education are the current tools of trade.

There has been an increasing recognition of water quality issues of the Great Barrier Reef by all levels of government and by stakeholders. The progression of this recognition into remedial and preventative action on the ground is essential.

With declining water quality one of the greatest threats to the values of the Great Barrier Reef World Heritage Area, the Great Barrier Reef Marine Park Authority simply can not afford to fail in the implementation of the water quality strategy.

The Role of the Florida Keys National Marine Sanctuary in the South Florida Ecosystem Restoration Initiative

Billy D. Causey[1]

ITMEMS 1998 Proceedings

Background

The Florida Keys National Marine Sanctuary is administered by the National Oceanic and Atmospheric Administration (NOAA) in the United States Department of Commerce. The Sanctuary is one of twelve national marine sanctuaries that are managed as a system spread throughout coastal United States.

The Florida Keys extend approximately 404 km (220 miles) southwest from the southern tip of the Florida peninsula. Located adjacent to the Keys landmass are nationally significant marine environments, including seagrass meadows, mangrove islands and extensive living coral reefs. These marine environments support rich biological communities possessing extensive conservation, recreational, commercial, ecological, historical, research, educational, and aesthetic values which give this area special national significance. The lure of the Florida Keys has attracted visitors for decades. The clear tropical waters, bountiful resources, and appealing natural environment were among the many fine qualities that attracted visitors to the Keys in the past.

The National Marine Sanctuary Program has managed segments of the coral reef tract in the Florida Keys since 1975. The Key Largo National Marine Sanctuary was established in 1975 to protect 353 square kilometres (103 square nautical miles) of coral reef habitat stretching along the reef tract from just north of Carysfort Lighthouse to south of Molasses Reef, offshore of the Upper Keys. In 1981, the 18 square kilometre (5.32 square nautical miles) Looe Key National Marine Sanctuary was established to protect the very popular Looe Key Reef located off Big Pine Key in the Lower Keys. These two National Marine Sanctuaries were, and continue to be, managed very intensively. The installation of mooring buoys to protect the reefs from anchor damage, educational programs, research and monitoring programs, and various resource protection programs, including interpretive law enforcement, have been concentrated in these two marine protected areas. Since these two Sanctuaries were located offshore, the health of the coral reef resources has been affected by land-based sources of pollution and nutrients. Managing these two sites has been like trying to manage islands in the middle of the ecosystem. Obviously, the major threats come from outside the boundaries of the Sanctuaries. In order to be successful at management, an ecosystem approach had to be implemented.

By the late 1980s it became evident that a broader, more holistic approach to protecting and conserving the health of the coral reef resources had to be implemented. Regardless of the intensity in managing small portions of the coral reef tract, Sanctuary Managers were witnessing declines in water quality and the health of corals from a wide range of sources. The more obvious causes of decline were from impacts due to point source discharges, habitat degradation due to development and overuse, and changes in reef fish populations due to overfishing. Clearly, less obvious sources of decline were affecting the health of the coral reefs and these had to be identified.

1. Superintendent, Florida Keys National Marine Sanctuary

Sanctuary Designation

In 1989, mounting threats to the health and ecological future of the coral reef ecosystem in the Florida Keys prompted Congress to take action to protect this fragile natural resource. The threat of oil drilling off the Florida Keys in the mid to late 1980s, combined with reports of deteriorating water quality throughout the region, occurred at the same time scientists were assessing the adverse affects of coral bleaching, the die-off of the long-spined urchin, loss of living coral cover on reefs, a major seagrass die-off, declines in reef fish populations, and the spread of coral diseases. These were topics of major scientific concern, and the focus of several scientific workshops, when three large ships ran aground on the coral reef tract within a brief 18-day period in the fall of 1989. Coincidental as it may seem, it was this final physical insult to the reef that prompted Congress to take action to protect the coral reef ecosystem of the Florida Keys. Although most remember the ship grounding as having triggered Congressional action, it was in fact the cumulative events of environmental degradation, in conjunction with the physical impacts, that prompted Congress to take action to protect the coral reef ecosystem of the Florida Keys. On 16 November 1990, President Bush signed into law the Florida Keys National Marine Sanctuary and Protection Act (FKNMS Act).

The Act designated 9600 square kilometres (2800 square nautical miles) of coastal waters off the Florida Keys as the Florida Keys National Marine Sanctuary and immediately addressed two major concerns of the residents of the Florida Keys. There was an instant prohibition on any oil drilling, including mineral and hydrocarbon leasing, exploration, development, or production within the Sanctuary. In addition, the legislation prohibited the operation of tank vessels (ships) greater than 50 metres in length in an internationally recognised *Area to Be Avoided* within the boundary of the Sanctuary.

Clearly, the greatest threat to the environment, the natural resources of the Keys, and the Keys' economy has been the degradation of water quality over the past two decades. This has been a major concern for the residents of the Keys for years. Commercial and recreational users of the resources in the Keys, environmentalists, scientists, and resource managers are all in agreement that the water quality of the Keys is in sharp decline and the commercially and recreationally important resources are extremely threatened. Some of the reasons for the decline are believed to be: the lack of fresh water entering Florida Bay; nutrients from domestic wastewater such as shallow-well injection, cesspits, septic tanks, etc.; stormwater run-off containing heavy metals, fertilisers, insecticides, etc.; marinas and live-aboards; poor flushing of canals and embayments; build-up of organic debris along the shoreline; sedimentation; lack of hurricanes; and environmental changes associated with global climate change and sea level rise.

Congress recognised the critical role of water quality in maintaining Sanctuary resources when it directed the Administrator of the Environmental Protection Agency, in conjunction with the Governor of the State of Florida and in consultation with the Secretary of Commerce, to develop a comprehensive Water Quality Protection Program for the Sanctuary.

The FKNMS Act called for the Secretary of Commerce, in consultation with appropriate federal, state, and local government authorities and with a Sanctuary Advisory Council, to develop a comprehensive management plan and implementation regulations to achieve the protection and preservation of living and other resources of the Florida Keys marine environment.

Since approximately 65% of the Sanctuary encompasses State waters and numerous state and federal areas of jurisdiction overlap or lie adjacent to the Sanctuary boundary, it was imperative that the planning process for the Sanctuary be an inter/intra-agency effort. Also, due to the high level and diversity of public utilisation of the resources in the Florida Keys and the importance of tourism to the economy of the Keys, it was equally important that the public have a strong role in the development of the comprehensive management plan.

The Sanctuary Act called for the public to be a part of the planning process, and that a Sanctuary Advisory Council (SAC) be established to aid in the development of the comprehensive management plan. A 23-member Advisory Council was selected by the Governor of Florida and the Secretary of Commerce. The Council consists of members of various user groups; local, state, and federal agencies; scientists; educators; environmental groups; and private citizens. Over the course of the planning process, numerous public workshops were held to get input from knowledgeable individuals on a wide range of topics that could be implemented in the management of the Sanctuary. Development of the final management plan took six years of comprehensive planning and utilised an integrated approach with all the local, state, and federal agencies, as well as the public through the Sanctuary Advisory Council made up of a wide range of stakeholders.

The final management plan for the Sanctuary contains 10 action plans including: (1) channel and reef marking; (2) education and outreach; (3) enforcement; (4) mooring buoy; (5) regulatory; (6) research and monitoring; (7) submerged cultural resources; (8) volunteer; (9) water quality; and (10) marine zoning. The marine zoning plan represents a major departure from the traditional management actions in Sanctuaries. The Act mandated that the Sanctuary program 'consider temporal and geographical zoning, to ensure protection of sanctuary resources'.

Perspective

Since declining water quality and ocean pollution were identified as the greatest threats to the continued health of the coral reef in the Florida Keys, Congress directed the United States Environmental Protection Agency to work with the State of Florida and the National Oceanic and Atmospheric Administration to develop a water quality protection program for the Sanctuary. The planning effort was initiated parallel to the development of the Sanctuary's management plan. Even though the geographic scope or spatial extent managers were considering as important to addressing water quality problems was enormous in both scope and extent area, it was soon learned not to be large enough.

At their first meeting in 1992, the Sanctuary Advisory Council pointed out that the problems affecting water quality in the Keys was not simply derived from the Keys themselves, but from upstream. Upstream was Florida Bay, South Florida, the west coast shelf of Florida and tributaries that drain a vast portion of South Florida. It became quite clear that we had to look well beyond the boundaries of the Sanctuary to address the source of water quality problems affecting the health of the coral reef. But how far should managers look for the source of impacts?

The answer to this question became clearer in 1993 when the US Secretary of the Interior, Bruce Babbitt, convened a meeting of all the federal resource managers in south Florida. This action initiated the formation of the South Florida Ecosystem Restoration effort that is currently under way. Today, local, state, federal, and tribal interests are all members of the Task Force whose primary objective is to 'get the water right in South Florida'.

Over the decades many mistakes have been made in the way we manage our fresh water and its run-off into our estuaries. Today, we are attempting to get the quality, quantity, timing and distribution of fresh water back into the system so as to resemble its historic patterns of flow through the built environment and ultimately to the ocean.

The South Florida Ecosystem Restoration Story

This case study will focus on many of the lessons learned along the way in both the Sanctuary planning effort for the Florida Keys National Marine Sanctuary, as well as the South Florida Ecosystem Restoration project. A challenge in an ecosystem management approach is to get resource managers to create a vision that extends well beyond jurisdictional boundaries, both at national and international scales, and establish broader objectives in ecosystem management. Another challenge is to get scientists to rethink their classical definition of an 'ecosystem' and apply the same broad vision of the ecosystem system as the managers. Important too, is that managers and scientists alike recognise that human activities are an integral part of ecosystem management and their activities have to be included in an ecosystem management program.

THE ECOSYSTEM

There are no other Everglades in the world. They are, and they always have been, one of the unique regions of the earth – remote, never wholly known. It is a river of grass. Marjory Stoneman Douglas wrote those words about the Everglades in 1947. Since then we have come to realise that the River of Grass is part of the much larger South Florida ecosystem.

This ecosystem covers an amazing diversity of landscapes including: the Upper Chain of Lakes above Lake Okeechobee that are the headwaters for South Florida; the meandering Kissimmee River which flows into Lake Okeechobee; the hardwood hummocks where both tropical and temperate species reside; the mangrove forests that line the coast and Florida Keys; all the estuaries that support numerous species of fish and wading birds and; all the way to (and including) the biologically rich coral reefs.

Before efforts were made to drain the South Florida wetlands, the landscape had three key qualities. First, it was extremely flat, with no more than a 20-foot drop in elevation over 100 miles from Lake Okeechobee to Florida Bay. Second, the landscape had varied flora, fauna, and habitats. Finally, and most importantly, the landscape was a rainfall-driven system, characterised by dynamic water storage and sheet flow.

Because of its many natural assets, South Florida attracted people and money, which led to development, agriculture, tourism, and other growth industries. Today over five million souls reside in South Florida's east coast alone. This number is expected to triple by 2050 if current trends continue.

The increase in population, combined with increasing development, agriculture, and other human activities is putting the entire South Florida ecosystem in peril. From the headwaters through the Florida Keys, the natural system is being strained as never before.

Urban and suburban areas also face equally severe problems, such as crime, under employment, and water shortages. *This unique natural and human system is in trouble.*

SO HOW DID WE GET HERE?

We funded efforts like the Central and South Florida Project, which both opened the door for urban and agricultural growth and altered the timing and distribution of water through the South Florida ecosystem. In addition we did the following:

- channelised the Kissimmee River;
- polluted Lake Okeechobee with agricultural run-off;
- damaged our coastal estuaries with excessive fresh water;
- brought Florida Bay to the brink of collapse by altering freshwater flows;
- introduced harmful exotic plants;
- intensified the effects of floods and droughts;
- reduced the spatial extent of wetlands by 50%; and
- permitted development to sprawl farther and farther into the natural system.

The collective consequences of these changes have affected all living beings in South Florida– plants, animals and people. These changes also threaten the wellbeing of South Florida's multibillion dollar tourism, agricultural, trade, and fishing industries, which are the economic backbone of the Region and the state.

Several observations stand out based on what is happening to the South Florida ecosystem. First, South Florida is a holistic, complex system that includes both the natural and the built environment. Second, the quality of life in South Florida is inextricably linked to the health of the natural system. Third, the health of the Everglades and the entire South Florida ecosystem depends on what actions all of us take.

The challenge we face today is to reconcile our human demands with the needs of the South Florida ecosystem. So what is being done to address the problems we face? Over the past 50 years the state and federal governments have been taking actions to stem and reverse the downward trends. Lands and waters have been protected, laws and initiatives have been passed to manage growth and protect the natural environment, and partnerships have been established to restore the ecosystem.

Of particular note are three recent events that have helped create the foundation for the current restoration effort.

- In 1993 the Federal South Florida Ecosystem Restoration Task Force was established through an interagency agreement. This task force has focused primarily on the protection and restoration of natural systems. This group has worked to: develop a consistent approach to addressing environmental concerns; set priorities for federal restoration efforts; and oversee and evaluate restoration efforts under way.
- In 1994 Governor Chiles established the Governor's Commission for a Sustainable South Florida. The Commission has focused on making recommendations for achieving a healthy Everglades ecosystem. It also has formulated strategies to achieve a sustainable economy and quality communities.
- Finally in 1996 Congress passed the Water Resources Development Act. Among its many provisions, four stand out for South Florida:
  - the act formally established the South Florida Ecosystem Restoration Task Force and expanded its membership to include tribal, state, and local governments;
  - the act accelerated the authorisation for and funding of critical projects, such as the Central and South Florida Restudy Project;
  - it enabled federal and non-federal partners to share costs (50–50) for South Florida restoration projects; and
  - the law authorised the task force to address the full scope of restoration, including the interconnections of environment, economy and society.

Two important premises have emerged from the Governor's Commission and the Task Force work. First, on its present course South Florida is not sustainable. Second, the important relationship between South Florida's environment, economy and society cannot be ignored. A common vision is emerging from these realisations and from the ongoing restoration efforts. It is a vision of 'a landscape whose health, integrity, and beauty is restored and is nurtured by its interrelationships with South Florida's human communities'.

SO WHAT ACTIONS DO WE TAKE?

Today we understand much more than we ever have about South Florida and its problems. But in suggesting solutions, we should keep in mind that there is still much to learn about the South Florida ecosystem.

Because there is still much to learn, the ecosystem restoration effort has adopted an *adaptive management* approach that stresses taking action where possible while also continuing to collect data, learn and plan. More specifically, the restoration effort is stressing the need for:

- system-wide management;
- integrated governance;
- broad-based partnerships;
- public outreach and communication; and
- science-based decision making.

System-wide management means taking a holistic, systematic approach to address issues regionally, not locally. It means placing an emphasis on obtaining results rather than on developing processes that may never be carried out. And it means searching for long-term, holistic solutions to South Florida problems rather than finding easy, temporary 'fixes' to our problems. Integrated governance is also critical to creating a shared vision for the restoration effort. Different levels of government need to work together to:

- develop regulations that are based on commonsense;
- share funding and cut costs;
- integrate budgets;
- develop cooperative programs that enable action to be taken faster; and
- streamline red tape and other institutional barriers.

Broad-based partnerships are another key element of the restoration effort. Governments also need to work cooperatively with interested parties if we are to solve the problems facing South Florida. Partnerships also are needed between federal, state, local and tribal governments and other partners to:

- advance a shared vision and commitment; and
- foster the mutual respect and trust needed for the restoration effort.

Public outreach and communication are essential to building support for the restoration effort. With the Region's high degree of cultural diversity, communication is needed to: connect people in meaningful ways with the effort;

- foster a clear exchange of views, ideas, and information; and
- instil a broad sense of stewardship, ownership and responsibility for the fate of South Florida.

Finally, sound restoration decisions must be based on science. The results of specific decisions and actions must be monitored to assess the effectiveness of the actions. Relevant scientific data needs to be identified and collected. Predictive ecological and socioeconomic models need to be developed to forecast and track trends. Science-based decisions also means coordinating research efforts and making them accountable. In other words, we need to make sure that we get the *best research, at the best price, and delivered on time.*

Additionally, we need to encourage new, creative technology that integrates both human and natural needs.

SO HOW DO WE ATTAIN THIS VISION?

Three overarching goals need to be achieved by the South Florida ecosystem restoration effort. We need to *get the water right, restore and enhance the natural system, and transform the built environment.*

Getting the water right means restoring more natural hydrologic functions while also providing adequate water supplies and flood mitigation. To do this we need to address:

- the quantity of water flowing through the ecosystem;
- the quality of water, the timing and duration of water flows and levels; and
- the distribution of water through the system.

More specifically, the restoration effort needs to:

- re-establish the sheet flows that once were common throughout the system;
- restore the natural variations in water flows and levels, without diminishing the region's water supply or flood control; and
- ensure that water supplies are clean enough for their intended use.

Other critical elements in getting the water right include:

- reducing the amount of water lost to tide through stormwater drainage; and
- replacing the system's lost water storage capacity.

The restoration effort's second major goal is restoring, protecting and enhancing natural areas. Attention needs to be devoted to recovering threatened and endangered species. The physical and biological connections between natural areas need to be re-established. Many more wetlands and other disappearing habitats need to be permanently set aside and protected.

The diversity and abundance of South Florida's native species needs to be reestablished. The spread of exotic species, like the melaleuca tree, needs to be stopped and reversed. In addition:

- the productivity of coastal areas, estuaries, and fisheries needs to be revived;
- coral reefs need to be protected; and
- commercial and recreation interests need to adopt practices that help sustain the natural system.

The third major goal of the restoration effort is to transform the built environment to sustain a prosperous economy, vibrant society and a healthy natural environment. To achieve this goal the restoration effort needs to address future development and the economy, including agriculture. Fostering sustainable development is a key to achieving this goal. Unending urban sprawl needs to be stopped. Land-use decisions need to be compatible with ongoing restoration efforts. Resources should be used efficiently for development. Government programs, incentives and tax structures need to be modified to support smart development.

A prosperous, diverse and balanced economy also must be present to restore the ecosystem. Industries like ecotourism need to be supported and promoted. Work also is needed to ensure that the actions of resource-dependent industries are compatible with the restoration effort's goals.

The support of business interests must be secured if the restoration effort's goals are to be achieved. Finally, a prosperous and sustainable agriculture needs to be supported. We need to:

- protect disappearing farmlands;
- promote research and best management practices that improve the sustainability of the agricultural industry; and
- encourage strong markets.

SO WHAT IS BEING DONE TO ACHIEVE THE SOUTH FLORIDA ECOSYSTEM RESTORATION GOALS?

Many projects are under way. Some are nearing completion, others will take decades to complete. The following examples illustrate the nature and scale of these efforts.

Performance Indicators and Models

The ecosystem restoration effort also is encouraging the use of *performance indicators and models* to provide direction, feedback and accountability for all of the projects going on or planned for South Florida. Performance indicators and models will help us keep track of changing hydrologic, ecological, water quality and socioeconomic conditions. They enable agencies to evaluate their performance, and they help the public identify the benefits and costs of the projects.

Central and South Florida Review Study

The Central and South Florida Project Comprehensive Review Study is a massive undertaking aimed at assessing how well the C&SF Project is functioning. The Restudy will determine what modifications need to be made to the project to restore natural hydrologic conditions in natural areas, while still providing for the other water-related needs of the region. Together with other efforts, it is hoped that the restudy will improve water quality and help restore the historic abundance and diversity of native species.

Water Preserve Areas

Another project under way is the creation of a series of *Water Preserve Areas* along the eastern margin of the Everglades, spanning Miami-Dade, Broward, and Palm Beach Counties. The water preserve areas will consist of an interconnected system of marshlands, reservoirs and aquifer recharge areas.

These areas are intended to:

- capture, store and clean excess stormwater now lost to tide;
- protect and conserve wetlands outside the Everglades; and
- provide a buffer between the expanding westward urban development and the Everglades.

Everglades Construction Project

The Everglades Construction Project covers a number of actions that are being taken to:

- improve the quality of run-off discharged from farms into the Everglades;
- capture, store and clean stormwater run-off that is now lost to tide;
- re-establish sheet flow and increase the quantity of water delivered to the Everglades; and
- decrease excessive freshwater discharges into estuaries.

The project is focusing primarily on building man-made wetlands, improving the canal system, and encouraging the adoption of *best management practices* for agriculture. Sixty-eight federally listed threatened and endangered species, as well as other species of special concern, occur in South Florida.

Multi-species Recovery Plan

To ensure the long-term survival of these species, the United States Fish and Wildlife Service is preparing a comprehensive *multi-species recovery plan.* This will be one of the first plans in the nation that meets the needs of multiple species on a regional basis. It will provide a blueprint that agencies can use in their work to restore the South Florida ecosystem.

Eastward Ho!

One of the projects underway to transform the built environment is the Eastward Ho! initiative. The purpose of this initiative is to redirect growth back to the historical eastern corridor and away from natural and agricultural areas. To redirect growth, federal, state, local and private entities are looking at ways to enhance the appeal of older urban areas. It is hoped that Eastward Ho! will both raise the quality of life in urban centres and reduce the impacts urban areas have on South Florida's natural and agricultural areas.

Florida Keys Carrying Capacity

The Florida Keys has experienced tremendous growth over the past several decades, which in turn has affected many of the Keys' natural resources. In response to these impacts, the United States Army Corps of Engineers is directing a carrying capacity analysis for the Keys. Information from the study should enable planners to model different growth scenarios and determine when resource thresholds are being exceeded. This should improve the capability of agencies to plan for and manage future growth on the Keys. The model that comes out of the Keys study may have applicability elsewhere in South Florida and even internationally.

South Dade Land-Use/Water Management Planning Project

One area in South Florida which potentially could see much change in upcoming years is the South Dade located between Miami's suburbs and Biscayne National Park. The project entails three separate, but linked components:

- Agricultural and Rural Lands Retention Plan;
- South Biscayne Bay Watershed Management Plan; and
- South Dade Wellfield Study.

The results of the planning project will determine the future economic, social and environmental sustainability for urban and rural Miami-Dade County.

Environmental Impact Statement for Southwest Florida

Southwest Florida is an area experiencing rapid growth and development, as well as many impacts to the natural environment.

The United States Army Corps of Engineers and Lee and Collier Counties have agreed in principle to prepare an environmental impact statement (EIS) that will take a holistic view of future development in the region. It will specifically be assessing the impacts of permits issued for development under section 404 of the Clan Water Act.

The EIS should enable the Corps to speed up the processing of development permits. It should also help ensure that the counties and the Corps take a consistent approach to new development, and it may generate new ideas for sustainable development.

SO WHERE DO WE STAND?

Today the South Florida ecosystem is facing many serious problems that directly or indirectly affect all of us. Building on the work that has been done over the past 50 years, we now have a blueprint to restore the ecosystem. We have a *vision and goals* for South Florida. Projects are under way and progress has been made in achieving these ends.

But we have a way to go. All of us–businesses, governments, and private citizens–need to continue to support and participate in the restoration effort. Working together, we can achieve our vision. South Florida's fate is in our hands.

SO CAN WE AFFORD IT?

According to the results of the 'restudy', the cost of the restoration effort will be approximately US$7.8 billion. Although this cost seems high, the question has to be reversed. Can we afford not to do the restoration? Based on the following economic considerations, the decision is clearly, 'yes, we must make the investment':

- one in six US jobs related to the oceans;
- 1995–US Fishing industry–US$20 billion;
- 1995–Coastal Tourism–US$54 billion (beaches are leading destination);
- Recreational fishing–US$30 billion;
- Example: Florida Keys National Marine Sanctuary
  - 2.5 million tourists annually
  - 13.3 million visitor-days annually
  - spend US$1.2 billion annually;
  - coastal and marine waters support 28.3 million jobs; and
  - United States coastal areas are the destination for 180 million annually.

Lessons Learned

The following is a list of lessons learned as they relate to ecosystem management planning for the Florida Keys National Marine Sanctuary. Their inclusion does not mean to imply they were not considered from the outset, but only to emphasise their importance to managers.

ECOSYSTEM APPROACH

- Establish a comprehensive boundary for the ecosystem based on natural and physical processes and not political or jurisdictional boundaries (barriers). Strive to eliminate jurisdictional and administrative barriers to ecosystem management.
- Apply the principles of ecosystem-based management from the outset in the planning process. In other words, approach the planning process with an ecosystem perspective, focusing on watershed-based management. Include the appropriate spatial extent within the boundary of the ecosystem.
- Use a public process to establish ecosystem management objectives and restoration goals based on our best understanding of the concepts of sustainability. Establish an Advisory Group made up of stakeholders and local elected officials, separate from an Interagency Core Group to assist in the planning process.
- Utilise an adaptive management process and in the absence of information, use the best science available upon which to base decisions.
- Support the planning process with analytical and technical expertise.

INTEGRATED MANAGEMENT

- Establish an integrated planning process but do not let the rigour of the process dominate the activities, but rather treat the process as another adaptive management tool. Utilise to the extent possible, existing integrated coastal management programs
- Bring all levels of government to the table for the planning process, from the local and regional level to the state, territorial, tribal and national level. Consult international levels of government when feasible and necessary. Insure the integrated planning process moves vertically and horizontally through the structure of the agencies and that all levels of government can participate in the planning process.
- Require participating representatives to have adequate authority to make decisions in the planning process.
- Focus on ways to implement effective ocean governance within the confines of existing authorities, but be open to new legislation when necessary.

SOCIOECONOMIC CONSIDERATIONS

- Recognise from the outset that humans are a part of the ecosystem and that our activities, or the effects of our activities, cannot be separated from any holistic approach to management.
- Although we continue to struggle with a true definition of sustainability, continue to apply the spirit of what we collectively think as a sustainable approach on the most conservative side of management principles.
- Invest heavily in outreach efforts at all target audience levels with the recognition that the environment and economy are linked at the outset of the project. This is especially true of decision and policy-maker audiences.
- It is absolutely essential to bring socioeconomic information into the planning process as a foundation for informed participation at an early phase. Treat this discipline with the level of importance that you would give the natural or physical sciences.
- Utilise the concept of marine zoning in the management planning process. This management tool is useful to eliminate or lessen visitor-use conflicts. Establish marine reserves or 'no take areas' where marine life is fully protected in critical marine environments.
- Listen to, and attempt to understand all points of view in an ecosystem management planning process.

Conclusion

The list of 'lessons learned' is more accurately the reflection of changing spatial perspectives. Clearly, the old paradigm of managing just within the boundaries of one's marine protected area does not and cannot succeed. It is critical that resource managers step back and take a broader perspective of the true spatial extent of the geographic and oceanographic boundaries that affect their areas. That's the easy step. The next is to work with others in an integrated process that focuses on achieving sustainable goals.

Acknowledgements

The sections of this report that discuss the South Florida Ecosystem Restoration Project were for a large part written through a facilitated process by members of the Working Group that supports the South Florida Ecosystem Restoration Task Force. This Working Group is made up of local, state, federal and tribal representatives. This collaborative process makes this an even more powerful message.

Integrated Management of Bays and Coastal Zones in the Wider Caribbean Region: Facts and Needs

Antonio Villasol[1], Manuel Alepuz[2] and Jesus Beltrán[3]

Introduction

The Wider Caribbean Area comprises the marine environment of the Gulf of Mexico, the Caribbean Sea and the 200 mile zone of the Atlantic Ocean adjacent to the countries in the Region, as well as their internal waters and the terrestrial environment up to the limit of the watersheds. Economic activity in the region focuses on the expansion of tourism, agriculture and extractive industries that are often directly or indirectly linked to coastal and marine resources.

The Caribbean Sea, an arm of the Atlantic Ocean, is partially enclosed on the north and east by the Islands of the West Indies, bounded to the South by South America and Panama and to the west by Central America. It is approximately 2415 km long and between 640 and 1450 km wide. It has an area of about 1 942 500 km^2.

The pollution of coastal areas from land-based sources is increasing in the Wider Caribbean, affecting the biodiversity of the natural coastal ecosystems. This is due to the rapid growth of coastal population centres without adequate sanitation facilities, making sewage one of the most significant pollutants affecting the coastal zone and the Wider Caribbean. Untreated sewage also poses serious health problems for the public.

Most of the countries in the Wider Caribbean Region have adopted legal instruments to control various aspects of domestic and industrial wastewater disposal to coastal and marine waters. The degree to which these legal instruments are applied in the practical management and control of environmental pollution varies from country to country, but is generally rather weak.

The Cartagena Convention (CAR) was adopted as the legal instrument for the implementation of the Caribbean Action Plan (CAP). The goal of this action plan is the protection of the marine and coastal environments through the promotion of ecologically and socially sustainable development of marine and coastal resources.

Background

The quality of the coastal ecosystems in the Greater Caribbean has been evaluated in general by means of pilot studies on land-based sources of contamination in coastal areas (GEF and UNEP, Heavily Polluted Bays Projects), the specific effects of hydrocarbon contamination (CARIPOL), the accumulation of toxic substances in organisms (Mussel Watch) or through the effects of solid residues and liquids from ships (GEF-OMI).

In the seventies, integrated marine contamination research began in Cuba. Project CUB/80/001 UNDP-UNEP-UNESCO: 'Research and Control of Marine Pollution Contamination in the Havana Bay' was carried out, and the experiences of this research were applied to diagnose environmental conditions of other coastal areas strongly polluted in the Caribbean Region.

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2. Executive Coordinator, Regional Project of Planning and Environmental Management of Bays and Heavily Polluted Coastal Zones of the Greater Caribbean
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From 1992-1998, in the framework of two regional projects related to planning and environmental handling of strongly polluted bays and coastal zones in the Caribbean Region. Case studies were executed in eight countries: Cuba, Havana Bay; Colombia, Cartagena Bay; Costa Rica, Puerto Limon; Jamaica, Kingston Harbour; Nicaragua, Bluefields Bay; Dominican Republic, Santo Domingo Littoral; Trinidad and Tobago, Point Lisa Zone; and Venezuela, Pozuelos Bay.
These projects have permitted the organisation of a database on the causes of the problems in many of the countries with several degrees of quality, being able to identify some corrective measures, on the sources of urban, domestic and industrial origin and facilitated information on the sources of marine contamination coming from ships.

Main Existing Pollution Problems in Bays and Coastal Zones of the Caribbean Region

The pollution of coastal areas from land-based sources is increasing in the Wider Caribbean, affecting the biodiversity of the natural coastal ecosystems. This is due to the rapid growth of coastal population centres without adequate sanitation facilities, making sewage one of the most significant pollutants affecting the coastal zones and the Wider Caribbean.

The pollution problems are principally connected to excessive inputs of nutrients (nitrogen and phosphorus) and micro-pollutants such as heavy metals, persistent organic pollutants (including pesticides), and hydrocarbons. In addition, sedimentation poses a serious problem in many bays and coastal waters.

Nutrient enrichment is an increasing concern in the Wider Caribbean Region, causing eutrophication, algal blooming, oxygen depletion and changes in biodiversity. In many of the bays connected to highly populated centres, extremely low levels of oxygen are observed in the lower part of the water column, where bottom sediments are often turned black. These anoxic conditions kill and drive away fish and benthic species. As with other areas in the globe facing widespread eutrophication (Black Sea, Baltic Sea, Yellow Sea), there is a longer-term risk that this phenomenon will extend beyond the natural borders of the bays and into the Caribbean Sea.

The micro-pollutants are generally not easily biodegradable and may bioaccumulate, thus affecting the biodiversity. They may also represent a health hazard through the contamination of seafood. Additionally, economic activity in the region focuses on the expansion of tourism, agriculture and extractive industries that are often directly or indirectly linked to coastal and marine resources.

Another conflict has been the erosion of the beaches that is observed at the present time in most of the coasts of the Caribbean. This problem is negatively influencing the development of tourism and recreation, very important activities for the region.

The human activities affecting the stability of the Caribbean beaches are:

- dredging for mining;
- wharves for the protection of channels and basins;
- constructions on the dunes; and
- dam construction and the deviation of big rivers.

These events have caused a series of common problems in all the countries. Between them the following stand out.

CONTAMINATION BY INDUSTRIAL RESIDUES

Most of the industries in the countries of the Caribbean dispose of their residues without previous treatment. In other cases the treatment is inadequate, due to the use of inefficient technologies, which in some cases are obsolete. In addition, there are no economic incentives for those industries that fulfil quality norms.

CONTAMINATION BY DOMESTIC WASTE WATERS

More than 70% of the population in the Caribbean Region is settled in coastal cities. Most of these cities have faulty sewerage systems and in some cases don't have this system. Another characteristic is unauthorised connections to the pluvial drainage, which converts them in many cases into sanitary sewers. Another quite widespread peculiarity in the region is that even the places where a sanitary sewerage system exists, an inadequate treatment system is present and the residues are poured into the coastal zone untreated.

CONTAMINATION BY DOMESTIC SOLID WASTES

This source is causing serious impacts in the bays and the coastal zones, independently of the deterioration that it causes in the environmental quality of their waters. Economic effects occur due to the breakdown of motors of small crafts, and impacts on the landscape as a result of the concentration of macro-solids are also remarkable. This phenomenon is especially harmful in the beach zone or where there is tourist development.

The main cause of solid wastes is insufficient infrastructure for the collection, treatment and final disposal of the garbage. In other cases the situation is made worse because solid wastes management projects do not exist. Another problem is derived from leaching of the landfills located near the coastal zones, which is an important source of toxic pollutants to the sea.

CONTAMINATION BY THE RIVER HAULAGE

This is mainly due to the poor handling that exists in the basins of the region, as a result of development without control of agricultural, forestry and industrial activities (for example, the uncontrolled use of pesticides, which in many cases is forbidden). Another phenomenon is the destruction of the mangroves in the coastal zones or the use of these areas as garbage dumps (due to the ignorance about the importance of these ecosystems in the storage and energy transformation processes). The mangroves are absolutely necessary for the maintenance of the productivity of the tropical coastal zones.

CONTAMINATION BY THE MARITIME – PORT ACTIVITY

This is caused by accidents in the ports' operations and discharges of oily bilge waters. Most of the region's ports lack appropriate systems for the collection, treatment and final disposal of the residues (as much solids as liquids) when providing this service to ships. Systems of environmental surveillance in our countries that force the ships' captains to obey the international agreements on preservation of the marine environment do not always exist.

The effect is that some countries of the Region suffer from the arrival at their coasts of solid wastes and hydrocarbons disposed of by the ships, and dragged by the marine currents and the wind. Studies carried out in Cuba show that the Archipelago Sabana-Camagüey and the Archipelago of the Canarreos are areas visibly affected by marine wastes, due to their nearness to the intense marine traffic through the Old Channel of the Bahamas.

CONTAMINATION DUE TO THE INEFFICIENT EXPLOITATION OF THE FISHING POTENTIAL

This situation affects the countries of the region every day, because of inappropriate fishing methods, including fishing with dynamite, and the intensive exploitation of some areas. Commercial fishing has diminished and, in some zones, has practically disappeared. This situation results in a decrease in the quality of life of the Region's fishing communities.

ALTERATION OF THE COASTLINE

The construction of the industrial, urban, port and tourist infrastructure, uncontrolled pruning, the filling in of the mangrove zones and faulty environmental education are the fundamental causes of these alterations.

The reasons for the contamination problems in the Region's countries are also the cause of the effect on social and economic uses developed in the bays and coastal areas. In other cases, one of the bases that sustained the development of many communities living in coastal zones of the region–fishing–has practically stopped. This is without doubt a strong social and economic impact.

Table 1 summarises the pollution problems, and the environmental impacts in the Wider Caribbean connected to discharges of sewage, nutrients and micro-pollutants. Some of these discharges may also pose a risk for environmental degradation of the Wider Caribbean Region.

Table 1: Summary of Environmental Impacts in Caribbean Coastal Ecosystems

POLLUTION PROBLEM	SOURCES	ENVIRONMENTAL IMPACTS
Nutrients	Untreated sewage Agricultural run-off Industry	Risk of: Algal blooming Eutrophication Oxygen depletion Reduced biodiversity Reduced reproduction of species Degradation of seagrass and coral reef ecosystems
Micro-pollutants (heavy metals, persistent organic pollutants, including pesticides, oil and hydrocarbons)	Industrial and oil activities Hazardous waste Use of agro-chemicals Ship traffic	Bioaccumulation Contamination in the food chain Reduced biodiversity
Suspended solids	Rivers Land use in watersheds	Sedimentation Reduced biodiversity
Solid waste	Port activities Industry Households	Littering Water pollution

Most Relevant Results Obtained in Surveys about Environmental Contamination in Heavily Contaminated Areas or Areas of High Risk in the Wider Caribbean Region

The main results reached by the countries involved in the Regional Projects (as well as specific studies carried out by specialised institutions in several countries of the region), have identified land-based sources as the main causes of contamination in the bays and coastal zones in the Caribbean. The wastes generated by the maritime-port activity, as a consequence of inappropriate handling, also contribute in a significant way to the degradation of these ecosystems. From these studies, it is possible to show the following examples.

COLOMBIA

Cartagena Bay is a large, semi-enclosed estuarine bay, and is part of a larger coastal complex including Tesca Swamp, Barbacoas Bay, a coral reef island complex, the coastal lowlands and Cartagena City. Since colonial times, Cartagena Bay has been an area of important economic activity. Multiple users, including the tourist area, the industrial zone of Mamonal, several port facilities and numerous coastal towns, share the use of the Bay.

Currently, Cartagena Bay receives approximately 90% of all industrial and domestic waste discharged along the Caribbean coast of Colombia. A total of 120 000 m^3/day of sewage is discharged from Cartagena city, of which 40% is discharged directly into Cartagena Bay. Twenty-nine out of a total of 620 businesses around the Bay are producers of liquid effluents of significant volumes. In addition, there are discharges from the port activities and solid waste is discharged directly into the Bay. These untreated discharges contain nutrients, organic matter, toxic compounds (heavy metals, hazardous organic chemicals, oils and grease), thermal discharges and suspended solids. From collective sources, Cartagena Bay receives an average of about 8.7 and 2.1 metric tonnes per day of nitrogen and phosphorus respectively.

In addition, the Canal del Dique, an artificial branch of the Magdalena River, provides the largest freshwater and sediment input to the Bay. It is also the source of the water supply for the city of Cartagena de Indias.

The high levels of contamination reaching these waters, due to the industrial waste discharges and urban wastewater, cause high levels of bacterial contamination as well as quick sedimentation. This has produced critical levels in the dissolved oxygen content below a depth of 8 metres and anoxic zones in the layers near to the bottom, with a marked environmental deterioration (EDURBE-FONADE 1994), even decreasing levels of fishing use. The main reason has been the uncontrolled use of several methods of fishing, including fishing with dynamite.

Other uses of Cartagena Bay that involved primary contact with the water have also disappeared. These were best developed in the zone known as Internal Bay. This is due to the microbiological contamination (Coliforms) which is higher than the established norms for primary contact for the World Health Organization. Twenty-two jetties exist in the bay which influence ecosystem quality through waste discharges and faulty operations (CEPAL/PNUMA report 1992).

During 1980 the Centre of Investigation on Oceanography and Hydrography of Colombia (CIOH), together with the University of Miami, carried out a study in Cartagena Bay. Samples of pesticides were analysed, and confirmed the presence of organochlorine substances. Later on during 1992, the CIOH with the support of the IOC/UNESCO, carried out a study of a case in *La Cienaga de la Virgen* (coastal lagoon), located in Cartagena, where organochlorines like aldrin, heptachlor epoxide, DDTs and their metabolites, lindane, dieldrin, endrin etc. were detected in water, sediments and certain marine organisms. The values in the sediments were of 2075 ng.g-1 HCH and 63.65 ng.g-1 for the HCB respectively. Aldrin, heptachlor epoxide, DDT and their metabolites, methoxychlor, lindane and PCBs were also detected (CIMAB 1998).

During 1995 sediments bordering the mangrove zone of this same bog revealed the presence of the same analysed compounds as previously, with small variations in the values of concentration depending on the climatic time.

In the outlet of the Magdalena River in *Boca de Ceniza* (Barranquilla), Colombia, the presence of organochlorines was reported. Pollution by organochlorines was detected in waters, sediments and organisms located in the Bay of Tumaco on the Colombian Pacific coast. Studies carried out by the *Instituto de Investigaciones Marinas* (INVEMAR) in the zone of the Magdalena River found polluted mangrove areas. In the estuarine zone of the Magdalena River there are many species of high ecological and commercial value, such as Manatees (CIMAB 1998).

JAMAICA

Kingston Harbour is the seventh largest natural harbour in the world, with an approximate area of 51 km^2, and consists of an upper basin, and inner and outer harbour. The harbour is relatively shallow, and the ship canal is regularly dredged to maintain the navigability of the canal.

Several sectors are users and potential users of Kingston Harbour, and are contributing to the contamination of the water.

- Sewage is by far the most important source for the contamination of Kingston Harbour. Sewage from 25% of the population (850 000) is discharged into the harbour with limited treatment.
- Industries established on the shore of Kingston Harbour include oil refineries, cement production, a power station, the food industry, fish processing plants and garment manufacturing. Industrial wastewater is discharged into the harbour without any treatment.
- Uncollected solid wastes from the city are dumped into gullies and stormwater drains, ending up in the harbour.
- Through port activities, both wastewater and solid waste from ships are discharged into the harbour.
- Releases into the Rio Cobre River and agrochemical use are also important sources of pollution to the harbour.

Through these activities Kingston Harbour receives a large amount of nutrients, organic matter, suspended solids, toxic compounds and other micro-pollutants (heavy metals, chemicals, oils and grease). This has led to a worsening of the eutrophication of the harbour, and the water quality is continuing to deteriorate. In addition, sedimentation from Rio Cobre and Sandy Gully causes severe degradation of Hunts Bay. The pilot phase project determined that there is not much biologically left in the Bay, and that sediments are so contaminated that they can be properly characterised as a net source of pollution to the Bay, even if other inputs of pollutants were cut off.

It has been reported that the deterioration of Kingston Harbour has been going on for about 30 years. This led to the progressive reduction of fishing use to practically zero levels and primary contact tourist use has disappeared from the beaches of the interior of the Bay (Sentar 1993; Villasol et al. 1997).

Several studies have been performed and remedial actions have been proposed, but so far relatively little progress has been made in implementing these actions, mainly due to a lack of financial resources.

NICARAGUA

The Bluefields Lagoon is located on the Atlantic coast of Nicaragua and has a surface area of 176 km^2 and an average depth of 1 m. It has been an atypical case in the Region, as it has not been affected by a strong industrial development which is incipient at the present time. The extension of the agricultural and cattlemen activities, without regulation and without a correct territory management in the Rio Escondido River Basin, has propitiated a pruning of considerable magnitudes. The problems caused by Hurricane Joan, which whipped the Region of Bluefields in 1989, caused an increase in the amount of settable material, altering the productivity of that ecosystem. This increase has caused a decrease in the fishing potential of the lagoon.

The riversides of the lagoon have deteriorated due to the presence of the solid wastes from the sources of pollution. The presence of organochlorine pesticide residue in superficial waters and the marine sediments manifests a dangerous contamination that facilitates, even in small concentrations, their accumulation through the trophic chain in species of high commercial value.

The outlet zone of the Rio Escondido River presented the higher incidence of this type of contamination–a logical result if we consider that one of the most important sources of introduction of these pollutants to the marine environment are the rivers. The corresponding results for the towns of Bluefields and the Bluff are second in order of magnitude. A high incidence of DDT is observed and of hexachlorocyclohexane possibly caused by the domestic use of these substances.

The maritime-port use has been equally affected due to the increases in sedimentation. This causes an increase in the expense associated with maintenance dredging of the channels, which are used for navigating inside the lagoon (Villasol et al. 1996).

VENEZUELA

Pozuelos Bay is located on the north coast of Anzoátequi State in Venezuela. It is surrounded by a complex of several islands, the widest steps being between Borracha Island and the Morro de Barcelona on the oriental coast. The Bay lacks direct fluvial contributions, but like the region of Barcelona and the zone between Meta and Pertigalete, it is subjected to the intense traffic of tankers that arrive at the six jetties of the CORPOVEN Company in order to discharge and load raw and refined oil products.

The Bay receives direct discharges of effluents from the inefficient water treatment systems of the Puerto La Cruz Refinery, the lagoons of ballast water from the jetties, and the treatment plants for urban wastewater from residential areas of Guaraguao and The Chaure.

An indirect form that affects the water quality of the Bay, mainly the Neverí River, are the Buenos Aires and B1 Barcelona pump stations with combined discharges of 106 of BOD5. In Guanta, through the same pump station, waters discharge up to 3.39x106 kg/d of BOD5 into Pozuelos Bay. Along the whole coast border, due to the strong development of urban-industrial activity and oil companies located in the zone, a remarkable degree of eutrophication and the presence of hydrocarbons of anthropogenic origin is observed.

One of the main risks to the ecological stability of the study area is caused by the high values of hydrocarbons discharged directly from the sewer and Puerto La Cruz pump stations and the 4860 kg per day that spill into the Bay from Barcelona and that indirectly could partially enter Pozuelos Bay.

The existing tourist development in the area stimulated the construction of wharves and breakwaters in order to increase the nautical activities, without evaluation of the environmental impact of these coastal structures. The consequences have been that tourist use has tended to diminish due to an increase in erosion processes occurring in the bay, which contribute to the deterioration of environmental quality (MARNR-IOV 1998).

DOMINICAN REPUBLIC

Santo Domingo Littoral, located to the south of the Dominican Republic, is an open coastal zone, delimited by Ozama River in the east and the Haina River in the west. The main infrastructures and economic activities are located on their margins and in the coastal zone. They include trade, industries, port activities and agro-industries. Industrial and domestic wastes are discharged directly, virtually untreated, into the coastal water. Here they are exposed to the action of marine currents and are quickly redistributed along the coast, with a growing deterioration in coastal waters and loss of their natural landscape.

The inadequate sanitary control has motivated an important reduction in the use of the coast, in particular tourist-recreational use–limiting primary contact at most of the beaches–and the nautical activity to the coast. Consequently, there has been a loss of value in goods and services.

The presence of residues of organochlorine pesticides (mainly lindane) in the surface waters along the coast stands out. In spite of the fact that their concentrations are not elevated, the marked influence of their own anthropic activity is demonstrated in the zone. Due to the great exchange of the waters with the oceanic water mass, there is a great dilution and removal effect of the pollutant loads arriving in the water column. The special physical-geographical conditions of this coastal zone show the high risk concern to this zone and the inevitable negative impact on the Caribbean Sea (García Galocha et al. 1998).

COSTA RICA

Puerto Limón Littoral is located in the city of Limón on the Caribbean coast and is the commercial and industrial centre of the Costa Rican Caribbean Region. Limón serves as a settlement for Costa Rica's main harbour on the Caribbean coast. At the same time, the Limón area is the centre for banana production in Costa Rica, and banana transportation dominates shipping activity in Limón Harbour. The plantations use large amounts of pesticides to prevent damage by pests to the banana crop.

Compared to the other project sites, as a non-enclosed water body like Santo Domingo Littoral, this zone is less contaminated because of the high dilution and dispersion characteristics of the contaminants and because of the relatively small population (73 000 inhabitants). However, some adverse impacts from sediments and sewage in the mouth of the rivers have been observed, as well as negative impacts on the composition of zooplankton from excess organic material. Measurable levels of pesticides emanating from the banana plantations have been detected in the waters of Puerto Limón. Some of these pesticides have also been identified in species in the National Parks included in this extensive zone.
The primary causes of increased pollution in the Limón region identified in the pilot phase include:

- inefficient solid and liquid waste management including the absence of proper treatment facilities, such as sanitary landfills. Hazardous waste management infrastructure is poorly developed, and only 50% of all solid waste in the region is collected, leading to the diffuse distribution of micro-pollutants to rivers, groundwater and the coastal zone;
- the discharge of untreated sewage, leading to local environmental and health problems in Puerto Limón;
- the direct discharge or insufficient treatment of industrial wastewater carrying micro-pollutants to the Caribbean Sea; and
- insufficient management of pesticides in the banana plantations, causing both health problems for plantation workers and the contamination of watersheds downstream from the plantations and international waters.

From all these activities there are discharges of nutrients, organic matter, suspended matter, oil and grease, heavy metals and organic micro-pollutants (e.g. pesticides). The Costa Rican Caribbean coastline (and the Wider Caribbean) is influenced by these contaminants. This coastline includes coral reefs and large wetlands with several endangered species. Some areas are today protected National Parks, mainly situated to the north of Limón (CIMAR-UCR 1998).

For instance, the reservation Gandoca-Manzanillo (Costa Rica) – a marine protected area located in the border with Panama – is affected by pollutants coming from Panama's agricultural activities. The estuarine zone of San Juan River, which flows between Nicaragua and Costa Rica, is another example of how the agricultural activities and the use of pollutants could have transboundary effects. Limón coastal area in Costa Rica is a place of high agricultural activity where pesticides are so widely used that local authorities are requesting Central Government intervention due to the great amount of residues entering the Caribbean Sea (CIMAB 1998).

PANAMA

The accidental spills of pesticides constitute a chapter on which there are frequent registrations. One happened in 1992 in the area of Dibalá, Chiriqui, where a spill of more than 4000 litres of chlorothalonil went into the Chiriqui Viejo River with high deterioration of the flora and fauna of the estuarine zone and serious damage to the marine organisms. In Panama, the deaths of fish, crabs, shrimps, turtles, crickets etc. associated with the environmental contamination by pesticides in the coastal zones of Panama and Costa Rica has been reported. Samples of fish from the Gulf of Chiriqui have revealed the accumulation of pesticide residues and the bioaccumulation of residues from sediments has been detected in maternal milk (CIMAB 1998).

TRINIDAD AND TOBAGO

The Point Lisas industrial estate and port are located on the west coast of Trinidad, bordering the Gulf of Pária. The rivers and marine areas receive effluents discharged from the adjoining industrial estate, and a sugar refinery and cement factory not actually located on the estate, as well as run-off from nearby human settlements and sugarcane growing lands.

The principal pollution problems found in these zones are as follows.

- Couva River at the weir shows high biochemical oxygen demand, as does the Brechin Castle River (which drains the sugar refinery) where chemical oxygen demand and total phosphate levels, particularly during the dry season, coincide with the operations of the Brechin Castle sugar factory. During the dry season, the Couva River at the weir and the Brechin Castle effluent channel can be considered grossly polluted by high BOD conditions leading to anoxia and low pH.
- Analyses of the ammonia-urea plant effluents indicate that ammoniacal nitrogen (NH3-N) exceeded World Bank stipulations while pH and temperature values were very close to the upper tolerance limits set for industrial wastewater.
- Temperature, pH, BOD, COD and suspended solids recorded in the methanol plant outfall exceeded plant specifications under normal working conditions, and the tolerance limits set for industrial effluents. This effluent was discharged into the Couva River. The levels of ammonia recorded in seawater samples from Couva Bay and Lisas Bay far exceeded the USEPA limit (1.1 μM).

- Temperature, pH and dissolved oxygen did not show wide variations within the Point Lisas marine area. Salinity variations were considered normal for tropical nearshore coastal waters. Physical parameters such as suspended and dissolved solids, pH, salinity and dissolved oxygen levels, were normal and did not differ significantly from previous studies.

The levels of dissolved and dispersed petroleum hydrocarbons (DDPH) appear to be higher for the offshore stations during the wet season. Although levels recorded exceeded the expected ambient levels (0.1 µg.L-1; Atwood et al. 1987) of DDPH in seawater, the levels never exceeded the USEPA limit (100 µg.L-1) for nearshore waters. The levels of petroleum hydrocarbons in the sediments of the Point Lisas marine area are naturally high. The Point Lisas area is located north of oil producing areas, which may be a contributory source of poliaromatic petroleum hydrocarbons (PAH) in these sediments.

The levels of zinc in the sediments, as in the seawater, were considerably higher than any other of the heavy metals analysed. Zinc in the sediments showed the opposite behaviour to zinc in seawater, that is, levels were higher in the sediments during the wet season.

It was generally felt that the work done under this project would provide input to a pollution control plan for the Point Lisas industrial estate and port rather than an environmental management plan for the whole Point Lisas area (IMA-CIMAB 1998).

Some preliminary studies carried out by the IMA in the Gulf of Pária show the influence of the Orinoco River in the environmental condition of this semi-enclosed area of the Caribbean Sea and recommend further research on that subject.

CUBA

Cuba has an integrated evaluation of the effects of the contamination along its coast and in the main bays. The model of development that existed in the first half of this century caused enormous damage to the environmental condition of the main bays. This was a product of a rapid increase in marine and urban development, without concern for the conservation of the existing marine ecosystems. Typical examples are the bays of Havana and Santiago de Cuba, classified as very polluted from the 1980s (UNDP-UNEP-UNESCO 1985), and despite the efforts carried out for their recovery, they continue to have the dubious title of being the most heavily polluted bays in the country (Villasol 1997; Beltrán et al. 1997). Havana Bay is the most important port in Cuba. It is surrounded by urban and industrial developments, which have a major impact on the quality of water reaching the Bay and distributed to the Wider Caribbean Sea. The average residence/turnover time of the water in the Bay is about 8 days.

The Bay receives about 48 000 m^3 of wastewater per day, carrying around 4800 kg nitrogen and 1200 kg phosphorus, resulting in elevated concentrations of nutrients. Studies show that the waters of Havana Bay are strongly affected by the dumping of sewage.

Havana Bay also receives suspended solids, hydrocarbons, heavy metals and other micro-pollutants from agriculture, industry and port activities. High concentrations of hydrocarbons and heavy metals have been observed in the sediments of the Bay, and degradation of the ecosystems is increasing.

The main sources of pollution to Havana Bay identified during the pilot phase are:

- Luyano River (organic material, nutrients, sewage, solid waste);
- the oil refinery;
- the Regla and Hacendados fish factories; and
- the fishing port.

The pollutants that enter the Bay also reflect negatively on the adjacent coast, particularly the presence of solids in suspension, heavy metals and hydrocarbons.

The study of the natural communities, especially of the fish fauna, has been used to demonstrate that there is regenerative potential and capacity in the ecosystem. This is necessary to diminish the daily pollution loads to levels that could be easily assimilated by the ecosystem and still allow their recovery (González et al. 1997).

The Bay of Santiago de Cuba, located on the south-eastern coast of the country, is the second most important port commercially and economically in Cuba. It is another example of competition between the continuous development of the region and an inadequate exploitation of the resource. Inefficient systems of treatment of the residual liquids exist as well as an obsolete sewerage system.

The Yarayó River contributes 56% of the fresh water, with 90% of the organic matter and hydrocarbons, heavy metals and nutrients constituting the main source of pollution in the Bay. Sewage affects some areas also. The interior lobe is heavily polluted, with a gradual improvement toward the mouth of the River.

Matanzas Bay, located on the north coast of Cuba, is a wide and open bay approximately 5 km wide at the mouth and extending 9 km towards the interior. The great depth and open configuration of the Bay favours the dilution of the pollutants.

The Zone of Beaches of East Havana City is an open coast and favours the dilution of the pollution loads entering from several rivers, sewers and pluvial drainage. Recent studies have determined that, in general, the quality of much of their waters, like the silts, is elevated. However, in the vicinity of some sources of pollution, especially the lagoon of the Itabo and the Guanabo Rivers, some deterioration is evident due to the continuous spill of sewage.

Another phenomenon of contamination in the beach zone is the constant arrival of clots or tar balls from ship waste thrown into the ocean from the intense marine traffic of hydrocarbons in the zone of the Florida Strait (Palacios et al. 1997). A similar effect could have been observed to the west of Havana City (Marina Hemingway).[4]

A focus of the contamination is the Colector de Playa del Chivo, located on Havana's north shore and very near to the Bay, which collects wastewater from 1.5 million of the city's inhabitants. A recent study determined a severe effect along the coast down to the 20 m isobar. The pollutants that most contribute to the adverse conditions are ammonium and total phosphorus.

Significant values of toxic substances were detected in the waters and at the surface, with a marked chronic character (fossil hydrocarbons and heavy metals, fundamentally Cu, Pb and Zn, and organochlorine pesticides), diminishing in relation to the distance from the point of emission. The contamination in Havana Bay has a marked influence on the zone. The zone of influence of this collector doesn't reach more than 500 metres, demonstrating great dilution power (Garcia Galocha et al. 1998).

A significant example of adequate management of a coastal resource is the case of the Bay of Cienfuegos on the south coast of Cuba. In this Bay, during the last three decades, there has been a rapid increase in industrial development, fertilisers, a thermoelectric plant, fishing and an oil refinery, as well as other small and medium industries.

Cienfuegos is considered the third most important port in the country. Due to the existence of a respected Environmental Handling Plan, it has been possible to maintain the fishing use of the bay and increase the tourist-recreational use, while maintaining the levels of environmental quality. There are some problems in the vicinity of the outlet of the Salado River as far as Majases (Villasol et al. 1989; Beltrán et al. 1994).

4. Studies carried out by Levy et al. 1981, demonstrated that the high incidence of these substances on the Caribbean beaches originated from the high traffic of tankers in the region, mainly from the Strait of Florida and the Gulf of Mexico. Vleet and Pauly (1987) arrived at similar conclusions after two years of uninterrupted observation and they expounded a classification for zones of risk for the distribution and abundance of the balls of floating tar (Pelagic Tar) in the Caribbean Sea, locating the Cuban coast as the recipient of this pollution.

The coastal zone that includes Cardenas Bay and Varadero Beach, located on Cuba's north coast, is another example of the possibility of developing highly competitive uses where an Integrated Development Coastal Zone Plan has been defined and executed. In this zone, in an area close to oil prospecting and exploitation, and one that developed rapidly, are the most important tourist centres of the country.

This has been achieved due to the efforts of the responsible institutions, whose investigation teams and the environmental administration in the zone worked in close coordination with the companies entrusted to carry out the Region's integrated development.

BARBADOS

A good example of integrated coastal zone management exists in Barbados where planning authorities have been able to maintain and increase industry development and tourism (pers. comm. to A. Villasol from V. Santiago and M. Alepuz).

Some Considerations for Sustainable Development Potentialities in the Caribbean Region Coastal Zones: Lessons Learned

Reaching sustainable development is vital for the countries of the Wider Caribbean Region. There is a requirement to establish mechanisms for medium and long-term planning. Much has been said about the environmental dimension of incorporating this into planning, but planners, scientists, technicians and politicians have to be capable of making an effort to maintain harmony between the economic and social activities and the earth value.

If this is achieved, definitive steps will address the sustainable use of the natural resources and the fight against contamination.

When talking about the Caribbean, and the fragility of its ecosystems, it is necessary to reiterate the environmental concepts, in many cases forgotten in the search of economic development at any cost.

Six basic ecological norms needed to achieve environmentally appropriate management of the coastal ecosystems must always be kept in mind.

1. Solar light is the primary energy source of the coastal ecosystem.
2. It is necessary to maintain the appropriate operation and the protection of the systems.
3. It is necessary to maintain an appropriate contribution of nutrients to coastal ecosystems.
4. It is necessary to maintain the quality and stability of the natural system of water circulation.
5. It is necessary to maintain the appropriate operation and the protection of the energy storage.
6. It is necessary to respect the structural integrity and the necessary conditions of the vital area in the coastal ecosystems (interior lagoons, wetlands, estuaries, algae and seagrass banks, routes of migration of species, the dunes and the coastal bars).

Experience demonstrates that, in the Wider Caribbean Region, it is not easy to achieve these basic ecological norms with the changes of use that take place in the coastal zones. The advance of civilisation and the economic development of our countries could not be sustained by the use of renewable resources alone. It is an inevitable necessity that certain types of resources that are not renewable are used, and in future are substituted by another. Here there exists the old necessity for true cooperation between the developed countries and the developing countries.

This is necessary in order to achieve environmental management of the coastal zones in the Region, efficient economic support and international cooperation directed to the Caribbean countries, with immediate access to clean technologies and training of the human resources. These are indispensable factors if we really want to achieve advances in this field.

However, knowing the socioeconomic characteristics of the Region, we are convinced that the actions required in order to achieve integrated resources management of our coastal zones should go beyond the rhetoric, or else we risk the present situation continuing and we lose the potential that the coastal resources signify for the economic development of the Caribbean Region.

In order to achieve this, more than help is necessary. There is a need for committed cooperation (rather than confrontation, and the search for our own benefits), solidarity and the exploration of common benefits for all.

A Caribbean Sea restored to its original glory, the elimination of the threat to marine life, the preservation of the coasts and beaches of the Caribbean, improved handling of solid waste, and a recycling industry, is what all aspire for the Wider Caribbean Region and could be possible given their recent condition of 'special zone' (OMI 1997).

LESSONS LEARNED

The same problems do not exist in all cases, nor is the same solution necessary, but the main learned lessons are as follows.

- Proactive coastal planning could anticipate the contamination, even with competing uses. The examples of Varadero in Cuba and Barbados demonstrates this.
- Several studies carried out in some countries that use pesticides freely, have demonstrated the influence and effects of this type of pollution far away from the application area.
- Normally, weak institutional and legislative frameworks exist, or there is a lack of regulation enforcement.
- Lack of financial resources, either for research or interventions.
- Where a lack of, or weak authorities exist, environmental matters are often missed.
- Insufficient integration of sectoral and central institutions. Interinstitutional agreements were effective when used.
- Regional coordination and cooperation may be improved. Local technical and scientific capacities can be used at the regional level.
- Lack of human resources and infrastructure. Graduate and postgraduate courses on coastal environmental management must be sponsored.
- Lack of information on environmental conditions. Oceanographic information is weak and poorly used in comprehensive assessments.
- Weak environmental framework and capacity at the municipal level.
- Lack of environmental awareness.
- Lack of incentive structures.
- There are insufficient studies on the effects of marine coastal pollution of the open sea.
- The question of the management of domestic wastes is a priority. Where treatment plants exist, they generally don't work. The installation of submarine outfalls is an alternative for the Region that must be studied carefully.

PROPOSED ACTIONS

At the present time in the Caribbean Region there are five projects of regional character, in various stages of execution or preparation–which in one form or another were conceived for the protection and improvement of the quality of the heavily polluted marine-coastal ecosystems of the Region. These are sustained mainly by the experience accumulated during the years of work for the CIMAB. The authors, executioners and consultants in several of the previous projects on planning and environmental management of heavily polluted bays and coastal zones of the Great Caribbean Region, will work directly or indirectly in ten countries in the Region.

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Session 4 Report: Pollution Control

Executive Summary

Land-based activities including pollution were reported to be one of the causes of concern to the marine protected areas. The lack of appropriate legislation in regulating agricultural practices and the use of pesticides, limited jurisdiction to the Great Barrier Reef Marine Park Authority over the control of the land-based activities, weak implementation of legislation, and non-involvement of marine management agencies in project formulation processes were specified as major constraints in the Great Barrier Reef area. Development of an integrated management plan with legislative back-up was mentioned as a major initiative for the protection of coral reefs in the Florida Keys National Park Area. Lack of adequate human resources, institutions, environmental awareness and data to study the impact of pollutants, and weak implementation of legislation were identified as the major areas that need to be addressed in the Caribbean region.

The workshop emphasised the need for the following to minimise the impact of land-based activities, especially pollution, for the protection of coral reefs and associated ecosystems in marine protected areas:

- adoption of a watershed approach with legislative backing for dealing with non-point sources of pollution;
- active participation of stakeholders and the community in the ICZM process;
- proper coordination among implementing agencies; and
- capacity building and adequate funding to implement ICZM projects.

Discussion/Additional Comments

- We do not seem to be able to learn from the mistakes of others and apply these in places where the 'catastrophe' has not yet happened (i.e. avoidance vs. restoration).
- Unfortunately there are no good examples of successful responses to the common problem.
- Independence in assessment and monitoring through greater accountability (e.g. more community involvement; developer pays but authority assigns who will undertake the work).
- Greater accountability generally (i.e. transparent processes, accessibility).
- Terms of reference need to be set by all affected parties, including the community–and be done early–and be subject to public scrutiny and review.
- Regulation must be part of the package.
- Issues are often the outcome of much larger economic factors/systems which drive development–dealing with the symptoms. Maybe we need to look at different measures/indicators of economic wellbeing.
- Science to address management issues and managers to address their questions in scientific terms (i.e. greater focus on directing research to management issues).
- While it is important to have decision-makers at the table–this can stifle innovation–we need mechanisms to allow innovation to surface without leaving decision-makers behind.
- Basis of ICM (Integrative Catchment Management) to achieve outcomes which are for the benefit of 'ALL' not 'SOME'.
- We need to recognise that the ecosystems we are dealing with are large and complex–the whole of catchment-reefs approach must be taken: i.e. it is no use regulating fish takes if we are not protecting and managing the fish habitat and nursery area, and if the water quality is not managed. Also, marine ecosystems include the land catchments that feed into them.
- More scope to look to what incentives and other non-legislative mechanisms can be used to encourage the desired outcomes; address what is stopping the stakeholder and industry groups and individuals from responding to clear information about the environmental effects of their activities.
- Need to agree on a minimum of basic measures that need to be undertaken to raise standards and address issues e.g. stormwater management, land acquisition programs, but must recognise that the whole of the community must be prepared to carry the cost of this and direct resources to such approaches.

- Encourage collaborative stakeholder working groups to work together to put agreed innovative suggestions forward to decision-makers to solve environmental issues.
- Realise that in some cases stakeholders with the power to make decisions can inhibit innovative solutions because of the requirement to follow 'party lines'.
- Stakeholder participation needs to be guided by a clear sustainability mandate. These may need to be adequate checks and balances.
- Fundamental problem is that governments seem only to be able to respond to crises. Therefore, problems have to reach crisis stage before they are probably addressed–very difficult to adopt a precautionary approach.
- There is a need to promote more benign treatment approaches to wastewater treatment including the use of technologies which allow re-use (as long as environmental concerns are met).
- Private land holders and private resource users need to take more responsibility for their actions and be more accountable to the broader community.
- The session acknowledged that it had focused predominantly on issues and approaches in developed countries/economies. Need to recognise that the situation in developing countries is likely to require other approaches which can take account of the lack of financial and other resources that exists in developing countries to respond to environmental issues.

CATEGORIES USED FOR LESSONS LEARNED

I Integrated Management, Coordination, and Linkages to other Initiatives, Programs and Instruments
S Stakeholder Partnerships
P Public Awareness and Education, including capacity building
D Data and Information for Management

LESSONS LEARNED

SHERIDAN MORRIS-WATER QUALITY MANAGEMENT INITIATIVE	I	S	P	D
Without direct jurisdiction, the capacity of GBRMPA to influence catchment development is limited in the short term. However, research and education appears to offer some management success for the future.	X		X	
Ongoing research and monitoring can be used to abrogate the responsibility to manage sustainably.		X	X	
Without political will, the enforcement of existing legislation is weak and often ineffective.	X			X
Legislation and policy must be flexible to account for changes in technology.	X			
Marine management agencies need to become involved early in the policy and project development stage.	X	X		
Link monitoring into a feedback management loop with workable compliance.	X			
Without community support and understanding of reef management, the short-term economic gain for a select few will dictate the form and speed of catchment development.		X	X	
There is a necessity to negotiate the issues on a face-to-face basis with land managers and developers.		X		
Utilise research as an extension and education tool and involve the target group in this process.		X	X	
Engage downstream industries.	X	X	X	
Don't assume that land-use managers will necessarily act upon credible scientific outcomes.	X			X
Research into cumulative impacts requires further development.				X
Engage the general community through non-government organisations.		X	X	
Predictive mechanisms used to determine future impacts currently lack credibility and community support.		X	X	

BILLY CAUSEY–THE ROLE OF THE FLORIDA KEYS NATIONAL MARINE SANCTUARY IN THE SOUTH FLORIDA ECOSYSTEM RESTORATION INITIATIVE

Establish a comprehensive boundary for the ecosystem based on natural and physical processes and not political or jurisdictional boundaries (barriers).	X	X		X
From the outset apply the principles of ecosystem-based management in the planning process.	X		X	X
Use a public process to establish ecosystem management objectives and restoration goals based on our best understanding of the concept of sustainability.		X	X	
Utilise an adaptive management process and, in the absence of information, use the best science available upon which to base decisions.		X	X	
The planning process must be supported with analytical and technical expertise.				X
Establish an integrated planning process but do not let the rigour of the process dominate the activities.	X	X	X	
Bring all levels of government to the table for the planning process, from the local and regional level to the state, territorial, tribal, and national level.	X	X		
Focus on ways to implement effective ocean governance within the confines of existing authorities, but be open to new legislation when necessary.	X			
Recognise from the outset that humans are a part of the ecosystem and that our activities, or the effects of our activities, cannot be separated from any holistic approach to management.	X	X	X	
Although we continue to struggle with a true definition of sustainability, we continue to apply the spirit of what we collectively think as a sustainable approach on the most conservative side of management principles.	X			
Invest heavily in outreach efforts at all target audience levels with the recognition that the environment and economy are linked at the outset of the project.		X		
It is absolutely essential to bring socioeconomic information into the planning process as a foundation for informed participation at an early phase.	X		X	X
Utilise the concept of marine zoning in the management planning process.	X			X
Listen to, and attempt to understand all points of view in an ecosystem management planning process.		X	X	

MANUEL ALEPUZ–INTEGRATED MANAGEMENT OF BAYS AND COASTAL ZONES IN THE GREATER CARIBBEAN REGION: FACTS AND NEEDS.

Proactive coastal planning could anticipate the contamination, even with competing uses.	X			
Several studies carried out in some countries that use pesticides freely have demonstrated the influence and effects of this type of pollution far away from the application area.			X	X
Normally, weak institutional and legislative frameworks or the lack of regulations enforcement exist.	X			
There is a lack of financial resources, either for research or interventions.				
Where there is a lack of or there are weak port authorities, environmental matters are often missed.	X	X		
There is insufficient integration of sectoral and central institutions. Inter-institutional agreements demonstrated effectiveness when used.	X		X	
Regional coordination and cooperation may be improved. Local technical and scientific capacities can be used at regional level.	X		X	

Lack of human resources and infrastructure. Graduate and post-graduate courses on coastal environmental management must be sponsored.			X	
Lack of information on environmental conditions. Oceanographic information is weak and poorly used in comprehensive assessments.	X			
Weak environmental framework and capability at municipal level.	X		X	
Lack of environmental awareness.			X	
Lack of incentive structures.	X			
There are insufficient studies on the effects of the marine coastal pollution in the open sea.				X
The question of the management of domestic wastes is a priority. Where treatment plants exist, in general they don't work. The installation of submarine outfalls is an alternative for the Region that must be studied carefully.			X	
Ecosystem evaluations have not been undertaken and yet they are necessary for politicians and decision-makers.			X	

SESSION 5: Protected Areas and the Private Sector

Chair: Anthony Hooten
Rapporteurs: Adrianne Waterman, Nancy Daschbach
Presenters: Kelly Robinson, Stephen Colwell, Sibylle Riedmiller

ITMEMS 1998 Proceedings

Sustainable Coastal Tourism in the Caribbean and the Private Sector Perspective

Kelly F. Robinson

Caribbean Tourism

The Wider Caribbean encompasses an area that includes 12 continental countries bordering on the basin and 14 island nations, as well as seven dependent territories. Within this Region is found a variety of people, cultures and political systems representing countries with different types and stages of economic development. French, Dutch, English and Spanish are the common languages of the Region, while a mix of Creole is found intermittently.

Generally speaking, tourism is the largest single source of foreign exchange earnings in much of the Wider Caribbean. According to a report issued by the World Travel and Tourism Council in 1995:

- more than 500 000 people are employed in the tourism industry in the Caribbean, which means one in every four jobs;
- tourism accounts for roughly 25% of exported goods and services, which contribute 31% of the Gross Domestic Product–the largest relative producer of travel and tourism in the world;
- in 1995 the Region earned US$11.8 billion of foreign trade from overseas visitors;
- over the next decade an estimated 36% increase in tourist arrivals is anticipated;
- In the Caribbean, travel and tourism has the potential of expanding 70%, creating 2.2 million jobs by 2007;
- scuba diving is an increasing valuable attraction in the Caribbean, which provides 57% of scuba diving tours worldwide;
- An estimated US$1.2 billion will be earned from scuba diving alone by 2005.

Nationally, there are economies that are wholly dependent upon tourism.

- In 1988 Jamaica reported that the tourism industry was the largest source of foreign trade, representing 23% of the country's hard currency receipts.
- 70% of the Cayman Islands' economy is dependent upon tourism.
- Antigua and Barbuda are almost completely dependent upon tourism.

Many governments, whose primary economic activity was traditionally agriculture or manufacturing, are now turning to tourism as it is a labour-intensive industry and provides high rates of foreign exchange. Although tourism has recognised environmental and social impacts, it is generally perceived as one of the few alternatives for economic development in many of these developing countries. The past several years have witnessed explosive growth in the region's tourism. Many countries have embarked on massive hotel construction programs. It is estimated that the number of rooms in the Caribbean will double in the next seven years.

The tourism product in the Wider Caribbean is largely dependent upon the natural resource base, that is, the physical environment. The traditional marketing approach of selling 'sand, sea and sun' has created a mind-set that has resulted in the concentration of tourist facilities in the coastal areas of the islands and continental Americas.

The concentration of these tourism facilities and activities in the coastal area, and the increasing dependence of Caribbean economies on tourism earnings, means that the tourism industry, as a sector of the economy, makes the greatest use of coastal and marine resources.

Caribbean Environment and Impacts

There is a high degree of diversity in the Caribbean, in its living species and habitats. In the case of the islands, there is also a high degree of endemism, induced by geographic separation. Fifteen per cent of the world's reef systems are found in the Caribbean Sea and the scientific community has been raising concerns over the serious decline of these reefs which have been identified as being at one of the greatest risks.

According to a 1988 study of US Parks Department and Organization of American States, there are 135 legally established Marine Parks and Protected Areas in the Greater Caribbean Basin. However, like elsewhere on the planet, they are predominately understaffed, under-financed and dependent upon the whims of ever-changing political governance.

Studies conducted under the auspices of UNEP and USAID have identified the environmental problems affecting the coastal and marine resources of the Wider Caribbean as:

- deforestation;
- erosion and sedimentation;
- beach and dune destruction;
- pollution;
- dredging;
- coastal land reclamation; and
- overfishing.

Environmental impacts caused specifically by tourism can be categorised as follows.

Construction

- landfills
- dredging
- building on shoreline and steep slopes
- drainage
- sand mining
- inappropriate design

Operational

- sewage and solid waste disposal
- boat maintenance
- beach maintenance
- guest consumption patterns

Recreation

- scuba and snorkelling
- yachting
- sport fishing
- jet skis/sand buggies
- night-life

These impacts result from, or are exasperated by:

- inadequate policy or design framework;
- ineffective planning and monitoring systems;
- inadequate institutional capacity; and
- low sensitivity or awareness on behalf of the resource users

Furthermore, a 1990 study by the Pan American Health Organization revealed that, due to the lack of sewer systems in the Region, half of the wastewater treatment plants operated in the Caribbean are owned by the tourism sector and 74% of these systems do not comply with the selected criteria for good operation. Only 8% of the plants operated by hotels and resorts employ a certified operator. The management of most is delegated to the gardener or maintenance man.

Partnerships for Sustainability

In recognition of the importance of tourism to the Region and the importance of the environment to tourism, the Caribbean Hotel Association (CHA) initiated an environmental program through a volunteer committee. The Association is a trade organisation comprising over 1200 hoteliers, 700 suppliers, and various government organisations, encompassing 34 countries and spanning from Bermuda in the east to Cancun in the west. Whilst the activities of the volunteer committee helped bring environmental issues into mainstream awareness, the CHA lacked the human and financial resources necessary to institutionalise its activities.

It was therefore decided to seek support from within the industry. A call was made and an elite group of industry leaders banded together to create a Governing Council for the Caribbean Action for Sustainable Tourism (CAST).

The Governing Council is a diverse group whose varied interests will help to achieve an interwoven fabric of sustainability and guarantee that measures taken by hoteliers are not kept in isolation, but extend the full gauntlet of tourism activities. This group commits a quarter of a million dollars annually to ensure the continued prosperity and environmental health of the region by creating a pro-active industry coalition whose principle focus is the development of sustainable tourism.

The Caribbean Action for Sustainable Tourism is a non-profit organisation chartered in 1997. It undertakes collaborative environmental activities within the hotel and tourism sector, promotes effective management of natural resources and provides access to expertise in sustainable tourism, assisting hotel and tourism operators in the Caribbean region to achieve the goals of Agenda 21 for sustainable development.

CAST is the key link to the private sector in communicating challenges that impact the sustainability of tourism and the Caribbean region. CAST identifies and promotes solutions for addressing these challenges to industry policy makers, and owners and operators of hotels and tourism businesses.

Stakeholders include government bodies at the ministerial levels in tourism, health, agriculture, environment, and planning. Private sector leaders also share a large responsibility in working in collaboration with government to ensure programs that are viable and effective and adapted by their industry colleagues. Working together with regional conservation organisations, monitoring and surveillance schemes have been created which equally divide responsibility for adherence to legislation and guidelines. Through its activities and programs, CAST is a conduit for parties interested in sustainable tourism development.

Such groups comprise the Technical Advisory Committee that is composed of organisations and institutions who are engaged full-time in environmental activities. This group forms individual relationships with CAST and assists the Director in delivering CAST's programs, while carrying forward their own agendas. Collaboration with these organisations and institutions allows CAST to provide credible information and programs for its members.

The establishment of CAST has allowed the private sector to:

- create a unit within the industry association with three full-time staff positions and four retained consultants who are specifically dedicated to environmental programs for tourism;
- create strategic partnerships with regional scientific and environmental organisations;
- solicit private sector funds as a means to promote corporate images; and
- create a conduit for multilateral funding agencies that seek to work with the private sector in the areas of tourism and environment in the Caribbean.

Actions

As a child organisation of the Caribbean Hotel Association and with an audience of 1200 tourism operators in the region, the majority of CAST's activities have focused primarily on tools, materials and training programs designed for hotel operators.

Under the auspices of a grant from the United Nations Environmental Programme in Kingston, with funding from USAID in Jamaica, CAST undertook several tasks in the development of the Caribbean Environmental Network Project. The purpose of the project was to reduce the negative environmental impacts caused by tourism on coastal and marine resources by promoting greater collaboration and coordination of coastal resource management activities with the tourism industry, and the implementation of corrective actions by various interest groups.

The actual outputs included:

- reports on the degradation of coastal and marine resources, including best methods and approaches to address the problem;
- a regional plan of action outlining the proposed actions to be taken;
- the establishment of a tourism industry environmental network designed to disseminate information and provide leadership;
- a cadre of persons (planners, engineers, tourism industry and government representatives) trained to undertake coastal management; and
- the design and implementation of four pilot projects.

Under this grant, CAST was able to create a network of 250 regional organisations which includes Ministries of Tourism, Ministries of Health and Environment, NGOs, and hoteliers. The network is used to distribute four quarterly copies of Green Hotelier Magazine, monthly issues of the CAST newsletter (BroadCAST), and an electronic mailing list that highlights information relative to sustainable tourism. A website linking the various stakeholders has been created to facilitate the provision of information and the promotion of organisations.

The printed publications solicit information from all members of the network and provide a platform to exchange information between the tourism industry and scientific community.

The network provides a database of concerned organisations and is strategically placed within the private sector. This database formed the participant list for a regional meeting on the development of an Environmental Action Plan for the Tourism Industry. The meeting convened stakeholders from all sectors and provided a platform for dialogue between the various groups. The facilitated meeting resulted in a Plan of Action that identifies steps to be taken by industry for the further development of sustainable tourism. The plan is organised into seven priority areas, one of which is Coastal Zone Management. This collaborative effort allowed all sectors to participate in the development of the plan and identify their role in its implementation.

Several manuals were published specifically for hotel operations. They include an Environmental Management Toolkit which is an operational guide of recommended best practices for hoteliers and is broken down into departmental sections, allowing each department to quickly identify the actions to be taken. The Toolkit includes chapters on Beach Management, Recreation and Entertainment, and Resource Management. The Toolkit is currently being translated into Spanish and French.

Additionally, a Green Resource Technology Guide was created to identify those technologies most appropriate for use in Caribbean Hotels. Buying specifications for equipment such as wastewater treatment plants, environmentally friendly cleaners and detergents, laundry water re-use systems, drip irrigation systems, and even solar panels are included in the Guide. An annex to the Guide is a list of suppliers in the Region who provide the equipment. The addition of this suppliers list allowed us to sell advertising which resulted in US$5000 revenue. We foresee this being an ongoing activity and a guide that we can update yearly. Furthermore, a second annex of environmental groups working in the Region was included with a description of their areas of activities. The idea was to create relationships between hoteliers and NGOs to develop monitoring and environmental education programs.

Recently completed are the Best Practice Case Studies. The Caribbean Hotel Association instituted, with support from American Express, a Green Hotelier award that recognises those hotels that have made a significant effort towards good stewardship of their surrounding environments. The awards are divided into four categories: stewardship, awareness, conservation, and community integration. The awards have gained prestige and recognition from the hotel industry and after four years, are highly sought. A study of the actions of the past four years' award winners was undertaken in order to promote those actions which have proven effective to the industry. This proved to be an effective strategy as the initiatives recommended had already been implemented in local hotels. The Case Studies are complemented by three overviews on Marine Parks, Tourism, and the Environment. The overviews sought to bring to light the importance of marine protected areas and the tourism industry's role in supporting them.

Eventually it became apparent that, until a benchmark for recognition was established, it would be difficult to monitor change. Whilst geographical differences result in a myriad of programs and activities in different hotels, it is necessary to establish a standard by which all participating hotels can be evaluated, especially when considering that the most attractive aspect of environmental programs for hoteliers is the perceived marketing advantage. The development of an eco-label or logo would be advantageous in recruiting more hotels into the program. To further this idea, an evaluation of existing labeling or certification programs is being undertaken. Amongst others, ISO 14000 is being examined to identify which program would promote to the greatest extent activities to mitigate the recognised environmental impacts caused by hotels. It must therefore address wastewater management, chemical use and environmental education.

If thoughtfully advised, tourists will respect environmental controls and regulations. However, the primary danger to the environment comes not from tourists or established operations, but from the flawed development process that must be accepted as the responsibility of the region's governments and private sector to correct. The overwhelming bulk of tourism development is taking place without environmental assessments having been prepared. With thousands of rooms under construction, the pitfalls as well as the opportunities must be evaluated.

To address this challenge, the United Nations Environmental Programme pledged a grant to CAST to support the Specially Protected Areas and Wildlife Regional Program (SPAW). The SPAW project is a response to the Cartagena Convention, Agenda 21, adopted at the Earth Summit in 1992, and the Regional Agenda for Action of the International Coral Reef Initiative (ICRI) developed in Jamaica in 1995. This project sought to improve the technical capability of the Wider Caribbean region to prevent and control pollution caused by the tourism industry and to encourage regional cooperation among public and private sectors.

UNEP granted the funds under the Conservation and Sustainable Use for Major Coastal Ecosystems in the Wider Caribbean Project to undertake the development of a training course on the Siting and Design of Tourism Facilities. Two one-week workshops, one in English and the other in Spanish, were coordinated. Sponsored participants included government officials in the areas of Tourism, and Town and Country Planning. Paid participants included private sector developers, hotel owners and chief engineers. The workshop focused on the importance of major ecosystems, impacts to those ecosystems caused by tourism, siting and design methodologies to mitigate impacts, legislative mechanisms for enforcement, and appropriate technologies. A manual was created to support the training and is currently being edited for reproduction and distribution.

A further training program on the Maintenance and Operation of Wastewater Treatment Plants was undertaken in collaboration with the Caribbean Environmental Health Institute (CEHI). The Institute is a scientific organisation founded by the Ministries of Health of the Caribbean Community that undertakes training, the collection of data, laboratory services and research. This public/private partnership allowed the expertise of CEHI to be accessed by hotel operators and owners. The one-week course provided guidance in the selection, design and operation of wastewater treatment plants for hotels. Presentations were complemented by on-site evaluations of several local facilities. A manual in both Spanish and English is currently being produced.

Impacts, Successes and Lessons Learned

- Private industry is willing to support environmental initiatives when they can identify tangible benefits to themselves. Benefits can include an improved corporate image, competitive marketing advantage, reduced operating costs, compliance with environmental legislation, or products and services. CAST has been successful in identifying the benefits of participation to several distinct entities.

- The creation of CAST as a private sector entity has been advantageous in that the industry is receptive and open to an organisation that it perceives as 'one of its own'. The identification of necessary materials and tools is undertaken by industry representatives, as opposed to the scientific community, which results in practical guides and manuals, as opposed to academic studies or reports. Environmental consultants or scientists are of course contracted to provide the technical input, but the materials are reviewed before publication by independent hoteliers to ensure that the language, format and context are relevant to day-to-day operations. Once developed, there is an already existing network through the hotel association to disseminate the materials, normally at a cost.

- Other tools, such as the newsletter and Green Hotelier magazine, are open to all groups for publication of articles of interest. Technical input is supplied by those who have expertise in a particular area or field. These organisations perceive a value in contributing as it allows them to place their organisational names and principals in front of a group of industry leaders. Subscriptions to NGOs are subsidised by the fees paid by hoteliers.

- As tourism is the economic engine of the Region, most groups have identified it as a vehicle through which they can achieve their own interest or goals. Thereby, CAST provides a conduit through which they can work. The collaborative development of the private sector Environmental Action Plan is an example of this. Already established programs and activities are included in the Plan and regional entities have been identified to undertake specific aspects of the Plan.

- Training courses provide opportunities for continuing education and networking. It is an effective vehicle through which to promote ideals and practices. However, they must be continual. While CAST will continue to deliver the training at a fee to developers, architects and hotel operators, a public sector counterpart must undertake the responsibility of delivering training to government officials.

- The Town and Country Planners who did participate indicated that they were at a strong disadvantage as industry is growing at an accelerated rate with which they can not keep pace. They also expressed frustration over the disregard of environmental legislation, such as the requirement for EIAs, by planning committees because of pressure from governments to attract developers. The EIAs are perceived principally as simply an obstacle to progress.

- It was generally felt that a quantitative analysis of the financial implications to both operators and national economies would be needed to provide incentives for the appropriate siting and design of tourism facilities.

The Future

Currently, UNEP, CAST and the Caribbean Tourism Organization (an association of Ministers of Tourism throughout the Wider Caribbean) are considering the development of sustainable tourism indicators for the Region. The development of these indicators would help to gauge the success of environmental initiatives within the Region. Perceived indicators would include measured levels of pollution at monitored sites, implementation of land-use zoning restrictions, the proportion of coast line which is developed, real prices of local fish, the destination of sewage and its degree of treatment, investment in sewage collection/treatment/disposal facilities, the number of protected areas, and the establishment of carrying or density capacities.

Although the World Tourism Organization has developed sustainable tourism indicators globally, they have yet to be implemented on a national or regional level.

Additionally, we wish to pursue the establishment of a certification course for wastewater treatment plant operators and a licensing program for plants in collaboration with the Caribbean Environmental Health Institute and the Pan American Health Organization. The certification of operators would increase the level of technical competence in the hotels, and strive to promote adherence to the recently published effluent standards of UNEP and CEHI. The licensing of facilities would mandate capital investment in wastewater treatment plants.

Most notable, however, has been the award of a grant by the Multilateral Investment Fund of the Inter American Development Bank for the development of operational standards within hotels. The project will identify standards through a collaborative effort of hoteliers, Ministries of Environment and Health, tour operators, and national promotion boards. Once established, hotels will be trained against the standards, and those that achieve compliance will be recognised by a branding system. Over US$300 000 alone has been earmarked for the marketing of the brand to tour operators and consumers, bringing into focus, again, the importance of a competitive edge for hoteliers.

Potential activities could also include the establishment of reef monitoring programs through dive centres located in hotels, and the training of beach recreation staff about conservation practices for mooring buoys, snorkelling, boat maintenance and environmental education.

Dive-Tourism and Private Stewardship of Small-Scale Coral Reef Marine Protected Areas

Stephen Colwell[1]

Abstract

Dive-tourism has the potential to help protect or to destroy nearby coral reef habitats. This paper explores the activities of two dive resorts that became de facto managers of small-scale Marine Protected Areas (MPAs), and suggests that commercial partners, such as dive resorts that have a vested economic interest in promoting abundant marine life, can become the primary stewards of small-scale MPAs in a limited number of coral reef areas.

Case Studies: Protected Areas and the Private Sector

Introduction

Tourism in coral reef areas is often viewed, at best, as a necessary evil. The potential negative impacts of tourism are well chronicled and include: sediment from coastal construction; clearing of mangroves; nutrient loading from sewage and fertiliser run-off; overfishing or harvesting to serve the visitor demand for seafood; dredging or blasting to make marinas or channels; and damage from improper forms of boating, anchoring, diving or other recreation on the reefs.

The primary acknowledged benefit of tourism is the ability to provide a source of income and foreign exchange in areas that often lack both. Even this claim is sometimes challenged, however, because substantial 'leakage' often means that most of the economic benefits are not realised by those living in the coral reef area.

The following case studies suggest that there is a potential for dive-tourism to provide more than just economic benefits. Dive resorts may provide direct stewardship for small-scale marine protected areas and can play an important role in conserving local coral reefs. Small-scale, MPAs, where commercial entities such as dive resorts provide the primary stewardship of local coral reef resources, are referred to in this paper as 'Entrepreneurial MPAs'.

Case Studies

CASE STUDY 1: THE EL NIDO RESORT, BACUIT BAY, PALAWAN, PHILIPPINES

Although blast fishing, cyanide fishing and other types of destructive fishing practices are banned throughout the Philippines, they are still practised with devastating results in the once fertile coral reef habitat in the north-west corner of Palawan Island. Because this is an isolated area, far from the reach of most regional or national authorities, enforcement of marine conservation regulations is limited. The only areas that are regularly patrolled are those within an easy boat ride of the El Nido Resort, a Japanese and Filipino operated luxury dive resort in Bacuit Bay, Palawan. There is little scientific data to prove the long-term impact of the El Nido Sanctuary on the nearby reef ecosystems, but the anecdotal evidence indicates that the Sanctuary has some of the healthiest reefs in the Region and that, without the Resort, the Sanctuary would be nothing but a 'paper park'.

The Sanctuary has been patrolled for the last decade by the resort's employees (some of whom have been deputised as Sanctuary wardens). The steady stream of boats for dive trips and marine taxis to a sister resort makes it difficult for blast fishers or others to operate unobserved. As a result, the reefs within the patrolled areas are in relatively good condition and a fair variety of reef fish and other marine life can be observed in all stages of maturity. Near the Sanctuary's boundaries, the effects of cyanide and blast fishing are evident in large areas of standing dead coral and rubble with minimal marine life; the majority of the fish that can be found are juveniles. At night, you can see the lights of fishing boats encircling (but not entering) the patrolled area.

1. Executive Director, The Coral Reef Alliance (CORAL)

Although some of the employees/wardens have been threatened and even shot at, there appears to be substantial support for the Sanctuary within the local communities because a good percentage of islanders living near the Resort are actually employed by the Resort. In recent years, the majority of poachers identified have been from other islands and other countries, not from the local communities.

El Nido provides one example how a resort can function as a de facto steward for an MPA—providing an infrastructure through which the Sanctuary can maintain at least minimal management of the local reefs. The Resort's goal is to protect the coral reefs and marine life that attract divers—the vast majority of the Resort's clients. Protection of biodiversity or endemic species is an incidental result. Nonetheless, the Resort's initiative to prevent destructive fishing in the area has had a much greater impact than any legal measures or formal designation of protected areas established by the government.

CASE STUDY 2: SANDY BAY/WEST END RESERVE, ROATAN, HONDURAS

In 1989, the Sandy Bay Marine Reserve was established on the island of Roatan, covering two miles of fringing coral reef. The Reserve was designed to protect the reefs from spearfishing, anchor damage, coral and sand mining, diving for lobster and other practices that were rapidly depleting the local marine life. The primary force behind the establishment of the Reserve was a dive resort in Sandy Bay known as Anthony's Key Resort. The Resort supplied patrol boats, gas and mooring buoys for the Reserve. The Resort was also the primary beneficiary of the new Reserve, as the protected reefs near the Resort soon became known for having the most marine life on the island. The owner of the Resort (who later was elected to the Honduran Congress) took an active role in the management of the Reserve. He threw fishers who violated the Reserve's regulations in jail, and offered training in bartending, waiting and diving as alternative livelihoods to local spearfishers who were unemployed because of the new regulations.

Although there was initially some local resistance to the Reserve (especially among spearfishers), it gained greater community support in 1991 when management of the Reserve was taken over by the Bay Islands Conservation Association (BICA), a local NGO with broader community participation. After only three years of management, the reefs within the Reserve made a remarkable recovery. Marine researchers at the Resort documented substantial increases in the number of marine species found in the Reserve as well as the size of grouper, lobster and other marine life popular with divers.

By 1993, hotel and dive shop operators in the neighbouring West End area, noticing the popularity of the protected reefs in the Sandy Bay Reserve, formed their own committee to extend the Reserve an additional three miles to form the Sandy Bay/West End Reserve. Anthony's Key Resort continued to be the primary source of funding for the Reserve until 1996 when it reduced its support—apparently because of political differences with BICA.

The future of the reefs on the island is in doubt. Rapid development of the coastal area (bringing in more tourists, more sewage and greater demands for fish and lobster) raises doubts as to how effectively the existing Reserve can protect the reefs. At the same time, efforts are under way at the national and international level to designate the majority of Roatan's coastal waters as protected areas and to provide additional funding and staffing for the Reserve. Whatever the final result, it is clear that without the Resort's leadership and financial support, the Reserve would not have survived, and the local reefs would be in much poorer condition than they are today.

ICRI Cornerstones

INTEGRATED MANAGEMENT

Neither site followed what would be accepted as an integrated coastal management approach. The project goals were not integrated within national or regional economic and physical planning, there was limited input by other stakeholder groups and local communities had very little participation in management decisions and actions. Nonetheless, the projects managed to succeed in creating functional MPAs. Why did these projects succeed where, under ICM principles, they should have failed?

In El Nido, the MPA worked because almost all of the inhabitants of the local fishing communities were employed by the Resort. This meant that the Resort had greater effective control over local activities, and local communities had a sustainable source of alternative income. This arrangement will not work in all circumstances, particularly if there are a large number of other stakeholders with conflicting plans for the use of the marine resources. In addition, because of the lack of formal integration with other government, NGO and private partners, the benefits of the MPA is restricted to a relatively small geographic area.

The Sandy Bay Reserve succeeded in the short term because of a combination of the local economic power exercised by the Resort owner and the use of police power to enforce the MPA regulations (even though the regulations did not officially have force of law). When the management of the Reserve was passed to an NGO, there was broader community support, but the Reserve experienced more enforcement difficulties. The failure to get more effective integration with government agencies and to get agreement from local landholders may ultimately lead to the downfall of the Reserve because the unregulated land-based sources of destruction (coastal construction, lack of erosion control or sewage treatment, and increased demand for seafood) appear to be much more threatening to the health of the reefs than the marine activities controlled by the Reserve.

CAPACITY BUILDING

The primary form of capacity building incorporated in these Entrepreneurial MPAs was training for resort employees. In some cases this was only vocational training for cooks, maids etc., but for the employees who actually worked on the water, it sometimes included training in educating divers, handling poachers and enforcing MPA regulations. In general, the capacity building was at the minimal acceptable level, and was done primarily for the convenience of the Resorts rather than as a form of local human development.

No substantial public awareness activities were undertaken at the El Nido Sanctuary. Public awareness and education programs were incorporated at Sandy Bay, but only after the Reserve had been in operation for several years. This community outreach, as noted above, did seem to build greater local support for the Reserve and allowed it to expand to include a larger area. The Marine Research Center maintained by the Resort at Sandy Bay regularly offers classes on various aspects of marine biology, but these are almost exclusively for foreign visitors, so the overall impact of the formal programs may be negligible. More important for local capacity building would be the informal communication between the scientists at the Center and the local fishers.

RESEARCH AND MONITORING

In both cases, there had been rudimentary surveys of the local marine resources before the MPAs were put in place, but there was no substantial documentation of baseline biological conditions. Fish surveys conducted by divers before and after the Sandy Bay Reserve started operating produced solid evidence of improving conditions; it is difficult to know if these studies would have carried much weight if the increases in local marine life hadn't been observed by the local fishing community members themselves.

One of the dangers of having the monitoring controlled by the Resorts was demonstrated in Sandy Bay. Here, the scientists at the Research Center were, apparently, instructed not to study the impact of the Resort's decision to dredge large areas in front of the resort that (according to outside observers) dumped large amounts of fine silt on surrounding reefs.

PERFORMANCE REVIEW

No formal performance evaluations appear to have been carried out on either MPA, although there are sporadic reviews of the Sandy Bay Reserve because of the effort to create a larger MPA which would include many more of the coastal areas of the Bay Islands.

Lessons Learned

GENERAL

1. Dive resorts, acting as de facto managers of small-scale MPAs, can act as the primary stewards of local coral reef resources. These Entrepreneurial MPAs are most appropriate where the government or local community is unable or chooses not to exercise its right to manage the local marine resources.

2. Entrepreneurial MPAs must have the ability to enforce restrictions on resource use (e.g. destructive fishing) otherwise they are just another form of 'paper park'. This requires the delegation of enforcement power by some entity acknowledged to have the right to manage local marine resources. This is not a surrender of sovereignty, only a delegation of marine tenure or the right to control resource use.

3. Entrepreneurial MPAs have the advantage of using existing commercial infrastructure (such as boats and communications equipment) and management structures, making it possible to create these small-scale MPAs more quickly and to institute management regimes more easily than with large-scale MPAs. Thus, Entrepreneurial MPAs may have a better chance of providing the 'success stories' that planners and managers need in order to convince a broader audience of the value of MPAs.

4. Entrepreneurial MPAs cannot provide the comprehensive protection ultimately required for large marine ecosystems, but they may perform several valuable functions including:
   - protecting discrete areas that serve as refuges for threatened marine life;
   - building local capacity in MPA management;
   - acting as test cases for MPA management techniques;
   - building public awareness of and support for MPAs; and
   - providing core areas for larger, slower developing MPAs.

5. Entrepreneurial MPAs are suitable only in a limited number of areas because of two conflicting criteria for success:
   - they seem to work best in relatively isolated areas where there are fewer potential conflicting uses of the marine resources by other stakeholders and there is little or no enforcement of regulations or restrictions by others; and
   - they must be relatively accessible in order to attract a steady, paying clientele of scuba divers, snorkellers and other visitors to help offset the costs of managing the MPA.

6. When private parties make a substantial investment in an Entrepreneurial MPA, care must be taken to make sure that the private parties' interests are considered if the MPA management is taken over by a government agency or other manager. In some cases, some form of accommodation should be made or compensation given. Otherwise, other private parties are unlikely to make the initial investments (such as docks, mooring buoys, training programs etc.) needed to create Entrepreneurial MPAs in other areas.

INTEGRATED MANAGEMENT

7. Many of the lessons from projects using integrated, community-based management for coral reef areas apply equally well to commercially supported MPA efforts. Among the most important lessons is that without substantial input from all key stakeholders in defining issues, selecting management strategies and implementing management measures, the best laid plans for MPA management are not sustainable. Dive resorts must be approached as full partners in the planning and management of MPAs, not just as potential sources of revenue to support MPAs. Dive resorts, in turn, must acknowledge the rights of other stakeholders and accommodate their needs. This includes providing sustainable livelihoods to those displaced by MPAs.

MONITORING

8. Baseline studies of marine resources and follow-up monitoring over an extended period of time by outside researchers can provide verification of the effectiveness of the Entrepreneurial MPA's stewardship of local marine resources. The demonstrated increase of marine life within the MPAs has proved to be an important inducement for other areas considering some form of coastal resource management.

REVIEW

9. There must be regular external reviews of the performance of the MPA managers. There is great potential for the abuse of power by a resort or other commercial entity that has profit as its primary motive and does not answer to a public constituency. The resort's own activities, including disposal of sewage and solid waste, coastal clearing and construction, and recreational use of the marine resources, must be subject to scrutiny by a government agency, non-government organisation or other unbiased observer.

Conclusion

Flexible and creative approaches to coastal resource management are needed in order to achieve ICRI's goal of reversing the global degradation of coral reefs and related ecosystems. In certain circumstances, dive resorts or similar private enterprises may be able to provide the financial resources and management capacity to create and operate small-scale MPAs, particularly in isolated coral reef areas.

Many of these Entrepreneurial MPAs will suffer because they may be created with less research and planning than is recommended for the establishment of more traditional types of MPAs managed by governments or NGOs. On the other hand, some of these smaller Entrepreneurial MPAs will achieve their potential and mature more quickly than traditional MPAs, help develop local capacity and provide some of the success stories and lessons in MPA management needed to make the goal of increased protection a reality.

Private stewardship of coral reef areas carries some risks, but given the current rate of coral reef degradation around the globe, the potential benefits of Entrepreneurial MPAs should not be ignored or rejected simply because Entrepreneurial MPAs do not fit conveniently into the current model for MPAs. Eventually, many MPAs may evolve into some form of hybrid MPA with increased partnership among private stewards, NGOs and governments. For the immediate future, private stewardship of small-scale MPAs may well be the key to successful conservation in a number of coral reef areas that otherwise would have little or no hope of meaningful protection.

The Chumbe Island Coral Park Project: Management Experiences of a Private Marine Conservation Project

Sibylle Riedmiller

Abstract

Chumbe Island Coral Park (CHICOP) in Zanzibar, Tanzania, is a rare example of a small but increasing number of privately created and managed protected areas operating in an often difficult institutional and legal environment. Over six years the project has invested heavily in the conservation of Chumbe Island and has made exceptional achievements in establishing it as an efficiently managed protected area, providing significant educational benefits. It is the only existing marine protected area in Zanzibar and was the first established in Tanzania.

This paper analyses the background and history of the project and describes management experiences, problems and achievements in the legal, political and institutional environment of Zanzibar, Tanzania; a country which after Independence embraced a socialist development model and only recently encouraged private investment.

Private Protected Areas – A Promising Conservation Management Model?

In spite of their considerable economic potential through tourism, the sustainable management of nature reserves by central government agencies has proven difficult in many African countries because of institutional weaknesses and because proceeds from tourism are normally not re-invested in the reserve management and related services. In addition, government nature reserves often suffer from conflicting interests between different user groups, particularly traditional users and tourism.

One attempt to overcome these problems are project designs aimed at the devolution of authority for wildlife conservation to local communities. While these are increasingly favoured by donor agencies and attract considerable funding, government agencies still find it difficult to actually transfer authority and funds to local levels, while local communities are found to have limited management capabilities, particularly where there is no tradition of resource management (Scheinman & Mabrook 1996). As a consequence, privately managed protected areas are now beginning to be acknowledged as an alternative. Indeed, new environmental legislation in Zanzibar, as elsewhere, specifically allows for protected area management powers to be delegated to private bodies.

A recent survey commissioned by the World Conservation Monitoring Centre (WCMC) in selected African countries (Watkins et al. 1996) reviewed private initiatives where 'wildlife conservation is a primary activity'. The rather surprising finding is that more than half of all protected areas in the South African Republic are under private ownership and management, while Namibia, Botswana and Kenya also have a considerable number of private protected areas. Generally, 'countries which have had free-market economies for a long time and in which the purchase of freehold property is permitted, have attracted private individuals and corporate bodies to invest in conservation-oriented initiatives'. (p.6).

The study concluded that 'the private sector makes an invaluable contribution to biodiversity conservation', and that 'private protected areas provide a variety of important conservation and other services. These include providing safe havens, the breeding of endangered species in the wild for subsequent re-introduction, ecological tourism and sustainable use of wildlife' (p.4). In some cases, the conservation role of private protected areas is crucial for the survival of particular endangered species. The overall conclusion is that 'there is much to learn from the private sector, particularly with respect to the economies of managing protected areas through sustainable use of wildlife resources, ecotourism and other enterprises' (p.6).

Though endowed with a wealth of natural resources that have a high conservation value, Tanzania has so far not attracted private investment in conservation. Two decades of socialist policies and large-scale expropriations of land, enterprises and private houses have resulted in a near collapse of the economy and made the country highly dependent on donor funding. This was compounded by the fact that tourism was not encouraged until recently and the revenue potential of conservation areas could not be realised. However, changes in international donor policies from the eighties have made economic realities and sustainability an issue, and Tanzania is now undergoing policy reforms towards a more liberalised economy. Private investment is encouraged in general and tourism is expected to become one of the leading economic sectors in the country, while ecotourism is the buzzword of the day.

On the conservation side, Tanzania traditionally has a well-established system of world-renowned terrestrial protected areas, while the several marine parks designated along the coast in the early seventies remained on paper only (Jameson et al. 1995). In these, rampant dynamite fishing and other destructive fishing methods have damaged many coral reefs, probably beyond recovery (UNEP-RSRS 1989).

Encouraged by both the more liberal investment climate and the need for investment in marine protection in particular (and being a passionate diver, sailor and amateur marine biologist herself), the initiator of the Chumbe project decided to establish a small private marine park project where the profits from a tourism operation would sustain conservation management and environmental education for local people. After concluding a consultancy on environmental education in Zanzibar commissioned by FINNIDA and the Department of Environment in 1990/91 (and with fifteen years–eight of them in Tanzania–of project management experience with a major bilateral aid agency) the project initiator undertook to search all around the reefs of Zanzibar for several months to find a suitable area for a small private marine park project. The project initiator opted for Chumbe Island, as it was uninhabited, had a relatively undisturbed environment and little evidence of extractive activities.

Chumbe Island

Chumbe Island is a small coral island of approximately 16 ha situated eight miles south-west of Zanzibar town close to the shipping channel to Dar es Salaam. The island was not included in the National Marine Park System proposed by the Institute of Marine Sciences of the University of Dar es Salaam (Ngoile 1989), nor in any other such proposal. Therefore, it is unlikely that it would have been made a conservation area without the private initiative and investment to create the park. In 1991, Chumbe probably had no more conservation value than the several other islets surrounding Zanzibar, though conditions for conservation appeared more favourable for the reasons given below. Based on the initiative of Chumbe Island Coral Park Ltd. (CHICOP), a company created in 1992 for the establishment and management of the reserve, the Chumbe Reef Sanctuary was gazetted in December 1994 under provisions of the *Zanzibar Fisheries Act 1988,* and is now a fully managed conservation area.

On its western shore, Chumbe Island is bordered by a fringing coral reef of exceptional biodiversity and beauty. Scleractinian coral cover and species diversity are among the highest in the Region, and the reef has at least 90% of all the species that have ever been recorded from the whole of eastern Africa (Veron, letter dated 27 March 1997). Over 370 species of fish belonging to 50 families have been recorded including giant groupers *Epinephelus lanceolatus* (up to 1 m in length) – a rare occurrence in shallow reefs, as well as 16 species of butterflyfish – a coral feeder which is thought to give a good indication of coral quality and diversity (Mildner-Fiebig 1995). Despite incidents of seasonal coral bleaching occurring mainly during the months of March and April, and considerable storm damage in 1994 and 1997, the reef has so far always fully recovered within a couple of weeks up to a year. A massive coral spawning of mainly *Acropora* species was observed in November 1994 (Mildner-Fiebig 1995).

Most of Chumbe Island is covered by an undisturbed coral rag forest, an ecosystem of probably high conservation value that is little researched and rapidly diminishing elsewhere in Zanzibar and Tanzania (Beentje 1990). Bird surveys conducted by CHICOP in 1993 and 1994 have recorded 45 species, including several first records for Tanzania and Zanzibar, e.g. the Arctic Skua *Stercorarius parasiticus* and Pomarine Skua S. pomarinus (Koehler 1994), and others that are no longer seen in Zanzibar because of the predominance of the Indian House Crow, a scavenger bird introduced approximately one hundred years ago. The rich fish life attracted a large breeding population of the rare Roseate Terns (*Sterna dougalli*) in mid-1994, a noted event in ornithological circles (Iles 1995). An ornithologist working with CHICOP ringed about 200 nestlings before they left Chumbe Island.

The island has also become a refuge of the rare Coconut Crab *Birgus* latro which is abundant there, but threatened elsewhere in the Indian Ocean as it is widely eaten and used in fish traps. In late 1997, CHICOP in cooperation with the Commission of Natural Resources, started a sanctuary in the Chumbe forest for the endangered and endemic Ader's duiker (*Cephalophus adersi*) as they could not be protected from poaching in the Jozani forest. This is now supported by the WWF as an 'insurance strategy' for species survival, and it is planned that after successful breeding on Chumbe Island some animals will be transferred to Jozani forest to restock the population there, once management is more effective.

Institutional Set-Up of the Nature Reserve Management

The Government of Zanzibar approved the project as a tourism investment based on the provisions of the *Zanzibar Investment Protection Act 1986,* and gave CHICOP the lease of the project site on Chumbe Island. After commissioning ecological baseline surveys on the flora and fauna and thus establishing its conservation value, CHICOP negotiated the conservation of the island and the Chumbe Reef Sanctuary was gazetted as a protected area in 1994. Simultaneously, CHICOP was given management contracts for the whole of the island and the reef sanctuary.

To facilitate a relationship with stakeholders in conservation, and with the valuable assistance of the Institute of Marine Sciences of the University of Dar es Salaam, an Advisory Committee was established. This was formed by representatives of the Ministry of Agriculture, Livestock and Natural Resources, the Department of Environment, the Institute of Marine Sciences and the leaders of neighbouring fishing villages. The Committee meets once or more per year and is typically a forum for discussion of the Management Plan, progress reports and any problems coming up over the year. The last such meeting in November 1997 was held on Chumbe Island and chaired by the Principal Secretary of the Ministry of Agriculture, Livestock and Natural Resources. In addition, several joint programs were conducted with different government departments, e.g. a rat eradication campaign done jointly with the Plant Protection Division in 1997, and excursions of school children to Chumbe Island organised through environmental school clubs under the Department of Environment, e.g. as part of the activities for the International Year of the Reef 1997.

Presently ongoing and planned joint research programs with the Institute of Marine Sciences are dealing with coral recruitment, coral transplantation, temperature and tidal current measurements, coral reef monitoring, fish population dynamics and other topics. Research applications are normally channeled through the Institute of Marine Sciences, and have to follow the research regulations spelt out in the CHICOP Management Plan 1995-2005. According to these regulations, priority is given to research that is essential for the conservation of the reef, the forest and of notable species, and only non-destructive and non-extractive methods are allowed.

Management Plan 1995–2005 and Operations

From the beginning the conservation management of Chumbe Island followed common practice of donor-funded conservation projects. While this reflects the genuine commitment of the management to conservation (and the professional background of the project initiator), it has also helped to raise the project's credibility among some government departments and the donor community that supported several program components.

A Management Plan was produced in 1995 by consultants contracted for three months by CHICOP (funded by BESO) who had previous experience of managing a tropical island nature reserve (Aride Island, Seychelles). They held extensive meetings with a wide variety of stakeholders, including CHICOP staff, all concerned government departments and representatives of other environmental projects, local fishermen and private diving companies.

The comprehensive document includes information collected so far by the baseline surveys, on the physical, biological and cultural features of Chumbe Island, specifies aims and objectives and prescribes detailed management actions based on these. The appendices propose a management policy for sustainable development, a research policy, safety and health regulations for staff and visitors, and guidelines for visits as well as a division of responsibilities of essential personnel. In summary, the Management Plan specifies that only non-consumptive and non-exploitative activities are permitted in the Sanctuary area (including activities relating to education, research and tourism).

The government responsibilities outlined in the Plan (and based on the previously signed Management Agreements) are mainly related to public announcement of all legal and regulatory measures concerning the reserve and their enforcement through the relevant organisations (Fisheries officers, Navy, Marine police, Courts of Law), while CHICOP has full managerial and financial responsibility for Chumbe Island.

The Management Plan was endorsed by the Advisory Committee and is now the basis for project operations. The following program components were implemented between 1992 and 1997:

- baseline surveys and species lists on the island's flora and fauna (from 1992, ongoing);
- negotiations to get the Chumbe Reef Sanctuary gazetted (up to 1994);
- production of the Management Plan (1995);
- employment and training of park rangers (from 1992);
- establishment of forest and marine nature trails (from 1993);
- procurement and production of educational material (from 1993);
- eradication of rats *Rattus rattus* (1997);
- establishment of a sanctuary for the endangered Ader's duiker *Cephalophus adersi* (from 1997, ongoing);
- rehabilitation of the lighthouse keeper's house as Park HQ/Visitors' Centre (to be concluded in mid-1998); and
- construction of seven visitors' 'eco-bungalows' (1995-1997).

Most of the above project activities have been concluded successfully, several with some donor support, others funded privately. The Chumbe Island Nature Reserve is now registered with the World Conservation Monitoring Centre in Cambridge (UK) and recognised as a private conservation area which offers a diverse and attractive visitors' program[1]. Chumbe Island will by mid-1998 start full operations as an ecotourism destination. CHICOP has also been chosen as an innovative conservation project implementing Agenda 21 for presentation at the EXPO 2000 World Exhibition.

Management Experiences

At the time when Chumbe Island was chosen by the project initiator in 1991, it was uninhabited and seemed to face little immediate threat. Similar to other historic sites in Zanzibar it appeared an abandoned place with signs of passed glory, such as an old lighthouse built during colonial rule in 1904, and other ruined historical buildings. A lighthouse keeper was still on the payroll of the Harbours' Authority but had not been residing on the island for decades. Fishing was traditionally not allowed on its western side, as small boats would have obstructed vessels plying the shipping channel to Dar es Salaam, and also because the whole area surrounding the island was a military area where the army routinely conducted shooting range exercises from the adjacent Chukwani coast. In addition, few boatmen could then afford an outboard engine to go to this most distant of the islets surrounding Zanzibar town. Therefore, conditions appeared quite favourable for the establishment of a protected area there, as no traditional users were displaced and had to be incorporated or compensated.

However, with the advent of liberalisation from the early 1990s things changed rapidly in Zanzibar. The booming tourism industry took possession of the most attractive sites (some apparently for speculative reasons) and also created a rapidly growing market for marine products, leading to over-exploitation of lobsters, kingfish and other upmarket seafood. High prices made fishing an attractive occupation for urban youths who had little respect for traditional fishing grounds and the more conservative traditional fishing practices, and who could also afford modern propulsion and fishing gear. Destructive fishing methods, such as dynamite and 'kojani' or 'kigumu' fishing (smashing corals to scare fishes into nets) are widespread in the region (Horrill 1992; Guard 1997).

Therefore, challenges to the management of the area increased during project implementation, particularly for a private initiative that could not count on the enforcement machinery of the Government. Although the Government of Zanzibar had gazetted the reef sanctuary in 1994, and Management Agreements obliged Government to assist with enforcement, this was in actual practice entirely left to the park rangers employed, trained and equipped by CHICOP. However, the protection of the conservation area on site turned out to be a minor challenge the CHICOP management had to face, compared with the demands and bureaucratic requirements posed by the different Zanzibar Government departments.

ON-SITE MANAGEMENT EXPERIENCES OF THE REEF SANCTUARY 1993–1997

Since CHICOP was created in late 1992, former fishermen from adjacent villages have been employed and trained as park rangers and stationed on the island to ensure that the protected area of the reef is not disturbed by fishing activity. From 1993, CHICOP has engaged resident volunteer marine biologists and educationists to train the rangers on the different aspects of their work. Throughout this time the rangers have made daily monitoring reports of the activities within the protected area. This chapter analyses those reports from 1993-1996, and other evidence to date.[ii]

The data gathered from these reports are unique as they give a daily account of the hands-on management of a small island environment and provide detailed information on methods used to deal with external pressures on the protected area. It has been possible to calculate accurately the number of incidents of fishermen breaching the boundaries of the protected zone from the very beginning of the project. With these data it is possible to assess trends in fishing pressure seasonally as well as trends in the origin of the fishermen, their vessel types and their target catches over time. In addition, the fishermen's reactions to the rangers doing their job have also been meticulously recorded.

Methods Used by the Rangers

At least one outboard motorboat is permanently anchored by Chumbe Island so that in the event of a vessel entering the protected area, the rangers have the means to go to the vessel concerned and speak directly to the fishermen. The ranger first informs the fishermen of the protected status of the Chumbe Reef Sanctuary. Many fishermen, unaware of this information, will obligingly exit the protected zone immediately. However, the majority of fishermen are already aware of Chumbe Island's status. The ranger then explains to the fishermen the importance of coral in providing breeding areas and protection for juvenile fish in order to replenish fish stocks in the area. He explains that contrary to the widely held belief that coral, or 'mawe na miamba' in Swahili (literally meaning 'stones and rocks'), is inorganic and lifeless, coral is in fact made up of colonies of fragile living organisms. The ranger will then inform them of the objectives of CHICOP as the managing body responsible for Chumbe Island, which includes providing environmental education to local schoolchildren and other visitors.

In spite of the violent nature of some fishing methods used by a number of fishermen they have to confront, the CHICOP rangers carry no weapons and have limited powers of enforcement. They can only try to convince the fishermen verbally, and may report frequent offenders to the CHICOP management, who in turn has in only one case (despite numerous attempts) been able to get the police to issue a warning to the offender. Surprisingly enough, it can be said that good relationships have developed over the years between the rangers and some of the local fishermen, and in some cases personal respect for the rangers has contributed to deterring attempts to fish in the protected zone. As a matter of fact, fishermen requiring assistance are never turned away, which has also contributed to the success of the protected area management, as shown below.

Trends in Anchorage and Fishing Activity in the Reef Sanctuary

Data extracted from the rangers' daily monitoring reports from 1993 to 1996 and continuous information thereafter demonstrate a clear decline in the total number of incidents over time, particularly from 1995, suggesting the overall success of the rangers' methods in deterring activity within the protected area.

However, the decline was not gradual. Confirming our prior assessment that Chumbe has not been a preferred fishing area, incidents were few throughout 1993, the first year of patrolling, with not more than between two and ten per month. However, these incidents increased drastically between November 1993 and March 1994 (with a peak of 43 incidents in March 1994) and again between July 1994 and February 1995 (with a peak of 19 in October 1994). After that, and up to the present, the number of monthly incidents is between zero and not more than eight.

The rangers explain some of the distinctive peaks in 1994/95 with the months of Ramadhan. Approaching Ramadhan fishing pressure increased as fishermen prepared for the fasting month by increasing catches to sell in order to buy goods such as quality food, clothes and gifts for this period. Others used the protected area for anchorage in the evening to prepare their food and break their fast. During this time the rangers have noted that there is also a proportionately greater number of fishing attempts at night as fishermen tried to avoid detection, but also because many fishermen will not enter the seawater for religious reasons during the days of fasting. However, there also appear to be other reasons why pressure was particularly high during these years, as indicated below.

The Fishermen's Responses to the Rangers

By analysing the rangers' monitoring reports it was also possible to crudely gauge the attitudes of the fishermen and the changes in attitude over time. When approached by the rangers the fishermen reacted in a variety of ways, but for the sake of analysis these have been categorised into four responses: a, b, c and d.

The numbers of fishermen falling into *category (a)* have remained low (between 1 and 14% of all cases) in the four years from 1993 to 1996. These fishermen claimed that they were not aware of the protected status of Chumbe and obligingly left the protected area with no trouble. *Category (b)* covers the fishermen who knew the status of Chumbe but tried to fish and/or anchor irrespective of this. Often they would simply leave the area when they saw a ranger approaching, or they would sometimes state that they were not in agreement with the prohibitive actions of the rangers, but would ultimately leave on amicable terms without causing trouble. From 1993 to 1996 the percentage of fishermen reacting in this way ranged from a high 66% in 1993 to a lower 42% in 1994 (with median figures for the other years). This was the most common reaction in the years 1993, 1995 and 1996. When verbal contact was made, the comments made by the fishermen included some individuals claiming they had been given express permission to fish these waters by the Department of Fisheries, and others complained that as citizens of Zanzibar they should have the right to fish or anchor wherever they desire.

The next category, *category (c)*, comprises fishermen who were aware of the protected status of Chumbe but who were angry about being unable to fish and/or anchor in these waters. Their reactions ranged from annoyed and verbally abusive to threatening violence. This kind of response reached a high 49% of all cases in 1994, with the vast majority of aggrieved fishermen originating from Malindi (Zanzibar town), and who were also responsible for the very high number of incidents during some months in 1994 and 1995, as mentioned above. It appears that there were organised attempts by this particular group to challenge the status of the park, with sometimes as many as 15 boats dropping anchor in the protected area at a time. At one point the permanent moorings provided for the fishermen were deliberately sabotaged to encourage anchoring within the protected area. On a few occasions the rangers' lives were threatened, but no physical attacks were ever recorded. It is worth noting that the majority of these fishermen were not looking to fish in the protected waters, as traditionally this area was not fished by vessels from this region.

There is evidence of political factors influencing the behaviour of this particular group from the Malindi area. They sometimes stated that CHICOP had no right to enforce the protected status and claimed that they enjoyed high-level political support.[iii] However, infringements by people from the Malindi area also decreased drastically, particularly after the general elections in late 1995, and the number of responses in category (c) decreased to 14% in 1996.

The responses of the fishermen in the final category, *category (d)*, are recorded as those individuals who were aware of the protected status of Chumbe but believed themselves to be fishing outside of the boundaries of the reserve. An ongoing dispute exists between certain fishermen concerning the delineation of the protected area, but the proportion of fishermen in disagreement over this is very low at only 2% of all incidents in 1996. They also claim support from the Department of Fisheries.

Finally, through analysing these daily reports it has been found that the Chumbe rangers gave assistance to over 110 vessels between the years 1993 and 1996. These vessels carried between 2 and 20 fishermen at a time and the kind of help given by the Chumbe rangers included: fixing broken sails, engines and the like; providing food, water and refuge from bad weather; providing use of the radio; and fixing leaking and sinking boats. No vessel is ever turned away by the Chumbe rangers who will go out of their way to provide assistance wherever possible.

OTHER MANAGEMENT EXPERIENCES

Bureaucratic Delays Multiplying Costs

The initiator of CHICOP took interest in Chumbe because of its natural environment and its potential value as a nature reserve that could be sustained by ecotourism. Therefore, several years of pre-operational investment had to be spent in patiently and tenaciously exploring legal possibilities for the protection of the island, in campaigning for this in a politico-administrative environment which did not welcome such initiatives, and in negotiating a project design which served this purpose.

The option to preserve Chumbe Island without any infrastructure development did not exist in 1991, as Zanzibar had no policy or legal framework for conservation areas until recently (1997), and has not yet established a government body for the management of protected areas. Before 1995, there was also no legal possibility to establish non-government organisations. Therefore, for approval, a private conservation project had to be presented primarily as an investment in permanent tourism facilities.

This had important financial implications. The official investment policy in Zanzibar favours high investments in large tourism projects (for foreign investors the minimum is now US$4 million), that is hotel projects with 'luxurious' multistorey, airconditioned buildings typical for multinational hotel chains, such as Sheraton, Serena etc. The Government of Zanzibar would lease land only to projects that erected 'permanent' structures, and leaseholds of projects that fail to do so are revoked after some years to avoid land speculation. The makuti (palm thatched) roofs preferred for hotel projects by many developers are discouraged, and tented camps, an increasingly popular low impact investment in mainland Tanzanian game parks, are also not approved in Zanzibar. In this context, the Chumbe Island project became a challenging case of a private investment in creating and managing a conservation area that combines the advantages of more efficient private management with the revenue potential this appears to have in a growing tourism market.

With the decisive support of the Department of Environment, negotiations were conducted from 1991 to 1995 with the government departments concerned, and with three fishing villages adjacent to Chumbe. Altogether seven different government departments with ambiguous and sometimes divergent policies were involved in the process.

In late 1992, the project was finally approved by the Zanzibar Investment Promotion Authority (ZIPA) and CHICOP was registered as a limited company for the management of the future reserve. Negotiations for the gazettal and the Management Agreements for the fringing reef and the forest took another two years. In the absence of legal provisions for conservation, a clause of the *Zanzibar Fisheries Act 1988* provided the legal justification. Building permits and purchase of the ruined former lighthouse keeper's house from the Port Authority were finally concluded in late 1995 and building operations could start, more than three years after the investment had been approved. However, conservation measures on site were taken immediately after approval of the project in 1992, with the employment of park rangers and a marine biologist resident on the island.

Indeed, even after approval by ZIPA, the innovative design of CHICOP has complicated project implementation to an extent that commercially oriented investment would not have accepted. The negotiation of the preparatory steps, such as land lease, building permits, gazettal and management agreements for the conservation area, as well as research permits for scientists and project staff, took several years to conclude, delays which the investor was not prepared to avoid by paying bribes. The very substantial bureaucratic delays have more than tripled implementation time from two to seven years and this has multiplied costs, from an original estimate of about US$250 000 in 1991, to an actual expenditure of more than four times that amount. Approximately 60% of this was spent on conservation, education and research, while the remaining 40% funded the construction of visitors' accommodation.

Up to the present, some government departments regard CHICOP as just another tourism venture, while the activities and achievements on the conservation side are only beginning to receive official support and recognition within the country. Despite the fact that a very large part of the investment funds and time was spent on the conservation of Chumbe Island and its establishment as a managed protected area, CHICOP enjoys no favoured status or exemption from the very substantial, and ever increasing costs of land rent, licences, permits, fees and taxation, which now reach a minimum fixed amount of US$10 000 per year; this corresponds to about a third of the operational costs.

Innovative Eco-Architecture and Logistical Difficulties of Developing an Island

Other challenges resulted from the very innovative architectural design of the Park HQ and the visitors' accommodation, as well as from the difficult logistics of developing an island. Energy and water supply and waste disposal on Chumbe Island are based on the state of the art of building in nature reserves. Solar panels and rainwater catchment provide energy and water. Waste and sewage disposal are particularly important in sensitive coral areas. The installation of compost toilets instead of flush toilets not only reduced the water consumption, but also avoided any sewage run-off into the sea. Greywater from showers is recycled through sand filters and garden irrigation. These systems were not only unknown to local builders and craftsmen, but there was also little experience available on their functioning under tropical island conditions.

Chumbe Island consists of fossil coral rock and has no source of fresh water. Therefore, excavations were hardly possible, and sand, water and all other building materials had to be transported to the island, which is surrounded by reefs and has no permanent landing site. In addition, from 1994 to 1997 Tanzania and Zanzibar suffered from a regular energy crisis that created shortages of fuel and cement on the local market for extended periods. All these factors complicated the building process and contributed to enormous delays. Altogether building operations lasted four years instead of the one year originally planned by the architects, which also increased costs considerably.

Tapping the Ecotourism Market for Revenue Generation

Based on the high values placed on unspoiled and pristine destinations in the tourism market, the economic viability of the Chumbe Island project was assessed to be good in the feasibility study produced in 1991 and updated in 1994, and in a study on tourism in Zanzibar that was commissioned in 1995 by the International Finance Corporation.

However, revenue expectations also had to be corrected. Here, the lesson learned is that income from ecotourism is by no means automatic even when tourism is booming, as is the case in Zanzibar. The principal reason for this is that all activities in conservation (e.g. Jozani forest, Menai Bay, Misali Project etc.) are donor-funded, with little or no management costs passed on to visitors. As a consequence, individual tourists and tour operators can visit most local nature destinations at very low cost.

What is happening on the ground is the following. As elsewhere, the tourism market is split between backpackers coming to the country individually, and an increasing number of up-market tourists brought by international tour operators and their local agents with a prepaid package program. Backpackers opt for low-cost destinations, while international and local tour operators also prefer taking well-paying up-market tourists to unmanaged areas, or areas managed by donor-funded projects, at little cost to the operator.

From 1997, CHICOP started offering day excursions to the island for US$50 per person, which includes boat transfers, guidance through the marine and forest trails by the park rangers, hire of snorkelling gear and a full meal and drinks. However, few travel agents have shown interest in this, as they would only get commission when sending clients to Chumbe Island. It is more profitable for them to organise island trips themselves (sometimes charging similar or higher rates) to Prison and Bawe islands for example, where no management costs occur.

Thus it can be said that CHICOP is facing 'unfair competition' from unmanaged nature destinations and donor-funded projects that subsidise conservation. The lesson learned after experimental operations over one year is that local marketing of Chumbe Island has only a limited potential for generating the income needed to sustain a professionally managed reserve and to subsidise environmental education for local people.

Benefits to Stakeholders

The Chumbe Island Coral Park project provides crucial conservation services to the population of Zanzibar, including fishermen, schoolchildren and the population in general. The project:

- **has secured continued protection of valuable flora and fauna,** in the absence (or inability) of government agencies to do so. Zanzibar had no effectively protected areas, and has to date no institutions to manage them.
- **helps restocking of locally depleted fisheries and promotes recovery of degraded coral reef ecosystems.** Chumbe is located upstream of the most important fishing grounds opposite Zanzibar town. The sanctuary provides a protected breeding ground for fish, corals and other species which then spread out to recolonise nearby over-fished and degraded areas.
- **contributes to biodiversity conservation and ecological restoration,** by effectively protecting a coral reef which holds at least 90% of the scleractinian coral species ever recorded in East Africa and an undisturbed reef flora and fauna, which allowed successful breeding of rare migrant birds, e.g. the Roseate tern *Sterna dougalli* (in 1994). Chumbe also harbours a large population of the rare Coconut Crab *Birgus latro* and offers a breeding ground for the endangered Ader's duiker *Cephalophus adersi,* which can later be reintroduced to other conservation areas, once these are established and managed effectively. In particular, after the successful eradication of rats *(Rattus rattus)* in 1997, Chumbe Island is also a safe haven for yet unknown flora and fauna typical of intertidal reef flats and coral rag forests which are little researched and rapidly diminishing elsewhere in Zanzibar and Tanzania.
- **provides a training ground for local people in conservation area management.** Since 1992 five former fishermen have been trained in marine park management and monitoring techniques for the reef and the forest. They have also learned English and gained the knowledge needed to guide both local and foreign visitors on the island. More park rangers can be trained by the project, to be posted to similar projects in the region.
- **helps create environmental awareness among fishermen** of adjacent villages who have over the years been convinced by the park rangers (former fishermen themselves) to understand the rationale of a marine protected area, to respect the boundaries of the Reef Sanctuary, and in exchange enjoy increased fish harvests in the vicinity. This has been particularly successful, as over the last two years infringements of the park regulations have become rare.
- **gives permanent help to local fishermen in distress.** As there is no maritime rescue service available in Tanzania, the assistance given by the Chumbe rangers to fishermen during rough weather, and when boats, engines and sails need fixing, is crucial. They also provide radio communication from the island to anyone in need.
- **provides a direct source of income to local fishermen.** Local fishermen will also benefit directly by selling fish and other seafood to the island restaurant once tourism visits are more regular on the island.
- **contributes to capacity building of government staff** from different departments who have been involved in the Advisory Committee and dealt with important issues concerning the establishment and management of the reserve, particularly through the discussions preceding the approval of the Management Plan 1995-2005. During the recent rat eradication campaign, staff of the Plant Protection Division and a trainee supported by the EC-funded EDG conservation project in Zanzibar have been trained on the technicalities of rodent control in nature reserves, and did a similar job on another island proposed for protection (Misali Island in Pemba).
- **has created unique facilities for environmental education** for school children and other visitors. Nature trails and educational materials (in Kiswahili and English) have been developed in the forest and on the reef and, since 1994, several excursions of school children have been organised through the Department of Environment based on the initiative of a VSO-volunteer responsible for environmental clubs in schools cooperating with CHICOP. As part of the activities for the International Year of the Reef in Zanzibar, the BBC-Blue Peter Program filmed such a day excursion of Bububu primary school children to Chumbe on 17 May 1997.

- **cooperates with the Harbours Authority to keep the lighthouse functioning.** The rangers now act as lighthouse keepers and light the old AGA-gas-powered system (installed in 1926) with matches, when for some reason it is extinguished. Before that, the lighthouse rarely functioned. This service is particularly important for the traditional shipping traffic (dhows) which has no access to modern navigational aids, such as GPS.
- **provides valuable experience in the financially sustainable management of protected areas.** The project is yielding many insights useful for solving the problem of financial sustainability in the management of protected areas in Zanzibar and elsewhere, and the lessons learned will contribute to the development of a sustainable protected areas system in Zanzibar and the Region.

In summary, Chumbe has done work and is offering services more typical of large donor-funded conservation projects, which are not normally contemplated by private business. In addition, due to the substantial bureaucratic delays and other problems, the pre-operational investment from 1992 to date has been four times the original estimate, and more investment is still needed to fully realise the project goals and capitalise on the achievements. This has put the commercial viability at risk, as visitors have to be charged high prices to sustain the park management, or even achieve capital recovery. The present marketing of CHICOP is not yet able to reach the more wealthy markets overseas.

Conclusions

In conclusion, the Chumbe experience suggests that private management of marine protected areas is technically feasible and efficient even when the enforcement machinery of the State is not available or ineffective. The costs of private management are probably considerably lower and the incentives to struggle for commercial survival much stronger than would have been the case with a donor-funded project. Chumbe Island now provides a diverse and undisturbed breeding ground for endangered species in the coral rag forest, and a pristine and diverse coral reef harbouring a very rich fish population.

This confirms findings of the WCMC study mentioned above (Watkins et al. 1996) about the contributions the private sector can make to biodiversity conservation, and is now also recognised by some government departments and donor-funded projects in conservation in Zanzibar. One recent example is the sanctuary established on Chumbe Island, with WWF support, for the endangered endemic Ader's duiker *(Cephalophus adersi),* upon request of the Commission for Natural Resources and the CARE-Jozani-Chwaka Bay Conservation Project.

However, the experiences of the Chumbe Island Project also suggest that the commercial viability of private conservation projects is at risk when cumbersome bureaucratic requirements increase costs for investment in general, and for innovative project designs in particular, and as long as unmanaged or donor-managed wilderness areas can be accessed at very low cost (though still charging high prices) by the tourism industry. What the Chumbe project would need now is additional investment in professional marketing overseas, to access the wealthy markets directly. It is hoped that the selection of CHICOP for presentation at the World Exhibition EXPO 2000 will provide worldwide publicity.

There are other more fundamental issues in Tanzania (and probably some other African countries) which discourage private involvement in conservation. Investment in this field is necessarily long-term and requires high security and a supportive legal and politico-administrative environment. The following conditions would need to be addressed to make the country more attractive for investment in conservation:

- Land tenure in Tanzania and Zanzibar is only available on leasehold, in contrast to other African countries, such as South Africa, Namibia, Botswana and Kenya, which allow freehold and have attracted considerable private investment in protected areas (Watkins et al. 1996).
- While the above situation could be offset to a certain degree by legal provisions creating special incentives for investment in environment and conservation, such as long-term land lease and management rights, reduction of, or exemption from land rents, licences, fees and taxes, these incentives do not exist.

- In Zanzibar particularly, the legal framework does not enhance security of investment in conservation, as private investments under the 1986 Zanzibar Investment Protection Act are affected by a particular weakness of this Act when it comes to the issue of expropriations and compensation.[iv] Recent additional legislation–the *Environmental Management for Sustainable Development Act 1996*–in actual fact further weakens the provisions of the 1986 Investment Act against the expropriation of private property, as this Act facilitates 'extinguishing existing rights' in protected areas for the sake of conservation.
- Though the same Environmental Management Act (1996) provides for management powers to be delegated to private bodies, this may not encourage private commitment to conservation, as proceeds would have to be passed on to the planned government management authority. In actual fact, the Act ignores a situation where the investment in conservation and the establishment of a protected area has been done by a body other than the State.
- Second-tier constraints[v], such as the very cumbersome bureaucratic procedures and wide discretionary powers of civil servants for granting land leases and building permits, as well as residence, work and research permits for expatriate staff, encourage corruption and increase costs of investment. In addition, the customary annual budget speeches announcing sometimes far-reaching changes of legislation affecting these conditions for foreign investment also increase investment costs and add to economic insecurity.
- Some long-term investors in conservation may wish to retire in the country of their project. Present immigration laws in Tanzania do not allow this, and foreigners have to renew their permits every year at considerable cost.
- Another disincentive for private investment is the present labour-market legislation and administration inherited from the socialist past, when the State saw its role in defending workers' rights against employers. For example, in Zanzibar it is difficult to sack employees because of theft and embezzlement, even when caught red-handed.
- Last but not least, capital recovery from investment in conservation is typically dependent on one single sector of the economy: tourism. The tourism industry is particularly volatile and sensitive to political turmoil (often associated with election periods), adverse weather conditions (el Niño) and perceived security and health risks (cholera epidemics etc.). In 1997 and early 1998, East Africa as a whole had more than its fair share of all of this, with an immediate, and sometimes drastic decline in tourism arrivals.

There is little doubt that the above issues present a very tall order indeed, if the aim is to make Tanzania and Zanzibar more attractive for private investment in general, and private commitment to conservation in particular. It would probably take many years of sometimes painful political decisions and determined action (confronting vested interests) to improve the present legal, institutional and regulatory environment for investment.

Maybe the Chumbe Island Project has been undertaken ten years too early in this part of the world, where on a political level, environmental problems and degradation were not felt severely enough to make conservation a necessity and a priority, and when donor money was still abundant and easily available and the private sector not yet seen as a valued partner in this field. However, it is extremely encouraging to note that those who directly felt the increasing degradation of their environment and had no access to donor money when they joined CHICOP–the fishermen turned park rangers–are now the staunchest conservationists on Chumbe Island and proudly and very competently show visitors around the reef and the forest. Without them, their enthusiasm, commitment and never tiring vigilance, Chumbe Island would not have become the fascinating conservation area it is today, and the project initiator would have been demoralised by the many obstacles and obstructions over the years, and probably stopped the project somewhere halfway.

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i For more detail see CHICOP, Progress Report 1992-1997.

ii This chapter is in large parts based on a paper written and presented by Eleanor Carter, Omari Nyange and Yussuf Said, at the National Coral Reef Conference, 2-4 December 1997, Zanzibar.

iii The then Member of Parliament for Malindi was mentioned, who at that time was also the Minister of Agriculture, Livestock and Natural Resources.

iv A legal analysis of this Act concludes that 'it seems that the Act was drafted in ignorance or disregard of the controversy at the international level over the issue of compensation for nationalised property. One indication of this is the looseness in the use of certain important terms and the consistent inconsistency... the investor can only appeal against the amount of compensation granted but not against the decision of Government to acquire or nationalize his property '(p.349-350). Chris Maina Peter (1988), The 1986 Investment Protection Act of Zanzibar, ICSID-Foreign Investment Law Journal, p.338-351.

v In a recent analysis of the investment climate in African countries, Rauth (1997) concludes that, in spite of major policy reforms towards liberalisation of the economy, second-tier constraints remain which 'become overwhelming and pose a critical threat to continued formal private sector development'. As a heritage of socialist or state-driven economic policies in the past, 'most African countries still use control-oriented approaches that have resulted in rule-driven bureaucracies with little service mentality. Institutional practices have been designed with the assumption that the private sector is the antagonist and procedures and regulations are formulated under the assumption that the private sector is guilty until proven innocent. This approach has resulted in particularly cumbersome regulations. In addition, the controls have given government officials wide discretionary powers which have encouraged corruption. Although taxes have been simplified and lowered, they remain numerous, ambiguous and complex. In Tanzania, officials at one prominent business organisation estimate that 80% of all businesses must cheat to survive—and tax liabilities can represent as much as 60% of gross revenue.' Rauth concludes that 'the combination of the ambiguous environment and high taxes created a hothouse for corruption. Business people need to pay bribes to survive and remain competitive. Not surprisingly, civil servants perceive business people as corrupt which leads them to erect more controls and more stringent regulatory processes, resulting in even longer delays. In reaction, businesses resort to bribes to accelerate the process. As a result, a vicious circle of increasing delays (and) corruption is created for formal sector enterprises.'

Session 5 Report: Protected Areas and the Private Sector

General Findings

1. Private sector involvement is not an issue that has yet been examined in great detail and the number of case studies is fairly limited.

2. The fact that the group had over 40 participants was significant in itself and indicates that there is substantial interest in the topic.

3. Generally, the group felt that the concept of private sector involvement is a good idea, but acknowledged that economic viability (either through profit or public relations benefits) is the main driving factor for the private sector to sustain interest. Private sector interests want assurances that their efforts will improve business.

4. Although not unanimous, the group agreed that examining private sector involvement should be based on a standard of coral reef (and associated ecosystem) sustainability, as opposed to shifting marketing focus – such as jet skiing, beach bathing or other water sports.

5. In the case of private sector enterprises, such as hotels, the group found the following opportunities and challenges.

   Opportunities
   i. It is clearly a growing industry (~36% in 1999 in the case of the Caribbean).
   ii. There are appreciable tangible economic benefits to hoteliers (energy savings and certification) and locals (provided they are not marginalized by exclusive practices).
   iii. 'Certification' is a critical component and something hoteliers relate to well.

   Challenges
   iv. Some areas are becoming tourism-dependent to the point of losing indigenous knowledge and practices.
   v. There are few cases where a legislative framework is in place to monitor impacts of tourism.
   vi. There is no consistent/integrated management or coordination of the construction industry, including EIA requirements.
   vii. Resource reallocation or exclusion to locals is a potential problem.
   viii. There is a need for ongoing and consistent stakeholder involvement.
   ix. There is little or no understanding of the impact of carrying capacity of tourists on the resource base.
   x. There are no indicators in place to measure effectiveness.

6. Private sector MPAs:
   i. Examples are uncommon. Why are examples better in some cases compared to others?
   ii. Three conditions have been identified for establishing private MPAs–when governments:
   - grant permission;
   - lack capacity; and
   - are apathetic.
   iii. The establishment of Marine Protected Areas will work only in certain cases.

   Opportunities
   iv. MPAs have potential for the small-scale management of coral reefs–they can protect a discrete area (some made an analogy to management intensity and costs equivalent to golf courses).

v. They are potentially cost-effective alternatives to publicly designated MPAs.
vi. There is a direct joint interest in conservation and they provide common ground for other resource use.
vii. There are advantages to enforcement with small-scale MPAs that the private sector can support.
viii. We can build local capacity (ranger/volunteer training and education) and keep it as part of the local community.
ix. They can act as a test case for MPA management, and raise awareness to governments lacking awareness or capacity.
x. There are benefits in ensuring that user fees are applied directly to that specific area (and not siphoned by some government general fund).
xi. More efficient use of donor funds is possible.

Challenges

xii. Private sector MPAs can exclude locals.
xiii. They eliminate access to resources previously used.

7. Aside from 'ecotourism', there are other opportunities for the private sector to be involved. A couple of examples were identified, but not explored in detail by the group, for example:
   - diamond mining (case studies in Africa, i.e. Ghana); and
   - commercial fishing (e.g. St. Brandon)

Lessons Learned

TOURISM/HOTELIERS

- Marketing is desirable.
- The messenger is *very* important.
- Collaboration by several groups is necessary.
- The economic analysis of costs/benefits is required to demonstrate the value of 'greening' to business.
- There is a need for tourism sector incentive policies.

PRIVATE MPAs

- The successes measured to date are case-by-case dependent.
- There are no examples of private sector MPAs incorporating and practising ICM principles beyond MPA designation.
- Although small case studies show independence from government, ultimately there is no way to effectively operate without some partnering and coordination with governments, NGOs and donors.

COMMON AND *RECURRENT* ISSUES IDENTIFIED

- Stakeholder inclusion is crucial.
- Has to be economically viable.
- Compensation to those displaced or compromised by protected area designation.
- Education and training.
- Enforcement.
- Other private sectors should be involved (as opposed to - exclusive focus on tourism).
- Development issues outside of MPAs.
- Certification.
- Leverage (Government, Donors, and Private).
- Development of Sustainable Indicators.

Session Five's Relationship to Wednesday's Cross-Cutting Themes Working Groups

INTEGRATED MANAGEMENT, COORDINATION AND LINKAGES TO OTHER INITIATIVES, PROGRAMS AND INSTRUMENTS

- The hotel industry coordination is improving in some areas, with standards and certification programs being developed.
- There are no examples of private sector MPA success using Integrated Coastal Management principles. Thus, the focus is on adopting ICM adjacent to private MPAs.
- Other private sector business should be explored further in Marine Protected Area establishment.

STAKEHOLDER PARTNERSHIPS AND COMMUNITY PARTICIPATION

- How do we build effective partnerships to make MPA's work?
- How do we create incentives to see that Marine Protected Areas and relevant processes [such as EIAs (with local input)] are effectively carried out?
- What are the key factors needed to motivate stakeholders (i.e. promoting a sense of ownership)?
- We need to find and develop strong mutual relationships between THE private and public sector.
- We need to recognise that there is a Government, Donor and Private Sector interdependence.
- For the private sector to retain interest, legal/financial/social/personal incentives are needed to make the partnerships work.
- Variation among cultures requires differing approaches.

PUBLIC AWARENESS AND EDUCATION, INCLUDING CAPACITY BUILDING

- The Tourism Industry presentation shows this is under way in the Caribbean and Indonesia.
- Regulations vary between countries within regions and are often ad hoc.

DATA AND INFORMATION MANAGEMENT

- We need to develop tourism-based indicators.
- We need to have a better understanding of the abundance and distribution of other private sector efforts regarding Protected Areas—possibly a case study inventory and analysis.
- Data acquisition for socioeconomic impacts on adjacent communities is required.

SESSION 6: Tourism and Protected Areas

Chair: Lolita Gibbons
Rapporteurs: Stacey Tighe, Perry Alino
Presenters: Meriwether Wilson, Kalli de Meyer, Hillary Skeat

The GEF Egyptian Red Sea Coastal and Marine Resource Management Project – A Decade Of Effort, Experience and Trade-Offs Required to Achieve Marine Tourism and Conservation Goals

A. Meriwether Wilson

Abstract

This paper presents a case study of the 'Egyptian Red Sea Coastal and Marine Resource Management Project'. The project is supported by the Global Environment Facility (GEF) through the World Bank. It aims to address coastal-marine related tourism and conservation linkages of the Egyptian Red Sea through integrated approaches to coastal-marine resource management, coupled with innovative partnerships of the three lead agencies in the coastal arena: the Red Sea Governorate, the Tourism Development Authority and the Egyptian Environment Affairs Agency. This ITMEMS case study first presents the overall setting, rationale and objectives of the Egyptian GEF project. These set the stage for the original project design in the early 1990s. It is followed by a summary review of the key outputs and results from project implementation largely realised during the past two years. Although the overall Egyptian Red Sea project is framed around an integrated coastal zone management (ICZM) context, this case study highlights the project's emphasis on linkages between tourism and coastal-marine protected areas (CMPAs) and respective national and international strategic initiatives which co-evolved throughout this decade. The case study concludes with perspectives and lessons learned from this project that are relevant to the core themes of ICRI, including aspects of: integrated management, capacity building, research and monitoring, and review elements. This paper is based on core reports published through the GEF Project as described in the text, and impressions from the author who consulted on the project throughout its duration.

Project Overview

ECOLOGICAL AND SOCIOECONOMIC CONTEXT

Egypt's Red Sea coastal margin and islands contain a globally significant portion of the world's reservoir of coral reefs and to a lesser extent, associated ecosystems such as mangroves and seagrasses. The Red Sea and Gulf of Aqaba areas of Egypt are estimated to comprise about 1500 km of reef length including the coastal and island margins, while the Red Sea shore area alone (from Sinai down to Sudan) includes nearly 800 kilometres of fringing reef, extensive wadis, mangroves and seagrasses. In general the Red Sea coastal and marine ecosystems contain a high biodiversity of different species, including approximately 300 species of coral and 500 species of seaweed, many of which are endemic due to the isolated character of the semi-enclosed Red Sea. Although Egypt's mangrove trees are not extensive in scale, they do represent the northernmost limit for mangroves in this Region. The nearshore coastal wadi and floodplain systems provide essential water resources, but also contain the highest diversity of terrestrial flora and fauna throughout Egypt. This resulting mosaic of wadis, islands, mangroves, coral reefs and seagrasses together play key roles in shoreline stabilisation and collectively support essential fisheries resources, as well as a growing tourism industry that is largely focused on scuba diving and marine recreation.

At present the population base of Egypt's Red Sea residents is about 90 000, but this is expected to rise to 1.3 million during the next 20 years. This is due to both the emerging tourism sector, as well as the national policy need to encourage settlement outside of the increasingly overcrowded Cairo area. Before about 10 years ago, limited shipping, petroleum, mineral extraction and fisheries were the economic mainstays for most of the people of the Red Sea Region. The Red Sea coast only had substantial settlements in the Hurghada-Safaga area in addition to the Sharm el Sheikh in Sinai, yet recent advances in water desalination and transport modes, coupled with a relatively untapped and pristine natural resource base, have fostered large-scale tourism development horizons. In support of developing employment and economic opportunities in the Region, the Government of Egypt (GOE) has also provided increased infrastructure support (e.g. housing, hospitals) in the Red Sea area during the 1990s.

RATIONALE AND GOALS OF THE GEF PROJECT

While the GOE is fully committed to sustainable development and is today party to over 30 different legal instruments addressing marine resource management, both the GOE and the private sector stakeholders recognised in the early 1990s that coastal-oriented tourism was a viable economic sector, but it was already causing negative ecological impacts, such as:

- reef degradation through intensive diving pressure and anchor damage;
- habitat degradation, especially of the sensitive supra-littoral, intertidal, nearshore areas through landfilling and jetty construction; and
- land- and sea-based pollution.

By the early 1990s, Egypt had a powerful 'protected areas' law (No. 102) through which the Ras Mohammed Park in Sinai was established. However, there was still no fundamental environmental law to address broader coastal-marine resource management issues, no formal process for conducting environmental impact assessment (EIA), and no zoning or permitting guidance for development along the coast. Therefore three of the key government bodies, each with significant responsibilities along the coast, collectively requested that the GEF support a comprehensive project to support ecologically sustainable tourism and conservation, but within a context of integrated coastal zone management. These three bodies are: the Red Sea Governorate (RSG) responsible overall for the Region; the Egyptian Environment Affairs Agency (EEAA) responsible for environmental management, monitoring and enforcement; and the Tourism Development Authority (TDA) charged with promoting tourism development and land sales. Without a mechanism to facilitate coordinated management and responsibility sharing, each of these bodies could potentially be at cross-purposes, so joint execution of the GEF project became a cornerstone of the resulting project design and vision.

In light of the above context the GEF, through negotiation with the above parties and the World Bank, agreed to support a three-year (maximum time allowed at that time) pilot project to address tourism development, planning and biodiversity conservation, with the following goals.

1. **Formulate action plans** within the national context to ensure that development is consistent with sound environmental management, to protect the shared marine resources of the Red Sea coastal zone.
2. **Strengthen the capacity** of key government institutions and agencies to carry out integrated, multi-sectoral coastal zone management activities.
3. **Enhance public and private partnerships** to assure that economic development is consistent with sustainable environmental management of common marine resources.
4. **Develop practical solutions** for the management of protected areas and marine recreational resources and conservation of biodiversity.
5. **Establish a database/GIS** including an atlas and inventory of coastal and marine resources to be available to government, agencies, institutions and stakeholders for optimal and sustainable use of these resources.

Project Design, Realities and Results

PROJECT SCOPE AND SCALE

The implementation phase for this project was designed for three years during the GEF pilot phase and originally anticipated to be conducted from 1993–1996 with parallel processing for a World Bank tourism infrastructure loan. The project was designed to be co-executed and managed by the RSG, EEAA and TDA with specific capacity building, information management, strategic and infrastructure benefits flowing to each, as well as indirect benefits to a broader group of stakeholders (e.g. local residents; conservation interests tourism investors and facility operators; tourists, environmental service industries; fisheries, petroleum and mineral industries; and military interests). The targeted geographic area for the project includes all of the Red Sea coast from 40 km north of Hurghada to Sudan – the European Union was already providing support to the Sinai for the Ras Mohammed Park and was to provide a total of US$ 4.5 million to support a broad spectrum of activities within the following interrelated components:

1. **Integrated Coastal Zone Management Plan** (surveys, database, priority setting);
2. **Environmental Impact Assessment** (capacity and guidance agreeable to all agencies);
3. **Marine Pollution** (facilitate capacity building for the EEAA and RSG);
4. **Reef Recreation Management** (foster links between reefs, tourism, education); and
5. **Coastal-Marine Protected Area Management** (support new area(s) for biodiversity conservation, tourism and education purposes)

A primary design challenge revolved around how to achieve true integration of multiple and interrelated activities while also engendering ownership, role clarification and clear benefit streams amongst the three lead agencies (RSG, EEAA and TDA). Two options emerged: (i) to effectively have three separate sub-projects with clear component and agency-specific roles; or (ii) to establish a core team to drive the project in an integrated manner, facilitating co-agency support along the way, and in the final year propose a redistribution of tangible goods to each agency. Ultimately all parties agreed on the 'core team' arrangement but with distinct mechanisms established to facilitate coordination, communication and objectivity, including the following structures:

- Project Management Group (PMG) involving the respective directors of EEAA, RSG and TDA;
- Technical Advisory Committee with nationally reknown advisors from the academic community to provide objective scientific guidance;
- Local Project Manager and Core Team including 'seconded' staff from agencies and contracted long-term local consultants;
- International Advisors with specialist skills in ICZM, marine protected areas, reef ecology, and pollution, requiring a sequence of in-depth targeted training throughout the life of the project (e.g. six one-month visits by each over three years); and
- Short-term local and international experts as needed on specific issues and reports.

IMPLEMENTATION REALITIES

The project was originally designed to be implemented over a three-year period, with two main phases:

1. preparation of an ICZM Plan over the first 15 months focusing on conducting reconnaissance surveys and background reports, and subsequent zoning through GIS and database integration, as well as the preparation of EIA guidelines; and
2. support during months 16 to 36 of the initial implementation of priorities from the ICZM findings, e.g. development and initial implementation of a Reef Recreation Management Plan, and identification, approval and initial establishment of one or more protected areas outlined in a CMPA Strategy. Marine pollution priorities identified in phase i were to be acted upon during phase ii. Cross-component supporting activities, e.g. training and database refinement and updating, were to be conducted concurrently throughout the project.

In reality, the entire project process has taken over five years from design to action (1993–1998), yet the first two years were effectively 'non-active' due to bureaucratic complications from parallel processing with the associated World Bank loan. Once the project started with separate processing, initial start-up still took a year longer than envisaged due to complexities in staffing the core team, as the partner agencies did not have sufficient staff available to provide 'secondments'. Consequently, three-year consultancy posts for the 'core team' were created and filled by senior university staff with relevant experience. Contributions from the international advisors and local experts were designed to be targeted, timely and substantive. Once expertise and office logistics issues were resolved, highly accelerated progress took place during the next two years, with some changes to the phasing, scope and scale of some activities, while still fulfilling the project objectives. (Results are detailed in the subsequent section of this paper.)

In parallel with the GEF project progress from about 1995 to present, several significant legislative and strategic elements also were realised during this period, which fostered a more focused policy, legislative and economic climate for overall environmental management of Egypt's Red Sea coastal-marine resources at both international and national levels. These elements are briefly highlighted below and also illustrate increasing interest and influence by the international donor community for conservation agendas during this period:

- adoption of a comprehensive Environment Law (No. 4) in 1994 which established greater capacity for the EEAA to oversee monitoring, zoning, and permitting functions in most areas of the Red Sea coast;
- sufficient support from the European Union to facilitate the expansion of the protected areas network (through the existing Law 102) for additional coastal-marine areas in the Gulf of Aqaba;
- Ministerial decrees expanding the scope of Law 102 to include all mangrove stands and islands as protected areas (yet critical areas remain unprotected including wadi corridors, seagrass beds, and the vast fringing reef system along the shore);
- preparation of a National ICZM Framework (targeting Egypt's Mediterranean and Red Sea areas), led by the EEAA with support from the Danish government;
- preparation of a National Biodiversity Strategy as part of Egypt's commitment to the Biodiversity Convention, led by the EEAA with support from GEF;
- collaboration with the United States Government in various Red Sea activities including: (a) the preparation of a policy document on environmentally sustainable tourism (in conjunction with the RSG, EEAA and TDA; EST/USAID; (b) ongoing support to the RSG, EEAA and local non-government groups in the placement of mooring buoys along the Red Sea coast; and (c) training to the EEAA for reef management on reefs near Hurghada and lobbying for a Red Sea Marine Park to incorporate all of the Egyptian Red Sea shores from the high-water mark out to 100 metres depth.
- involvement by the GOE in the GEF-supported Red Sea and Gulf of Aden Strategic Action Plan addressing transboundary marine issues; and
- support to the ICRI process as it evolves.

Yet, in spite of the abovementioned legal and strategic achievements during the last half of the 1990s, the scale and pace of tourism development along the Red Sea coast remains relentless. New airline charter markets now include the Egyptian Red Sea and continued large-scale resort development is encouraged with minimal enforcement of new environmental regulations in the Hurghada-Safaga area. While areas further south have minimal infrastructure in place at present, there are many proposals for large-scale resorts and expanded transport networks in the 'development pipeline'.

OVERVIEW OF RESULTS AND FINDINGS

In order to better address increases in both environmental awareness and tourism pressures, the GOE and the World Bank continued to be committed to the GEF project through its initial start-up challenges, and maintained that the original rationale, objectives, and inter-agency partnership arrangements were still highly relevant in the last half of the 1990s, as well as both contributing to and building upon the additional legal and strategic achievements noted above. In this context, the 1996–1998 time period of GEF project implementation was one of more targeted environmental action, yet more complex from multi-agency coordination perspectives in light of the heightened profile of multiple international donor agencies. Ironically, this gave added impetus to the 'core team' GEF project implementation structure as a high degree of objectivity was easier to maintain, and turned out to be essential for conducting realistic baseline information gathering and subsequent analyses.

In review, most of the envisaged project components and activities were completed between 1996 and 1998, due in part to the favourable circumstances that occurred or developed during the course of the project (as noted above). The following is a highlight of the achievements of the project to date

- **Capacity Building and Partnerships.** Bimonthly meetings of the heads of the three agencies over a period of several years (including numerous changes of people in respective posts); training and involvement by local and international teams of over 150 agency and university staff as core team and/or experts; and increased awareness of the investor and diving community of the complexity and needs of marine resources.
- **Information Management.** Development of a GIS-based database computer network; incorporation of information from over 200 scientific and socioeconomic surveys; scientific and planning analyses; information presentation into various formats including: CD-ROM Biodiversity. Inventory of all taxa recorded from surveys; 1984 and 1996 digitised Landsat imagery of whole areas; and GPS-based mapping of all mangrove areas, and materials for the key reports and products noted below.
- **Infrastructure.** Various forms of equipment were provided to the project team (e.g. computers, vehicles, offices) and will be utilised by the RSG, EEAA and TDA. Two specific buildings were part of the project support and are now under preparation, including an Environmental Resources Building to house EEAA marine pollution and protectorates staffs in the Hurghada area, and an International Visitor Centre on the southern coast, led by the TDA to facilitate linked tourism and environmentally linked activities.
- **Key Reports and Products.** Preparation of over 75 GEF-commissioned background reports; a publication streamlining EIA procedures prepared jointly by TDA/RSG and EEAA; and seven GEF sequential and iterative core reports (noted below), each of which incorporated the evolving legal, strategic policy and donor climate discussed previously:
  1. *Inception Report* (a 1996 revisit and detailing from the original 1992 Project Document);
  2. *Baseline Report* (summary of initial findings from the first 76 survey stations);
  3. *Preliminary Coastal Zone Management Plan* (based on initial survey analyses);
  4. *Coastal Marine Protected Area Strategy and Action Plans;*
  5. *Reef Recreation Management Action Plan;*
  6. *Final ICZM Action Plan;* and
  7. *Draft Monitoring and Evaluation Project Report.*

In keeping with the project objectives, and to better provide a tangible platform upon which the evolving donor interests could most effectively cooperate in the Egyptian Red Sea area, the interrelated action plans (reports 4, 5, and 6 above) prepared through the project have gained added merit and weight. They are briefly summarised below.

- **Coastal-Marine Biodiversity Strategy and Action Plan.** In order to ensure that the biodiversity of critical coastal and marine ecosystems, habitats and species are conserved, strategic proposals to expand Egypt's existing coastal-marine protected areas (CMPAs) were prepared. The proposed target areas evolved from the survey findings and are considered to both complement and contribute to other strategic CMPA-related initiatives–in particular the Egyptian National Biodiversity Strategy and the GEF Strategic Action Programme for the Red Sea and Gulf of Aden–as well as the broader goals of ICRI and the IUCN.
- **Reef Recreation Management Plan.** The goal of this plan is to manage reef recreation in such a way as to prevent unacceptable impacts of tourism and foster positive development. The pilot area is the increasingly dense area from Hurghada to Safaga, yet the concepts of the plan are applicable throughout the Egyptian Red Sea coast. Reef-protection-based zoning proposals and management guidelines for reef recreation are presented and activities for training and environmental education are developed.
- **Integrated Coastal Zone Management Plan.** This plan initiates a process for establishing and implementing priority actions to sustainably develop key coastal and marine resources over the next 5–10 years. It has an emphasis on zoning proposals and institutional responsibilities related to environmentally sustainable tourism, protected areas, reef recreation, information management, risk assessment and environmental awareness and education.

SUSTAINABILITY AND PARTNERSHIPS

Initial analyses of the fundamental differences between anticipated and actual GEF project design indicate that:

- it took two years rather than one to acquire sufficient background studies, ground-truthing based surveys, and strategic documents to develop a sound, objective and scientific underpinning for ICZM planning that was acceptable to all parties; and
- the second phase, which targeted incorporation of the project's recommendations into the day-to-day activities of respective RSG, EEAA, TDA work programs, as well as specific infrastructure (e.g. the visitor centre and environmental buildings), will take place in what will be 'operationally year three' of the project, but effectively is a 1-year extension (without new funds) planned for 1999–2000.

In addition, as GEF funds can only be used for catalytic, start-up and/or demonstration type projects, and additional funds cannot be acquired for project continuance, it is important that the final year of the project emphasise priority setting by each agency (RSG, EEAA and TDA) to best incorporate key findings of the project and establish clear sustainability linkages with other donor partners active in the region. From the perspective of the GEF–an agency-specific and respective sense of ownership perspective–the Final ICZM Plan provides an indicative summary of key benefits to each of the three lead agencies that have resulted from the project, and is summarised below. Yet, each of these actions will continue to require a commitment to partnerships amongst the lead agencies, in addition to the many other stakeholders who have an interest in the ecologically and economically sustainable development of Egypt's Red Sea resources.

PARTNER AGENCY	INDICATIVE KEY BENEFITS FROM THE GEF PROJECT*
Egyptian Environment Agency	■ Integrated coastal zone management plans for the Affairs project area prepared, including revised institutional roles and detailed action plans ■ Preliminary coastal resource user zoning scheme ■ Coastal zone management implantation mechanisms ■ information based on extensive ecological, land-use and socioeconomic surveys ■ GIS and information management systems ■ Justification for three demonstration coastal protected areas ■ Provision of ecosystem management guidelines ■ Improved environmental monitoring capacity ■ permitting and enforcement capacity ■ Proposals for recurrent funding mechanisms for coastal zone management implementation
Tourism Development Authority	■ Guidelines for environmentally sustainable tourism ■ Visitors centre and environmental education facilities ■ Improved developer environmental awareness ■ Planning information based on extensive ecological, land-use and socioeconomic surveys ■ Shared GIS and information management systems
Red Sea Governorate	■ Shared GIS and information management systems ■ Improved permitting procedures for reef recreation management ■ Improved land-use planning information for municipal areas

(* Adapted from the *GEF Core Report No. 6–Integrated Coastal Zone Management Plan*)

Linking Tourism and Protected Areas – CMPAs

In light of the linkages between tourism and protected areas, which are a focus topic of the 1998 ITMEMS conference, this paper highlights the CMPA component of the GEF Egyptian Red Sea project. The following presents the overall objectives of the CMPA Strategy, and respective emphasis on linking biodiversity conservation with development actions in the coastal zone.

OBJECTIVES OF THE GEF CMPA STRATEGY

- Initiate effective conservation mechanisms to maintain a healthy and ecologically functioning status of significant biodiversity features for coastal and marine ecosystems along Egyptian Red Sea shores, with particular emphasis on coral reefs, mangroves, seagrasses, wadis and migratory species.
- Establish CMPAs that are sufficiently small in scale to be feasible and that demonstrate tangible conservation management measures (signs, rangers, monitoring, education) and shift the balance from paper to real parks, but that are sufficiently large to embrace the core contiguous boundaries and ecological features of respective ecosystems.
- Ensure that these biodiversity conservation areas provide access to natural and wild places for all Egyptian people to visit, enjoy, learn from and cherish, in the immediate present and the foreseeable future.
- Facilitate an integrated approach to coastal marine ecosystem and habitat management across geo-political boundaries (local to international), sectors (e.g. tourism, education, energy) and respective government, NGO and community-based partners who collectively manage these ecosystems.

- Contribute to the establishment of a network of sites that, when well managed, will maintain favourable conservation status of key ecosystems. These can be used as controls to study, compare and expand the scientific knowledge base, as well as providing opportunities for environmental awareness and education at all levels of Egyptian society. In so doing, these sites will contribute towards implementing Egypt's National Biodiversity Strategy and the National Framework Programme on Integrated Coastal Zone Management.
- Through this network, respond to the global call to action from international forums to establish a fully functioning global network of representative coastal-marine habitats that minimise loss of biodiversity at ecosystem, habitat, species and genetic levels.
- Demonstrate that conservation actions can be achieved at many levels when there is a spirit of partnership between people and place.

CMPA STRATEGIC APPROACH

In order to ensure that the CMPA areas were fully integrated with other project components as well as related parallel initiatives, the following strategic approach was used to identify a matrix of suitable CMPA target areas and ecosystems that would meet the above objectives.

Incorporate and contribute to GEF project activities
(Integrated Coastal Zone Management Reef Recreation Management, Environmental Impact Assessment, GEF Database/GIS)
+
Incorporate and contribute to existing national and international coastal-marine frameworks relevant to CMPAs in Egypt
(National Biodiversity Strategy, National Integrated Coastal Zone Management Plan, Environmentally Sustainable Tourism Policy, Red Sea and Gulf of Aden Strategic Action Plan)
+
Encourage linkages with cross-cutting sectors:
(tourism, public involvement, pollution mitigation)
⇓

Conduct coastal-marine biodiversity surveys ⇒
identify key ecosystems ⇒ potential areas ⇒
apply selection criteria incorporating CMPA objectives ⇒
CMPA targets
⇓

CMPA Strategic Framework
Overviews of key coastal-marine ecosystems and demonstration-oriented action plans to demonstrate CMPA objectives in selected geographic areas

THE CMPA BIODIVERSITY FOUNDATION AND SITE IDENTIFICATION PROCESS

In order to conduct field verification and establish biodiversity priorities and practical considerations, over 116 terrestrial and marine stations were surveyed of the flora and fauna in wadis, coastal plains, tidal flats, beaches, mangroves, nearshore reefs and islands. These surveys covered an area from 40 km north of Hurgada down to Shalatein (surveys were planned for the entire Gebel Elba coastal margin, but restricted access to the extreme south made this difficult). The survey areas and methods were based upon initial reconnaissance for logistics and sector divisions assessment, coupled with literature searches to identify gaps in knowledge. From the reconnaissance visits, priority ecosystems, habitats and taxa were chosen, and subsequently 116 ecological surveys were carried out using transect methods reaching 15 km inland into the wadis, and out to 25 metres depth for the sub-tidal marine areas. Once the survey information was collated, assessed and coupled with the socioeconomic and reef-recreation information, it was clustered and evaluated as indicated below:

- **Key ecosystem and habitat features for 33 areas** including Coral Reefs, Seagrasses, Algae, Mangroves, Corals, Submerged Reefs, Nearshore Islands, Offshore Islands, Wadis, Birds; and Wildlife);
- **Biodiversity analysis for 33 areas** based on: value and importance (ecological, biodiversity, economic), threats, primary users, general condition (degraded, healthy), actions needed, and present protection status;
- **Application of typical IUCN criteria for 33 sites** including biogeographic, ecological functioning, natural values, scientific values, socioeconomic values, logistical/access, and legal status;
- **Further analysis of eight candidate areas** including: size, represented habitats (range), conservation status, partner agency (EEAA/TDA/RSG) level of support, and other stakeholder concerns; and
- **Final proposed GEF framework around three sites** that met the following objectives: integrated ecosystems, diversity of management goals (reserve/ecotourism), cohesive ecological units, accessible and doable, small-scale demonstration proposed by multiple parties.

RESULTING COASTAL AND MARINE PROTECTED AREA (CMPA) STRATEGIC FRAMEWORK

A CMPA Framework Matrix summarises the ecological significance and justification of each proposed CMPA area. It is the result of the above analysis and provides the overall framework and foundation that emerged through the CMPA Strategy development process. Both the CMPA Framework and overall CMPA Strategy document are designed to facilitate actions for critical ecosystems through two intersecting axes, both of which integrate ICZM planning approaches.

1. **Priority ecosystem axis** – This axis is intended to be applicable to wherever coral reef, mangrove and wadi ecosystems are found. The ecosystem axis provides guidance with regard to: (a) rationale for targeting the ecosystem; (b) ecological functioning; (c) distribution and condition; (d) values (e.g. biodiversity, economic, ecological roles); (e) threats (natural and human); and (f) actions to address information gaps.

2. **Geographic area axis** – This axis targets specific actions for several geographic areas that contain two or more of the priority ecosystems noted above. Detailed action plans for three CMPA target geographic areas focus on the following: (a) rationale for site selection; (b) location and description; (c) present and potential uses; (d) action directions and indicative zoning; (e) indicative CMPA operation requirements; and (f) indicative regulatory and financial needs.

GEF Proposed CMPA Strategic Framework

ECO-SYSTEM x prop CMPAs	APPROX. AREA (land and water)	REEFS	ISLANDS	MANGROVES	WADIS	1. Conservation Status 2. Level of Support 3. Management Objectives
Hurghada Islands	600 km² six nearshore islands	Fringing reef all around the islands	Five key islands in area	One island is 40% mangroves, all others have no mangroves	None	1) Islands legally protected, but not reefs 2) GEF, EU, USAID note as priority area 3) Target reef conservation, dive and recreation management
Wadi El-Jimal Area	380 km² total area, coastline extending back to wadis	Coastal fringing reef along the shore; reefs around Wadi El-Jimal Island	Wadi El-Jimal Island	Scattered, along the shore	Large wadi area	1) Legal protection for mangroves, islands, not reefs, wadis 2) GEF as protected area; USAID as ecotourism area 3) Target as integrated ecosystem management and ecotourism links
Hamatah Area	350 km² area, coastline extending back to wadis	Reefs around islands and along the shore	Si Yul, Showater and Mahabis Islands	Extensive, along the shore	Large wadi area	1) Islands and mangrove; protected, not reefs and islands 2) GEF and EEAA/NBS proposed as protected areas 3) Target as integrated ecosystem management with ecotourism links

Lessons Learned

The information presented here as a case study for this ITMEMS Symposium on the GEF Egyptian Red Sea Coast Resource Management Project is by necessity brief, but focuses on the project's history and accomplishments for the purposes of this symposium. The following provides an indicative set of perspectives or lessons learned from this case study presented in the context of the ICRI-ITMEMS themes and is targeted to a broad audience of coastal-marine resource managers interested in establishing MPAs within an ICZM context.

INTEGRATED MANAGEMENT

Specific institutional and coordination mechanisms are needed to achieve both multi-agency/sectoral integration and ownership.

In this project it was decided to have a core team of people represented by the lead partners as implementers or coordinators of the implementation phases. While this facilitated intellectual and institutional aspects of integrated management, as well as objectivity, additional steps were needed to ensure that there was a sense of ownership as well as appropriate 'hand-over' or sustainability of the project objectives beyond the lifetime of the project itself. In this project, in the final year, a rigorous assessment and exit strategy is required to clearly identify and phase information transfer and activity continuance, if relevant, back to the respective lead agencies, as well as management of changing or declining donor support. Therefore some of the formal multi-institution and cross-sectoral mechanisms established in this project should be continued in one form or another after the project closes (e.g. the Project Management Group (PMG) and the Technical Advisory Committee). This should ensure that the key stakeholder interests continue to have a forum, and dialogue between agencies is fostered.

Emphasise tangible, incremental and practical activities.

With integrated management projects or programs there is an increased need for practical, physical illustrations of project goals and outputs (e.g. reports, buildings, equipment) to sustain interest and ownership. In addition, activities that are distinct and incremental in nature will be more acceptable and manageable, and they can be phased and cumulative in design to engender substantive policy, and zoning and legislative changes and revisions over time.

Stress flexibility and coordination with changing donor interests, but retain focus on core objectives.

Innovative and strongly environmentally-based activities in Egypt are slowly becoming mainstream in the government and private sectors but they are still reliant on international assistance for the most part. Therefore, there is a vital need for all international agencies to fully coordinate and cooperate on activities for the common good of the people and natural resources of Egypt. In addition, both flexibility and focus are required of an integrated project with changing donor interests that influence the context during the life of the project.

CAPACITY BUILDING

Consider political and enforcement implications when making zoning proposals.

It is imperative that when integrated and multi-area and multi-sector zoning proposals are proposed, the political ramifications are fully assessed with regard to which authority(ies) will have the primary responsibility, and to ensure they have sufficient capacity. In the case of MPA zoning there is always a classic dilemma of a large MPA with development zones vs. a more targeted MPA network within a larger ICZM framework.

Build on existing rather than anticipated staffing.

In this case study, each of the three lead partners was anticipating exponential staffing increases (and therefore increased jurisdictional control) throughout all phases of the project, yet in reality over a 10-year period, each agency increased it size only marginally. This meant that the project had to rely on more local consultants than originally anticipated and even now the capacity for each agency to carry out basic recommendations will still be a challenge. Therefore, it is recommended that projects be based on existing capacity and staffing rather than fully assuming that significant numbers of additional staff will come on board over a short time. There could still be a mechanism in the project's design of institutional elements should staffing numbers and portfolios of expertise change during the project's time frame.

Minimise logistical difficulties and staffing requirements.

In conducting a project in a large or multiple area, have sufficient network nodes, or offices as required, but minimise as much as possible as each node or office requires increased staffing, equipment and people management. This project had two offices—one in Cairo intended to be a small 'policy-link' office to each agency's headquarters, and a Red Sea 'field office'. In hindsight, having only the Red Sea field office would have simplified coordination and facilitated better information flow and integration.

RESEARCH AND MONITORING

Visual presentation of complex and integrated material is highly communicative, yet need not be complicated.

The maps, satellite images, graphs, charts, etc. that were able to be prepared through the course of the project utilising a database management and GIS systems of analysis and presentation made information communication to parties with different interests much more clear and facilitated more constructive dialogue and decision-making results. At the same time, the project lost considerable start-up time with differing opinions of the scale of GIS and database networking requirements. In the end a fairly simple system was sufficient.

Consensus by different stakeholders requires time and supporting technical detail.

Multi-agency projects will inherently take longer to reach consensus on project directions, as well as request a higher level of technical detail to make decisions to mitigate political bias. This puts a higher requirement on research and monitoring to provide answers for management, but in many cases decisions must be made with only basic stages of enquiry and analysis. For example, this project had to invest much more time in detailed surveys than originally envisaged for the various agencies to feel comfortable in making strategic zoning recommendations.

Identify MPAs based on basic knowledge with indicative boundaries as part of the project financing conditions.

It was intended for the MPA area(s) to be identified early on in the project from basic reconnaissance surveys, and after selection, more intensive work would follow in the area(s). Yet, as noted above, considerable detail was required to have constructive discussions that led to the postponement of priorities and subsequent implementation.

REVIEW (PERFORMANCE EVALUATION)

Focus on a balance between flexible response to changing circumstances, staffing etc., but maintain a critical path to meet core objectives and time frame realities.

Review and evaluation are needed at stages sufficient to learn but also to guide next steps, and be of sufficient depth, phasing and purpose to adjust project activities, but without compromising the goals or being overly influenced by dominant policies or people.

Strategic projects have a long-term vision, but are best realised through step-by-step incremental experiences.

The evolution and gradual establishment of protected areas in Sinai demonstrates examples of practicality, replicability, ownership and innovation, all of which require both vision and site-specific examples.

Substantially funded projects need to have a minimum of five years for implementation.

This project was designed as a three-year project, but in effect is taking five years in real terms, which is a lesson learned about a more realistic time frame.

Making Tourism Work for the Bonaire Marine Park

Kalli De Meyer

Abstract

Bonaire is economically dependent on tourism–primarily dive tourism–and its challenge is to ensure that tourism works for the island. In order to achieve 'sustainable' tourism, three aspects need to be considered: impact of tourism development, impact of running tourist facilities and impact of the tourists themselves.

Undoubtedly the Bonaire Marine Park has been most successful at managing the impact of the tourists themselves under the banner 'Bonaire needs tourists... who care'. The Park has successfully used the tourism industry to help police and protect the marine environment. Examples will be given of programs used to educate tourists and industry professionals along with proposals for future work. Examples will also be given of the problems faced and inroads made into minimising the impact of tourism development and the running of tourist facilities on Bonaire.

Lessons Learned

- Tourism can help to underpin and support conservation efforts and MPA management.
- Tourism can not only pay for management, but play a major role in policing and protecting the MPA.
- Balancing nature conservation and tourism is more than addressing the direct physical impacts of tourism on reef environments.
- We need to consider the:
  - impact of tourism development;
  - impact of running tourist facilities; and
  - direct physical impact of the tourists themselves.

Key Elements

FINANCING

- MPAs cannot be actively managed in the absence of a continuing source of funding.
- Tourism can and should pay for MPA management at tourist destinations.
- A recent study by WWF Holland concluded that tourists are the group most willing and able to pay for conservation.

EDUCATION

- Education is a prime requirement: no one will support what they do not understand.
- The tourism industry can be very effective at providing information to their clientele.
- Tourists need education before they arrive at their destination with preconceived ideas about 'paradise' and no concept of the need for water conservation etc.
- The education process needs to begin at home (via the Internet).
- Travel writers, the media, airlines, travel agents, etc. should be used to help get the conservation message across.

INVOLVEMENT

- It is important to make those involved part of the conservation effort, especially at the grassroots level.
- Greatest progress can be made when the stakeholders develop a custodial attitude towards the resource.

MOTIVATION

- Clear and tangible benefits/results should be offered whenever possible.
- It is easiest to motivate those involved if problems are tangible.
- If they are not, examples of what happens when things go wrong may be most effective.
- It is crucial to be able to put a monetary value on the resource, especially when speaking to decision-makers and developers.

NETWORKING

- Progress can only be made when we share a common vision and work together.
- On a local level, we need to work with the stakeholders, tourism industry, tourist office, government agencies, etc.
- NGOs are an important element as they can say and do what others often cannot.
- Internationally we need networks like CAMPAM to network amongst ourselves.
- We also need to interface with researchers, etc.

In actuality, MPA Management is 50% Planning, 50% Opportunism and 100% People.

Tourism Management in the Great Barrier Reef, Australia

Kim Watson[1], Hilary Skeat[1] and Bryony Barnett[1]

Introduction

Australia's international obligations under the World Heritage Convention are to ensure 'the identification, conservation, protection, presentation and transmission to future generations of the cultural and natural heritage' of the Great Barrier Reef. 'Presentation' is the key word for the tourism industry. The Marine Park tourism industry is the primary vehicle for presentation of the Great Barrier Reef World Heritage Area.

Tourism is the principal industry in the Great Barrier Reef Region, with an approximate annual value to the Region in excess of A$1 billion (Vanderzee 1996). Visitation to the Reef in 1997 was recorded at 1.6 million visitor-days (Environmental Management Charge data). The volume and profile of tourism use of the Great Barrier Reef World Heritage Area has changed significantly in the past 20 years, presenting new challenges to managers.

This case study examines the new approach that has been adopted in managing marine tourism use. In particular, it focuses on the use of a permits system to manage the marine tourism industry. We are shifting the mechanism of tourism use management from individual permits to a more strategic and integrated management approach throughout the Great Barrier Reef Marine Park. The major practical benefit of the new system will be its ability to address both the individual and cumulative impacts of tourism use, while also reducing administrative effort. The change has been incremental over the past five years and is not yet complete, but there are a number of lessons learned that may be helpful to other reef tourism managers.

The Great Barrier Reef Tourism Industry

EVOLUTION OF TOURISM IN THE GREAT BARRIER REEF

The volume and profile of tourism use of the Great Barrier Reef has changed significantly in the past twenty years, presenting new challenges to managers. Most reef visitors during the 1960s and 1970s were there to catch fish. The small tourism industry offered day trips and extended charters to accessible islands and reefs. The accessibility of the outer reef was greatly enhanced with the introduction, in the early 1980s, of high-speed high capacity catamarans ('fast cats') and in the early 1990s the even faster wave-piercing vessels. This was a period of exponential growth in the capacity of the tourist industry to take visitors to the reef. Today's reef visitor has a wide choice of locations to visit and experiences from which to choose, including sightseeing, snorkelling, diving, coral viewing, fishing and watersports.

TOURISM INDUSTRY PROFILE

The Marine Park tourism industry comprises a diversity of operations. Typically, these operations fall within one of the following categories:

- site-specific operations which offer regular (usually daily) trips to specific reef or island destinations, and may be mooring or pontoon-based;
- area-specific operations which offer day trips or extended charters within a specific area, and may include a number of regularly visited sites;
- roving operations which offer opportunities for charter throughout a wide area of the Marine Park, most of which are restricted to no more than two days access in any seven-day period to any site;
- hire operations which offer small watercraft or bareboats for hire without crew; or
- cruise operations with large vessels accessing a limited number of places in the Marine Park.

1. Tourism and Recreation Group, Great Barrier Reef Marine Park Authority

A total of 595 tourism operations are currently permitted in the Marine Park, covering 1674 individual craft, including 328 bareboats, 127 aircraft, 17 cruise ships and 461 hire craft (dinghies, watersports craft, kayaks, etc.). (GBRMPA Permits database, September 1998)

Management of Tourism Use

Tourism use in the Great Barrier Reef Marine Park is managed jointly by the Great Barrier Reef Marine Park Authority (Commonwealth) and the Queensland Department of Environment and Heritage (State), within the statutory framework of zoning plans, management plans and permits. Although Zoning Plans have been a major and integral component of Marine Park management, their primary effect has been to define where extractive industries, such as trawling, line fishing and collecting are allowed. The zoning plans provide little direction on tourism activities principally because, in the early years, tourism use was very low. Consequently, tourism use is allowed, subject to permit requirements, in more than 99% of the Marine Park.

The principal tool used to manage tourism has been the permit system. The zoning provision requires all marine tourism operations to have a permit. The granting of such a permit is subject to assessment against set criteria. Permit applications have been assessed and granted on a 'first-come, first served' basis with conditions specific to the area of operation and type of activity.

PERMITS AS A MANAGEMENT TOOL

In the early 1980s there were very few tourist program permits, and the permits themselves consisted of a single page and few conditions. In the late 1980s and early 1990s there was a huge increase in the numbers of permits. There was a similar increase in the length and complexity of the permit documents as they became increasingly used to set site management conditions.

A management approach based largely on a discretionary permit system was appropriate in the early stages when there were few tourist operators and programs. A flexible system of management was called for at a time when the impacts of marine tourism were poorly understood. The use of permits has allowed flexibility and entrepreneurial development, providing a mechanism for identifying and reducing impacts of individual operations. However, as the marine tourism industry has burgeoned, over-reliance on permits has caused numerous problems. By the early 1990s, the following problems were identified.

- Permits were too lengthy and complex.
- A great deal of effort went into assessing, negotiating and generating individual permits and therefore the application processing time was long and the demand for staff resourcing was long and difficult to predict and manage.
- Tourism operators considered they were being unfairly restricted, vis-a-vis the general public and other commercial operations, by having conditions and restrictions imposed while similar constraints were not placed on other users whose activities may have caused the same impacts.
- Changing policies and the lack of plans sometimes resulted in inconsistencies in permit decisions and in the conditions being imposed on permit holders. This was exacerbated by longer term permits (six years) where changed management regimes could not be readily applied until the permit came up for renewal.
- Permits were used increasingly to apply restrictions that would be better and more equitably applied in a consistent manner through Zoning Plans, Management Plans, and/or Regulations.
- It was not possible to address the cumulative impacts of marine tourism use through individual permit assessments.

REVIEW OF THE MARINE PARK PERMIT SYSTEM

The need for a shift away from permits as the prime management tool for marine tourism use was acknowledged in a major review of the Marine Park permit system in 1993/94. The review concluded that there could be no 'quick fix', but that a combination of tools and strategies other than permits would need to be applied in an integrated way to reduce reliance on permits in managing tourism. The following principles for management of tourism use were proposed.

- There should be an emphasis on the management of impacts and sites rather than regulation of users.
- Any necessary constraints on use should be applied, as far as possible, to all user groups.
- In general, management should ensure a high level of protection for sites of especially high conservation value, with minimal risks being accepted in their management. Access to most other sites should be largely unrestricted but subject to some general management provisions, monitoring of use levels, and monitoring of impacts at some sites at least.

It was recommended that in order to maintain adequate protection for the Great Barrier Reef World Heritage Area, the permit system should be retained including thorough impact assessment for operations, structures, etc. with potential for significant impact. However, for most operations, the permits could be simplified and standardised and procedures could be clarified and streamlined.

A New Approach to Tourism Use Management

In the years that have followed this review, the Authority has been working towards implementing a more strategic and integrated approach to the management of marine tourism use based on:

- strategic policy and planning—establishing a clear direction for managing marine tourism;
- direct management—establishing well-defined, enforceable and effective management controls to protect the values of the Marine Park;
- self-regulation by the tourist industry—encouraging, assisting and promoting environmental responsibility and professional presentation of the Reef within the marine tourism industry; and
- active partnerships—encouraging the industry and other stakeholders to be active partners in Marine Park management.

STRATEGIC POLICY AND PLANNING

In order to provide a strategic framework for future management, the Authority is developing a Reef-wide plan for managing tourism use throughout the whole of the Marine Park that takes into account the cumulative impacts of tourism use. To establish a statutory basis for management plans, amendments to the *Great Barrier Reef Marine Park Act 1975* were required. Under this new legislative framework management plans have been developed for two areas, Cairns and Whitsundays, that attract at least 85% of all tourism use of the Great Barrier Reef. These key management plans address impacts on the natural environment (such as anchor damage to coral and disturbances to wildlife) and social and cultural issues (displacement of traditional and historical use). Management mechanisms such as the provision of settings (designating ranges in intensity and types of uses allowed) and reef protection strategies will impact on all users of the Reef. The plan also impacts on tourism use specifically through site access restrictions and moorings management. Concerned that tourism use is approaching its sustainable limit in these areas, the statutory policy of the plans recognises historic users and limits opportunities for new operations.

DIRECT MANAGEMENT

The major area of change for direct management has been simplifying and standardising the permit system for tourist program permits.

Through developments on a number of fronts, especially in relation to place-based planning, the Authority and the Queensland Department of Environment and Heritage are now in a position to jointly introduce the first stage of a system of simple, standard tourist program permits. These permits will provide many improvements for the managing agencies and operators, including:

- transparency;
- equity;
- certainty; and
- more rapid and effective processing.

Using the variables of activities undertaken, areas accessed, frequency of access and size and type of vessel/aircraft, four standard types of tourist program permits have been defined, two of which are further divided into classes of operation:

- Tour Operation (3 classes);
- Cruise Operation;
- Hire Operation (2 classes); and
- Craftless Operation.

It is planned to introduce these standards soon on a trial basis. Ultimately it is intended that the permit types will be described in the legislation and will be introduced along with the 'new look' one-page permit and accompanying Reef Operators Manual (explaining Zoning Plans, Management Plans, and permit requirements).

Not strictly an exercise in 'capacity building', the standardisation of the permit system should, however, have the effect of freeing Authority and Department of Environment and Heritage staff to work on strategic management issues rather than their being committed to case-by-case permit decisions and administration.

SELF-REGULATION: CAPACITY BUILDING WITH MARINE TOURISM OPERATORS

To promote and encourage environmental responsibility and professional presentation of the Reef, capacity building with marine tourism operators is being achieved in a number of ways.

Codes of Conduct and Best Environmental Practices

The Authority has been working with the marine tourism industry toward the adoption of codes of conduct and compliance with best environmental practices.

Tourism Industry Training Programs

Training programs for operators who employ staff to inform passengers about the Reef and best practices were developed by the Authority in 1996. Tourism industry training programs continue to be implemented and routinely reviewed.

Accreditation

The Authority is investigating, with industry and other stakeholders, the issue of accreditation for marine park guides and operators. At present, Authority staff are working closely with the Whitsunday bareboat industry to develop a staff training program which will form the basis of future accreditation for this industry.

ACTIVE PARTNERSHIPS

Stakeholder participation is an essential component of marine tourism management. Formal processes for community consultation have been established through ten Regional Marine Resource Advisory Committees (RMRACs) with representation from stakeholder groups (including the tourism industry, recreational and commercial fishing sectors, conservation interests, Aboriginal and Torres Strait Islander interests, local authorities and specific interest groups). In addition, a new expertise-based Tourism and Recreation Reef Advisory Committee is to be established by the Authority to advise specifically on tourism and recreation issues.

'Active partnerships' is also a strong component of research and monitoring of the Reef environment. The need for a better understanding of the cumulative impacts of tourism has been highlighted as the Authority moves away from permits as the primary management tool to a more strategic, plan-based approach. The ecological and social impacts of Marine Park tourism are being investigated by a number of researchers and institutions including the CRC Reef Research Centre, James Cook University, the Australian Institute of Marine Science, and the Great Barrier Reef Marine Park Authority. Supporting this effort the marine tourism industry, through the Reef 2005 Project, has developed site monitoring systems as well as social monitoring of visitor expectation to ensure visitor satisfaction.

Lessons Learned and Recommendations

STANDARD PERMITS

Much developmental work has been undertaken in order to simplify and standardise the tourist program permits system. It is this area of implementing a new approach upon which we will concentrate in analysing the lessons learned. It is too early yet to assess the effectiveness of the standard permits, but we do have a sense of lessons learned thus far.

Lesson 1

Using permits to regulate tourism use of an area is appropriate in the early stages of development of the industry because they are individualised, they are reactive and responsive and they allow entrepreneurial development. However, as the sustainable limit of an area is reached there is a need to address cumulative impacts, to manage more strategically and to introduce less resource-intensive systems of management. As the Authority did not have the legislative capacity to undertake statutory place-based planning until recently, the transition from one approach to the other was delayed.

Recommendation: Use permits as an initial management tool, but put your effort into strategic planning early, and allocate resources to address issues when first identified. Endeavour to be pro-active, take a risk and develop a plan, it provides a transparent context for operators in making business decisions and provides a solid base for decision-makers.

Lesson 2

One of the problems in the previous permit system was the perception by the tourist industry that they were being discriminated against by being over-regulated while recreational users were subject to few restrictions.

Recommendation: It is appropriate to manage repetitive uses such as tourism through permits, but don't neglect other sectors which have an impact and contribute to cumulative impacts. Implement appropriate management regimes applicable to all relevant users, not just those who can be easily managed through permitting.

Lesson 3

The Marine Park permits are usually issued for six years and it is difficult to introduce changes to the conditions of the permit. This has meant that emerging conservation or management issues could not be addressed for existing operators, except at renewal of their permit.

Recommendation: Design a management system that can accommodate gradual change in management requirements (with appropriate stakeholder input), for example plans of management provisions that apply directly to operators and can be amended, and generic permits which contain few specific management conditions.

Lesson 4

In our case, developing and implementing change to the permitting system has been gradual and incremental. It has come after years of documentation, consultation, brainstorming, negotiation and hard work. Over the years the vision may be modified, the factors that need to be accommodated may change and there may be changing political imperatives. The process of change needs to be flexible enough to accommodate such alterations, while still achieving the eventual desired outcome. One of the important things for us has been that consensus (with Managing Agencies and the tourism industry) was reached early on the need for radical change and on the fundamental components of the desired final result.

Recommendation: Develop active partnerships with the tourism industry. Keep the tourism industry informed and involved in the major aspects of review, policy development and system design, being mindful that decisions made will directly affect them.

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Discussion Notes

- There is a need for tourism monitoring by the tourism sector, often as the watchdog. Required monitoring could be tied to a permit. Follow-up would be by park and other more highly trained staff.
- Tenure has a role: who owns the reef or resources can make all the difference.
- Permits play a key role. They could be useful but can not be overused, and should have a clear justification.
- A lack of planning and the need for an identified source of financing were evident as key components that weakened outcomes.
- Sustainable tourism may be the last hope for coral reef conservation. 'Tourism is the solution not the problem'.

Outcomes

1. Integrated Management, Coordination and Linkages to other Initiatives, Programs and Instruments
2. Stakeholder Partnerships and Community Participation
3. Public Awareness and Education, including Capacity Building
4. Data and Information for Management

Lessons Learned	**1**	**2**	**3**	**4**
Support community-based management.	X	X		
Integrate all management–public and private (hoteliers, government, fishers and tourism).	X	X		
Strategic Planning is vital, and should be undertaken early.	X	X	X	
Fees count! People own something (and will act as stewards) if they have paid for it.	X	X	X	X
The Private Sector should be paying for management. Tourism can pay all the costs.	X	X	X	
Have a range of legal tools, as they have an important role.				
Education of the community and stakeholders is an important tool.	X	X	X	
Management needs strong political and financial support.		X	X	
Define property rights.	X	X		
Start with small scale and simple, and progress to the larger scale–demonstration value.	X X	X X	X X	
Provide incentives to industry participation.				
Enforcement is important, compliance is necessary.	X	X	X	
Understand the threats, identify the impacts, and monitor the use and impact.		X	X	
Instigate different levels of monitoring (operators, researchers).	X	X		X
FUTURE CHALLENGES FOR SUSTAINABLE TOURISM OVER THE NEXT FIVE YEARS **Challenge**	X	X	X	X
Population growth in the coastal zone, including tourism population growth. This includes understanding the maximum sustainable capacity.	X			X
Integrating ecological connections, conserving on a large scale, including integrating coastal and marine environments.	X	X		X
The need for equity so that all users, including locals, benefit equitably from tourism.	X	X	X	
Getting across the message of sustainable use and its benefits, including the ecological and economic benefits	X	X	X	
Facilitating self-regulation by the tourism industry and ensuring that the codes are adhered to. This may involve attaining a corporate ethic and generating political will.	X	X		
Achieving a strong Environmental Impact Assessment process.	X		X	X

SESSION 7: Destructive Fishing Practices and Collecting Methods

Chair: Hassan Maniku
Rapporteurs: Jeffrey Low, Lida Pet-Soede
Presenters: Solomon Makoloweka, Liana Talaue-McManus, Greg Andrews, Sari Suryadi

ITMEMS 1998 Proceedings

Silencing the Dynamite Fisheries along the Tanga Coast, Tanzania

Chris Horrill[1] **and Solomon Makoloweka**[1]

Introduction

The Tanga Region is the most northern coastal region of Tanzania encompassing the three coastal Districts of Muheza, Pangani and Tanga Municipality. The Region extends 180 km south from the Kenyan border and supports a number of ecologically important and diverse habitats including coral reefs, mangrove forests, seagrass beds and coastal forests. It is important as a turtle feeding and nesting area and provides feeding grounds for over 1% of the world's population of crab plovers (Dromas ardolea). Reef development along the coast is broken with 41 distinct sections of coastal fringing reef, and a total of 55 patch reefs along the length of the coast (Figure 1). Thirty of these patch reefs are adjacent to the continental shelf (outer patch reefs) with 25 patch reefs (inner patch reefs) located in shallow water (less than 25 m) between the coast and continental shelf. In total there are 96 reefs in Tanga covering 376 km.

Studies of the condition of the Tanga Region's reefs have been sporadic. Early work tended to be descriptive (Ray 1968; UNEP 1989) and/or sampled a small proportion of the reefs in a localised area (Ray 1968; IUCN 1987; UNEP 1989). Nonetheless an impression of how some of these reefs have changed can be gained from Ray's (1968) description of some of the reefs adjacent to Tanga town as being among the best along Tanzania's coastline. By 1987 however, this situation had drastically changed. A study undertaken by IUCN concluded: 'the reefs are extensively damaged throughout the Tanga Region. In most areas a percentage cover of live corals of less than 20% was recorded. In some areas live coral cover was less than 10%. On Niule reef (leeward side) a live coral cover of less than 1% was estimated' (IUCN 1987).

A wider survey of the reefs was undertaken in 1995 (Horrill 1996), the purpose of which was to assess the extent of reef degradation, reef biodiversity and levels of resource use. From a sample of 14 coastal reefs, 17 inner patch reefs and 27 outer patch reefs, it is estimated that 12% of reefs are completely destroyed, 24% are in good condition with the remaining 64% in poor or moderate condition. Information from communities and monitoring systems that have been established since the assessment took place indicate that most of the damage to reefs north of the Pangani River is the result of dynamite fishing (Horrill 1997). Incidences of this type of fishing are of lower order of magnitude south of the River. It is also of interest that the majority of sampled reefs destroyed or in poor condition are adjacent to areas of high human population density, that is adjacent to, or to the north of, Tanga town. Conversely, reefs in relatively good condition are adjacent to low human population density areas, especially those south of the Pangani River.

1. Tanga Coastal Zone Conservation and Development Programme, Tanga, Tanzania

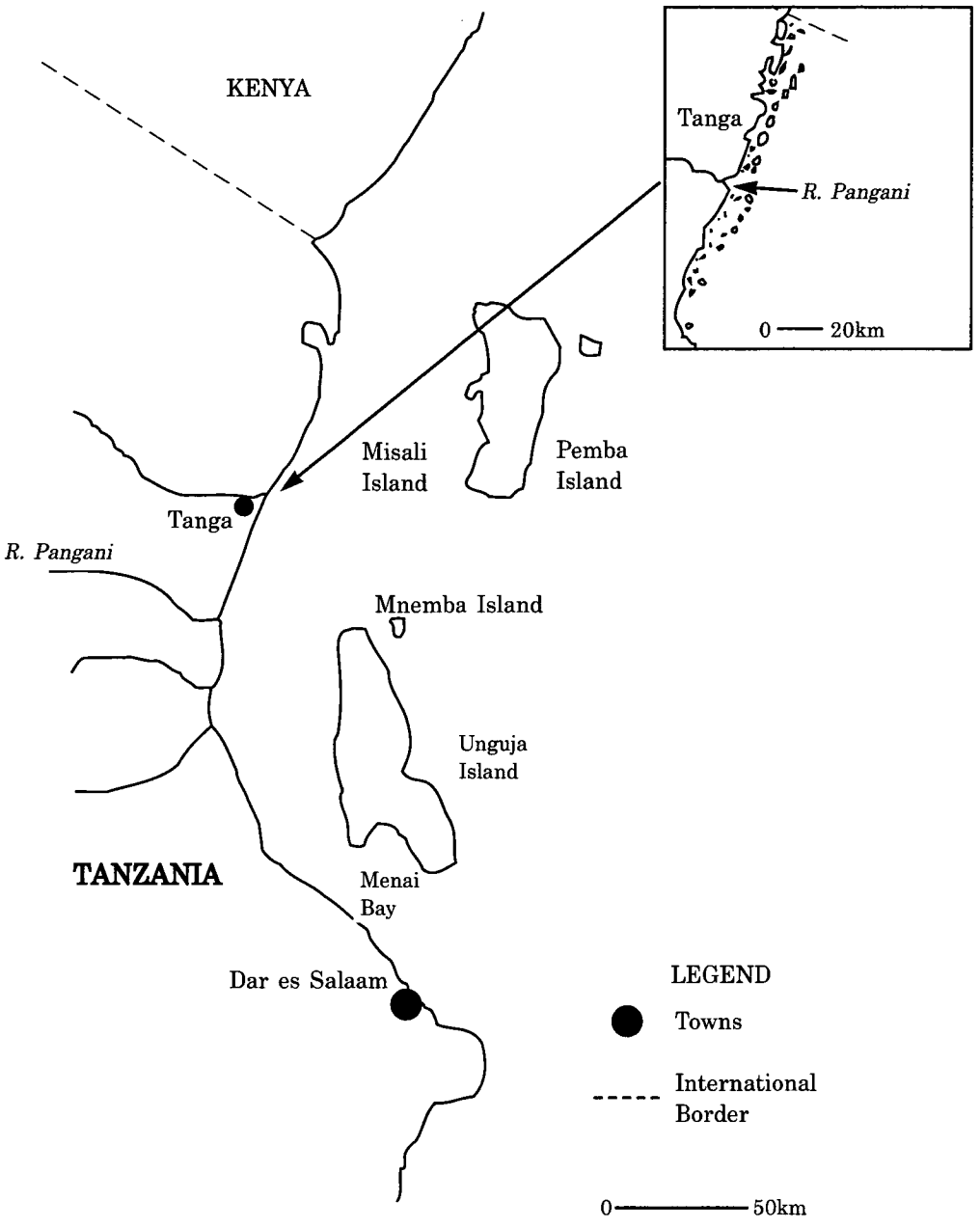

Figure 1: Reefs of the Tanga Region

Problems Associated with Previous Control Measures

Despite the prior prevalence of dynamite fishing throughout the Region, the majority of government officials and villagers were aware of the negative impacts both to the environment and fishers. Destructive fishing, especially that using dynamite, was identified as the major issue in fisheries management by workshops held with villagers and government personnel, participatory socioeconomic and coral reef surveys as well as a study on existing traditional management (Scheinman & Mabrook 1996). In each of these fora, stricter law enforcement was proposed as the most effective solution to this issue.

Problems in controlling dynamite use were identified as: (1) the lack of arrests; (2) delays in bringing cases to court; and (3) the lack of, or, improper sentencing. Between 1979 and 1992 only five cases were brought to court. In three cases no judgement was given; one case was appealed by Fisheries and in the other two fines were very low. Unfortunately, there is no information on the number of arrests made and cases which did not appear in court.

Previous strategies for the arrest of offenders relied on: (a) Fisheries Officers to detain fishermen landing fish suspected as having been caught by explosives or poisons at designated landing sites; and (b) land and sea patrols from a central base (Tanga) to inspect gears. Neither of these was effective. Villagers reported that incidences of dynamite fishing did not occur when patrols were operating in an area, but commenced immediately after their departure. This view was supported by experience gained during the coral reef survey. Dynamite fishing would not occur when it was known that the survey team and marine police were in the area, but would commence immediately afterwards. It was also observed that in some areas (e.g. Mwambani) there seemed to be a signalling system to show when government boats were in the vicinity. Problems associated with patrols were: (a) complaints of complicity of Fisheries Officers at landing stations (10% of officers in the Region had outstanding complaints in 1995); (b) Fisheries Officers in villages complaining of intimidation by dynamiters and only receiving low payments for trying to deal with these problems; and (c) poor support and supervision of Fisheries Officers in the field.

A further difficulty was financial sustainability. Government funds have not been sufficient to implement these types of centralised patrols as well as maintain the necessary equipment. Currently, there are three disused boats requiring complete rehabilitation. Two can be found at the marine police headquarters and the third in the harbour.

Actions Taken and their Effectiveness

Prior to the start of the Tanga Coastal Zone Conservation and Development Program natural resource management was the sole preserve of government agencies. However, this type of management coupled with lack of resources, both human and financial, resulted in inaction of government and communities to deal with management problems including dynamite fishing.

The failure of sectoral, directive management by government agencies resulted in government willingness to try a collaborative, integrated approach to the management of coastal resources. This is now being developed under the auspices of the Tanga Coastal Zone Conservation and Development Program which is funded by Irish Aid, with technical support from the World Conservation Union (IUCN). The Program started in 1994 and is an integrated conservation and development initiative implemented in a number of three-year phases. The overall goal of the Program is: Sustainable use of coastal resources in Tanga Region for the benefit of present and future generations of residents, as well as other people and programs in Tanzania and East Africa.

To achieve this goal, the Program is working with key government sectors of the three coastal administrative Districts within Tanga Region and a number of village communities in developing cross-sectoral (integrated) management of priority issues. The Program's strategy in addressing a large number of issues over an extensive area is to deal with a small number of priority issues in localised areas. The approach taken is based on a project cycle of listening, piloting, demonstrating and mainstreaming (Piccotto & Weaving 1994). The first part of this cycle is the identification of stakeholders and the gathering of information from them. Piloting is the small-scale experimentation of different approaches to deal with priority issues. Successful approaches are continued in the demonstration phase and become everyday practice during the mainstreaming phase. Monitoring and evaluation is an integral part of this cycle giving an adaptive and evolutionary approach to the development of management strategies. This strategy led to the Program addressing the priority issue of fishing with dynamite in three of the larger fishing communities (Mwambani, Kigombe and Kipumbwi) whose fishing grounds cover approximately 33% of the coastline.

Villagers in all these villages formed committees whose mandate was the reduction of destructive fishing. These committees are: in Kigombe, the Kamati ya Doria (Patrol Committee); in Kipumbwi, the Kamati ya Ulinzi na Usalama (Patrol and Security); and in Mwambani, the Kamati ya Uhaba wa Samaki (Fish Scarcity). The committees requested program support to conduct land and sea patrols.

There have been three distinct phases in the development of the present day patrols. The first was initiated in the villages of Kigombe and Kipumbwi and used villagers and marine police. Mwambani was not selected because:

1. it was unclear how much support there was for the committee from other villagers. There were complaints of intimidation from dynamiters culminating in the resignations of the chair and secretary;
2. there was a lack of fisheries officers in the Tanga District who had not been accused of complicity in dynamite fishing. The two Tanga District Fisheries Officers trained by the Program for this purpose were caught taking bribes from dynamite fishers during the coral reef survey; and
3. the police could not guarantee the safety of the boats. During the coral reef survey an anchor rope was removed from one of the boats despite the presence of two police officers.

At Kigombe and Kipumbwi, the Program entered into agreements for collaborative sea patrols with the respective management committees. The terms of these agreements were:

1. marine police would be based in villages where they would support villagers and fisheries officers;
2. community members would report known dynamite boats as they went to, or returned from, fishing;
3. villagers would participate in the patrols as well as monitor the actions taken by the government officers; and
4. both the village committees and the fisheries officers would keep logs of the number of reported incidences (including information on number of blasts, location, type of boat and number of fishers), what action was taken, what the outcome was, and if there was no outcome, what the reasons were.

Incidences of dynamite fishing decreased dramatically when patrols were introduced at the end of 1995 (Figure 2). However, incidences rose in Mwambani and Kigombe in February 1997 primarily caused by a lack of commitment by some of the marine police officers. Villagers also stated that it was also compounded by the lack of a patrol boat at Mwambani. The establishment of a patrol unit at Mwambani reduced, but did not stop, the dynamiting as the problems with the commitment of the marine police continued, despite disciplining a number of officers. It was then decided to train villagers as militia so that they could take over fully from the marine police, but this also failed as shown by the second peak in incidences in January 1998. The experience from this strategy was that villagers could control offenders from their own village, but not outsiders. This led to the Program facilitating an agreement similar to the one with marine police, but this time with the Navy who had just been given a civilian role. Since the Navy has supported the patrols (end of February 1998), there has only been one blast and the boat responsible was confiscated and the crew arrested. However, the involvement of the Navy has also not been without problems as there have been several claims of brutality from villages. Some of these claims are without foundation but unfortunately others are not. To counter this problem the Program is currently developing a set of guidelines for fisheries-related offences, including dynamiting, which includes definitions of offences, arrest procedures and penalties.

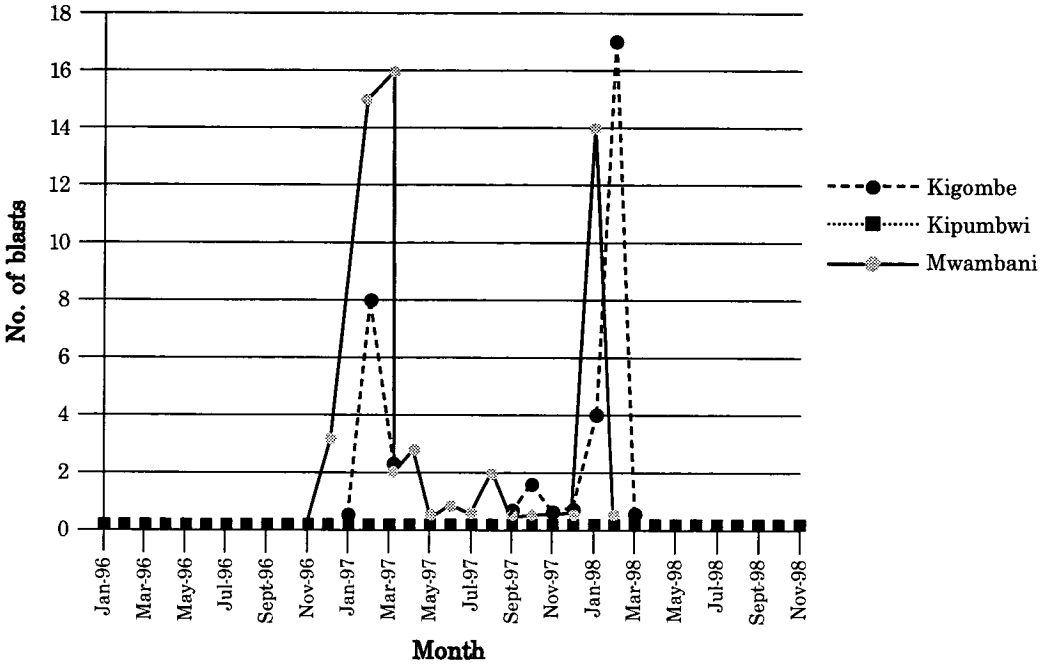

Figure 2: Number of incidences of dynamite blasts recorded at Kigombe, Mwambani and Kipumbwi

Problems in the courts were reduced as a direct result of greater awareness of the threat of dynamite fishing amongst prosecutors and magistrates through the conduct of workshops with these groups. This is rather ironic as it showed that awareness was most effective when given to the professional group rather then to the villagers, which is often suggested and tried at great cost. Previously, convicted fishers were given a fine of US$3 to US$7.50, however recent convictions have resulted in fines of US$500 and/or imprisonment for two years. Stricter enforcement has also led to an increase in the number of fishers who have valid fishing licences. This, in turn, has led to raised revenue for District governments with Tanga Municipality realising US$11700 of unexpected income from licence fees.

Financial Sustainability of Management and Enforcement

The assumption made by all conservation initiatives is that sustainable use can be achieved through management of the use and development of resources. It is therefore crucial that the established management systems to achieve this aim are also sustainable. Key to this is the building of institutions that have sufficient financial resources to be sustainable. Main management costs are likely to be those associated with enforcement, provision of technical assistance, training and monitoring and evaluation. The cost of running one patrol unit (including equipment depreciation) per year is about US$5000 (Horrill 1997) and the other costs are likely to double, if not treble, this total. Thus, it could cost a minimum of US$10 000 per year to finance one village management unit. Given that there will be about nine of these units (three in each District), the annual cost of management in each District will be not less than US$30 000.

Despite its abundant natural resources, Tanzania is a poor country dependent on donor assistance. Development of the private sector, including local communities, is often hampered by a heavy taxation regime (see earlier this Chapter). It is therefore not feasible to raise finances for management costs through increasing the tax burden; finance has to come from existing revenue. Revenue in the fisheries sector in Tanzania is raised through export royalties, licensing fees and a fish catch levy. Export royalties are collected by the central government whereas licensing fees and one half of the fish catch levy is paid to the District government. The other half of the catch levy is paid to the village government. Typically fish catch levy is between 10 and 15% of the total value of the catch and is paid by the seller to the local fisheries officer. Larger villages or fisheries centres such as Kigombe have an estimated annual fish catch of around US$60 000 giving an estimated revenue of US$3000 to the District and the same amount to the village government (Horrill et al. 1998). Muheza District and Tanga Municipality have three large fisheries centres and so could theoretically collect US$9000 per year from fish catch levies. However, it is estimated that Pangani District revenue will be much less than this (US$6000) as there are only two large fisheries centres, Pangani town and Kipumbwi. When estimates of revenue from licences are included, fisheries revenue for Tanga Municipality could be in the region of US$20 000, for Muheza District US$14 000 and Pangani District US$12 000. These figures are a long way short of the estimates of what will be required to maintain effective management. It is clear that cost-sharing mechanisms must be found to ensure the long-term sustainability of management. Other partners that are being considered are the central Government, retention of export royalties, village governments, Tanzania Revenue Authority and the private sector. Proposals for central Government support and for the use of export royalty retention have already been submitted.

Lessons Learned

The Tanga experience of using a collaborative approach to management of reef and reef fisheries resources has given noticeable results within two years and has shown that villagers are prepared to deal with issues and implement solutions. Progress was largely due to gaining the support of users by focusing on a small number of priorities and concentrating on the critical actions to address them. This was reflected in the setting of clear objectives for village action plans, which was critical in ensuring that everyone knows what they are trying to achieve. Success in dealing with dynamite fishing laid the foundation for the implementation of other management actions, such as reef closures. Ironically it is unfashionable for projects or programs to support strict enforcement, but information from all groups and experience on the ground has shown it has worked. Strict enforcement of regulations in Tanga still has a number of problems and a long way to go, but it must be recognised that those who are disadvantaged by law enforcement will always attempt to undermine it.

Other experience from implementing collaborative enforcement has shown that villagers are more effective in controlling offenders from within their own village rather than those from other villages. Moreover, villagers' expectations of what government officers can do, and what other government officers think they can do (the Navy), are often too high. They do not readily recognise the limits on the use of firearms and the detainment of known dynamite fishers without the required evidence. It has also shown that what is lacking is a clearly defined policy and program of implementation at all levels of government. The support of government is critical to the success of this type of management as government personnel need to provide good, timely technical and policy advice and to monitor progress. Transparency in decision making at all levels is also essential so that as many stakeholders as possible are aware of what is happening.

Future needs for success are the development of sustainable institutions, inter-institutional arrangements and financing mechanisms for management. Reliable, simple monitoring systems to measure and evaluate the effectiveness of management measures in meeting expectations are also required. Work on developing these mechanisms is ongoing and will be largely dependent on effective support from the central Government and the continuing commitment of local government and villagers to address the issues despite the current problems.

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Mafia Island Marine Park, Tanzania: Implications of Applying a Marine Park Paradigm in a Developing Country

Greg Andrews

Introduction

The group of islands incorporating Mafia Island lie off the east coast of Africa and are a part of mainland Tanzania (Figure 1). The islands are within 20 km of the mainland coast and under the influence of Tanzania's largest river, the Rufiji. Mafia Island Marine Park (MIMP) was gazetted in April 1995, and its boundary incorporates varied coral reef, mangrove, seagrass and soft bottom habitats, islands of raised Pleistocene reef, cays, and coastal forest with a total area of 821 km^2 (Fig. 2).

This paper critiques the process and motives for the establishment of the MIMP. The paper explores conservation advantages and disadvantages of the establishment of the Park and the use of the World Conservation Union/Great Barrier Reef Marine Park (IUCN/GBRMP) paradigm for its management. The premise that the project was a model of community participation and represents a new approach is challenged. The management of two key environmental threats (dynamite fishing and coral mining) are used to illustrate the advantages and disadvantages of transposing conservation and management paradigms from developed countries to developing countries.

Historical Background

Discussions on marine parks in Tanzania, particularly in the Mafia region, have been undertaken since 1968 (Ray 1968; UNEP 1989). First attempts to manage the marine and coastal environment through protected areas in Tanzania commenced in 1975 through regulations under the *Fisheries Act 1970.* Seven small areas of reef were declared Marine Reserves for total protection (Figure 3). These included two areas around Mafia Island–Chole Bay and Tutia Reef. Lack of capacity led to these reserves being 'paper' reserves with no active management being established. Pressure from various groups urged the creation of larger, multiple-use areas combining conservation and the concept of sustainable use and development.

Studies initiated in 1988 by the University of Dar es Salaam (Institute of Marine Science: IMS), with financial support from Shell Petroleum Development Tanzania Limited, and in collaboration with other agencies (Frontier–Tanzania), sought to provide baseline information on which to develop a proposal for Tanzania's first Marine Park. Biophysical and socioeconomic data was collected. An area of southern Mafia incorporating ten village communities was proposed for the MIMP. It was acknowledged that the communities are highly dependent on the natural resources of the area for food, shelter and income. In addition, several commercial concerns whose businesses also directly depend on the natural resources were identified. The local marine resource uses of the area include: finfish fishing, octopus fishing, coral collection, shell collection, sea cucumber, mangrove crab and lobster collection.

In February 1991, a meeting was held in Dar es Salaam to discuss the concept of a marine park on Mafia Island. This resulted in the formation of a Steering Committee appointed by the Principal Secretary of the Ministry of Tourism, Natural Resources and Environment[1]. This committee was to develop and propose the mechanism for creating and managing a marine park centred on Mafia Island. The Steering Committee collated existing information including the information presented by the IMS and the Frontier–Tanzania project (Horrill & Ngoile 1991). Frontier–Tanzania, with local counterparts and the Steering Committee, discussed the idea of a multiple-use marine park with the community.

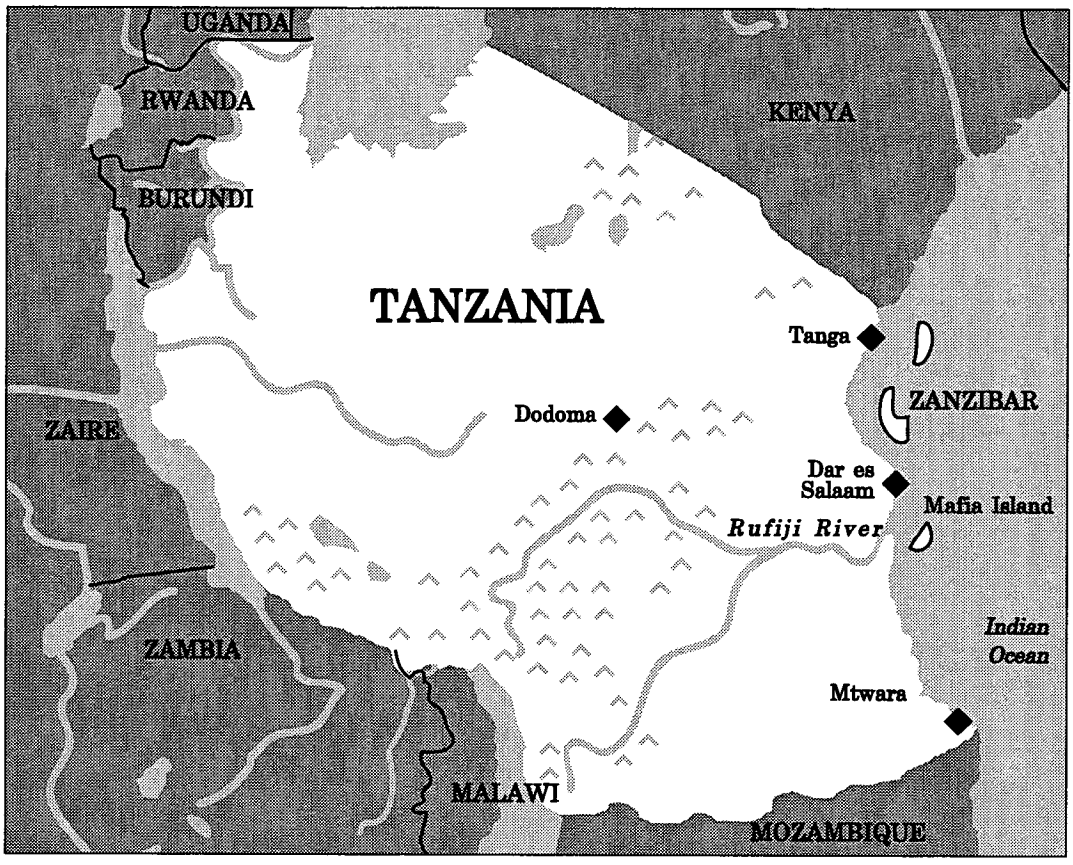

Figure 1: Location of Mafia Island

In developing proposals for a protected area, the Steering Committee identified the need for the following two activities:

1. an assessment of the existing legislative base for such a protected area and the generation of recommendations and draft documents for any new legal statutes required; and
2. a forum at which the Mafia community and other stakeholders could air their views.

Responsibility for marine parks was delegated to the Division of Fisheries (DoF). Following a request from the DoF, the Food and Agricultural Organisation (FAO) agreed to sponsor the first of the Steering Committee's activities, a consultant, in collaboration with a representative of the Attorney General's Chambers, began work in September 1991 to review the legislative base and propose recommendations. The legal team concluded that there were various problems with the existing legal base. While formulating a specific legal structure for a park around Mafia Island, the team regarded the Mafia plans as part of a longer-term program of developing a network of marine parks and reserves. The result was the drafting of a Marine Parks and Reserves Act and Regulations.

1. Environment was separated from the Ministry of Tourism, Natural Resources and Environment and placed under the Vice-President after the elections of October 1995.

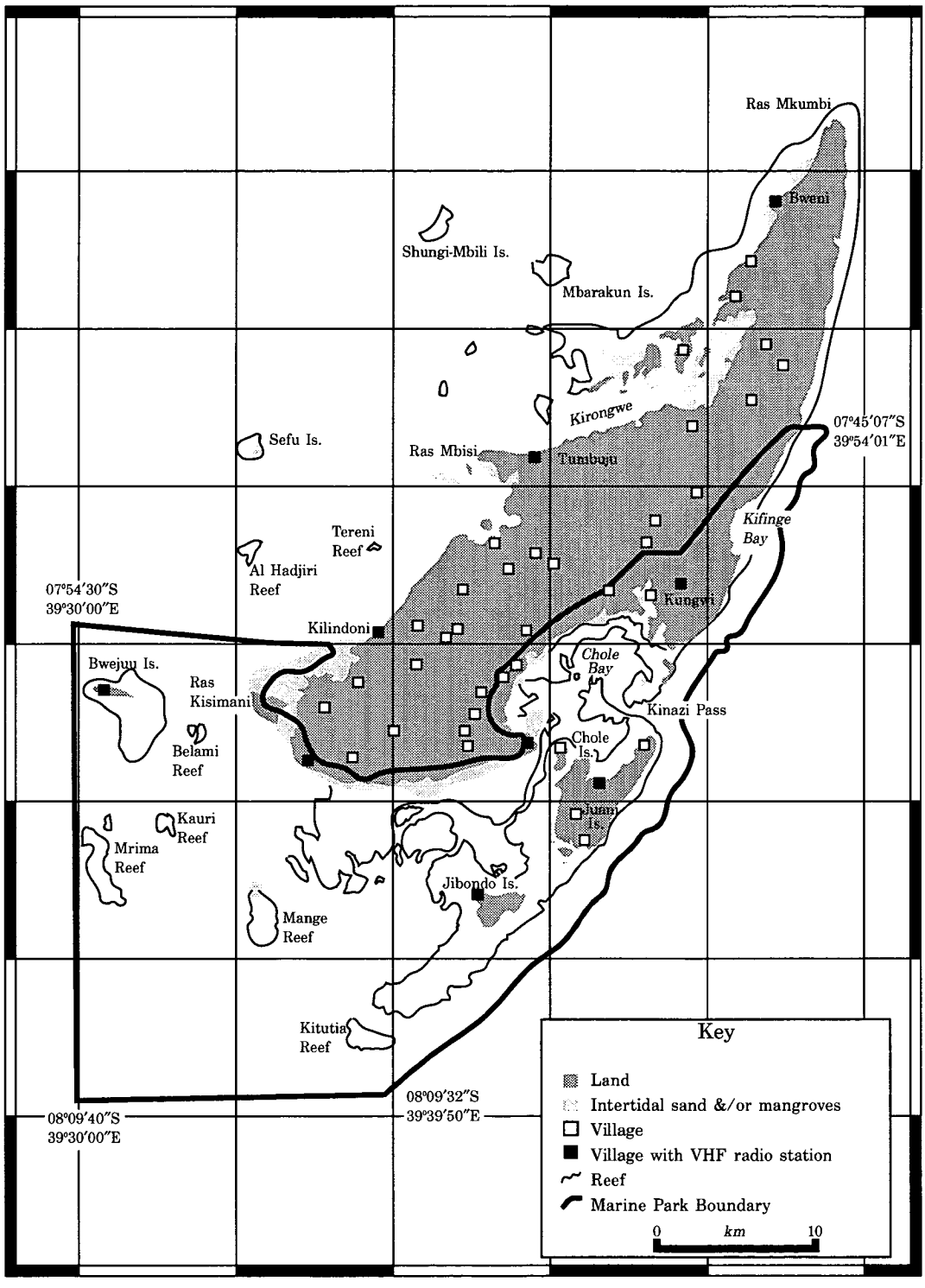

Figure 2: Mafia Island Marine Park

The second activity was addressed by a workshop, funded by the World Wide Fund for Nature (WWF), which was held on Mafia from 20 to 25 October 1991. As a result of the workshop a proposal for the development of the MIMP was recommended. This provided a basis for the preparation of a General Management Plan (GMP). This workshop is often considered the centrepiece of community participation. The draft General Management Plan developed post-workshop (completed 1993) includes development proposals, zoning plans and administrative arrangements. The GMP was prescriptive and ambitious and despite claims about community participation, has never been circulated to stakeholders.

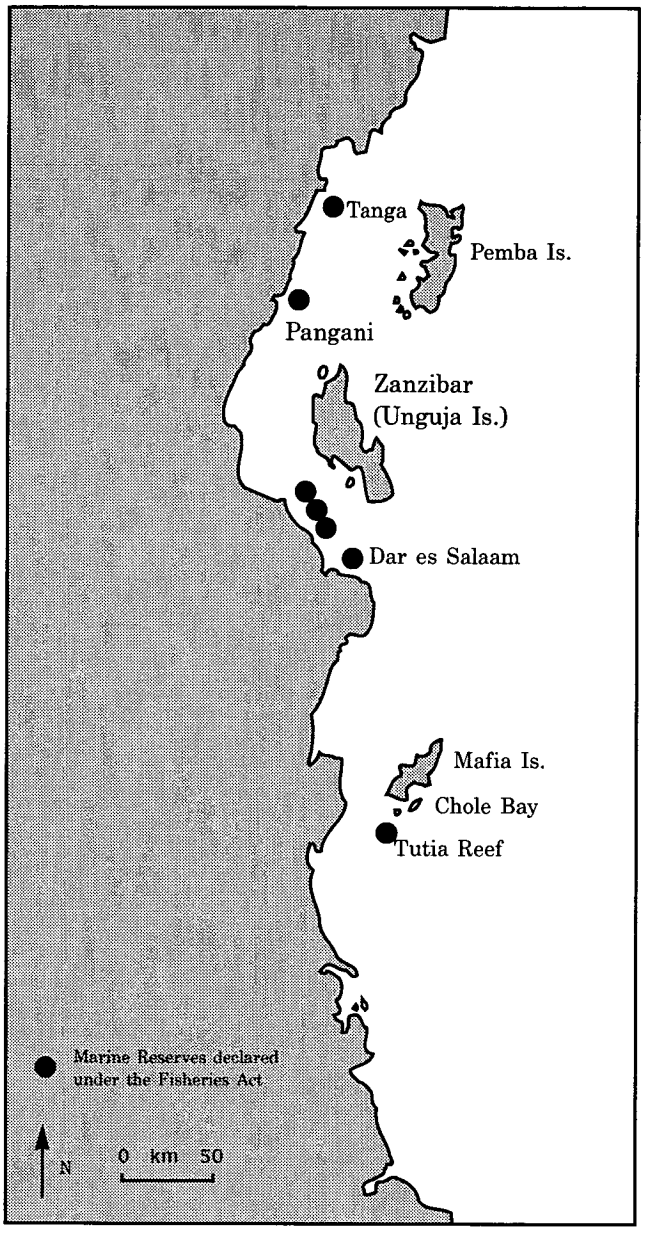

Figure 3. Location of Marine Reserves established in 1975

The *Marine Parks and Reserves Act* was passed in November 1994 and the Park was gazetted in April 1995. The lack of active management since conception and gazettal is the result of the time it has taken to appoint the Board of Trustees for Marine Parks (Board of Trustees, first meeting held in November 1996) and setup the other institutional structures as outlined in the Act. WWF has implemented a successful anti-dynamite program through the district authorities and has attempted to facilitate a more committed community participation and development program. The Division of Fisheries with funds from Norwegian Aid (NORAD) has undertaken some additional community projects.

Both the Ministry and donors appear committed to establishing a working Marine Park. However, the creation of new institutions and the struggle for control over the new enterprise has led to conflict between key participants. I will argue that significantly greater conservation gains could have been achieved had the initial focus been on determining key environmental threats with specific strategies to manage them, rather than on establishing a marine park *per se*.

The Process to Develop the MIMP

The above historical background briefly sketches the process in the establishment of the MIMP. Whilst almost impossible to document in detail the institutional and individual conflict that occurred over this period, it is important in so far as it is an expression of an underpinning, dynamic competition – a competition expressed at two levels, internationally and locally, each with individual motivations. Firstly, there is conflict due to international agencies jockeying for recognition as key players in the establishment of Tanzania's first marine park. Secondly, there is conflict as various local agencies and individuals compete to maximise institutional and financial benefits from the project. Amidst this torrid landscape, the development of the park occurred in an ad hoc manner with the key objective and output being to establish Tanzania's first marine park.

The document, titled 'The development of a Marine National Park Mafia Island, Tanzania' (Ngoile 1989), sets the scene for the development of the Park. This work, undertaken by the Institute of Marine Science and funded by Shell Petroleum, is the first to look in some detail at the establishment of a marine park in Tanzania, and presents broad biophysical and institutional information. The preface reads, 'Although Tanzania is one of the world's leading country (sic) in conservation, with 12 terrestrial national parks and about one-third of its total area under some kind of protection, none of the country's marine resources are effectively protected.' It goes on to say, 'The information would subsequently be used in devising a master plan for the establishment of the marine park including the required infrastructure, legislation and the regulations pertaining to the management of the park.' This statement assumes that a marine park would be the best conservation tool to manage the marine resources of Mafia. There is little evidence that any other avenues for management were ever considered. The key assumption is that a protected area is the most effective tool in managing the issues related to Mafia Island and will deliver a conservation gain.

The degree to which key international conservation bodies continue to prescribe and market parks and natural reserves as central instruments for the conservation of biological diversity may also explain the lack of serious consideration for alternative conservation management approaches on Mafia Island. As Pimbert and Pretty (1995) write: 'Several international organisations continue to call for an expansion of the network of protected areas in the 1990s.' Indeed the IUCN Policy on Marine Protected Areas (Kelleher & Kenchington 1991) states that it is their policy 'to recommend that, as an integral component of marine conservation and management, each national government should seek cooperative action between the public and all levels of Government for development of a national system of marine protected areas.' The MIMP was borne out of this pressure to establish a network of marine protected areas rather than the immediate need for a closely regulated and managed system to 'protect' the marine resources of Mafia Island and surrounding areas. I suggest that agencies and donors need to have a 'thing' rather than a process on which to concentrate their funding and that this has led to considerable failure in the implementation of conservation programs.

Parks and protected areas have long been considered the best means to 'protect' 'fragile' and 'pristine' environments and many such areas have been selected for their aesthetic and scenic values. 'Pristine' evokes images of environments as they existed before human impact. The literature on Mafia Island is replete with such descriptors (Anderson & Ngazi 1995; Horrill, Darwall and Ngoile 1996; Mayers et al. 1992) whilst at the same time acknowledging that 'Mafia Island has been inhabited for at least 1000 years' and 'Most of these inhabitants are dependent on the marine environment as a source of food and income' (Caplin 1975, in Anderson & Ngazi 1995). Gómez-Pompa and Kaus (1992, in Pimbert & Pretty 1995) suggest the concept of an 'untouched or untamed land is mostly an urban perception the view of people who are far removed from the natural environment they depend on'. We attempt to protect this 'pristine' state rather than develop strategies that manage use. This sustains the contradiction that we are managing biophysical resources rather than managing people and their use of those resources. We develop parks rather than manage people.

A park is an object with boundaries recalling the earlier preservationist's notion of a 'thing' requiring protection. Conservation outcomes will be better served when the focus is on conservation as a dynamic process, where the community and other stakeholders 'do' rather than 'have' something. On Mafia Island the concept of a park encouraged battles over the 'thing'. These battles were fought by various players in various ways. Government officials competed over access to funding. Euro-american environmentalists competed for interests and high status positions in a cutting-edge project. Mafians outside Park boundaries expressed jealousy and contentiousness because they were not in the Park (Whalley 1997).

The degree to which international conservation agencies invested in the park for the park's sake rather than for conservation outcomes, is evidenced by the fact that the project was heralded as an innovative and model project well in advance of any conservation gains. International agencies have considerable investment in the notion of marine parks and this becomes a prescribed outcome with too little care for the individual contexts.

Concentration on the Park as the outcome also led to the failure to develop appropriate strategies to manage the change that implementation of the project caused. No strategies, for example, were developed to assist institutions to change from resource exploiters based on economic need, to resource managers based on sustainable use and conservation. Individuals and institutions were expected to change from centralised decision-making processes based on economic development and resource exploitation to decentralised facilitation for conservation and community development. This was to be achieved without strategies or direct funding. This inevitably led to the exploitation of funding and opportunities designated for Mafia Island. The controversial history of aid and assistance to poor nations like Tanzania should have alerted donor agencies to the risk that institutions and bureaucrats would attempt to monopolise the institutional and financial benefits that such a project carried. On Mafia Island it was obvious at the community level that there was concern over particular individuals and institutions accruing the majority of benefits from aid programs. There was on Mafia Island a belief amongst the community that international funds supported unpopular institutions. This becomes particularly alienating when programs are pushing the virtues of community participation and decision-making.

In many respects Mafia Island was the last place in Tanzania that required the sort of high-level management a marine park can afford. As early as 1968, Ray (1968) attempted to prioritise areas for the development of marine parks in Tanzania. Twenty years later the United Nations Environment Programme (UNEP 1989) again identified areas for the development of marine parks in Tanzania. The UNEP paper states (UNEP 1989:21) 'The selection of these areas have been based on the uniqueness of the habitats, biological importance, commercial fisheries importance and recreational/tourism potential.' The selection of areas, however, included little critical analysis of impacts or threats. In fact, as recently as November 1998, the latest funding proposal for the MIMP states, 'the real level of threats to the marine park are relatively unknown' (WWF 1998). Additionally, no alternative management approaches were considered.

From the outset, the establishment of the MIMP was the primary objective. The conservation issues, institutional arrangements and community development processes were then required to fit this paradigm. Environmental issues became subordinate to the Park. Key activities were dominated by political manoeuvres to control the new arrangements. Despite the problems, the international commitment to the Park was based on the continuing assumption that if the institutional framework and Park were established, then conservation gains would be forthcoming.

The Advantages and Disadvantages of the Marine Park Paradigm in Tanzania

The marine park paradigm presented by the international community can be a useful tool for the management of marine resources in particular cases. This paradigm evolved significantly from the development of the Great Barrier Reef Marine Park in Australia. Mafia Island presents a very different scenario. In Africa, the community view of a park is one of total exclusion and protection. To change this perception to the multiple-use approach of marine parks is in itself difficult, and the cause for much concern within communities. However, the debate over terminology is not the key issue here. The term 'park' evokes the sense of a definable 'thing' with established status, and as such helps to orient the community to a common concrete goal. The international community has much invested in the notion of protected areas and indeed they provide a definable entity around which to orient donor funding. For Mafia Island, this is one of the few advantages of the marine park paradigm. There were few problems raising large amounts of donor funds for the MIMP. The availability of funding becomes a key attraction for countries like Tanzania.

The conservation issues of concern to the Mafia Island community, the managers and scientists, could have been adequately addressed within existing institutions and frameworks. Despite the fact that the Park continues to be developed, conservation issues remain basically unaddressed. I will use the examples of dynamite fishing and coral mining, to briefly illustrate how conservation threats became subordinate to the establishment of the MIMP. In addition I will describe how dynamite fishing was eventually dealt with outside the Park framework. The two issues present very clear arguments for alternative approaches and clearly illustrate why the focus on Mafia Island as a marine park has, to date, produced minimal management successes and much discord amongst the key players.

Dynamite Fishing and Coral Mining

Dynamite fishing and coral mining are two of the key environmental threats to the marine environment around Mafia Island. They were arguably the catalyst for the development of the MIMP in that they represented a threat to the 'pristine' state and fisheries. The idea of a marine park was already firmly entrenched however, and these issues had to be dealt with within the proposed framework for the Park. This meant that rather than dealing directly with the issues by developing the best available management strategies, the management of these issues had to fit into new legislation and new institutional arrangements resulting from the establishment of the Park. This is despite the fact that both dynamite fishing and coral mining were regulated under existing legislation (Fisheries Act and by-laws under the Local Government Act) and further legislation to facilitate action was not necessarily required.

An alternative approach could have been to build capacity in existing institutions in collaboration with the community. The process of establishing a new institution with new legislation effected little change. Indeed the controlling interests of the new institution are the same interests, for various reasons, that failed to deal with these issues in the first place. Any deficit in mechanisms could have been adequately dealt with by amending local by-laws under the Local Government Act or simple policy statements at a higher government level. As it stands today the *Marine Parks and Reserves Act 1994* has not established regulations and does not add any additional mechanisms for control of these issues. In any case it would be the same judiciary that would prosecute offenders under new regulations that has substantially failed to apply penalties under the existing regulations.

A successful anti-dynamite program was being carried out by WWF and the local community under an agreement with the District Authorities using the existing Fisheries regulations. Agreements and close working arrangements were quickly reached, in writing, with senior Police, the District Commissioner (the direct representative of the President), the Principal Secretary of the Ministry of Natural Resources and Tourism, and village representatives. This agreement came about because of continued community pressure to deal with this issue and the failure of the new and old institutions responsible to do so. Administrative arrangements with three institutions to undertake patrols with the new boat supplied by WWF were in place in about two months. The best efforts to resolve this issue within the new framework of the MIMP over the six years since the MIMP was conceived had failed. A previously (1994) 'quick fix' anti-dynamite program, funded by WWF (Operation Dynamite), also failed to produce any results, as there was no community involvement and no accountability.

The recent control of dynamite fishing outside the MIMP structure was successful due to the in situ nature of the approach that was developed to manage the situation. This plan utilised close working relationships with key players and the community and utilised existing decision-making structures. Close cooperation was achieved in a cost-effective manner to the mutual benefit of all the key stakeholders. Involvement of the community extended to all levels and included a formal process for the villagers to select a name for the new patrol boat (Ukombozi). The establishment of a network of solar powered VHF (Very High Frequency) radio systems, controlled and managed by the villagers, provided an efficient surveillance system that created clear links with the community and had substantial additional benefits for the community (Figure 2). Fisheries officers previously denigrated by the community gained respect and pride by being a part of a successful program.

Coral mining, like dynamite fishing, had various legislative (national and local) and institutional management arrangements before the instigation of the MIMP. However, coral mining on Mafia Island had a very different set of cultural norms. Whilst dynamite fishing was seen by the local community as abhorrent and a threat to their culture and livelihood, coral mining was not. Dynamite fishing was perceived by the local communities to be undertaken by 'outsiders' (i.e. non-Mafian), whilst coral mining was undertaken by the local community for building material and as a source of income. In fact it was the pressure from the community that prompted WWF to undertake anti-dynamiting activities outside the MIMP structure. Stopping dynamite fishing thus became purely an issue for enforcement with almost unanimous local support, whilst coral mining required a whole new set of approaches.

With coral mining the MIMP approach was simply to attempt to ban it and enforce the ban. However, to remove such an important and traditional source of material from the community would have put the MIMP in conflict with the very communities it was relying on for support. In addition, while the MIMP was pushing the 'no use' approach, various construction activities funded by other agencies and supervised by the MIMP were using live coral as their building material.

WWF had commissioned a report (Norton 1995) to look at alternative building techniques. Other agencies had funded trials of limekilns to improve the efficiency of lime production and the use of mud bricks as alternatives. A consultative and steady approach providing alternatives was winning the support of the community. The community appreciated the damage that removing coral can cause. They refer to coral as 'nyumba ya samaki' which literally means 'home of the fish', and were open to change as long as they had alternative options. The steady approach through community development and providing alternatives was producing results. However, in the middle of 1997 the Mafia Island airport was to be improved. Officers from other government ministries purchased 200 tonnes of locally produced lime to cover the runway. This lime was produced from coral accessed within the Park with the tacit approval of the MIMP administrators.

While much good work was being undertaken by various agencies outside the MIMP structure, the local community received mixed messages about coral mining from the MIMP decision-makers. The final insult came when, after the purchase of lime for the local airport a complete ban on local use was attempted. The community, all too familiar with this type of hypocrisy and inconsistency, generally continues current practices and awaits a consistent policy, one with which the community can coexist. Despite this, community support for the MIMP remains high, as it is generally perceived that the removal of dynamite fishing from the area was a direct result of their support for the MIMP. Mafia Island is an isolated district with little or no development activities other than the Park. Support will remain high with high expectations from the community. However, this support has been exploited and manipulated for political advantage by nearly all that have had come into contact with the project.

Lessons Learned

The Park, as a predetermined and prescribed outcome, significantly limited the effective achievement of actual conservation gains. I would argue that the project went far down the path to a marine park without objective evaluation of performance, because of the way the project was structured. Key individuals and agencies most likely to gain kudos and institutional and financial gain were those making the decisions about the direction of the MIMP. There was no power or decision-making delegated to the community or independent entities. In addition, there were no mechanisms within the project to ensure accountability or effective conflict resolution. The project failed to instigate the ICZM philosophy of integration at the most basic level. There were no mechanisms for the individual donors to communicate or make funding decisions as a coordinated body. Funding arrangements were independent of each other. This situation was ruthlessly exploited with many elements of the project receiving dual funding with conflicting objectives.

Where community conservation is the key objective, and to increase the success of effectively reducing threats to tropical marine ecosystems, conservation agencies need to reconsider intervention strategies and move away from a top-down approach. Threats require evaluation in situ and to be put into the context of the cultural, political, economic and biophysical environment. A process that calls for evaluating the situation and applying appropriate existing paradigms or developing individual approaches to suit the particular circumstances is relevant. While developed countries have the time and resources to commit to various ideals of conservation within a global context, the fisher, coral miner and family providers on Mafia Island have a very different perspective. The global approach to the management of tropical marine ecosystems and the international push for a representative system of Marine Protected Areas has no relevance to the Mafians. They are however, very interested in maintaining their immediate ecosystems. Mafia Island communities have a lot more to lose from environmental degradation than do a multitude of individuals and agencies making decisions on their behalf ex situ. Importantly both groups of participants have fundamentally the same objective. Establishing common ground and having a common vision needs to be the first step in any project. In the case of Mafia Island it became a matter of selling the product, 'marine park', as opposed to developing a common purpose.

The *Marine Parks and Reserve Act 1994,* was modelled on the international paradigm of ICZM, of which marine parks are considered a key tool. The Act does little to integrate decision-making. If anything, it adds additional layers of administration. The Act requires the formation of a Board of Trustees, a Marine Parks and Reserves Unit within the DoF, and a MIMP Advisory Committee – this at a time when the Tanzanian Government was desperately trying to downsize its public service to meet International Monetary Fund (IMF) arrangements. Additionally, it immediately followed a major review of the wildlife sector (Planning And Wildlife Management PAWM/USAID 1995) which recommended a rationalisation and consolidation of the environmental management sector.

The marine park concept is tightly interwoven with the philosophy of ICZM, and international agencies pursue intervention at the highest level of government. In countries with limited infrastructure, integrated decision-making at any level is difficult. This is particularly acute in very poor countries where departments are fiercely territorial due to the limited resources for which they are competing. Given this competition and the downsizing of the public sector in Tanzania, intervention at the highest level of government was always going to prove difficult. International conservation agencies establishing a new enterprise with high levels of funding in this context should have been alerted to the obvious reality that conflict and competition would ensue. No attempts were made to develop strategies to assist change or to resolve conflict between groups. Critical assumptions about institutional capacity to undertake their new role were made.

Future projects need to explore less formal mechanisms for management rather than simply creating new legislation. Government policy statements can address issues of overlapping or conflicting jurisdiction. Informal arrangements can be more cost-effective, more enduring, more flexible and less threatening. Given a process with real participation and consultation, participants are more likely to own the outcomes. This ensures less need for legislating and enforcing change or creating new institutions. In many respects the MIMP had fundamental growing pains due to the overly ambitious nature of the project. The need to be all things to all people is a major constraint to success. An approach that incorporates shared power and real participation as well as strategies to change various inappropriate institutional and bureaucratic cultures is warranted. This requires a long-term view and entails initially addressing the actual environmental threats, whilst patiently nurturing the evolution and development of appropriate community processes. At some point, this may finally translate to the development of a marine park. Only at this point could it be truly labelled 'a people's park' and represent a model of community conservation.

If the objective is to introduce a new paradigm, then understanding the culture of various agencies and institutions is crucial. Organisations are made up of people in various relationship configurations of which interdependence is a significant feature. Ultimately the response to change is expressed in the experience of individuals and the management of change is extensively the management of people. No strategies were developed to promote the organisational change required to support the new concepts of conservation and community participation. Promising to deliver changes around increased participation, without having the organisational support to do so, is bound to leave individuals feeling betrayed, undervalued and ultimately resistive.

The pragmatic view would have been to expect conflict between various key players and individuals, as a perfectly predictable outcome of organisational change. This view recognises organisations as highly political systems in which individuals and departments compete for scarce resources (Bolman & Deal 1991). There is resistance to change as individuals manoeuvre to protect interests and territory. Those in power were no better off under a system that concentrated resources and benefits on Mafia Island. In particular, those with the key responsibilities for establishing the new institutional framework for the MIMP were those who had the most to lose from this new arrangement. This was obvious, and strategies to compensate for this should have been developed if building capacity within institutions to sustain this new enterprise was a goal.

A clear example of organisational resistance can be seen in the community development projects undertaken within the MIMP with funds directed through the Government. Two years after the Norton (Norton 1995) consultancy, which looked at alternatives to using mined coral (principally *Porites spp.*), the MIMP funded building projects on Jibondo Island using coral mined from the Park. Conservation or community development was certainly not the driving force behind these activities. They were decisions to win over various groups on Mafia Island for power and territorial claims. These types of actions should have been predictable, yet no strategies for accountability or processes for decision-making were implemented by any of the key players to avoid this.

The concept of the MIMP as a true community-based project is highly commendable. The fact that the new Act does not reflect this concept is partially due to the fact that little thought was given to the meaning of 'participation' and 'community'. Nowhere in the literature relevant to the MIMP are these concepts actually defined or seriously discussed. The failure to define 'participation' and 'community' early on in the project led to the failure to implement strategies to ensure actual participation. When we have a clearer focus on what participation and communities are, we will give greater consideration to the intervention points of projects. Central government bodies may not be the most appropriate level for true community-based work. A World Conservation Union (IUCN) project in Tanga is generally perceived to be a successful example of ICZM at the community level. There are probably many good reasons for this, however, prime consideration has to be that the IUCN project injected its activities directly at the regional and district level and was not constrained by the need to set up a marine park. Mafia Island would have been ideal for intervention at the district level as it encompassed only one district. Immediate benefits at the community level and fewer layers of bureaucracy would have been the advantage of intervention directly at the village and district level on Mafia Island.

Community participation and decision-making remains rhetoric without mechanisms to achieve this. Concepts and processes for community participation and decision-making must be discussed, developed and articulated for the particular context early in project development. Communities should be given some role in determining how participation and decision-making are initiated. There is much fear embodied in these concepts – the fear of losing power by those that have it and the fear of using power to those promised it. Those giving it up must be taught how to share it and those taking it up must be taught how to use it. The arrogant perception that communities lack the education and technical understanding to fully participate must be redressed. Mafia Island already had extensive or existing community-based decision-making processes. Tapping into these existing structures in many cases is much more appropriate and cost-effective than developing new ones. Believing agencies and individuals when they use the rhetoric of empowerment and participation without accountability is misguided.

It is extremely important early in projects such as Mafia Island to establish effective operational links between the key stakeholders and players. This was never achieved on Mafia Island. The formation of various committees and advisory groups was used to exclude various factions and stakeholders in the decision-making process. While some would argue that the members of these committees represented key groups, in reality this was not the case. The committees were heavily laden with bureaucrats and technocrats. Everyone on the Board of Trustees and Advisory Committee was appointed at the national level (even the local representatives are appointed). Meetings were mostly held on the mainland and attendance was by invitation only. Access to decision-making bodies during the development of the MIMP was highly limited.

In relation to the MIMP, power was highly centralised. In many respects the new Act removed participation from the local community as many of the issues now under the Act had been previously dealt with through the District Council under the Local Government Act. This new arrangement usurped that authority, added another layer of bureaucracy and failed to integrate the various interests. It is important in the early stages of any project to ensure there are checks and balances with regards to the process, and that genuine linkages with other stakeholders are developed. Mechanisms for information flow and feedback to the stakeholders are also essential.

For the MIMP to have community support it was important that they were convinced about tangible economic and social benefits accruing from the project. These economic and social benefits were easily promised to encourage support for the project, but to deliver these in a sustainable manner was extremely ambitious and in many respects dishonest. The development of the MIMP and the provision of social and economic benefits to the community were in the long term to be funded from tourism. Considering the cost of the development of the MIMP and its various organs this was never going to be achievable. Tourist projection figures were highly exaggerated. When it was clear that tourism was never going to be in a position to fund the park in a sustainable manner, no redress was made. This put enormous pressure on the fledgling and struggling tourist operators on Mafia Island who were major stakeholders but again, were rarely consulted.

It was unrealistic to assume one marine park could fund the Board of Trustees, the Marine Parks and Reserves Unit and the Mafia Island Advisory Committee as well as MIMP staff, operational expenses and put money back into the community and have some left over to develop new marine parks. Indeed, Tanzania's terrestrial parks, with their World Heritage listings and huge tourist appeal, fail to do this and require substantial donor and government support. Thus the issue of sustainability for protected areas in undeveloped countries needs to be viewed from a different perspective, and actual environmental and social gains need to be factored into the financial sustainability equation.

Much can be learnt from the establishment of the MIMP. The difficulty is to get those in positions of power to take on these lessons and actively pursue change that will lead to greater success – a success measured in terms of environmental, not political outcomes. The biggest obstacle to dealing with many of the fundamental problems of the MIMP is the level of investment that various individuals and agencies have in marine parks, and specifically the MIMP, as an outcome.

Conclusions

The people within the MIMP still believe that they will have a controlling interest in determining the park management and will gain monetary benefits in the form of tourist charges. This promise of money remains central to their support for the Park. Unless a more well-considered process is undertaken, with the community as a dominant and driving force, the MIMP faces the same fate as previous attempts at Marine Reserves in Chole Bay and Tutia Reef (Figure 3). Large amounts of donor money may give the impression that something is being achieved, however the days where the success or failure of protected areas is measured by the amount of infrastructure achieved, should pass into history. Mafia Island Marine Park needs commitment and accountability, not rhetoric and overcapitalisation.

While I have argued that the issues of dynamite fishing and coral mining could have been resolved more cost effectively and in less time without the umbrella of the MIMP, I am not suggesting that, given the opportunity and some fundamental changes, this Park would not produce results. Indeed it fulfils many good criteria for a marine protected area.

- It is of a manageable size.
- It has community support.
- The community has existing well-organised, decision-making structures, easily able to be harnessed towards real project participation.
- The boundaries incorporate the coastal zone.
- The MIMP is an easy focal point for international agencies to fund.

My argument is that key environmental issues for Mafia Island could have been dealt with in less time with less money and with much less angst. This could have been achieved by commencing at the community level and would have in time attracted genuine multi-sectoral support as benefits flowed across the board. The project highlighted many issues that are common across the developing world and require a more enlightened approach. Hopefully the experiences on Mafia Island will encourage institutions and agencies to closely evaluate the advantages and disadvantages of applying sophisticated, developed-world paradigms in developing countries.

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Bridging Community Needs and Government Planning in the Togean Islands, Central Sulawesi, Indonesia

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ITMEMS 1998 Proceedings

Introduction

A global 'hot spot' analysis by Conservation International (CI) identified the 'Wallacea' region of Indonesia, including the Togean Islands, Central Sulawesi, as one of the top 19 global biodiversity hot spots. These hot spots are areas of highest species diversity and endemism, and are under greatest risk – therefore critical for long-term conservation strategies.

Conservation International first became involved in the Togean Islands through support for primate conservation in Sulawesi. Sulawesi represents an incredibly diverse floral and faunal intersection of the South-East Asian and Australian biogeographical regions which has resulted in an astounding number of endemic species, including a macaque found only on the Togean island of Malenge.

The presence of endemic species and the biologically diverse and economically valuable marine environments prompted CI to develop, in partnership with Indonesian NGO, YABSHI and a long-term research and conservation program in the Togean Islands. Local project activities are administered from a permanent research station established by YABSHI at Malenge Island and managed as a locally-based entity called Sekber Konsorsium Togean. Increasingly, since the partnership began with CI in 1992, YABSHI has expanded its scientific role to community development and policy outreach to build political support for conservation. In addition to bringing its conservation expertise and help in acquiring funding for the project, CI has taken the lead in the development of community-based conservation enterprises.

Konsorsium Togean's goal is to develop an integrated marine and terrestrial protected area in the Togean Islands, in which coastal communities, local government and other stakeholders can achieve consensus upon the designation, delineation and management of the area.

This paper briefly presents the successes, challenges and lessons learned in implementing a tropical marine ecosystem management project in the Togean Islands archipelago.

Site Description

Nestled in the middle of the Gulf of Tomini, just south of the Equator, the Togean Islands archipelago is composed of seven principal islands and their satellites on a shallow plateau no deeper than 200 metres. An almost continuous barrier reef protects this plateau. The Togeans occupy approximately 70 000 ha of land, with a total marine and terrestrial area of nearly 200 000 ha.

The Togean Islands archipelago is frequently mentioned as containing all four coral reef types (patch, fringing, barrier and atoll reefs) in close proximity. It is located in the Coral Triangle, an area with extraordinary levels of marine biodiversity, roughly bounded by Indonesia to the west, the Philippines to the north and Papua New Guinea to the east.

1. Conservation International

Seagrasses are found in channels and passages between the two big islands and also in several other areas, often near to coral reefs. Dugongs are occasionally reported from these areas, especially in the channel that separates Batudaka and Togean Islands and that between Talatakoh and Togean Islands, although sightings have become rare. Mangroves grow mostly in bays. Dense and old mangrove forests found near Lembanato village are an important conservation priority for the Konsorsium. Lembanato villagers traditionally use the mangroves for several purposes, including medicine, rituals and firewood. Many endangered species use the Togean Islands as a breeding ground, including dugongs and hawksbill and green sea turtles. These islands also support one of the last populations of the endangered coconut crab (*Birgus latro*), a giant crab that spends most of its life on land. Although still relatively abundant in the Togeans, this crab has been wiped out throughout most of its range in Indonesia by human predation.

Almost 60% of the land area of the Togeans is covered in tropical forest that supports an impressive array of local and Sulawesi endemic species including: the Togean macaque (*Macaca togeanus*) – a primate only recently described in 1996 (Frochlich & Supriatna 1996); the Togean lizard (*Varanus salvator togeanus*); the babirusa or 'pig deer' (*Babyrousa babyrussa togeanus*); and the Togean Tarsier (*Tarsius togeanus*). Tomini Bay where the Togeans are located, hosts some of the country's most productive tuna fisheries. In addition, CI's recent Marine Rapid Assessment Program (MRAP) survey found relatively high numbers of marine species, with perhaps some exclusive to the Togean Islands. Conserving the forest habitat that these animals require for survival is as much a priority for CI's program in the Togeans as are the islands' marine environments.

The People of the Togeans

Approximately 30 000 people representing six ethnic groups (Togeanese, Bajau, Bobongko, Buginese, and Gorontalonese and Javanese transmigrants) inhabit the seven major islands of the Togean Islands. There are 37 villages, each with its own pattern of livelihood. In some of the villages, such as those of the Bajau, nearly all are fishers. In other villages, there are very few full-time fishers and farming is the main activity. However, nearly all of the Togean Islanders are part-time fishers to some extent. A growing proportion is now employed in the tourism industry and associated businesses.

Poverty is the main issue in the Togeans, as 29 of the 37 villages fall within the category of 'poor villages' in which annual income per capita is below Rp. 700 000 (US$100). In this economic crisis, prices of basic needs are increasingly high, making it difficult for locals to meet their needs.

Environmental Threats

The Togean Islands face local as well as national development pressures. The major environmental threats to the natural ecosystems of the Togeans are unmanaged tourism, cyanide and dynamite fishing, and the clearing of forest for agriculture, which results in erosion and siltation of coastal waters.

UNMANAGED TOURISM

Tourism in the region – though currently small in scale – is being developed rapidly by both outside investors and local entrepreneurs. Nearly 20 000 overseas tourists visited Central Sulawesi in 1996, 4000 of which (20%) travelled to the Togeans. From 1995 to 1996, the number of visitors to the Togeans increased 150%. The biggest attractions are their great natural beauty and recreational potential. The Togeans are a particularly attractive snorkelling and scuba-diving destination because of the clear and calm waters of the sheltered bay.

Although presently unmanaged, tourism has the potential to benefit the environment in the Togeans by being developed and managed in a way that benefits local people and respects local biodiversity. To date, there has been no coordination among tour operators, or between these operators, government agencies, local operators and coastal communities. Furthermore, there are no adequate sanitation facilities, and no strategy to manage the ever increasing number of visitors. Dive operators continue to use anchors that damage coral reefs because no mooring buoys are yet available.

CYANIDE AND DYNAMITE FISHING

Cyanide fishing is largely carried out by local fishers but the driving force behind the industry are live fish traders from Hong Kong and the large cities of Indonesia, primarily Ujung Pandang and Jakarta, who have been operating in the Togeans since 1992. These traders established small permanent fish camps in which Napoleon wrasse (Cheilinus ungulatus) and groupers are held in fish pens waiting for the arrival of boats that will transport them direct to their home ports.

Dynamite fishing is mostly carried out by local fishers to get quick cash. Fish caught using bombs are usually for salting and are sold outside the Togeans for increasingly higher prices. Of these two unsustainable and dangerous fishing methods, dynamiting results in the most damage to coral reefs. Where it has occurred, only coral rubble and a crater on the substrate remain. During the 1998 Marine RAP survey in the Togean and Banggai Islands, many instances of dynamite fishing were recorded.

FOREST CLEARING

Commercial logging has been illegal in the Togeans since 1996, so current forest clearing is carried out by local farmers to grow cash crops, mostly coconut, cacao and cloves.

One possible consequence of expanded farming is a reduction in the supply of fresh water. In 1997, water wells on Malenge Island went dry, and some believe that it was probably a combination of El Niño and the expansion of crop plantations. When wells dry up, local people have to travel far to the main water source near the forest. From an economic standpoint, allocating more time to accessing fresh water means that local people have less time to pursue activities that can generate income for them.

OTHER THREATS

Crown-of-thorns starfish (*Acanthaster planci*) have had noticeable impacts on coral reefs in the Togeans, such as those on the east side of Malenge Island. During a 1998 Marine RAP survey of the Togean and Banggai Islands, many instances of coral bleaching were also observed. It is commonly accepted that the causes of these outbreaks are not well understood, but many believe that they are happening or at least increasing in frequency as a consequence of human activities.

The capacity of government to respond to these threats is limited by over-stretched resources at both the provincial and national levels, the remoteness of the island group, and the lack of local NGO capacity to provide technical support and scientific information.

Conservation Strategy

Realising the complexity and urgency of tourism development and the environmental threats to the Togean Islands, the Konsorsium adopted a strategy that uses a combination of policy level and community-based approaches, and that is based on a recognition that:

1. governments have a principal role in controlling large-scale external threats such as logging or oil palm estates, although they lack capacity and resources for conservation planning and enforcement;
2. governments could develop legislation which facilitates community involvement in decision-making processes; and
3. local communities are closest to the biodiversity that needs to be conserved, so their activities must be environmentally sound and economically viable if any conservation program is to be successful.

The Konsorsium's goal in the Togean Islands is to create a marine and terrestrial protected area in which communities, local government and other stakeholders agree upon the designation, delineation and management of the area. In this process, building consensus among major stakeholders is important so that a more effective and sustainable marine and terrestrial protected area is created. The Konsorsium's main activities in the Togean Islands fall into three categories: baseline data collection, community development toward environmentally sound development, and policy outreach.

BASELINE DATA COLLECTION

There is not much biodiversity or socioeconomic information on the Togeans to help guide conservation management. To fill in this information gap, the Konsorsium has conducted several studies, including a Marine RAP survey of the coral reefs of the Togeans. In addition, the Konsorsium's community development workers are presently carrying out a participatory community-mapping project in Lembanato and Malenge. This community-mapping project will give coastal villagers in Lembanato and Malenge their own map of features such as fishing grounds, agricultural plantations, village boundaries, water supplies, and other village-level information.

Conservation International Indonesia also developed GIS and a database on the Togeans. Previous research and secondary literature were entered into the database. Maps were digitised to include recent coral reef monitoring carried out by YABSHI researchers. The information produced by this research has provided the Konsorsium with a series of conservation area priorities and appropriate management techniques which are discussed below. Both studies arm the project with information that it can use to influence development plans in the Togeans.

ENVIRONMENTALLY SOUND DEVELOPMENT

The principal approach of this project's community development work is to ensure that economic activities are based on sustainable use of local resources. Community-based ecotourism is seen as one way to increase economic benefits to local people while conserving the environment. The Konsorsium has therefore put a lot of its effort into ecotourism by: working with coastal communities to establish tourist-based enterprises; working with the private sector to achieve better coordination and appropriate marketing of the local tourism industry; and working with all stakeholders – including the provincial government – to ensure marketing and development is environmentally sound and effectively marketed. Our definition of ecotourism in the Togeans is tourism that is environmentally sustainable, culturally sensitive, and of benefit to local communities. Local economic benefits and foreign exchange from ecotourism add local, regional and national value to the health of reef and forest ecosystems in this remote location.

Last year Conservation International led a community ecotourism development workshop resulting in the formation of the Togeans Ecotourism Network (TEN). TEN is composed of community representatives who seek to establish guidelines for tourism, assess training needs, and coordinate tourism services, and currently has a membership of 14 individuals representing six community groups (village Malenge, sub-village Tanjung, sub-village Pulau Papan, sub-village Kadoda, village Kabalutan, village Lembanato). Community groups here are defined as groups of people in a certain administrative area, like village and sub-village.

These community groups are mainly people who are interested in tourism business and who understand the benefit of conservation for their business. Members include tour operators, cottage owners, boat owners, guides, handicrafts makers and farmers. TEN was developed as a network to link ecotourism business players and also ecotourism products in certain community groups. In Malenge village, CI provides technical assistance in developing forest trails with a birdwatching platform, information sign-boards along the trails to indicate the uniqueness and richness of Malenge forests, and trains guides to be able to take tourists there. In Kadoda sub-village, CI and YABSHI helped TEN to develop handicrafts (hats, food mats, place mats) from coconut leaves for self-consumption and selling to some cottages.

CI also raised awareness on the reef in front of Kadoda and developed buoys to protect their reefs. Traditional attractions are also being encouraged in the bajau community in Pulau Papan sub-village and Pulau Kabalutan village as part of the ecotourism project. A 375-metre Lembanato boardwalk was constructed by the TEN members in Lembanato with technical assistance from CI. Exploring other services, including vegetable farming in Tanjung sub-village for self-consumption as well as supply to TEN cottage members, are also carried out. CI provides training in food service and quality, small cottage management, boat safety and comfort, and financial management for TEN members. All the ecotourism products and services were developed so that existing tourism business in the Togeans benefits the locals, is sensitive to local culture and moreover ensures the sustainability of resources.

Membership of TEN is not limited to the existing number, but anticipates growing as more people hear about it and see the benefits other members receive. Along with the success story from TEN, the community gained confidence and used TEN as a link to decision-makers. In May 1997, TEN with assistance from CI and YABSHI initiated an ecotourism workshop in Poso, the district capital, to introduce the products and works TEN had been undertaking. The results were tremendous. Locals gained more confidence and decision-makers realised the importance of community-based ecotourism. Later, the Department of Tourism donated Rp. 4 000 000 (US$400 at that time) to TEN in Lembanato for better managing the boardwalk. The success of TEN's work in the Togeans was brought to the attention of the Governor of Central Sulawesi and he officially opened the tourism national program 'Let's Go Central Sulawesi' on the Lembanato boardwalk. Recently TEN has received recognition with the British Airways Award, a prestigious award to recognise an environmentally and culturally sensitive approach to tourism.

Community outreach aims to ensure that community and other stakeholders' needs and expectations are well recognised and accommodated in the region and that the consensus-building process is reached so that the community plays an active role in the integrated protected area management of the Togean Islands. Important results from community outreach works are livelihood patterns and stakeholder identification. In the case of Lembanato village, it appeared that informal leaders are far more influential than government representatives. The program in Lembanato is specifically designed to address the cultural and religious aspects of this village. Information gathered in this community outreach activity is important in guiding Conservation International to better meet their needs.

POLICY OUTREACH

Policy outreach is carried out through a series of formal and informal discussions and workshops to raise decision-makers' awareness of the importance of developing a multiple-use protected area for the Togean Islands. The main targets are: planning (provincial and district planning board, local authority), forestry and conservation people (Ministry of Environment, Department of Forestry at the national, provincial and district level); tourism development people (Department of Tourism at the provincial and district level); fisheries people (Department of Fisheries at the national, provincial and district level); local informal leaders at the village level; and NGOs working in the Togeans. The kind of protected area that CI is promoting is one that acknowledges the needs and aspirations of local people and other stakeholders, such as decision-makers, private sectors and other NGOs working or involved in the Togean Islands.

A series of formal workshops commenced in May 1996, which were officially opened by the Assistant to the Ministry of Environment. The first workshop resulted in more open discussion and communication between decision-makers and the Konsorsium. The coordinator of the Konsorsium was formally invited as a member of the planning board whose role it was to ensure that planning met the people's needs. This was followed by a spatial planning workshop in 1998 (RDTR – Rencana Detil Tata Ruang / Detailed Spatial Planning Workshop) to discuss the development of the Togeans. Input from the Konsorsium was able to ensure a larger portion of forests in the Togean Islands (ex logging area) would be protected. Moreover, at the end of the workshop it was agreed that the focus of Togean development was tourism and fisheries on a small to medium scale. Logging concession is no longer an issue. A participatory workshop inviting decision-makers in Palu on using economic valuation to guide development and land-use planning was held late this year. As a result of this participatory exercise, each department improved its understanding of others' activities and priorities; a useful step in rationalising development planning. All workshops led to a better understanding and perception of Togean development among the stakeholders in the Togean Islands.

The Konsorsium invests a large portion of its resources into working with the government in Indonesia, because its programs have a huge impact on biodiversity conservation in the Togeans, and because environmental conservation unfortunately is not presently well understood or promoted by government officials

Lessons Learned

- Activities on land such as logging, slash and burn agriculture, and mangrove clearing impact on marine life, especially in the Togeans where no land area is very far from the sea. CI's conservation strategy in the Togeans therefore targets both marine and terrestrial ecosystems.

- Partnership with a local NGO, YABSHI, has ensured success in working in a remote area such as the Togean Islands. YABSHI has a better relationship with local people and local government, while CI can take advantage of its links with the national government and international financial and technical expertise. In establishing the research station and conducting research on Malenge Island, YABSHI earned respect and recognition with local people for its commitment to conservation. This reputation paved the way for forming partnerships with local communities on village-based projects. Establishing a partnership with a national NGO required a large investment in building its capacity in project management, technical expertise and fundraising. Although investment in capacity building might seem a disadvantage in terms of the need for increased project resources, it is worth it in terms of the benefits of having a partner with an excellent local reputation and commitment to conservation. Furthermore, the long-term goal is to create local conservation capacity, so a large investment up-front will pay off later on in terms of project sustainability. The main challenge in building this partnership is to have a clear understanding of the vision, responsibility, and expectation, and to develop clear communication guidelines.

- Political decisions are often made without taking local people's priorities into account. Often it is because decision-makers are not well informed on the local situation due to their inability to access local information. To avoid this problem, CI and YABSHI have created formal and informal communication links between village community representatives and government officials. Success stories from community-based ecotourism projects were especially effective in getting policy-makers to pay more attention to local people's perspectives. The confidence that has been gained on both sides will likely result in future conservation benefits, particularly in ensuring that political decisions and plans take local people's priorities into account.

- Raising a local economy should always be an integral component of conservation activities in the Togeans. TEN (Togean Ecotourism Network) was first established to address the tourism issue in community groups targeted by CI. As TEN has grown and established credibility, it also serves as a forum for addressing social and conservation issues such as land tenure, destructive fishing practices, sea cucumber farming, and vegetable farming.

- Documenting local knowledge on resource-use patterns though participatory community mapping helps to ensure that the correct communication projects reach the appropriate community group and are based on adequate understanding of local resource-use patterns. Fishers in community groups in Kadoda (part of Malenge) for example, depend heavily on the reef in front of their village. The reef is also the most visited reef by tourists. After communicating with TEN and the community group in Kadoda, they expressed the need to build buoys so that activities in the reefs would not damage the environment. With their help in the design of the buoys, CI developed three buoys, one of which will be deployed in Kadoda reef. In knowing the community's resource-use pattern, CI was able to understand their dependency on the reef and facilitate the development of buoys, which will benefit their fishing and tourism activities.

Session 7 Report: Destructive Fishing Practices and Collecting Methods

Executive Summary

The objective of the session was to utilise real case studies to identify lessons learned and future challenges in the promotion of sustainable coral reef fishing practices and collecting methods.

Four case studies presented in the session dealt with: experiences in a Tanzanian fishing village; a participatory coastal development planning experience in Bolinao, northern Philippines; implications of applying the marine park paradigm; and bridging community needs and government planning in Indonesia.

The four case studies clearly showed that knowledge about destructive fishing was well understood among the local community. They highlighted that community participation was more important than government intervention. Also, that it was important to identify alternative employment as well as provide support in development of sustainable practices among the stakeholders. In order for the community to be more effective in managing the fishery, there is an urgent need to obtain funding and provide logistics.

The presentations were from culturally diverse environments although the end product was the same–protection of the marine environment. There were no tailor-made methods available for solving the problems, and these differences need to be addressed when management strategies are developed.

Lessons Learned

- It is important to define destructive fishing (NB: Habitat Destruction–Coral Reefs) – dynamite and coral mining.

- Categories of Discussion:
  1. Integrated Management–Coordination, Linkages to Initiatives, Programs and Instruments
  2. Stakeholder Partnerships and Community Participation
  3. Public Awareness and Education, including capacity building
  4. Data and Information for Management

Lessons Learned	1	2	3	4
Improve understanding of villagers on the economic value of coral reef resources			X	
Training enforcement e.g. water cannon and mace			X	
Peer pressure (bottom-up approach?) by empowerment of locals			X	
Judiciary awareness			X	
Pre-emptive methods of enforcement			X	
Help in resource management and planning			X	
Change of attitudes toward destructive fishing			X	
'Coffee-shop' education in areas where enforcers are ineffective			X	
Point out other options for demanded end product to the resource users			X	
Level at which action must be taken depends on nature of the resource and its user examples: goods exported–APEC and local consumption–village elders	X			
Important to work at the buyer side as well for 'money makes the world go around'	X			
Need for exchange forum regarding area–specific experience	X			
Protect damaged reefs from further destruction with the community	X			
Support alternative sources of income in communities	X			
Not only for curing the 'disease' but also for prevention–Integration practically: coordination amongst NGOs/GOs/POs	X			
Need to decide WHAT is a good parameter for impact of destruction of reefs (diversity? biomass? average size?)				X
Threshhold levels for sustainable harvesting? Domestic consumption and foreign consumption				X
What is the total amount harvested/damaged–maybe 'no big deal'				X
Basic information from the field and from the community on spatial patterns				X
Comparisons on information geographic/political/cultural-socioeconomic setting between countries allows for selecting appropriate enforcement actions				X
Information on government commitment because this can limit 'effectiveness' of an enforcement action				X
Surveillance stations (COMMUNICATIONS)		X		
Ownership of resource		X		
'Umbrella' organisation (NGO or otherwise) to coordinate local activities		X		
Government backing of community enforcement		X		
Empowerment of local leaders		X		
Alternative livelihood to replace unsustainable cash economy methods		X		
Limits to community participation when cash economy is considered		X		
Action from consumer end–legal import and export etc.		X		

SESSION 8: Coastal Development

Chair: Miguel Rolon
Rapporteurs: Deb Callister, Chandima Wickramasinghe
Presenters: Catherine Courtney, Brian Crawford, Ahmed Shehata

Integrated Coastal Management in the Philippines: Testing New Paradigms

Catherine A. Courtney[1] and Alan T. White[2]

Philippine Setting

For the last 20 years a variety of government and non-government organisations have been conceptualising and implementing an array of coastal management projects in the Philippines to address some of the crucial issues affecting its 18 000 kilometre coastline with its rich variety of productive tropical ecosystems (Ferrer et al. 1996; Christie & White 1997). The issues of most concern are declining fisheries, mangrove forest and coral reef destruction, and poverty among coastal communities.

The Philippines is endowed with approximately 27 000 square kilometres of coral reefs of which only about five per cent are still in excellent condition (Gomez et al. 1994). The numerous factors contributing to this decline are intertwined and not easily isolated for management purposes. Nevertheless, the primary issues affecting coral reefs, which are often used as symbols for the broader coastal management issues in the country, are: various kinds of sedimentation and pollution stemming from upland and coastal development; illegal and destructive fishing practices; overfishing due to an open-access fishery regime throughout the country; increasing poverty among coastal dwellers; a rapidly growing population; and variable political will to squarely address the problems.

Mangrove forests are in no better condition. The original mangrove forest cover of about 450 000 hectares in 1920 is now diminished to less that 140 000 hectares. This decline is mostly a result of clearing for shrimp farming operations, other forms of aquaculture and habitat conversion for urban development (Olsen & White 1997).

In short, the Philippine coastal zone is under siege from a variety of activities and impacts which are eroding the natural resource base and the area's potential for future sustainable use. The lack of control of almost all development in the coastal zone is symptomatic and indicative of what is to come if much stronger and more effective institutions and procedures for integrated coastal management are not put into place in the near future. Coral reefs, the single most productive and economically important ecosystem in Philippine coastal waters, have already shown significant decline and will continue to do so in this scenario without much improved management support.

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Coastal Management in the Philippines

Coastal resource management (CRM) has been practised in the Philippines over the last two decades to try to stem the increasing tide of damage to habitats and the decline of fishery production. CRM initiatives have been supported and nurtured by a variety of institutions, i.e. government, non-government, people's organisations, research institutions, and by multilateral and bilateral donor organisations, employing different strategies and approaches. Such projects, working through local governments and private groups, have targeted nearshore fisheries and habitat management as a primary focus (Ferrer et al. 1996; White & Lopez 1991). The Coastal Resource Management Project (CRMP) supported by the United States Agency for International Development (USAID) is building on the experiences of past efforts and introducing innovations for coastal management which build on the lessons of past projects.

The Coastal Resource Management Project espouses multidisciplinary, multi-sectoral (crossing political and institutional as well as environmental boundaries), multistage and participatory processes of planning, implementation and monitoring for sustainable coastal resource management. The present stage of coastal management activities in the Philippines is more appropriately referred to as integrated coastal management (ICM).

The multi-sectoral, multidisciplinary and integrated character of all processes leading to ICM planning and implementation is an essential prerequisite to success (Chua & Scura 1992; Scura 1994; Christie & White 1997). The CRMP promotes these cross-cutting and integrated approaches with a focus on sustainable resource use which minimise impacts on coastal ecosystems from fishing, aquaculture, and tourism. It also considers land-based activities, such as deforestation and urbanisation. This integrated approach is accomplished by collaboration with ongoing projects of the municipal and national governments and other donor-assisted projects focused on the coastal environment and its governance. Key strategies and activities are:

- participatory coastal resource assessment as defined by Walters et al. (1998);
- coastal resource management or integrated coastal management planning;
- economic development for coastal resource users;
- implementation of limited access regimes such as marine reserves and sanctuaries;
- training in skills relevant for ICM implementation;
- legal instruments required for effective support of ICM;
- policy analysis and formulation; and
- monitoring and evaluation.

Past experience in the Philippines shows that an essential element of successful coastal management is active participation by the entire community (Tobin & White 1992; White et al. 1994). This includes day-to-day resource users such as fishers, local government, national government, non-government organisations, private sector and other stakeholders.

The project is assisting communities to develop resource management plans through a participatory process involving the preparation of coastal area profiles using participatory coastal resource assessment, and identifying and evaluating management options (Walters et al. 1998). Implementation of these plans is facilitated by assistance to local government units to institutionalise coastal resource management. Monitoring of coastal resource use is being strengthened through assistance by national government agencies and law enforcement branches of the government.

In addition, CRMP innovations emphasise:

- development of a critical mass of local leaders who support and perpetuate ICM practices;
- encouraging a strong synergy between the project's national and local level initiatives to ensure that the development of local ICM regimes are consistent with national government policies and that the policies can be infused with practical experiences from the field level;
- insisting that local governments allocate budget and personnel for ICM activities;
- not relying too heavily on site-based models but rather on expansion using a variety of forms of community resources and collaboration; and

- using an aggressive education and communication campaign at the national and local levels which is integrated with all project components to achieve maximum and long-lasting influence on different interest groups.

The CRMP activities are being implemented at national and local levels to achieve strategic expansion of the project activities to 2000 kilometres of Philippine coastline by the year 2001. Six 'learning areas' serve as models for coastal resource management and represent the core of the field activities of the CRMP to achieve a threshold that will continue beyond the life of the project. The six areas are: Northwest Bohol; Olango Island, Cebu; Malalag Bay, Davao del Sur; Southeast Negros Oriental; San Vicente, Palawan; and Sarangani Bay (Figure 1). These six field areas include 29 municipal government units and cover about 650 kilometres of coastline.

Work within learning areas entails a collaborative planning and implementation process which is centered around the role of the municipal government, community organisations and national agency initiatives. A typical agenda for a learning area and the roles of the various participants is detailed in Figure 2 (White 1996; 1997) and includes:

1. defining memorandums of agreement between the CRMP and local governments which commit personnel and budgets for ICM;
2. identifying local organisations and individuals (both public and private sector) who can potentially play key roles in the planning and management process;
3. implementing participatory coastal resource assessment and mapping exercises with barangay (smallest political unit in Philippines) level groups;
4. developing coastal environmental profiles through local community participation and collaboration with local academic institutions;
5. conducting ICM training for key government and NGO participants;
6. promoting participatory planning at the barangay, municipal and learning area level;
7. implementing an enterprise development scheme through community groups and the private sector which provides livelihoods outside of fisheries;
8. defining ICM plans and projects within larger area plans; and
9. facilitating ICM interventions, monitoring and evaluation.

The CRMP identifies, cultivates and promotes the current and future coastal resource leaders in the Philippines through its training and planning programs. The five practices of effective leaders espoused by Kouzes and Posner (1995) are adapted for CRM leadership and used as a guide.

1. **Challenge the process.** Search for answers to the open access problem and stop destructive practices. Take risks to achieve extraordinary results.
2. **Inspire a shared vision.** Enlist all stakeholders to share a vision of sustainable use of coastal resources where active participation and management is the norm.
3. **Enable others to act.** Foster collaboration in planning and implementing coastal resource management by soliciting participation and sharing information.
4. **Model the way.** Set an example by participating in and contributing to coastal resource management activities.
5. **Encourage the heart.** Recognise the hard work and commitment of others and advertise the successes to other coastal communities.

Defining the Results of the CRMP at the Field Level

After two years of operation the CRMP has refined its operational objectives for field-level interventions to help clarify all project activities. This occurred through the development and refinement of indicators for measuring project performance both for the benefit of the donor (USAID) and all the project participants. The indicator, which measures project performance within its six learning areas covering 650 kilometres of coastline, is shown in Table 1. The thrust of this indicator is that each municipality meets certain criteria indicating improved coastal management. The criteria are somewhat flexible to accommodate varying conditions in different areas and different propensities of different local governments.

Table 1: Performance indicator for CRMP learning areas (650 km of coastline)

OBJECTIVE*	Enhanced management of renewable natural resources
INDICATOR	Kilometres of shoreline where improved management of coastal resources is being implemented
UNIT OF MEASURE	Kilometres of shoreline and number of municipalities
INDICATOR DESCRIPTION	To be counted, municipalities need to be meet all of the following conditions: 1. Resources for CRM allocated by local government unit 2. Resource management organisations formed and active 3. At least two CRM interventions implemented: a. Illegal fishing substantially reduced b. Fishing pressure reduced c. Marine sanctuaries established and maintained d. Open access restricted e. CRM plans prepared and adopted f. Other habitat protective measure in place

* The overall objective is the same as 'Strategic Objective No. 4' for USAID, which covers all USAID natural resource management projects.

Table 2. Performance indicator for CRMP expansion areas (1350 km of coastline)

INDICATOR	Kilometres of shoreline where improved management of coastal resources is being initiated
UNIT OF MEASURE	Kilometres of shoreline and number of municipalities
INDICATOR DESCRIPTION	Municipalities will only be counted when collaborating institutions have initiated field implementation using CRMP products. The terms and application of CRMP product use will be defined in memoranda of agreement with targeted institutions and organisations. CRMP products include training modules, guidance documents, and information, education and communication materials. Where possible, records will also be kept of non-target user applications of CRMP products. To be counted, municipalities need to meet all of the conditions listed in Table 1 with at least two CRM interventions INITIATED.

The CRMP is obligated to assist to improve coastal management along 2000 kilometres of coastal areas which includes the learning areas and expansion areas as defined in Tables 1 and 2. The first indicator (Table 1) measures 'improved management of coastal resources'. The second indicator measures the number of municipalities (km of coastline) 'replicating or initiating improved CRM utilising Coastal Resource Management Project products and services'. The various CRMP products and what must be utilised and initiated are shown in Table 2. Expansion areas are those coastal areas and municipal governments where the CRMP hopes to catalyse improved coastal management without an on-the-ground presence of personnel. Rather, the CRMP is achieving this through dissemination of technical and educational materials, support of trained personnel, spreading examples of work in the learning areas, and other means which are usually triggered by the demand of the local government or communities of concern.

Within the CRMP learning areas, one of the favoured forms of intervention is the establishment of marine sanctuaries that effectively reduce fishing effort and rehabilitate coral reef and nearshore marine habitats. To measure the relative success of the marine sanctuaries, the CRMP is monitoring change in fish abundance and average percentage change in living coral cover inside and adjacent to the sanctuaries. These biophysical parameters reflect the effects of management and are also useful in showing results to local participants. The monitoring techniques are performed collaboratively by Philippine scientists and local community members. The mangrove component of CRMP is measured by the hectares of mangroves under community-based forest management agreements, approved Protected Area Management Plans, or other tenure instruments.

The CRMP also has a large information, education and communication component which cuts across the entire program at both the national and local levels. A few of the activities and interventions include publications, videos for national television and training, media events, contests a moving exhibit on the value of marine and coastal resources, and a variety of public seminars. The indicator of success for this broad set of activities is the percentage of respondents from a survey of target groups that demonstrate knowledge of CRM and ICM problems and solutions. Although the ultimate goal of CRMP is behaviour change in the coastal areas as a result of CRM interventions, the only effective measure of this is through actual improvements in management noted within the learning and expansion areas of the project. These changes are measured by the two indicators shown in Tables 1 and 2.

The Coastal Resource Management and Project Experience

The CRMP has undertaken many activities during its first two years of operation. Those activities and results which are directly leading to improved coastal management within the coastal target areas of the project include the following.

NATIONAL POLICY-RELATED ACTIVITIES SUPPORTING COASTAL MANAGEMENT

1. Legal and jurisdictional guidebook published and distributed
2. Mangrove management policies reviewed and revised to accommodate limited harvesting within management areas
3. National fisheries code analysed and publicised for effective implementation by local governments and communities
4. National ICM awards among local governments undertaken
5. Several major workshops for national policy makers, judges and prosecutors with responsibility for law enforcement in coastal areas
6. National coastal master plan initiated
7. Set of booklets initiated on procedures for ICM in the country
8. Numerous publications and videos disseminated throughout the country to interested parties
9. A major exhibit on marine life and the important coastal and ocean habitats is touring the country to five locations and has been viewed by more than one million people.

FIELD-LEVEL ACTIVITIES IN SIX LEARNING AREAS

1. Memorandums of agreement signed with all 29 municipal governments
2. Participatory coastal resource assessments completed in each of 29 municipal areas covering 129 out of 274 barangays
3. Six coastal environmental profiles in final draft form
4. 150 graduates from 11-day ICM course active in learning area ICM projects
5. 152 barangay (community) level management groups formed and active
6. Various municipal ordinances drafted and passed by local governments which enhance coastal fishery and ecosystem management
7. One or more marine sanctuaries initiated or established in each learning area
8. 3000 hectares of mangrove habitat in Bohol Province initiated for community stewardship management agreements in 1999
9. Community-level enterprise projects in seaweed farming started in five learning areas, with ecotourism as a theme with projects in two learning areas.

EXPANSION AREA ACTIVITIES

1. Ten municipal governments outside of the learning areas have started their own ICM program with information and encouragement from CRMP.
2. Two biodiversity-rich areas are progressing with marine park and area management plans in collaboration with other donors and national and local government.
3. Linkages have been formed with three major donor and government projects to collaborate in up to 50 municipal areas using the CRMP products listed above.

Lessons Being Learned by CRMP for ICM in the Philippines

An important change in the manner that CRMP approaches the problems of ICM in the Philippines from past projects is that it is not only rooted in coastal fishing and resource-user communities. The CRMP was designed from the outset with the realisation that the issues facing Philippine coasts and their human communities are too complex, and caused by too many factors to come to viable solutions by intervening only at the local community level. The CRMP is strategically orchestrating interventions at both the national and local levels with various government and non-government institutions. It is attempting to catalyze action at the local community level through collaboration with local government in a manner that will empower the local government and its partners to continue on alone without the assistance of the CRMP. Although the CRMP has been less than three years in operation, there are some useful lessons being learned.

1. **Focus both on national and local level work simultaneously.** Past CRM precursors either focused on national level set-ups or were too site-specific and/or community based. CRMP works synergistically and simultaneously at both levels. Thus, the practicalities of field experience fuse with the generalities espoused at the national level. The processes related to the preparation of the Legal and Jurisdictional Guidebook for Coastal Resource Management in the Philippines (DENR, DA-BFAR, DILG 1997) show this synergy. At the field level problems pertaining to clarification, interpretation and implementation of laws affecting coastal resource use were identified through research and a series of technical working group meetings. These meetings involved the Department of Environment and Natural Resources, Department of Agriculture – Bureau of Fisheries and Aquatic Resources, Department of Interior and Local Government, and a host of non-governmental organisations, as well as the academic and scientific communities. These meetings provided a venue for the agencies to come to a common interpretation on a number of coastal environmental laws that are often perceived and treated differently.

2. **Use multiple education and communication strategies to build a wide base of support for ICM.** CRMP promotes ICM and its related issues to capture the interest of the mass of the Filipino population by embarking on media and education campaigns that are designed to increase awareness and ultimately, mobilise the populace into action. This approach builds and enhances networks of constituency groups to support ICM initiatives, thus ensuring sustainability beyond the life of the project.

3. **Encourage collaboration and synergy among agencies and donor projects.** CRMP started its policy component with (1) the development and application of legal and operational guidelines for CRM implementation; (2) setting CRM on the national social agenda; and (3) aligning resources and funding toward common objectives in consultation with counterpart government agencies and other donors. These efforts have resulted in most donors and government-sponsored coastal projects at least attempting to coordinate and share plans before implementation starts. This has resulted in more effective field results in several instances.

4. **Promote expansion by supporting demand from committed local governments and other insitutions.** CRMP is establishing a critical threshold of coastal municipalities which are actively implementing ICM to achieve the 'snowballing' effect. At present, technical assistance at both national and local levels targets 2000 km of shoreline or roughly 11% of national shoreline length. At this threshold level, ICM is anticipated to continue beyond project life because of the development, implementation and institutionalisation of ICM tools.

5. **Support leadership in ICM through training, education and learning by doing.** The CRMP is nurturing and developing a group of ICM leaders by providing skills and training opportunities, at the local field level as well as at the provincial and national levels, through training opportunities which emphasize hands-on planning and analysis within the context of the participants own geographical areas of responsibility.

These lessons are helping to draw up plans for present and future directions for ICM in the Philippines. The most important finding is that, for ICM to be adopted by local governments throughout the country in a mode which enhances both quality of environment and life for people in coastal areas, it must be acceptable, understandable and mostly practical to implement for local governments, communities, national government and private sector partners. ICM cannot be empty concepts and ideas. It has to offer tangible solutions that produce results in terms of improved quality of coastal ecosystems and their production, improved livelihood opportunities and improved ability on the part of local and national participants to do the job themselves. Although the complexities are great, the vision cannot be clouded by objectives which overshoot their mark. Objectives of field projects must be achievable while providing real benefits.

Acknowledgements

The CRMP is an initiative of the Government of the Philippines that began in March 1996 and is supported by the United States Agency for International Development. CRMP is implemented by the Department of Environment and Natural Resources in partnership with the Department of Agriculture-Bureau of Fisheries and Aquatic Resources, local government units, non-government organisations and other assisting organisations. Technical support and management are provided by Tetra Tech EM Inc. Useful comments in the preparation of this paper have come from Abbie Cruz-Trinidad, Policy Advisor to CRMP; Tom Bayer, Training Coordinator for CRMP; Jennifer Murphy, Research Intern for CRMP; and many others who work directly with the project who are too numerous to mention.

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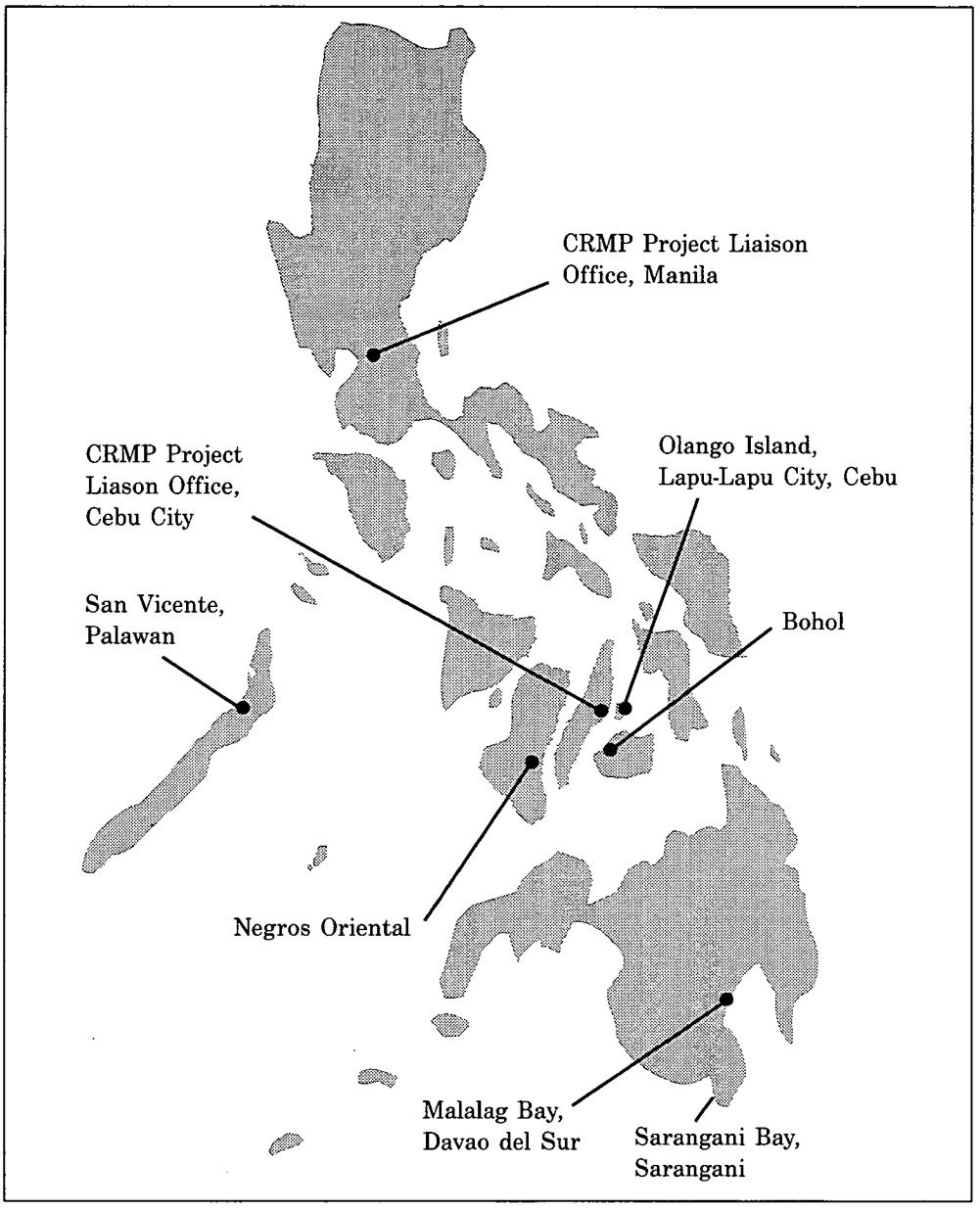

Figure 1: Six learning areas of CRMP and project offices

Phase	Activities and Outputs	Technical Assistance, Roles of Non-Government Organisations, Academe, Donors and National Government	Roles of Community, Local Government and Stakeholders
1. Program preparation	■ Determine boundaries and scope ■ Make workplans/ budgets ■ Assign personnel ■ Secure consensus on overall approach	■ Prepare workplans ■ Formulate working agreements ■ Contract staff ■ Train staff ■ Facilitate consensus on design	■ Enter into memoranda of agreement ■ Participate in discussion ■ Communicate needs and potential roles
2. Secondary information gathering	■ Compile existing maps, reports, data ■ Interview information sources ■ Compile existing laws, agreements, plans ■ Review other sources of information	■ Locate sources of information ■ Compile information in useful form ■ Coordinate activities	■ Provide information ■ Assist to compile information ■ Begin to develop information storage and retrieval system
3. Field assessment/ study: Participatory Coastal Resource Assessment (PCRA) and other research	■ Train practitioners ■ Conduct PCRA mapping and data collection ■ Contract special research studies on fish stock assessment, habitat condition, water quality, enterprise and others	■ Train practitioners ■ Facilitate PCRA ■ Conduct specialised research ■ Analyse research data ■ Make results available	■ Conduct PCRA with technical assistance ■ Participate in special research and data collection ■ Assist to analyse data ■ Provide inputs to mapping
4. Database and profile development	■ Set up data storage and retrieval system ■ Compile coastal environmental profile ■ Use profile as planning base ■ Refine boundaries and further research needs	■ Determine data storage site, personnel ■ Write profile ■ Distribute profile ■ Facilitate discussions on boundaries and research needs	■ Provide information ■ Assist with profile analysis ■ Use profile for planning ■ Decide on boundary demarcation
5. Prioritise issues and analyse causes	■ Conduct community and municipal-based planning sessions ■ Develop issue tree ■ Prioritise issues for management	■ Facilitate process ■ Interject outside perspectives, research findings, policies, etc. ■ Help translate issues into causes	■ Participate in process and provide major input ■ Participate in conflict resolution ■ Set priorities in real terms
6. Policy and plan formulation	■ Conduct planning workshops to determine objectives, strategies and actions ■ Determine clearly stated goals, objectives and indicators ■ Interagency coordination ■ Determine composition of management body ■ Initiate preliminary plan implementation	■ Facilitate planning process ■ Provide technical guidance ■ Assist to set up management bodies	■ Provide basic policies ■ Provide major inputs to plan ■ Build consensus among community ■ LGU support to planning process
7. Plan/project implementation	■ Design pilot projects ■ Test projects ■ Formalize and set up management council ■ Secure support as required ■ Increase implementation effort	■ Facilitate initial implementation ■ Provide seed funding ■ Provide technical guidance ■ Conduct training course as required	■ Take full responsibility ■ Participate in implementation ■ Provide local personnel
8. Monitoring and evaluation	■ Train monitoring and evaluation team ■ Monitor environment and ICM process and feedback to database and plan ■ Evaluate program results and feedback to plan	■ Assist to train LGU personnel ■ Assist to analyse data ■ Assist to set up sustainable system	■ Collect data ■ Use data to refine plan and update database ■ Participate in process ■ Take responsibility

Feedback to appropriate phase

Figure 2: Phases, activities, and participant roles in a coastal management planning process (White 1997)

Community-based Coastal Resources Management in Indonesia: Examples and Initial Lessons from North Sulawesi

Brian R. Crawford[1], I. M. Dutton[2], C. Rotinsulu[3] and L. Z. Hale[4]

Abstract

Proyek Pesisir (Coastal Resources Management Project – Indonesia), a cooperative initiative of the government of Indonesia and the US Agency for International Development (USAID), has been working for 18 months in the province of North Sulawesi to establish effective models of participatory and community-based coastal resources management. Many of the issues in the province, and models being established through this project, pertain to the management of coral reefs which remain in good to excellent condition, although threatened from destructive and unsustainable use practices. Models, or examples of best practices being developed include the formulation and implementation of village-based integrated coastal management plans, community-based marine sanctuaries, village ordinances, and participatory early actions. This paper describes the experiences and lessons learned by Proyek Pesisir in establishing community-based marine sanctuaries at one field site within the Minahasa Regency. It is argued that community-based and decentralised coral reef and coastal management initiatives can be established within the current institutional framework given the new openness within government and demands by the public for governance reforms.

Site Profile and Background Information

PROJECT CONTEXT AND OBJECTIVES

Proyek Pesisir is the in-country title of the Indonesia Coastal Resources Management Project (CRMP) which is part of the USAID-BAPPENAS Natural Resources Management II (NRM II) Program being implemented between 1996 and 2003. The CRMP is implemented via the Coastal Resources Management Project II cooperative agreement between USAID/Washington and the Coastal Resources Center of the University of Rhode Island (CRC/URI). The strategic objective is 'to decentralize and strengthen natural resources management in Indonesia' (USAID 1996:2).

The design of the NRM II program proposed that this objective would be achieved through the implementation of natural resources management programs dealing with forest resources and protected areas, coastal resources and biodiversity conservation. Each program coordinates at national, provincial and local levels with counterpart agencies of the Government of Indonesia (GoI) and with non-government, industry and academic organisations, resource users and communities directly.

Since the latter half of 1997, and especially since May 1998, Indonesia has been seriously affected by political, financial and climatic changes. These changes pose considerable challenges for all development assistance programs, particularly those dealing with natural resources management. While the temptation exists for donors to focus exclusively on immediate needs of food security, and disaster relief, the CRMP recognises that these issues will be better addressed in the medium to longer term by achievement of the NRM II strategic objective.

1. Technical Advisor, Proyek Pesisir (Coastal Resources Management Project – Indonesia)
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4. Associate Director, Coastal Resources Center, University of Rhode Island

It is hypothesised that decentralised and strengthened natural resources management will enhance the ability of Indonesian resource users to cope with acute change phenomena and promote wiser decision making about the long-term use of resources. As noted by USAID (1996), it will start Indonesia on the path towards sustainable management of its forestry, coastal and natural resources which support the livelihood of two-thirds of its (200 million) population, provide for over one half of its national income and are the most biologically diverse ecosystems in the world.

PROJECT ORGANISATION

The CRMP is deliberately positioned to interact with multiple institutions and address issues from the local to global levels. These relationships are fundamental and have been described as a series of purpose-oriented partnerships (Dutton et al. 1997) which enable the BAPPENAS-USAID aspirations for the NRM II program to be linked with broader GoI programs (e.g. the current coral reef rehabilitation and management project – COREMAP). They also enable the CRMP to contribute to global initiatives, including the International Coral Reef Initiative.

SITE SELECTION AND EVOLUTION

CRMP activities commenced in late 1995 with a customer survey and study of CRM needs and opportunities in Indonesia (CRC 1995). Following review of that study and approval from USAID-BAPPENAS, CRC/URI commenced in-country operations in October 1996.

The start-up period (October 1996–March 1997) established the national (Jakarta) and initial local (North Sulawesi) program offices. Concurrently, the CRMP national learning partner, the newly established Centre for Coastal and Marine Resources Studies (CCMRS) at the Bogor Agricultural University was contracted to assist with preliminary background studies. Initial activities in North Sulawesi included extensive consultation with local government and non-government organisations and communities, reviews of previous coastal project experience in Indonesia (Malik 1997) and a rapid appraisal of coastal villages (Pollnac et al. 1997) in the Regency Minahasa, the priority focal area for initial project development.

In July 1997, three field sites (Figure 1) were selected in North Sulawesi after consultation with local government authorities and local communities. These were followed by an initial socialization process with those communities to clarify expectations and identify appropriate approaches in each village. From October 1997, extension officers were stationed permanently in each community to facilitate project implementation. Since 1998, Proyek Pesisir field operations have expanded to the Provinces of Lampung and East Kalimantan, however, these programs are not discussed further, except insofar as to note that various lessons learned from North Sulawesi have guided project establishment in these new areas.

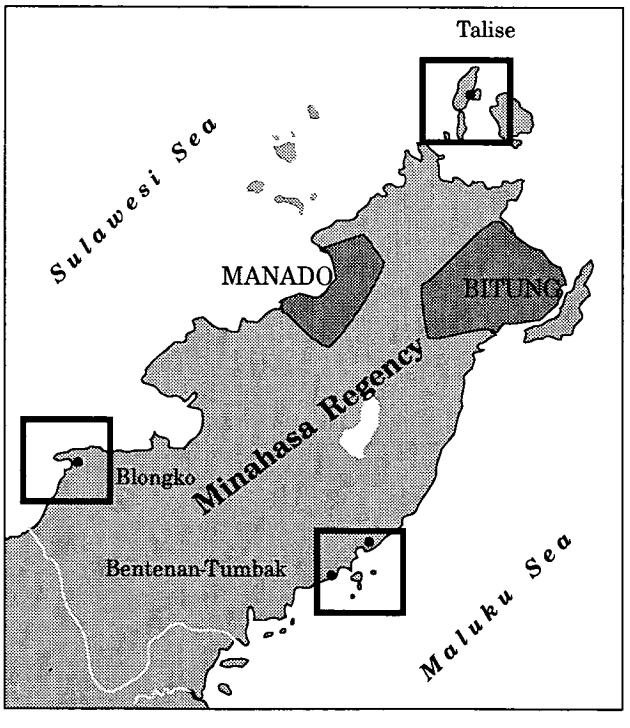

Figure 1: Proyek Pesisir field sites in North Sulawesi, Indonesia

Methodological Approach

AN INTEGRATED PROJECT VIEW

In this section of the paper, we discuss key elements of the methodological approach in an integrated way and describe the initial experiences of the most relevant aspects of our work and our philosophical view of the indivisible links between all stages of the management cycle, from setting goals to reviewing performance. The following sections therefore deliberately highlight only certain aspects of the CRMP experience. A more complete and elaborate account of experiences and lessons learned is being developed. One of the more innovative aspects of project design is developing approaches to and conducting learning reviews of aspects of CRMP practice – the first of those reviews is expected to be complete in early 1999.

EMPHASISING PROCESS – INTEGRATED MANAGEMENT AT EACH SITE

In field programs (local track), the goal of Proyek Pesisir is to establish examples of good practice in coastal resources management through the development and application of methods, strategies, actions, local ordinances and plans. It is thought that these can lead to improved or stable quality of life for the coastal communities, and stable or improved conditions of the coastal resources on which much of their livelihood depends.

A key project assumption is that in a country as large and diverse as Indonesia, no one planning model will be appropriate to all regions, provinces or for the thousands of coastal communities within the country. Any one province may also need to apply more than one approach to coastal planning and management. Therefore, it is likely that a range of models will be needed. Within and between the three project provinces in Indonesia, different planning approaches are being developed and tested (Proyek Pesisir 1998). Based on initial experience gained in the first year of the project, the North Sulawesi field program is now focusing on three specific community-based management approaches:

1. community-based village-level marine sanctuaries;
2. community-based village-level integrated coastal management plans; and
3. community-based village-level ordinances and policies.

The conceptual framework for the community-based planning and implementation process in North Sulawesi is to carry out the following steps.

1. Communities identified
2. Communities oriented and prepared for the planning process
3. Baselines established
4. Issues identified
5. Issues validated and prioritized
6. Management options developed
7. Management options selected and adopted
8. Implementation initiated
9. Review, evaluation, reflection and adaptation carried out

For each step, assumptions of best practice, which are to be tested and validated, have been made. These assumptions are, in essence, a series of hypotheses based on local circumstances and previous worldwide experience, on how the planning and implementation process should be carried out to achieve final outcomes of stable or improved quality of life of coastal peoples, and stable or improved condition of coastal resources.

The project has not completed all of these steps yet, and will require at least another year before management plans are adopted and plan implementation begins. However, through an approach referred to as 'early actions', (designed to build support for the larger planning effort and test implementation procedures), some implementation activities which can be completed quickly and at low cost to address initial issues identified, are being conducted while the longer-term planning process progresses. While many previous Indonesian donor-funded and foreign-assisted projects have stopped at the plan development and approval stage (Malik 1997), Proyek Pesisir intends to continue at these field sites until implementation is formally supported through normal Government of Indonesia budgeting and implementation channels.

CATALYSTS OF INTEGRATED MANAGEMENT: COMMUNITY-BASED EXTENSION OFFICERS

We believe that one of the most important ways to assist our partners to reach desired outcomes is to encourage a high level of participation in the planning and implementation process. Experience in similar programs (e.g. Sri Lanka: Dutton 1997) have shown that an extension agent can be critical to facilitating this process. The extension officer acts as the principal catalyst and coordinator for community-based activities by the project with technical support provided by the CRMP provincial (Manado) office, local consultants, non-government organisations and local government agencies.

Proyek Pesisir extension officers live in and work full-time in the communities, and are trained in a range of disciplines from marine ecology to community development. Despite the fact that all extension workers had college degrees, we found that significant investments were required to build the capacity of these officers to enable them to effectively interact with communities across the spectrum of local coastal management issues. To ensure adequate coordination and reporting of progress, field extension officers come into the Manado office on a monthly basis, through meeting with other field extension officers, feedback and peer problem solving occurs. In addition, senior extension staff and consultants mentor the field staff and provide periodic training activities to build the capacity of the field extension team.

The current field extension officers will not, however, remain assigned in the communities forever. Once plans and/or ordinances are developed, approved and implementation initiated and the community has developed sufficient capacity, the extension officer will be withdrawn from full-time assignment in the community. They will then start outreach and planning activities in neighbouring coastal villages as well as documentation of lessons and approaches based on the results at the initial field sites. The full-time assignment of the field extension officer is estimated for a period of one to three years, and will be followed by part-time visits for at least one year after their full-time withdrawal. To facilitate this transition, field assistants (members of each community) have been appointed and work (and train) alongside CRMP extension staff.

ENABLING INTEGRATION – THE IMPORTANCE OF INTERAGENCY COORDINATION

Under current centralised administration systems of the Government of Indonesia, provincial governments have been the primary agent for enabling the implementation of typically 'top-down' initiatives. Unfortunately, in the context of coastal and other 'environmental management' initiatives, this typically involves narrow 'sectorally-based' agencies with little mandate, will, experience or capacity. Of particular concern was (and remains) the lack of experience within these agencies to work cooperatively with government and non-government stakeholders in coastal resources management, and the lack of accountability inherent in the governance processes which prevailed under the Soeharto Government.

Proyek Pesisir initially began to cautiously address these problems in 1997 by working with the Provincial Planning Agency (BAPPEDA), a local university (UNSRAT) and a multi-agency Provincial Working Group (which played the key role in site selection), whilst concurrently engaging with key provincial NGOs, industry, and community organisations. As our experience has grown and the 'comfort level' among partners increased, initially defined roles are changing. For example, the Provincial Working Group has been reconstituted to provide more emphasis on policy development and overall project guidance.

At the village level, CRMP extension officers work closely with local village government, particularly the village head ('*Kepala Desa*') and the village development council ('*LKMD*'), and are responsible for additional coordination with the District ('*Kecamatan*') Government. The Manado office maintains linkages with provincial government and at the Regency (*Kabupaten*) level by acting as the secretariat of a Provincial Advisory Group and a Regency Task Force. The Regency Task Force on the other hand, formed in the project's second year, focuses on coordinating implementation actions at the field site level. While these mechanisms provide both horizontal and vertical linkages throughout the government system, it is within the communities where most of the activities and discussions take place. Communities themselves are deciding allowable and prohibited activities within marine sanctuaries, site location, sanctions, management structure, and authority of the management committees. At

the village sites, including the case of Blongko described below, primary responsibility for enforcement, management and compliance lies with the community, however, it is essential that government understands, accepts and empowers these initiatives.

It is significant to note that since Proyek Pesisir commenced, Indonesia has undergone massive social, economic and political change. The entire machinery of government is being re-engineered, and there is a genuine demand for more open, accountable, equitable and flexible forms of governance. The Manado Office and the Jakarta Project Office maintain close links with key national institutions including BAPPENAS (National Development Planning Board) and BANGDA (Directorate General for Regional Development of the Ministry of Home Affairs). These links provide both the foundation for legitimisation of project activity (e.g. ensuring funding is available to provinces for coastal initiatives) and the springboard for ultimately replicating project-derived practices and policy reforms. The current *reformasi* era within Indonesia is an unprecedented 'window of opportunity' for demonstrating to government how communities can be entrusted to manage coastal resources properly. The CRMP has seized that opportunity by:

- developing an accountable system for community development and management actions which is now being promoted as a model for channelling government funding into poor communities;
- facilitating interchange between communities and governments in a range of local (e.g. village-based trifling), provincial (e.g. seminars), national (e.g. conference) and international forums (e.g. study tours); and
- ensuring that provincial and national-level policy makers visit field sites to learn how communities can be supported to be better coastal resource stewards.

Those initiatives are leading to greater acceptance of the validity of community-based resource management and are helping shape the natural resources policy reform agenda for Indonesia in the next millennium.

CREATING MODELS: A MARINE SANCTUARY AT THE BLONGKO VILLAGE FIELD SITE

Adapting global experience to the Indonesian context of coastal resources management has been suggested by Dahuri et al. (1996). The successful Apo Island Marine Sanctuary in the Philippines (White 1989; Calumpong 1993) is an example of one model that Proyek Pesisir is attempting to adapt and test in North Sulawesi. The purpose of a community-based marine sanctuary is twofold. First, it can provide a biological function of biodiversity protection, and a protected spawning and nursery ground for marine organisms. Second, and particularly important to the local community, it can have an economic function of sustaining or increasing reef-related fish production, and in some cases, be a marine tourism destination for divers and snorkellers.

Global experience on approaches to developing collaborative and community-based management of coral reefs (White et al. 1994) has been employed as a basis for the process being followed in the establishment and management of the first Indonesian community-based marine sanctuary in the village of Blongko. The specific steps in the process are:

1. community Socialisation;
2. public Education and Capacity Building;
3. community Consultation and Village Ordinance Formulation;
4. village Ordinance Approval; and
5. implementation.

Community Socialisation

This process started with the extension officer establishing a project office within the village office, and conducting a series of formal meetings and informal discussions with various social and religious groups to inform them about the project goals and process. During this initial period, the extension officer also prepared an ecological and human history of the community (Kasmidi 1998) by interviewing elderly residents and other key informants about changes in population and settlement patterns, and changes in long-term conditions and use of coastal resources. This helped community members get to know the extension officer and vice versa and helped them obtain a better understanding of the management issues within the community. Through this process the villagers also provided a historical perspective of how the present state of the environment and community had come about. In addition, a technical team conducted initial surveys of the reefs and mangroves in the village, and the extension officer initiated a systematic socioeconomic survey of the community to determine baseline conditions.

Public Education and Capacity Building

The idea of making six hectares of the coast containing a fringing coral reef and mangrove forest into a marine sanctuary came about after a representative of Blongko village visited the marine sanctuary at Apo Island in the Philippines. This was followed by a reciprocal visit by the Apo Island Barangay Captain and member of the women's cooperative to observe Blongko and exchange ideas. The *Kepala Desa* (head of the village) in Blongko and the community quickly understood the Apo Island group's description of how their community-driven marine sanctuary effort was developed and implemented. The extension officer held numerous public education events on marine and coral reef ecology, and the marine sanctuary concept. Training in coral reef mapping and monitoring was also conducted. This information was then incorporated into the marine sanctuary planning process. Realising the potential benefits of increased fish production from a sanctuary and the value of the local fishery to their community in supporting the livelihoods of future generations, the community engaged in efforts with Proyek Pesisir staff to identify a proper site, and to develop a local ordinance to regulate the proposed protected area. Within a few months, the community fully supported the marine sanctuary concept. This was a major milestone in the process of establishing the marine sanctuary.

As part of developing the community capacity to manage a marine sanctuary, a grant project was created. Communities could prepare two to three page proposals to take 'early action' to address simple coastal management problems which do not require large sums of money or a long duration to complete. The objective behind these early actions in Blongko was to help build support for the marine sanctuary planning effort, and to test implementation strategies. Proposals were approved if they followed the procedures and met established criteria that include public participation in the proposal development, widespread community support for the proposals and community contributions (labour, materials or partial financing). These early actions in Blongko and other communities have typically been small-scale, only several hundred dollars, and have been for actions such as construction of latrines and wells, construction of a community meeting and information centre, mangrove replanting and small-scale drinking water supply development. Blongko is currently preparing proposals for the installation of signboards and sanctuary boundary markers. Community groups which implement the grants are trained in simple accounting and financial reporting procedures, and are required to submit a finance report and technical report upon completion of the grant project. Expenditure reports are posted in the village office for full public disclosure and accounting books are open to public review by anyone in the community. The early action program was instrumental in developing trust with the community, and demonstrating the project desire to listen to community needs, and commitment to act.

Community Consultation and Village Ordinance Formulation

After the extension officer conducted a series of formal and informal meetings and small group discussions, a local legal consultant (based on inputs provided by the community) drafted an ordinance. Additional meetings were held to discuss the draft ordinance and modify the contents. One stakeholder group – reef gleaners – never attended the formal meetings, but it was proposed that no walking over the reef flat would be allowed, which would impact their ability to reach gleaning areas on the other side of the sanctuary. The extension had to make special efforts to meet with gleaners informally and discuss this proposed prohibition. After much discussion, the gleaners agreed with this proposal as they had an alternative trail behind the mangroves that they could use with minimal inconvenience to reach the other side of the sanctuary.

Site selection was also another area of important discussion and decision making. A series of three community training programs on coral reef monitoring and mapping using the Manta Tow technique were conducted where the community themselves mapped the coral condition along their village. Fraser et al. (1998) showed that the community-generated data was not statistically different from professionally collected data. This map was used as the basis of discussions for selecting the actual marine sanctuary site. The first area recommended by the technical team as the best site was on a far point, which had the best coral cover and fish abundance. The community, however, rejected this location as it was often visited by bomb fishers from outside the community and was typically a resting location for fishers returning from offshore fishing trips. Other alternatives were considered. A reef in front of the village was proposed, but this area had tidal fishponds (locally called *bonor* and constructed from coral rock) on the reef flat. The technical team was concerned this might have a negative impact on the sanctuary concept. Finally, a third site was selected by the community with moderately good coral cover and within sight of the village.

The technical team recommended that the marine sanctuary only consist of a core zone as a way of keeping management and the language in the ordinance simple. However, the community was concerned that light boats used for night fishing of anchovies, if fishing too close to the sanctuary, would attract small fish out of the sanctuary, thereby having a negative impact on its function. Therefore, the community decided to include a buffer zone around the sanctuary that prohibited the use of light boats within 100 metres of the core zone boundary. This is one of several cases where the community decided on a stricter set of regulations than was recommended by the technical team.

An especially interesting event occurred which helped reinforce the marine sanctuary concept among the fishers in the village. One Blongko fisher was out at a fish aggregating device approximately three hours from shore when he met a Philippine fishing boat. One of the Filipinos spoke Indonesian and they started a conversation about fishing. The Blongko fisher mentioned the marine sanctuary concept being proposed and the visit of Apo Island residents to their community. The Filipino fisher from General Santos City was aware of the success of the Apo Island Marine Sanctuary and encouraged the Blongko fisher to support the establishment of the sanctuary in his village. The Blongko fisher previously was willing to go along with the sanctuary concept, but after this chance meeting at sea, became a strong supporter and advocate of the sanctuary.

Village Ordinance Approval

Final community approval of the ordinance took place at an all-village meeting called specifically for this purpose in September 1998. Copies of the final ordinance were made and distributed to every household in the village prior to the meeting. The final ordinance contains sections detailing:

- the legal basis that supports the establishment of a community-based marine sanctuary and the goals of a marine sanctuary;
- the location of the marine sanctuary;
- responsibilities of the management group and community in sanctuary management.
- allowable activities in the marine sanctuary and buffer zone;
- prohibited activities in the marine sanctuary and buffer zone;
- penalties for violations; and
- an attached map of the marine sanctuary location.

The approved village ordinance is being submitted to district and regent officials for their concurrence and toward gaining additional strength and support for implementation and enforcement. Throughout the process Provincial, Regency, and district officials have been kept informed of the sanctuary development. High-level delegations from Provincial and National agencies have also visited Blongko and expressed their support and encouragement in promoting the sanctuary concept and continuing this initial experiment in Blongko. The entire process, from the initial assignment of the extension officer at the field site to ordinance approval, has taken one year.

Implementation

Even before the village ordinance was completed, initial implementation activities were started and being planned. Already an information/meeting centre is under construction, placement of boundary markers is under-way, information signs are being created, a management committee has been formed, and a community group has been trained to monitor coral condition using the Manta Tow technique. A management group is in the early stages of formulating a management plan for the marine sanctuary.

Reflections and Lessons Learned to Date

In a project as innovative and timely (in the Indonesian context) as Proyek Pesisir, it is tempting to seize the quick lessons and begin to apply those practices and models which offer hope to protect biodiversity, alleviate poverty and improve livelihoods. The rate of degradation of Indonesia's vast coastal and marine resources, particularly coral reefs (Suharsono 1998), climate and development-induced natural disasters (Dutton and Crawford 1998), the urgency of dealing with economic decline and the importance of governance reforms (Ginting 1998) all predicate an urgent response from policy makers.

But where to begin and what kinds of initiatives work best? Perhaps the most consistent lesson learned to date is that the previous development paradigms of the New Order government of former president Soeharto have led Indonesia to the brink of collapse today. Entrenched corruption, collusion and nepotism (*KKN*), failure to acknowledge the legitimacy of public (c.f. corporate) control of resources, ill-conceived and improperly designed investment projects and laws, failure to encourage equitable development of outer provinces, and a lack of willingness to share information amongst stakeholders are all very real problems facing Indonesian coastal resource users and managers today. The good news is that those problems are now being openly discussed and are beginning to be systematically addressed. It is in this context that Proyek Pesisir is assisting communities, governments, industry and other stakeholders to explore, test and share solutions.

Some of the initial practices and policies derived from specific aspects of our work to date which are likely to assist this process are defined below. These are suggested not as a comprehensive set of guidelines, but rather as a basis for consideration in the design of complementary initiatives in the future. An unfortunate hallmark of most past coastal management initiatives has been a tendency to not learn from past experience.

INITIAL LESSONS FROM PLANNING AND MANAGEMENT ACTIVITIES

Map and understand the niche of the project

Considerable effort was expended in project design and later in an initial six-month start-up period on determining how best a coastal resources management initiative could be developed which properly addressed local and national needs. That consultation was undertaken by an experienced international and local project team and involved extensive consultation with project sponsors and clients. Initial consultation has now led to informal and formal channels for enabling the CRMP to be vertically and horizontally integrated with government and non-government governance processes.

Use the right human resources to build an extended team

Proyek Pesisir expended considerable efforts in finding suitable staff and consultants, and in developing a close working relationship with all key counterparts. This is a challenge typical of most coastal initiatives, however, and is exacerbated in Indonesia by (a) the lack of experienced professionals and (b) the lack of precedent for integrated, partnership-oriented project teams. Considerable effort has been made to select an appropriate balance of skills (including the often-underestimated administrative support) and in building trust and communication within the extended team (which we perceive as ranging from villagers to Ministers).

Work incrementally and adaptively

The process of developing one field program at a time, and then one key initiative at each field site, has worked well. For example, in the case of the Blongko Marine Sanctuary it has allowed resources to be concentrated to ensure the first sanctuary was established properly with appropriate public process and sufficient technical inputs. Cross visits between communities have increased the speed at which acceptance of the marine sanctuary concept is occurring at other field locations. Therefore, disseminating experience after establishment of an initial successful pilot site is recommended.

Use experienced community members as extension agents and trainers to other communities

Community members and fishers talking to other community members and fishers is often more persuasive than accepting the views of a community outsider however well intentioned they might be. The cross visits with the Philippines increased the speed at which we were able to adapt the community-based marine sanctuary concept to the Indonesian context and is increasing the speed at which it is being transferred from the initial site in Blongko to other sites in North Sulawesi. This technique has also proven effective in the successful integrated pest management program (farmer-to-farmer training) in Indonesia.

Develop and implement a public education strategy early on in the planning process

In retrospect, it probably would have been better to do more public education events early on than we actually implemented, and to have a public education strategy in place at an earlier period in the sanctuary planning process.

Engage local government institutions early on in the planning process

Line government agencies such as fisheries, forestry and the Provincial Planning Board, although informed and supportive of activities, have only occasionally involved their staff in actual field activities. This is a lost opportunity for these agencies to learn the details of the marine sanctuary planning process. Engaging the local line agencies more in the next round of field site marine sanctuary establishment is being attempted, and will help with the second phase of the project strategy which is a scaling-up of the concept as part of a provincial coastal management extension program.

LESSONS LEARNED IN CAPACITY BUILDING

Carefully assess the capacity of local partners and communities at the onset of a project

We initially overestimated the capability of institutions and personnel, and the speed at which work could be accomplished. It required us to continually make adjustments in work and training strategies to move at the pace of our staff, local counterparts and communities to ensure that the work was done properly, and that the proper foundations were put in place before the next steps in the process progressed.

Build the skills of staff and supply appropriate technical assistance in stages

Both training and technical assistance interventions need to be interspersed with immediate opportunities for on-the-job applications. Therefore, the content of training and technical assistance should be carefully linked to the skills required of staff at the appropriate time in the planning cycle. This allows staff to apply, analyse and improve skills as they go, and achieve a certain level of competency before moving to the next set of tasks. For projects that have a heavy emphasis on capacity building, setting clear performance and results milestones, and achieving them before moving on to the next set of activities is more important than carrying out activities, within a certain time frame with little attention to quality.

INITIAL LESSONS LEARNED IN RESEARCH, MONITORING AND PERFORMANCE EVALUATION

A significant amount of resources are required to undertake systematic monitoring

The CRMP expends considerable effort (time and funds) on monitoring and performance evaluation, especially at field sites. This is considered necessary as the field sites are being viewed as experimental sites when best practice approaches are being tested and validated. It is felt that without strong and persuasive evidence of the effectiveness of the models being developed, it will be less likely that they will be replicated or adopted on a wider scale. In addition, if a systematic monitoring program is not put in place for model testing (often justified to speed the process up or to save costs), and we are not certain of impacts of interventions, we run a danger of decisions for larger-scale investments for replication being wrong. The risks and costs of being wrong could exceed by several orders of magnitude the initial pilot model testing investments. This would be a tragic waste of large sums of taxpayer money, and loss of precious time. If environmental trends are negative, going down a dead end means even more severe conditions for the next round of necessary interventions, and reluctant communities unwilling to accept what may again be bad advice given previously. Finally, staff resources on approaches which may ultimately prove to be ineffective would be wasted. Once models of best practice are validated, replication to other areas would require a smaller set of indicators, and a simpler, less costly and time consuming approach to monitoring.

Use research as an overt extension tool for ICM

The process of ICM model testing is analogous to the research and development conducted at agricultural experiment stations and their associated extension delivery systems for developing improved varieties of rice. No agricultural researcher or extension program would dare make recommendations to farmers regarding levels and timing of pesticide and fertiliser applications, without first having a high level of certainty of the crop yields and profits to be expected. No ICM approaches should be widely disseminated either, until there is a high level of certainty that they will have positive results. A century of agricultural extension experience worldwide, and the integrated pest management program approach implemented with great success in Indonesia (which includes significant farmer participation in action research, training and extension), has lessons which can be applied to the development and adoption of best practices in coastal management.

Acknowledgements

The authors gratefully acknowledge the advice and assistance of CRMP colleagues and advisors in developing the ideas expressed in this paper. The ideas and opinions expressed in the paper are those of the authors and do not necessarily reflect the views of CRMP counterpart agencies or USAID.

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Protected Areas on the Gulf of Aqaba, Egypt: A Mechanism of Integrated Coastal Management

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ITMEMS 1998 Proceedings

Abstract

Recognition of the close link between coral reefs and associated ecosystems and ambitious tourism development objectives for southern Sinai, prompted the Government of the Arab Republic of Egypt to establish a network of marine and terrestrial protected areas to conserve critical natural resources and thereby support national economic development policies. The declaration of networked protectorates on the Gulf of Aqaba has in effect established a large marine protected area over 250 km of the coastline. Government conservation objectives supported by the Commission of the European Union are being realised, the Gulf of Aqaba is now fully protected, zero discharge policy is strictly enforced, coastal alterations are prohibited, artisanal fisheries are regulated, and consensus on management issues with resident communities and stakeholders has been achieved. The Gulf of Aqaba Protectorates Development Programme owes its success to proper integrated coastal zone management, strong legislation, unwavering Government support and the establishment of functional partnerships with the local community. This experience on the Gulf of Aqaba is going to be repeated by the Government of Egypt with strong support from the Red Sea Governor and investors by the declaration of the 'Great Red Sea Marine Park'.

Background

GEOGRAPHIC CHARACTERISTICS

The Gulf of Aqaba is a small, semi-enclosed branch of the Red Sea, 180 km long and 5 to 26 km wide, forming part of the Afro-Syrian Rift system. The Egyptian littoral occupies most of the western Sinai coast stretching along the Gulf for about 250 km northward from Ras Mohamed to Taba.

The coastal plain is narrow with granitic mountains descending almost directly into the sea. This topographic feature is broken by several large alluvial fans now targeted for either urban or tourism development. All shorelines, with the exception of areas subjected to periodic flash floods, are fronted by well developed and easily accessible fringing reefs. Monospecific stands of mangrove (*Avicennia marina*) are found on shorelines at Nabq and Ras Mohamed Protectorates.

The Gulf has steep walls dropping to a great depth (almost 2000 m in places) and is separated from the Red Sea proper by the 6 km-wide Straits of Tiran. There are two major marine basins in the Gulf, the northern one extending to a position opposite Nuweiba with a depth of 1000 m, and a southern basin extending to the Straits of Tiran with a depth of 1800 m. The Gulf region is arid with an average temperature from 14°C in January at Taba up to 45°C in August at Sharm El Sheikh. Water temperature in the Gulf remains constant: 21.5°C below a depth of 200 metres and varying from 20°C in January to 27°C in August at the surface. Tides are semi-diurnal with a range from 30 to 100 cm. Salinity is almost 40 parts per thousand. This high salinity is due to the high rate of evaporation and the slow rate of water exchange between the Gulf and the main body of the Red Sea.

1. Nature Conservation Sector, Egyptian Environmental Affairs Agency

MARINE AND TERRESTRIAL ECOLOGY

Though a relatively small body of water, the Gulf of Aqaba hosts an extraordinary diversity of corals and related marine life. Over 50% of the Gulf's shoreline is fringed with coral reefs. Approximately 210 scleractinian hard coral species and 120 species of soft coral have been recorded in the Gulf. In areas where coastal mountains rise steeply from the shoreline, corals reside primarily on narrow fringing reefs (less than 30 m wide) with steep, sloped fore reef of excellent coral cover to depths exceeding 100 m. Recent baseline studies identified 268 species of tropical and semi-tropical fish from samples taken in the Protectorates. Other studies have estimated that the Gulf harbours between 700 and 1000 species of reef associated and pelagic fish.

HUMAN ACTIVITIES AND THREATS

Tourism development on the Gulf of Aqaba has resulted in an increased resident population in urban areas. Support infrastructure required to cope with the increasing transient and permanent population is insufficient. Existing solid waste disposal facilities, sewage treatment plants, and water desalination systems are currently being upgraded and their number increased. Clearly this increase in population and tourism demand can and does affect the health and integrity of coastal resources. The Egyptian Environmental Affairs Agency (EEAA) is effectively mitigating the consequences of tourism development and population increase through a strong and well-conceived management policy, enforcement of environmental laws and public awareness targeting stakeholders and the population.

The Gulf of Aqaba is an important and difficult shipping route for vessels servicing both Jordan and Israel. It is estimated that approximately 6000 vessels of different kinds transit the Gulf each year. The International Maritime Organization (IMO) has plotted the boundaries of the marine protected areas on the navigation maps as areas to be avoided. In spite of these efforts, some accidents have happened resulting in damage to coral reefs. A damage evaluation system has been developed on an economic basis. The EEAA applies the principle 'polluter/owner pays' to all accidents.

There is no oil exploration or extraction in the Gulf of Aqaba. Industrial development on the Egyptian littoral is absent. Commercial fishing has been traditionally limited to artisanal, subsistence methods practised by Bedouins who concentrate their activity only on the back reefs. As a result, coral reefs have suffered some damage due to these practices. However, after education, fishermen have now accepted and participated in a fisheries management program to include respect of fishing seasons, monitoring and collection of catch data.

Integrated Management

EXPANSION OF PROTECTED AREAS IN THE GULF

The Gulf of Aqaba Protectorates consists of a network of three distinct units linked by protected coastlines, thereby creating a continuous length of protected shorelines on the Gulf of Aqaba stretching from Taba to Ras Mohamed at the southern extremity of the Sinai Peninsula. The declaration in 1983 of the Ras Mohamed Marine Protected Area marked the beginning of a process that was to eventually establish management over all coastal marine environments on the Gulf of Aqaba.

The Ras Mohamed Marine Protected Area existed as a 'paper park' until 1988 when the Government of the Arab Republic of Egypt instructed EEAA with the task of developing and managing this internationally significant coral reef resource in line with the tourism development strategy. With technical assistance from the Commission of the European Union, a program was started in 1989. Immediate actions included expansion of existing boundaries from 97 km^2 to 210 km^2 and designation as a National Park. Indicative management objectives, together with the prestige value of developing Egypt's first national park, were key elements in the decision to adopt a policy designed to mitigate immediate pressure on the site due to excessive tourism development in adjacent areas and unregulated semi-commercial fisheries within its declared boundaries. The Ras Mohamed National Park Development Project successfully implemented management measures that established Egypt's first national park, regulated artisanal fisheries, and initiated a process whereby stakeholders were provided partnership opportunities.

Support for management policies implemented in Ras Mohamed led to the declaration of two additional Protectorates on the Gulf of Aqaba in 1992. These areas are known respectively as the Nabq and Abu Galum Managed Resource Protected Areas. In 1994, those protected areas were linked together with the Ras Mohamed National Park through protecting all coastlines. Thus the Ras Mohamed National Park Sector was established. It consists of 1470 km^2 of marine and terrestrial habitats and 52% of Egypt's littoral on the Gulf of Aqaba. The Commission of the European Union continued its support to the EEAA and over the next three years, jointly implemented a programme that expanded management activities in Ras Mohamed and a multidisciplinary management programme targeting specific issues in Nabq and Abu Galum. Management of the Ras Mohamed National Park Sector successfully regulated tourism development activities and ensured that both coastlines and coastal marine resources remained integral.

Successful results of EEAA actions on the Gulf of Aqaba, coupled with strong support from many investors and stakeholders, led the Government to declare in 1996 the remainder of Egypt's littoral on the Gulf of Aqaba as extension to the Abu Galum Managed Resource Protected Area. Landwards expansion was realised through the St. Katherine Protectorate. Finally, the Taba Natural Monument was declared in March 1998. The EEAA has now established the South Sinai Protectorates Management Sector consisting of over 12 000 km^2 of linked marine and terrestrial protectorates.

MANAGEMENT OBJECTIVES

Management objectives favouring the development of the Gulf of Aqaba Protectorates are directed to respond to and mitigate the consequences of rapid development of a tourism-based economy in southern Sinai.

Proximity of the south Sinai Peninsula to the European tourism markets, coupled with the wealth of marine and terrestrial natural resources, outstanding landscapes, a rich cultural heritage and coral reefs of international significance, have acted as a catalyst and promoted investment in the Region. Since 1988 tourism capacity on the Gulf of Aqaba has expanded from 1030 beds to over 16 000 beds. Development ceilings have been set at 160 000 beds and these numbers are expected to be reached by 2017. The task of the EEAA in that respect is to conserve natural resources, regulate massive development projects and establish partnerships with stakeholders and investors and educate them about the close links between resource conservation and the long-term value of their investment.

The Gulf of Aqaba Protectorates management objectives were identified as follows:

- To provide for the full protection, conservation and management of natural resources, biodiversity, landscapes, seascapes, cultural heritage, historical sites, ecosystems, habitats and natural processes essential to their preservation as hereditary resources for future generations;
- To maintain the integrity of natural systems to protect and conserve their biodiversity;
- To provide for the protection of natural coastlines recognising that these are critical to the stability and health of coastal marine ecosystems;
- To manage desert ecosystems, landscapes and their biodiversity as areas of natural and economic significance;
- To provide for the full integration and protection of indigenous people resident in, or adjacent to, declared protectorates;
- To provide the means to ensure that resource harvesting is sustainable and in harmony with the objectives of the protectorates;
- To ensure that economic development activities are executed in accordance with the general objectives of the protectorates, and to encourage the establishment of compatible economic development activities;
- To provide opportunities for a full range of recreational activities ensuring that these are both socially acceptable and ecologically sustainable;
- To ensure that all actions likely to impact on the protectorates are subjected to proper evaluation according to the relevant legal instruments; and
- To prevent all actions that are likely to result in resource degradation, loss of scenic beauty, loss of amenity value, loss of biodiversity, reduced public access, or any other consequence likely to affect the value of the protectorates and their contained hereditary resources.

To a great extent the Gulf of Aqaba Protectorates have achieved most of the abovementioned objectives. The driving forces behind this achievement have been a combination of strong legislation, unwavering support from the EEAA, and the establishment of functional partnerships with private sector interests in areas adjacent to declared protectorates.

LEGISLATION

Law 102 of 1983 for Protected Areas provides the EEAA with a strong legislative tool to manage Egypt's protectorates. The law and its accompanying decrees stipulate that EEAA is the competent administrative authority to regulate and coordinate the actions of all other government authorities and ministries when these are likely to endanger or compromise the value, integrity or natural resources of any declared protectorate. The law specifically prohibits any action that may lead to the extermination, damage or alteration of any organism, system or formation considered as a habitat for the living terrestrial and marine resources of the protectorate. It also prohibits the introduction of exotic species and the removal of any organisms or materials found in the protected area.

The law also forbids any activities, actions or experiments in areas adjacent to a protected area that would affect the environment of the protected area or the processes within it without the express permission of the concerned administrative body.

Law 4 of 1994 for the Environment includes three main chapters concerning air, land and the water environment and two special sections concerning EEAA responsibilities and penalties.

The main articles concerning development and environment are those stipulating that an Environmental Impact Assessment (EIA) is obligatory to obtain a license for projects and establishments. The EIA should follow the guidelines determined by EEAA in agreement with the administrative authority.

On the Gulf of Aqaba *Law 102,* which is a powerful executive law, is applied. The wide range of articles of *Law 4,* which is a coordinating law, are exploited. By enforcing the two laws, all the main coastal activities can be regulated and proper integrated coastal management objectives are implemented.

OPERATIONS

The Protectorates staff implement all management, educational and enforcement measures required by the law to ensure that the conservation objectives specific to each protectorate are achieved. To that end staff are responsible for the following activities:

- identification of immediate and long-term management needs for each protectorate;
- preparation of access tracks and visitor management infrastructure;
- preparation of reef access points to limit damage to coral reef areas;
- public awareness and preparation of educational information materials;
- development and maintenance of natural trails;
- resource monitoring;
- marine and terrestrial patrols;
- installation and maintenance of vessel mooring points at all diving sites;
- evaluation of Environmental Impact Assessments for all developments inside and adjacent to the protectorates;
- continuous inspection of development sites to ensure compliance with existing regulations, and as a mechanism to develop partnerships with investors and management groups;
- enforcement of environmental legislation and protectorates regulations;
- continuous assessment and management of commercial and artisanal fisheries;
- provision of services to resident Bedouin communities;
- provision of free consultancy services to developers and investors to avoid destructive practices and maintain resource integrity, recognising that these are common property protected resources administered by the EEAA; and
- care and maintenance of equipment essential to protectorates operations.

- Development is controlled and regulated by EEAA staff who concentrate on the following items.

- All development and infrastructure projects are screened. Any proposal considered inappropriate is rejected. This includes any proposal containing elements that would alter coastlines, damage coral reefs or other marine resources, privatise the coast or coral reef areas, discharge effluents without prior treatment or which might affect neighbouring properties.

- Environmental Impact Assessments are requested from all developers. Once approved by EEAA, the Protectorates staff ensure that there is no deviation from the agreed development plan and inspect all properties on a regular basis to verify that regulations are strictly respected.

- Regular communication with all investors is maintained and functional partnerships are established with them. This process leads to the understanding that they too have a stake in the eventual success of conservation programmes and that these represent their best guarantee for continued sustainable returns on their investment.

- Hotel developments are regularly inspected and any actions that could lead to deterioration of coastal habitats are prevented beforehand. A prototype of dry or perched beaches, that causes minimal impact, has been introduced to some developments, and is being sufficiently utilised thus creating more beach areas without any modifications to existing shorelines.

- The local Bedouin communities are integrated through regular meetings called to present management programs to different Bedouin groups. The EEAA Nature Conservation Sector also employs a number of Bedouins and some of them have been upgraded to Ranger and Protectorate Superintendent level.

- Due to the fact that the narrow fringing reefs of the southern Gulf of Aqaba and Ras Mohamed attracted approximately 500 000 users in 1997, and as a result of statistics showing that snorkellers currently represent 60 per cent of all tourists, a number of access points and walkways over the back reef were constructed to reduce the cumulative damage to high-frequency visitor areas due to trampling of the reef.

- At present, a strictly implemented dive site management plan regulates the number of boats and divers/snorkellers that can access main dive areas and distribute pressure over a wider range of traditionally-used, and newly-opened, dive sites. Scientific reserve areas are kept closed to all activities for future reference and scientific research. Intensively used areas which are affected will be closed for rehabilitation if this solution is considered necessary. The use of anchors has been prohibited in the area to minimise physical damage to coral reefs, and mooring buoys have been installed. Fish feeding, which affects fish behavior and upsets the ecological balance on the reef, has been prohibited. The collection of coral, shells or any natural marine element is strictly prohibited.

- An effective public education program targeting visitors, local authorities and Bedouins has been implemented. Increased awareness levels within those target groups supports the Protectorate management policies on the Gulf of Aqaba. This programme is accomplished through regular meetings with user groups, producing interpretative materials, hosting university and school groups as well as organising educational seminars for tour operators, dive guides and hotel staff, especially the beach boys.

Capacity Building

MANPOWER

Donor-assisted projects in Egypt normally operate on the principle of secondment whereby staff assigned to each project by the State are seconded from an existing civil service post for the duration of the activity. This procedure, with its inherent problems, often leads to failure once the donor terminates assistance. The EEAA, with the support of the Commission of the European Union, initiated procedures that permitted the recruitment and training of staff specific to the immediate needs of both the Protectorates Development Programmes and its Nature Conservation Sector. Since its inception in 1989, the Protectorates Programme has recruited and trained professional and technical staff to ensure that the programmes are fully sustainable and that the administrative and operational structures remain after donor-assisted programmes have been concluded.

The Nature Conservation Sector of the EEAA has adopted a recruitment policy favouring an internal advancement procedure whereby staff are well selected, trained and targeted to assume specific management responsibilities. Three categories of staff are recruited: rangers trained to assume area management and later senior management positions; scientific rangers trained to assume direction of monitoring and research specific to the needs of management, and technicians trained to provide support and assume responsibilities such as Area Superintendent. This internal promotion system is currently operational and staff recruited during the early years of program implementation are now assuming senior management positions. It should be noted that rangers in the Arab Republic of Egypt must be university graduates in any discipline and must have a second language.

Some of the Gulf of Aqaba Protectorates staff are now prepared for top management positions through postgraduate training in European universities and training programmes at the Great Barrier Reef Marine Park Authority in Townsville, Australia.

RESTRUCTURING OF THE NATURE CONSERVATION SECTOR (NCS)

After ten years of experience with the management of the Gulf of Aqaba Protectorates, a new structure has been developed for the Nature Conservation Sector of EEAA which suits the actual needs of management of protected areas and the preservation of biodiversity in Egypt. The EEAA is compiling this structure within its new organisation which is under development and will set priorities for its implementation.

The main concept of the structure is to provide the NCS with means of semi-autonomy to perform a wide span of activities (over 15% of the country as protected areas), the capability to manoeuvre with mobile units and to maintain self-motivation at different levels of management.

ENVIRONMENTAL FUND

Law 102 of 1983 for Protected Areas stipulates the establishment of a Protectorates Fund which is the main component of the Environmental Fund of EEAA. This fund receives the entrance fees of protectorates, fines for violations and accidents, as well as donations. This fund is available to support and develop the management of the protected areas network in Egypt, in addition to the support of other environmental programs.

The income generated by fees of the Gulf of Aqaba Protectorates exceeds the operation and recurrent costs, making them the first fully self-financing protectorates in Egypt.

EQUIPMENT AND INFRASTRUCTURE

Qualified staff provided with essential equipment is the cornerstone of Protectorates management. The European Union donation provides the Gulf of Aqaba Protectorates with proper equipment needed for activities such as patrolling on land and sea (vehicles, motorbikes and fast boats), monitoring (laboratory facilities, field units, GIS, etc.), environmental education and public awareness (visitor centre facilities, materials), maintenance of tracks (loaders, graders) and a communications network.

The Government of Egypt is responsible for the infrastructure of roads, electricity, water supply, sewage system, construction of jetties in Protectorates and buildings for laboratories, visitor centres, workshops, diving centres and proper accommodation for rangers to avoid them leaving for more attractive jobs.

Maintenance of equipment, facilities and establishments is an essential element in keeping them in good condition and for their sustainable use.

COMMUNITY SHARING

Continuous and proper links between the Protectorates and all stakeholders — governmental, private, Bedouins and NGOs — is an efficient means to achieve functional and equitable large-scale coastal zone management objectives.

Education and public awareness of local communities is a multidirectional process in the form of seminars, meetings, workshops, education in visitor centres, shared diving trips by rangers, informal visits for tourist groups, communications with dive centres, and the distribution of materials, films and regulations in several languages. The Protectorates management encourages voluntary work for the conservation of the natural heritage that includes clean-up campaigns, monitoring, scientific inspections, installation of moorings, production of educational films, photos, publicity, etc.

Research and Monitoring

MONITORING PROGRAM

The Gulf of Aqaba Protectorates have established resource baselines for all major coastal and marine features focusing on coral reefs, associated ecosystems, reef fish communities, mangroves and adjacent coastal ecosytems.

Since 1995, a monitoring program has been started with support from international scientists. The initial outcome of this program has been the collection of data on ship groundings to determine reef recovery rates from 25 permanent and 12 further stations. The program will now concentrate on mapping all reef resources on the Gulf of Aqaba and will gradually expand to include 80 stations between Taba and Ras Mohamed.

In addition to coral monitoring, species associated with coral reefs are also monitored. The program focuses on macro-invertebrate species, molluscs (such as Tridacna), reef fish populations and crown-of-thorns starfish (*Acanthaster planci*). Mangroves located in the Nabq and Ras Mohamed Protectorates, considered to be the most northerly in the Red Sea–Indian Ocean complex, are permanently monitored as part of management efforts to protect this important monospecific stand.

Two main outbreaks of crown-of-thorns starfish have been detected and controlled. The first outbreak in 1994 was evaluated in cooperation with the Great Barrier Reef Marine Park Authority and approximately 800 starfish were removed. In 1998, a major outbreak was concentrated in reef islands of the Straits of Tiran. Previous experience was used and up to 60 000 animals were collected. The results still need to be assessed. The collection campaign was carried out by volunteers from all the dive centres under Protectorates staff supervision, and specific formats for collecting information were applied.

A regular survey process is being carried out for all development projects on the coastline. All information is mapped using GIS by experts from the south Sinai Protectorates Sector. GIS is considered an efficient tool to assess land-use plans and the environmental status of the Gulf of Aqaba. In addition, GIS is used to map habitats and physiographic information collected during monitoring and surveys. More data are now collected from partner institutions such as the Geological Survey, Remote Sensing, the Biodiversity Unit and literature. A lot of work is promising in that regard.

The South Sinai Protectorates Sector is making use of the data collected through the National Monitoring Network of the Environment which is now being developed in Egypt.

RESEARCH AND COOPERATION WITH THE COMMUNITY AND SCIENTIFIC INSTITUTES

The main scientific activities of Protectorates staff are concentrated on monitoring. However, much research work has been done in collaboration with the Egyptian universities and some international institutes. Research work that is of benefit to the management programs of the Gulf of Aqaba Protectorates is encouraged. Protectorates staff cooperate in research at different levels.

A central laboratory that serves for monitoring and research work done in the South Sinai Protectorates Sector has been established in Ras Mohamed National Park. The central laboratory consists of four main laboratories: for marine, geological, biological and physical analysis. In addition a field monitoring unit can be dispatched for specific scientific work and inspection.

Review (Performance Evaluation)

VERIFICATION OF ACHIEVEMENTS

This originates from the expansion of protected areas and declaration of new ones on the Gulf of Aqaba and in the south Sinai Governorate. Ras Mohamed was the first area to be protected in Egypt in 1983. Its area was of 97 km^2 which was expanded in 1989 to 210 km^2. The two protected areas of Nabq and Abu Galum were declared in 1992, and were interconnected in 1994. The protection was extended to the whole Gulf in 1996. Two other terrestrial protected areas were declared in South Sinai, at St. Katherine and Taba. The area of the five protected areas is now 12 000 km^2 which represents 42% of the Governorate.

The Government of Egypt declared these protectorates as a result of the successful return of resource conservation on tourism activities, employment and the economy of the area. This can also be evaluated by the tourism development expansion from 1030 beds in 1989 up to 16 000 beds in 1998, which has increased the value of assets. The number of visitors to Sharm El Sheikh increased from a few thousand in 1989 to half a million in 1998. The number of visitors to Ras Mohamed grew from hundreds in 1989 to 150 000 in 1998.

As the Government of Egypt recognised the close link between sustainable development and the environment, it gave directives in 1997 that existing and future protectorates should be plotted on the National Investment Map in order to be considered by all development projects.

The management system of the Gulf of Aqaba is considered suitable for integrated coastal management on the Red Sea. The Egyptian Environmental Affairs Agency, the Tourism Development Authority, the Red Sea Governorate and investors have requested the declaration of the Red Sea Marine Park.

ENFORCEMENT OF LEGISLATION

Developers on the Gulf of Aqaba now recognize the existence of the protectorates and guarantee not to alter or damage coastlines or to discharge any effluent. Owners, managers and dive centres make their guests respect conservation regulations enforced by EEAA rangers. The number of violations of hotels are now very limited due to awareness of the community and effective patrolling.

All developments now apply Environmental Impact Assessment (EIA) by law, which after agreement is considered as a commitment by developers from which they should not deviate. The number of acceptable EIAs received is increasing as a result of the understanding by investors that conservation programs are the best guarantee for continued sustainable returns on their investment.

Enforcement is essential to the success of natural resources protection. All ship and boat accidents are prosecuted, and fines are evaluated by the Protectorates staff based on the economic value of the damaged resources. Those accidents are decreasing due to the declaration of the boundaries on maritime maps, facilities for navigation in the Straits of Tiran and applying environmental laws on pollution or any damage to coral reefs. Any other incidents such as the collection of marine resources, fishing in marine reserves, or infringement to regulations are also prosecuted. The number of such cases is decreasing.

HEALTH OF CORAL REEFS AND ASSOCIATED ECOSYSTEMS

In order to assess the success of the management and regulatory measures applied through the Protected Areas Program, and to determine the impact of tourism and related development activities on coastal ecosystems, monitoring activities are designed to respond both to long-and short-term objectives.

The long-term monitoring includes fixed transects, permanent photo-monitoring stations, physical parameters, dynamics and interactions of coral reefs, and mangrove and seagrass systems. The short-term monitoring deals with the study and control of abnormal phenomena (crown-of-thorns starfish, diseases, etc.), beach dynamics, flash floods, assessment of artisanal fisheries and their effect on reef areas.

The collected information of the monitoring programs is encouraging and the level of reef degradation is decreasing. The system is now under development for contribution from staff and scientists.

MANAGEMENT PERFORMANCE

The increased number of well-trained staff to accomplish the sound planning objectives of programs, of proper inventory of data base information and analysis, the rational use and maintenance of equipment, the self-discipline of the personnel, and the timing of decisions are the main factors of proper management.

An annual work plan of all activities is prepared by the Nature Conservation Sector and approved by the EEAA chairman, and then followed up monthly. Annual financial auditing is applied to the Sector and Protectorates by a neutral body.

Biannual special missions from the European Union are assigned to evaluate achievements on the Gulf of Aqaba. Fortunately almost all reports are positive and appreciative of management performance and progress.

One of the main activities of the Protectorates programs is to provide support to the Bedouins. This includes regular health care visits, training some Bedouins (both women and men) on first aid and providing them with necessary kits and medicines, veterinary follow-up of their domestic animals, and educational programmes for their children. All this support is performed effectively in close cooperation with the representative authorities of the Governorate. The Bedouin community is one of the main sources of information on and conservation of local biodiversity.

The Protectorates sector also offers a free consultancy service to both investors and local government authorities by studying the ecological implications of tourist development and urban planning on coastal resources. The results are used by management to either accept the project proposals or suggest modifications that will mitigate or eliminate expected impacts. This procedure creates confidence and establishes functional partnerships between the Protectorates and the investment community.

Lessons Learned

Effective legislation and strong governmental support targeting the development and establishment of Protected Areas on the Gulf of Aqaba have been the driving force behind the successful implementation of these programs in the Arab Republic of Egypt. Key elements to their success can be defined as follows.

1. The expansion of the Protectorates network in southern Sinai could not have been achieved had the State not had the foresight and vision to craft an effective legal instrument, notable for its simplicity and strength.

2. The Protectorates Law (102 of 1983) and its accompanying Decrees provide the EEAA with executive authority over all Protectorates and their adjacent areas. Prime Ministerial Decrees provide EEAA staff assigned duties in the Protectorates with enforcement authority, and provide the Nature Conservation Sector of EEAA with full administrative authority over the Protectorates in its care.

3. Staff recruited to the Protectorates by the EEAA were selected and trained to fill specific posts with the Nature Conservation Sector of that Agency. Seconded staff from government authorities were not considered. This decision ensures that the Protectorates programs will continue after all donor assistance to the EEAA has been withdrawn.

4. Training programs were selected to provide hands-on experience from qualified experts contracted for that purpose by donor-assisted projects. Additional training was provided externally through the Great Barrier Reef Marine Park Authority, and through universities providing postgraduate training for selected staff. External placement training programmes were useful in expanding the management experience of staff, broadening their understanding of different management techniques, and permitting them to select appropriate management solutions to specific problems in Egypt.

5. Successful implementation of Protectorates programs in areas targeted for intensive tourism development can only succeed if stakeholders are fully integrated into the Protectorates management process. In southern Sinai, the EEAA has succeeded in developing functional partnerships with investors and local Bedouin communities through the provision of services and through continuous dialogue with all stakeholders. These processes have broken down the traditional barriers to the establishment of Protectorates in countries that do not have a history of environmental management or protectorates development.

6. Biodiversity conservation programmes that involve the declaration of new protected areas must have political support at the highest level from the outset if they are to achieve any measure of success.

7. The Protectorates programmes have become fully sustainable through the collection of entrance fees. The Gulf of Aqaba Protectorates could now function without subsidy from central government funding.

8. A flexible approach to management has been maintained permitting the Protectorates to respond to opportunities and problems as they arise. Such flexibility is particularly important to Protectorates development activities which must involve multiple partners, each with differing objectives.

9. The establishment of a climate of openness and transparency has been a key feature in the success of the Egyptian Protectorates Development Programme.

10. The integrity of critical coral reefs and associated marine ecosystems in the Gulf of Aqaba has been maintained despite rapid coastal development of adjacent areas. The EEAA Nature Conservation Sector has managed to enforce a zero discharge policy, regulate development of setback areas and maintain public access. In so doing, the EEAA has maintained or increased the value of this holiday destination and supported the resource-based tourism development of southern Sinai.

Conclusion

The Gulf of Aqaba Protectorates, representing a network of interconnected multicategory protected areas, have demonstrated that large-scale coastal areas can be administered effectively using protected area legislation. Common property resources administered by the State on behalf of the stakeholders and with the implicit cooperation of the community will, in all cases, yield positive results in a climate of open dialogue and transparency.

The Gulf of Aqaba Protectorates have become a benchmark for Protectorates development in the region and are now the focus of attention for other concerned riparian states.

The Gulf of Aqaba experience can be replicated in any situation where the State has promulgated effective legislation and strongly supports its objectives.

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Additional Lessons Learned

- It is important to learn lessons from others:
  - developed developing
  - mistakes successes.
- There is a need to strive for sustainable methods of mariculture, re-evaluate existing programs and modify, if necessary, in broader ecosystem and social context.
- Communities, in conjunction with other stakeholders, play an important role in resource management.
- Long-term sustainability of initiatives should be an integral part of planning and implementation.
- The role of extension officers working within communities is critical.
- The use of a total ecosystem-based management approach e.g. impact of activities in coastal land/watersheds on marine environment is important.
- Coastal management problems and solutions are not somebody else's problem but are all our own problems.
- There is a need to support initiatives at national and local government levels.
- Assess documents. Promote and disseminate details of successful models best practice manuals e.g. benefit-generating activities for local communities; local MPA establishment; establishment of local area management systems.
- Management plans/tools should be flexible and dynamic, within a well-defined longer-term vision/goal and incorporate both carrots [incentives] and sticks [legislation/enforcement].

Challenges

- To attain political will to endorse and undertake our recommendations - long-term vision versus short-term political expediency (intergenerational equity).
- To obtain a multi-disciplinary, multi-sectoral approach to planning and decision-making etc.

TWO TYPES OF WORKING GROUPS

- Encourage collaborative stakeholder working groups to work together to put innovative, agreed suggestions forward to decision makers to solve environmental issues.
- Realise that in some cases stakeholders with the power to make decisions can inhibit innovative solutions because of the requirement to follow 'party lines'.
- Stakeholder participation needs to be guided by a clear, sustainable mandate. There may need to be adequate checks and balances.

SESSION 9 – Coral Reef Assessment and Monitoring

Chair: Russell Reichelt
Rapporteurs: Shutao Cao, Pradyumna Kotta
Presenters: Gregor Hodgson, Jeremy Woodley, Jason Rubens, Tim Werner

Reef Check Global Survey Program: The First Step in Community-based Management

Gregor Hodgson[1]

Coral Reef Monitoring and Management on a Global Scale

For thousands of years, humans have exploited coral reef organisms for use as curios, jewellery, and food. Coral reefs have been considered self-replenishing resource systems that could serve as a continuous source of wild stocks. In contrast, terrestrial systems such as forests and agricultural lands, have long been managed to ensure sustainable production of resources and, more recently, to achieve biodiversity conservation goals. In 1997, the first Reef Check global survey of coral reefs was carried out (Hodgson 1999), revealing the extent to which increasing populations of humans have been damaging coral reefs at an unprecedented rate. A major new finding of the Reef Check survey was that overfishing was much worse at far more locations than expected, and particularly bad at many reefs remote from cities. This survey, using standardised scientific methods, confirmed anecdotal reports from scientists, fishermen and recreational divers, of declining coral reef health. A second Reef Check global survey in 1998 confirmed the previous results, and demonstrated the importance of having a global network of monitoring stations in order to track the effects of an unprecedented global bleaching and mortality event that was particularly severe in the Indian Ocean (Wilkinson et al. 1999).

Starting in 1996, the Global Coral Reef Monitoring Network (GCRMN) carried out the critically important work of raising the awareness of governments around the world about the importance of coral reefs and encouraging government agencies to get involved in monitoring. Subsequently, a decision was made to formally link the two programs under the International Coral Reef Initiative (ICRI) umbrella, with GCRMN focusing on assisting government efforts and Reef Check addressing community-based work.

Governments and private groups regularly monitor many activities. Weather, stock and commodity prices, fresh water levels, and tides are all monitored and reported frequently. Although hundreds of millions of people depend on coral reefs for their daily food supply, it is only now that we are beginning to realise the importance of monitoring the quantity and status of such natural resources. Without monitoring natural capital assets, it is very difficult to determine how much 'interest' can be used in a sustainable way. The lack of monitoring has allowed damage to continue undetected at many coral reefs. Without monitoring data, it is also impossible to judge the effectiveness of management efforts such as the establishment and operation of marine parks. In the future, it is likely that people will look back at the late

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20th century and wonder how humans could be so foolish as to not track the status of their natural resources.

Clearly, if coral reefs are going to continue to serve as economic as well as biodiversity resources, a major shift is needed in the activities of governments, private groups and individual citizens, towards actively monitoring and managing coral reefs. To do this, mechanisms are needed that will work primarily at the local and national levels, but also that will contribute to coral reef management at regional and global scales. To implement a global coral reef monitoring and management scheme, the following tasks must be completed.

- Establish a global network for information transfer and training.
- Provide a tool-box of methods for monitoring and management.
- Provide funds and trained staff for implementation.
- Ensure government and public support so that effects are not just temporary.

How Does Reef Check Help?

Reef Check has already accomplished much of the first task. There is now a network of national and regional coordinators with shared goals of coral reef monitoring and management in over 40 countries and territories in all tropical seas. Amazingly, NGOs, individual scientists, divers and others who simply care about reefs have established this network on a volunteer basis. Thus the network consists of people who are highly motivated to carry out reef monitoring and management and (in contrast to scientists) who are experienced community organisers. The network members interact both formally at meetings and regional training sessions, and informally over the Internet. This network provides the core framework that will allow replication and expansion of Reef Check teams in new countries and in new areas of countries where Reef Check is already operating.

METHODS

Equally good progress has been made towards creating a tool-box of methods for monitoring reefs. The Reef Check methods were designed to meet two goals: (1) to enable a non-scientist with a high school education to be trained in a short period to obtain accurate, valuable data that could be comparable on a global scale; and (2) to elicit results that are extremely rich in information about human impacts on coral reefs. The methods were published on the web and improved following a review by many coral reef scientists. The use of the web allows anyone to access the methods and to view training materials including colour photos of indicator organisms. The latest version is available at: **http\\www.ReefCheck.org**

Although an effort was made to ensure that Reef Check methods were compatible with other methods, particularly those used by GCRMN, they represent a major step forward in the development of community-based monitoring methods and differ in major ways from any other previous methods. Reef Check methods differ from other methods because they:

- require minimal training time (typically a few hours compared with the several days required to train in other methods);
- are much faster than most methods (half day per reef);
- are designed for non-scientists who are experienced divers with at least a high school education, so the pool of potential data collectors is huge;
- can easily be carried out in shallow water without scuba, because they depend on counting (no measuring);
- are holistic and include algae, fish and invertebrates;
- include organisms selected based on market value and ecological role;
- include an assessment of fishing and other human activities;
- produce a relatively small amount of accurate, extremely meaningful and statistically comparable data;
- produce data that are directly relevant to reef management;
- produce data that are nationally, regionally and globally comparable; and
- include separate packages for different biogeographic regions that allow intra-regional comparisons.

To achieve the goal of allowing non-scientists to gather accurate data, the methods were based upon counting easily recognised key indicator organisms using broad taxonomic categories—typically family level. Organisms with global distributions were selected to allow for comparability among sites anywhere in the world. Two sets of indicator organisms were chosen to allow intra-regional comparisons, one for the Indo-Pacific and another for the Caribbean. Subsequently, additional sets were designed for other locations including Eastern Pacific, Hawaii and the Red Sea. To achieve the goal of collecting valuable information about human effects on reefs, highly-prized organisms were selected that are at the top of the target list for fishermen such as lobsters, giant clams, grouper, snapper, parrotfish, humphead wrasse or butterflyfish.

Prior to 1997, many scientists believed that it would be difficult, if not impossible, to persuade other scientists to use one standard survey method. These fears were proved wrong later that year when over 350 coral reefs in 31 countries were surveyed by teams led by more than 100 marine scientists using the Reef Check core methods. There were also many voices initially, who suggested that the relatively low taxonomic specificity of the methods would render them less useful than others. Typically, however, once critics take the time to carefully study and use the methods, they begin to appreciate the care that has been taken to ensure the methods are robust with respect to well-defined, limited goals. This is partly because the sample size is quite large given the number of parameters. Reef Check is meant to supplement academic, scientific pursuits and more detailed monitoring work, not to replace them. As more results have been published, the critical voices have decreased in number.

A major challenge in 1998 was the growing demand to use Reef Check for more than just a one-time annual assessment. Most coral reefs are located in developing countries, and few of these countries have the resources or capacity to implement highly technical, detailed monitoring programs. Such programs have, after all, only recently been implemented in developed countries. Many coral reef countries could benefit from establishing a relatively modest monitoring program first, using core Reef Check methods, adapted to local requirements, and then adding more detail as needed. Therefore additional guidelines were created for those teams wishing to use the core methods for long-term monitoring (Hodgson, in press), and an agreement was reached with GCRMN that all GCRMN training would start with Reef Check methods.

The next step in methods development will be in the area of interactive reef management. There has been little progress in this area. Active coral reef management is a relatively new topic and, outside of Australia, Florida and a few other locations, there is little experience. What is now needed is a set of management methods that can be included in an Action Plan menu for reef managers. This is not as complicated as it may sound, because there are few options available to reef managers. A web-based, interactive management system will provide managers anywhere with the tools to do their job.

FUNDING AND TRAINING

Since 1998, the Reef Check program has also actively carried out fundraising activities, as well as seeking collaboration with other programs involved in coral reef monitoring. As a result Reef Check has been able to offer training of trainers workshops, often in collaboration with GCRMN, in many countries. So far, substantial funds have been raised by Reef Check to support training and monitoring activities in Asia, Melanesia and the Caribbean. In addition, cooperative training has been carried out with numerous regional and national programs and projects including UNEP (Indian Ocean and Asia), SPREP (Pacific), COREMAP (Indonesia), CRMP (Philippines) and CPACC (Caribbean). While Reef Check was based at the Hong Kong University of Science and Technology, most funds could be passed directly to field teams. With the independence of the program in mid-1999, a new challenge is to raise more funds for core operations in Hong Kong as well as for field teams.

SCIENTIFIC RESULTS

The results are the first synoptic database available on coral reefs from all oceans using a single method. While ReefBase contains records of thousands of reefs, few are comparable because the methods used were so different. By using one method in all locations it is possible to compare reefs from anywhere. In addition, the abundance of the indicator organisms, along

with the live/dead coral cover ratio provides one objective definition of coral reef health. Based on this definition, the results indicate that most reefs are suffering from over-exploitation of high-value edible species, and that few sites, regardless of how remote or whether they are designated as a marine park, are in good condition. The few hundred sites available so far are adequate for broad-brush assessment of regional and global reef health. In most countries, however, there are still insufficient numbers of sites to make scientific assessments about the status of reefs based on the Reef Check work alone. So far, only a small portion of the results have been investigated and published. The data are available to all from ReefBase and researchers are encouraged to use them for further, more detailed investigations. As additional years of data are built up, and trends become apparent, the value of the data will increase.

Most scientists and managers are, and should be, focused on the condition of reefs in their local area. The 1998 global coral bleaching and mortality event, however, demonstrated the importance of having a global monitoring network to track global changes on reefs. The network produced results that suggested that coral reefs may act as the 'canary-in-the coal mine' and are now being used to help pressure governments to reduce greenhouse gas emissions that cause global warming.

In the future, as more sites are added such that local and national-level trends can be assessed, the scientific results will help managers to judge the success or failure of management efforts.

DEVELOPING COMMUNITY AWARENESS AND STEWARDSHIP FOR REEFS

Over the past twenty years, there have been many calls to conserve coral reefs from scientists and prominent environmentalists. These calls generally have not been heeded because they were typically made at meetings attended by other scientists, who already were supporters of this concept. Scientists were not doing a good job of communicating their message to the general public, and so governments were not listening. In contrast, when the public collaborate with scientists in fundraising, in organising communities, and in training and surveys, their awareness is raised about the value of reefs, threats to their health and solutions to these problems. Press events serve to spread this message to a wider audience and cement the feelings of the core groups involved. Thus, the public relations aspect of Reef Check – PR for reefs – is an extremely important aspect of the program.

Another invaluable outcome of community group participation in the monitoring program is the development of a strong feeling of stewardship for coral reefs among individuals from diverse areas of society. As public support spreads for coral reef conservation and management, this puts pressure on government leaders to develop their own programs and to support private sector programs that share this goal. An extra benefit is that when scientists volunteer to serve as Reef Check trainers, this brings them into contact with the general public through community groups. Through this process, the general public gains a greater appreciation of basic and applied science and the role of marine scientists, which ultimately helps science to gain a bigger share of funding from government sources. It also helps to stimulate the interest of academic scientists in solving applied problems, which they normally might prefer to ignore as universities often do not appreciate applied research.

Participation in Reef Check is the first step in community-based management of reefs. It provides communities (e.g. tourist divers, villagers, and government officials) with the information and tools needed to make management decisions. When combined with an integrated coastal management plan and more detailed monitoring results from government programs, sufficient information will be available to effectively manage reefs.

Lessons Learned

A number of lessons have been learned over the past three years of developing the Reef Check program.

1. The concept and methods of Reef Check work well both to stimulate public awareness about coral reefs and to produce high quality scientific data that are useful for broad-brush assessments of coral reef health at the local, national, regional and global scales. Reef Check monitoring serves as an early warning system such that if problems are detected, more detailed monitoring can be implemented.

2. The problems facing coral reefs are generally the same everywhere in the world; overfishing, sewage, industrial pollution and sedimentation. The solutions are similar, but need to be adapted to match the local conditions in each area.

3. Monitoring and management have costs, and neither developing nor developed countries are willing to commit resources to fund large monitoring networks using detailed methods typically employed in ecological research. In places where coral reef monitoring has been established and tested within an integrated coastal management framework, a model is emerging that works well in both developing and developed countries. This model involves two (or more) tiers of monitoring methods, with less detailed, community-based methods such as Reef Check used at many sites, and more detailed methods such as those promoted by GCRMN used at a smaller number of sites. Reef Check is a win-win solution to the problem of insufficient resources because the heavy volunteer component reduces the level of government funding required. Public participation produces many positive benefits, including increased public awareness, support for conservation and reef science. It also opens a much needed channel for reef scientists to communicate with the public.

4. Coral reef management involves managing both coral reefs and people. Very few developed and even fewer developing countries are in a position to design effective national coral reef monitoring and management plans. A great deal of assistance will need to be provided to most countries for these much-needed plans.

5. Monitoring programs have been and are still being designed by academic scientists, with little input from managers, and without respect to a management plan. There is a risk that such plans will produce a lot of data of great interest to scientists, but of little use to managers. Monitoring programs should be developed adaptively, in the context of serving management needs. Reef Check, by focusing on human effects on reefs, provides one definition of coral reef health that is holistic (includes invertebrates, fish and algae), allows comparison with other reefs around the world and is relevant to the management of human activities on reefs.

6. The Reef Check methods should retain flexibility. While it is important that the core methods retain stability, users are encouraged to add indicator organisms and other parameters so that the methods can be matched to local management needs. This also ensures a proper balance between asking too much of volunteers, and allowing them to become bored due to typically low numbers of indicator organisms recorded.

7. There is no free lunch. In an ideal world, international and local funding agencies and governments would notice that groups of people are taking positive action to reverse the trend in declining reef health, and they would offer assistance and funds. In reality, each Reef Check team and headquarters has had to work extremely hard and make many sacrifices in order to generate sufficient sponsorship to implement the program.

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Establishment of Coastal Ecosystem Monitoring Programs: Lessons Learned by CARICOMP

Jeremy D. Woodley

Introduction

CARICOMP is a Caribbean scientific enterprise that has studied the structure and functions of mangrove forests, seagrass beds and coral reefs at diverse sites across the region, since 1992. It focuses on monitoring productivity of mangroves and seagrasses, and coral reef community composition. The 20 active sites are located in less-disturbed areas (in 18 countries) and yield baseline information for management. Central funding has provided a Data Management Centre staffed by a Data Manager, training workshops, manuals in English and Spanish, an annual meeting and a set of basic monitoring equipment for each site. Participating Marine Laboratories and Parks have provided personnel, fuel, boat and diving facilities. The network has also made synoptic studies of regional disease events and has begun to study the ways in which natural resources are used by human coastal communities.

Lessons Learned

1. **Start your monitoring program at a low level if necessary, but start it as soon as possible.** After the program was conceived in 1985, we designed ambitious monitoring protocols, but then spent several years trying to raise comprehensive funding before any monitoring began. Only in 1989 did we decide to start monitoring anyway, and to prepare a more affordable, achievable set of protocols (Level One).

2. **Make efforts to ensure that all members of your group feel like equal partners.** Ours is a multi-national, multilingual group, with members drawn about equally from Spanish-speaking and English-speaking countries. Early meetings were conducted in English (with occasional breaks for translation), which gave an advantage to the 'gringos' who seemed to be running the show, and led to some resentment. The atmosphere improved when a meeting was conducted the other way around: primarily in Spanish, with translation breaks for the anglophones.

3. **The Data Management Centre (DMC) has been essential to survival of the network.** Staff at each CARICOMP Site enter their data into spreadsheets which are then transmitted to the DMC. The Data Manager has received all the data (sometimes having to enter it herself) and has prepared network-wide summaries which are returned to all participating Sites, and eventually published. No one Site would have had the time to do this work, and it has provided essential feedback. In addition, the DMC acts as a communication centre, and a source of encouragement.

4. **Sustainable monitoring has been achieved by the commitment of participating individuals and institutions.** CARICOMP has not been able to provide direct support for monitoring to its member institutions. It has only been able to provide an initial box of basic equipment, the services of the Data Management Centre, and an annual workshop. But most participating individuals and institutions so appreciate the value of monitoring their coastal ecosystems, that they try hard to keep up with the program.

5. **Lack of funds has constrained all activities.** With more funding, more institutions would have been able to maintain Level One monitoring; more would have extended into Level Two; we would be monitoring at more depths, more sites; using more diverse methods; doing more socioeconomic monitoring; doing more educational activities; and working more to assist local communities.

6. **An annual workshop for participants has generated valuable esprit de corps.** The workshop provides a valuable opportunity to share and discuss problems, to share new information, and to discuss new methods. It generates renewed enthusiasm, and facilitates subsequent communication.

7. **E-mail has greatly aided network communication and data transmission.** Electronic mail now seems to be available almost throughout the Caribbean. Although not perfect, it has made international communication much easier. Data no longer has to be sent by mail or courier, but can be attached to an e-mail message in spreadsheet format.

8. **Permanent chain transects yield detailed linear information but are laborious.** We chose chain transects because of their low cost and high efficiency. With care, chain transects can be repeated with fairly high precision (<5% error) and, when replicated at ten permanent stations, measure benthic community composition with high accuracy. Repeated over time, they can detect changes greater than 4% of the total, and their sensitivity increases with repetition. Intercept lengths give information about the population size and structure of corals. Chain transects are underwater and labour-intensive, requiring divers with good identification skills, and patience.

   We are contemplating changing to a photographic or video method, tempted by the value of a permanent visual record. This would increase the cost and shift the labour-intensiveness to the laboratory. We are experimenting with the transition, wanting to maintain continuity at each Site. We must also find ways to reduce the cost per Site, perhaps by sharing equipment.

9. **Data entry at each Site into fixed template spreadsheets, facilitates checking for errors and reduces workload at the Centre.** The spreadsheet templates ensure uniformity of style and units at data entry, and carry out simple calculations without the otherwise inevitable human errors. The spreadsheets can be transmitted or mailed to the DMC, but are also immediately available to the home Site. Distributed data entry saves the DMC a lot of time. If a Site lacks the resources for prompt data entry, the DMC accepts raw data, but this is rare. At the DMC, spreadsheet data are entered into a relational database. This two-stage system has advantages of simplicity and flexibility, making the best use of each data storage medium.

10. **Many natural scientists are reluctant to attempt collection of social and economic data.** Most CARICOMP Site Directors have a background in natural science, and have not been trained to collect other kinds of data. They, at least initially, feel that they should not get involved in 'social science'. This reluctance may dissipate in individuals who are protected area managers, or otherwise active in conservation, and could be further overcome by the use of carefully explained protocols and questionnaires.

11. **Some individuals are good at interaction with resource users and others are not, irrespective of training.** I do not mean to belittle the value of training in outreach work in community relations, interview techniques and so on. However, much work with resource users is initiated and staffed by biologists who lack such training, where personal qualities of empathy, social understanding and sociability are paramount.

Development of the Global Coral Reef Monitoring Network (GCRMN) in South Asia: Preliminary Lessons

Jason Rubens[1]

Summary

In July 1997, with support from the UK Department for International Development (DFID), a program was initiated under the auspices of IOC-UNESCO and partner agencies to develop a regional component of the Global Coral Reef Monitoring Network (GCRMN) in three countries in South Asia. The GCRMN is a major component of the 'Research and Monitoring' element of the 1995 *Framework for Action* of the International Coral Reef Initiative (ICRI).

Resources for coral reef monitoring in South Asia are as scarce as in any region of the world. Therefore from the outset of the GCRMN South Asia program, strong attention was given to assessing and ultimately addressing the related issues of resource-scarcity and long-term sustainability. During the intervening 18 months, two points in particular have emerged which may be of general relevance to the ongoing development of monitoring programs in other areas. The first is the importance of directly addressing economic and livelihood issues as the primary focus for coral reef monitoring activity. The second is the potentially high value, and also the inevitable limitations, of involving non-specialists from community-level groups in coral reef monitoring activities.

Background

RATIONALE FOR THE GCRMN

In recent years, governments and international agencies have increasingly recognised that coral reefs are central to the livelihoods of many coastal populations around the world for coastline protection, fisheries, tourism and construction. This has been matched by a parallel recognition that coral reefs are being damaged at an increasing rate. Economic benefits yielded by reefs are diminishing accordingly.

A central obstacle in diagnosing the causes of reef damage, and in identifying where and how to prioritise remedial action, is a lack of quantitative ecological, social and economic monitoring data. Major challenges to the collection of such data include the special difficulties of working under water, a lack of political awareness and will to allocate necessary funds, a lack of specialised researchers, and a lack of standardised assessment protocols that can be applied by non-specialists.

The Global Coral Reef Monitoring Network (GCRMN) is conceived as a response to these problems. Since 1995-6 the Intergovernmental Oceanographic Commission (IOC-UNESCO), in partnership with the United Nations Environment Programme (UNEP) and the World Conservation Union (IUCN), has taken steps to develop the GCRMN within the framework of the International Coral Reef Initiative (ICRI) and the IOC's Global Ocean Observing System (GOOS). In 1998 the World Bank became a fourth international co-sponsor of the GCRMN. The Australian Institute of Marine Science (AIMS) and the International Center for Living Aquatic Resources Management (ICLARM) also provide technical support to GCRMN.

The GCRMN's major output is to help establish national networks of scientists, resource managers and communities to monitor coral reefs and related resource-use practices over time. The dual purpose is to provide critical data to coral reef managers and to raise awareness of relevant issues amongst managers and communities, ultimately to assist development of sustainable livelihoods in coral reef areas and sustainable use of biodiversity resources.

1. Regional Coordinator, GCRMN South Asia

LONG-TERM MONITORING AND RESOURCE-SCARCITY

The GCRMN South Asia program is not the first effort to establish standardised coral reef monitoring at a regional level in the world. Major initiatives in other regions have included the ASEAN-Australia Marine Science Project: Living Coastal Resources in South-East Asia, and the CARICOMP program in the Caribbean (see paper by J Woodley, Session 9). Although both programs have achieved a measure of success to the extent that they have bequeathed ongoing long-term monitoring activities, equally they have experienced the difficulties inherent in establishing sustainable, long-term monitoring programs in countries with relatively limited resources.

All three countries involved in the GCRMN South Asia program are relatively poor, developing countries (Table 1). Resources for coral reef monitoring are inevitably limited. This is particularly true of specialist personnel resources but also financial and equipment resources. These regional socioeconomic circumstances significantly influence the technical and logistical implementation of coral reef monitoring in such countries, especially in contrast with approaches to coral reef monitoring in richer countries such as Australia, USA, Japan and French territories.

Table 1: Relative economic status of south Asian and other selected coral reef countries. Sources: UNDP (1998), World Bank (1999)

Country	GNP 1997 USD/capita	Rank	Annual % population growth 1990–1997	Human Development Index (HDI) – Rank (Out of 174 countries)
India	390	102	1.8	139
Maldives	831	82	?	95
Sri Lanka	800	83	1.2	90
Australia	20 540	16	1.2	15
Belize	1320	69	?	63
Jamaica	1560	65	1.0	84
Mauritius	3800	40	1.1	61
Philippines	1220	71	2.3	98
USA	28 740	6	1.0	4

A critical point in determining the potential availability of national resources for coral reef monitoring in poor countries is the importance of coral reefs to livelihoods. In the South Asia region an estimated 2.5 million people live in direct proximity to coral reefs, the main areas being the Republic of Maldives, Sri Lanka, the Lakshadweep Islands (India), the Andaman and Nicobar Islands, the Gulf of Mannar (Tamil Nadu, India) and the Gulf of Kutch (Gujarat, India).

Reefs are central to many of these people's livelihoods through coastal protection, tourism and fisheries. The development status of the Maldives and Lakshadweep Islands depends entirely on the integrity of reef structures and their ecological health.

DEVELOPMENT OF THE GCRMN SOUTH ASIA PROGRAMME

In 1997 the UK Department for International Development (DFID) provided funds through IOC-UNESCO for a 21-month program to develop the GCRMN in the South Asia region, in India, the Maldives and Sri Lanka. The DFID funding specifically provided for:

- regional training in field monitoring techniques;
- pilot monitoring exercises; and
- development of coral reef monitoring action plans (CRMAPs) for the Region.

The program started in July 1997, with the establishment of a regional program office at the IUCN Sri Lanka country office in Colombo. A full-time Regional Coordinator was appointed alongside part-time National Coordinators in Sri Lanka, the Maldives and India. There is close collaboration with the South Asia Co-operative Environment Programme (SACEP) in Colombo, which is the regional nodal agency in South Asia for ICRI coordination.

Following a regional planning workshop towards the end of 1997 at Hikkaduwa Marine Sanctuary, Sri Lanka, regional training workshops in biophysical and socioeconomic survey techniques were held in the Maldives in May 1998 and in the Lakshadweep Islands in September 1998. SCUBA training was conducted in Lakshadweep in November 1998 and a coral taxonomy workshop was held in the Andaman Islands in December 1998. In addition, four pilot coral reef monitoring studies were implemented through national research institutions in Sri Lanka, the Maldives, the Lakshadweep Islands and the Gulf of Mannar. Towards the end of 1998, the preparation of national coral reef monitoring action plans was initiated through committees of relevant experts in each of the six main coral reef areas in South Asia. Some 30 institutions, universities and government departments in India, Sri Lanka and the Maldives have been involved in some capacity in these program activities.

Preliminary Lessons

Some lessons have emerged even from the initial stages of the GCRMN South Asia program, particularly in regard to sustaining long-term monitoring activities with limited resources. These points may have broader relevance to other parts of the world at a similar level of economic development, including some countries in the western Indian Ocean, South-East Asia, the Pacific and the Caribbean. This said, the significant social and cultural differences between some of these areas might qualify the degree to which the points below can be generalised.

1. **Political, economic and administrative priorities dictate that monitoring data must address livelihood issues.** For a monitoring program to be sustainable it must secure not only funding, but also political and institutional support, so that it receives adequate attention in terms of personnel time. In the Maldives and Sri Lanka in particular, staff in government departments tend to be overcommitted and personnel time is generally more of a limiting factor than funds.

   To attract political attention for coral reef monitoring, in view of the economic realities in South Asia at least, it is decidedly more effective to appeal to the economic importance of reefs to people's livelihoods, rather than, say, to issues of biodiversity conservation, natural heritage or scientific interest. Funds for coral reef monitoring in any such context are available from two broad sources – national government funding bodies and international donors. Political and ethical considerations by both of these sources generally dictate that the allocation of funds and time is heavily biased towards income-generating projects, livelihood improvement and sustainable livelihood development, especially amongst poor sections of the community/electorate.

   There are one or two sources of funding that are exceptions to this, such as the UNDP/World Bank/UNEP Global Environment Facility (GEF) and the UK Government's Darwin Initiative, which both specifically target biodiversity conservation. However, even GEF funds require complementary inputs from national government, which in turn will be prioritised for livelihood development. This is not to deny the value of international instruments such as the Biodiversity Convention, nor to suggest that they should not be used to promote the importance of coral reef monitoring. It is, however, a pragmatic reality that such considerations command a lower priority than livelihood concerns with most relevant national and international funding allocation.

2. **Monitoring data itself must also reflect livelihood concerns.** An implication of the above point is that the monitoring data itself must also be oriented towards livelihood issues. In other words, alongside conventional biophysical reef survey data, there needs to be a strong emphasis on collecting data relevant to resource management and sustainable livelihood development e.g. catch/effort data, resource-user demographics and livelihood information. Such data is likely to be more meaningful to national government policy makers and fund-holders, and indeed to resource-using communities, than data on, say, benthic composition or coral recruitment. This is not to suggest that the biophysical data is not also an integral component of monitoring in developing countries.

3. **Routine monitoring activities should be funded by national governments.** Historical experience in South Asian countries has demonstrated that in the interests of long-term continuity, at least some funds need to be secured from national government sources, specifically those required for routine monitoring activities. If routine monitoring is funded by short-term, externally-funded projects, the activity inevitably ceases with the project. This is probably a common experience around the world. Funds available from external agencies are better used for one-off or periodic capacity building, training and generic database development, such as those activities undertaken under the recent GCRMN South Asia program.

4. **Decentralising field activities is very cost-effective.** In the context of limited personnel and financial resources, it is very difficult to support substantial monitoring activity by centralised, specialist researchers and field technicians, as happens in richer countries. Few such people can be supported on a full-time institutional basis in South Asia, especially Sri Lanka and the Maldives, because funds for the science sector are limited. The low number of individual specialists seriously limits the total potential monitoring effort. Those few that are in South Asian institutions tend to be competent, however, they are generally located centrally in capital cities at universities and government research institutions. Therefore, a high proportion of the operational costs of field monitoring are taken up by travelling to and from often remote reef locations, and the provision of accommodation, food and field allowances. During recent pilot monitoring exercises conducted partly through centralised institutions under the GCRMN South Asia program, some 60-80% of the budgets were expended on travel and daily subsistence.

   To alleviate this situation, it is expedient (at least partially) to devolve monitoring activities away from centralised specialist research institutions, to local-level, non-specialist groups located in the vicinity of coral reef areas. Such groups can include marine protected area staff, dive schools, NGOs and other community groups, and can undertake both underwater surveys and resource-use monitoring. This approach has the double benefit of substantially reducing costs and substantially expanding the monitoring effort.

5. **Decentralising field activities also raises awareness amongst communities.** Decentralisation of field monitoring activities has a further, and perhaps ultimately more significant, benefit in promoting awareness of coral reef issues amongst the resource-using community. During pilot monitoring activities in the Lakshadweep Islands, for example it was found that the participation of just two-three divers from the local community in in-water surveys rapidly became a major talking point in an island community of some 6-8000 people. It happened that the survey was undertaken shortly after the major coral bleaching event in April-June 1998. The involvement of local individuals triggered a lot of interest and discussion in the community about why the survey was being done, what the participants had observed in the condition of the reef, and what might be the reason for the bleaching. In this way, local participation in monitoring began to fulfil a central management objective, namely awareness raising. Experiences of GCRMN in South Asia suggest that significant awareness raising can be achieved with relatively low numbers of participants, especially in small, close-knit communities such as atoll islands.

6. **Decentralising field activities also has disadvantages.** Alongside the above points it is important to bear in mind the potential downside of decentralisation of monitoring, especially in-water ecological monitoring. Decentralisation requires a substantial initial commitment in terms of training and assessment of the local participants. Ideally some form of continuous assessment by specialists is required. Some of the individuals involved in local-level monitoring may have little formal education and generally have a significantly lower capacity for detailed, concentrated survey work than specialists. It is important therefore to introduce methodological protocols, such as Reef Check, that are specifically designed for use by less-specialised researchers, are relatively simple to execute, and whose data is relatively easy to analyse and comprehend.

Following on from the latter point it must be recognised that the resolution of data collected locally is likely to be significantly lower than that collected by specialists. However, although data collected by non-specialists may be less precise, assessments both in and out of the Region by volunteer-based projects such as Frontier-Tanzania and Coral Cay Conservation suggest that it need not be less accurate, given adequate training and periodic supervision.

7. **Keep monitoring objectives simple.** During the process of developing monitoring action plans in South Asia, there was initially an almost universally strong temptation to be very ambitious in the scope of the monitoring. Preliminary discussion aimed at identifying monitoring parameters tended to generate impossibly optimistic wish lists of parameters. These included: benthic surveys, fish census, a broad range of physical oceanographic and water quality indicators, and beach and sediment profiling. Also significant were the vast range of possible socioeconomic parameters including catch/effort resource-use data, demographics of resource-using communities, income and livelihood measures, and less quantitative (but no less important) areas such as traditional knowledge of, and attitudes towards, the reef environment. All of these areas are certainly of great potential interest but collectively would require an army of researchers and massive funding.

   In fact regional researchers pointed out early on that such comprehensive monitoring programs had already been designed for various sites under past projects. But no such plans had ever come close to implementation because they were entirely impractical. It can seemingly do incalculable harm to the long-term sustainability of a monitoring program if the task is impossibly daunting, even at the start.

   The approach under GCRMN in South Asia therefore has been to target a much smaller set of parameters as the central priority. At least initially, it has been suggested that this be confined to benthic composition surveys coupled with quantitative catch/effort data for relevant resource-use at key sites. Alongside this, various physical oceanographic data and community demographics are available from secondary sources and can be acquired with relatively little effort. In general, the process of prioritising and restricting monitoring parameters needs to be ruthless.

8. **Dedication of individuals for in-water work is critical.** It may seem an obvious point, but for in-water and especially sub-aqua survey work, high personal motivation and enthusiasm is a critical quality for field practitioners, probably much more so than for most other types of environmental field work. In-water survey work makes unusual physical, and to some extent psychological, demands on researchers. This seems especially true in the South Asia region where there is generally a healthy caution about getting into the sea unless it is absolutely necessary. Researchers who do not have a particular enthusiasm for in-water work tend to find excuses to postpone indefinitely fieldwork sessions. Moreover, it is noticeable that those researchers that are field-active tend almost universally to have an unusually high level of dedication and single-mindedness.

   Following from this, it is especially important that training opportunities in underwater surveys and SCUBA diving – which are expensive, time-consuming and infrequent – are not wasted on individuals who do not really have a strong interest in pursuing such work. It is not uncommon for trainees to be selected by institutions because they ought to be interested in such work, rather than because they really are. Identification of trainees should be done much more on the basis of personality and interest, rather than on the basis of the, often temporary, institutional status of individual candidates.

9. **Distribute key results quickly.** It is assumed that some level of demand for monitoring data amongst managers and policy makers exists as the basis for any long-term monitoring programme. However, if the political profile of coral reef issues is currently low it may be necessary to nurture the demand with quick, simple, easily-digested results.

The mass coral bleaching event in 1998 provided a good example of this in South Asia. Rapid circulation of preliminary findings played an important role in stirring interest both in the bleaching event itself and also in developing long-term coral reef monitoring in the future.

However, it is also important to give appropriate qualifications for data that has been collected rapidly and which may not give a comprehensive or reliable picture. Policy makers tend to be generalists rather than technical specialists and may readily seize upon, or reject, over-simplified statements.

10. Regionalised training has advantages and disadvantages. During 1998 the GCRMN South Asia program conducted two major regional training workshops in biophysical and socioeconomic field methodologies. Participants from three countries attended each workshop. In recognition of particular training needs in India, two further national training initiatives were conducted – in SCUBA training and coral taxonomy.

Regionalised training has had significant benefits in South Asia in helping to create a sense of community and common enterprise amongst previously isolated coral reef researchers. Active field researchers from the different coral reef areas of India (Andaman Islands, Lakshadweep Islands, Gulf of Mannar, Goa) for example had never convened as a unified, professional group prior to the GCRMN South Asia program. The opportunity to interact and share experiences and information seems undoubtedly to have provided inspiration to some key individuals and institutions, and a certain amount of healthy competition is also evident. It is possible, however, that the same benefits would have been achieved through national-level training workshops.

Conducting training at a regional level can also bring particular problems. Researchers within countries tend to have relatively similar standards of training and therefore relatively similar training requirements. However, the standards and requirements between researchers of different countries, even in South Asia, are markedly different and it has been challenging to address these differences within the context of particular workshops. Inevitably perhaps, the regional training events tended to be dominated by the needs of the least well-trained individuals and also by the needs of the majority, i.e. the group of researchers from the largest country. Because of this, the needs of researchers who already had a higher level of skill (but who would certainly have benefited from further training) and of researchers from smaller countries tended to be less well addressed.

Acknowledgements

I should like to record my thanks for helping us to assemble the above lessons over the past year and a half to Mr Arjan Rajasuriya, Mr Maizan Hassan Maniku, Mr Abdulla Naseer, Dr B. R. Subramanian, Dr E. V. Muley, Dr Clive Wilkinson, Dr Barbara Brown, Dr Gregor Hodgson and also to Dr George Grice at IOC-UNESCO and Dr John Tarbit at the UK Department for International Development for their support throughout that period.

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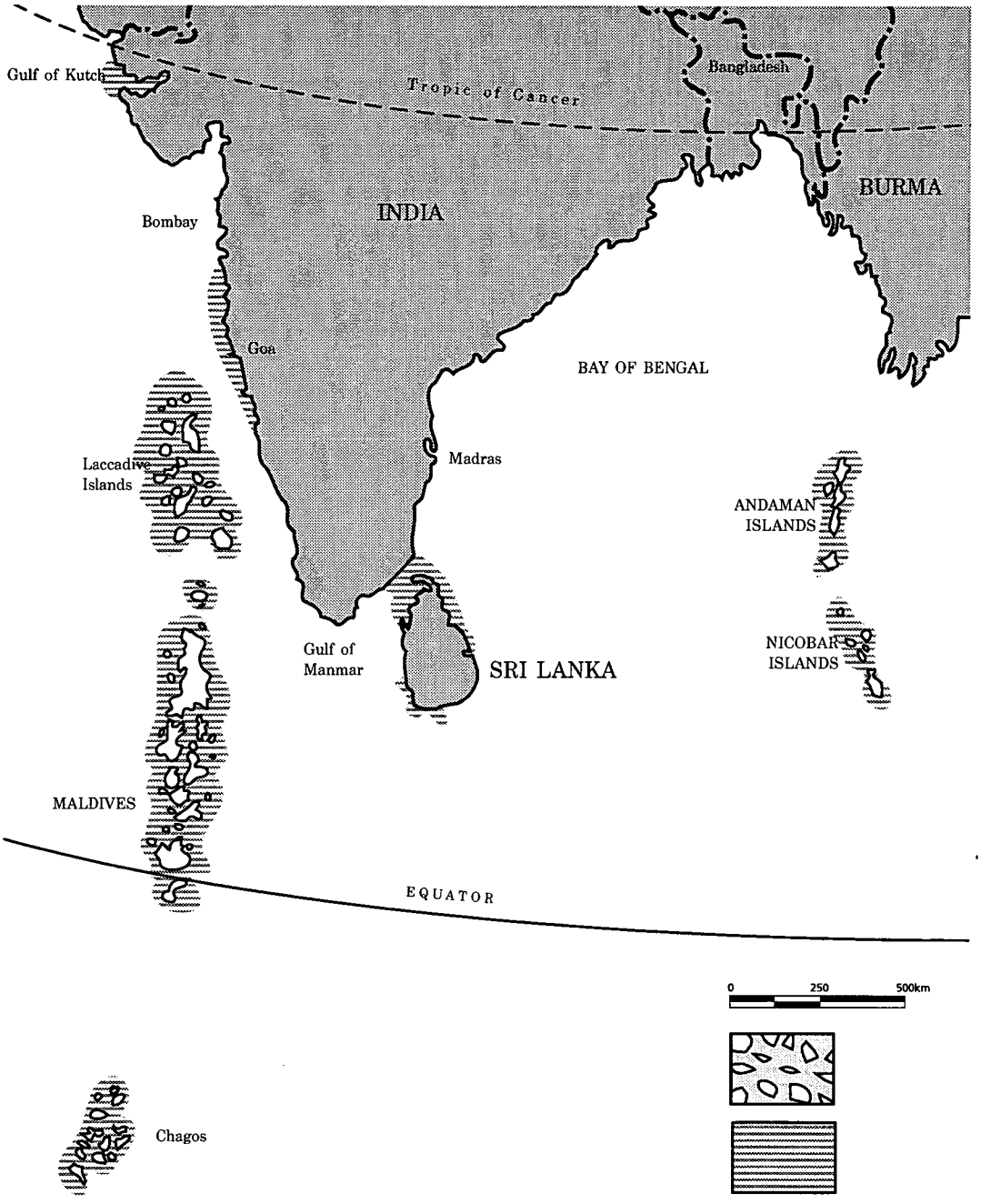

Figure 1. Coral reef areas of South Asia

Conservation International's Marine Rapid Assessment (RAP)

Timothy B. Werner[1] and Gerald R. Allen[1]

Introduction to Marine RAP

Conservation International's Rapid Assessment Program (RAP) is a mechanism for providing baseline biodiversity information on a selected forest, freshwater, or coral reef area. RAP surveys are 'quick-and-dirty' field assessments produced by a team that has as its core a number of expert field biologists. The information is analysed in tandem with socioeconomic data in order to recommend conservation priorities and to help guide local ecosystem managers. With 28 surveys (plus four training courses) so far completed in South America, Central America, West Africa, Madagascar, South-East Asia, Papua New Guinea, and the Solomon Islands, RAP has proven an effective tool in conservation planning, especially in identifying priority areas for conservation.

Originally conceived by Murray Gell-Mann and staff of Conservation International (CI) and the John D. and Catherine T. MacArthur Foundation, RAP was first applied in the tropical forests of the Andes. The rationale for RAP was that human beings were losing or committing forest areas to environmentally degrading exploitation even before biologists had any knowledge of the resident species and their relative abundance. The pace of forest destruction called for an inventory technique that could be deployed rapidly and yield quick results. RAP was never intended as a substitute for more intensive biological field studies, but only to provide a first-cut analysis of biodiversity, one step ahead of the bulldozers.

One important conservation implication of losing forests not previously inventoried was that perhaps a country's network of protected areas might not include the best representative samples of its overall biodiversity. Ideally, protected areas should capture the most representative and richest sites if they are to have maximum biodiversity conservation impact. One of RAP's most important contributions is to give a particular country or region basic knowledge about its biodiversity so that decision-makers can make intelligent decisions about habitat conservation and development.

RAP was later seen as a potentially useful tool in marine environments, which in comparison to terrestrial environments were even much less scientifically surveyed and also highly threatened. CI first applied Marine RAP techniques in the vast and biologically unknown Indispensable Reefs of Rennell and Bellona Province, Solomon Islands. This pilot survey proved effective in identifying these reefs as a national conservation priority, and validated the utility of Marine RAP in assessing coral reef biodiversity for conservation purposes.

Over the past 14 months CI has conducted three Marine RAP surveys in the 'coral triangle', a region comprising the countries of Indonesia, Philippines, Malaysia, Brunei, Papua New Guinea, northern Australia and the southernmost islands of Japan. This region was selected as the target for Marine RAP because:

1. it is known to have the richest tropical marine biodiversity in the world;
2. it has the most extensive area of tropical coastal and nearshore, shallow-water ecosystems;
3. it is a region with coastal and marine environments that are known to be highly threatened due to many environmental pressures, including those associated with population growth, fishing and coastal development;
4. there was very little or fragmented knowledge at best of the comparative diversity and environmental condition of most areas within the coral triangle; and
5. it was a region with established CI programs (Japan, Philippines, Indonesia, Papua New Guinea) that could help facilitate surveys and promote their conservation applications.

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Although the coral triangle will remain the primary target region for Marine RAP surveys, additional areas of the Indo-Pacific will be considered in cases where there is an excellent opportunity to use Marine RAP results to advance conservation or better understand the marine biodiversity found within the coral triangle itself. This broader region extends from the western Indian Ocean to the central Pacific. Possible surveys in the Atlantic also will be considered on a case-by-case basis.

MARINE RAP GOAL AND OBJECTIVES

The overall goal of Marine RAP is *to rapidly generate and disseminate information on coastal and nearshore, shallow-water marine biodiversity for conservation purposes, with a particular focus on recommending priorities for conservation area establishment and management.* In addition to producing species lists for taxa that serve as indicators of coral reef biodiversity, Marine RAP surveys support parallel assessments of environmental status and the social context of the areas surveyed. The objective of this approach is to analyse biological information in tandem with social, environmental and other ecosystem information to produce appropriate and realistic conservation recommendations.

To date, Marine RAP information has been used to advance conservation activities within the immediate areas surveyed (Milne Bay Province in Papua New Guinea, Northern Palawan Province in the Philippines, and the Togean and Banggai Islands in Sulawesi, Indonesia). For example, in Palawan, Marine RAP results contributed to increased awareness by policy-makers and local people about the impacts of large-scale tourism development, provided information to help mitigate these impacts, and identified core zones for coral reef protection that are being implemented by the Palawan Council for Sustainable Development. In Milne Bay, Marine RAP results have led to the identification and subsequent cessation of a cyanide fishing operation, greater awareness by local people and government officials about the importance of marine conservation, and the identification of high biodiversity areas which the provincial government plans to incorporate within its five-year plan as areas of conservation priority.

With three surveys completed, Marine RAP is now beginning to apply its findings to regional conservation objectives, as well, by providing previously unavailable or inadequate biodiversity information on the reefs of the coral triangle. The kinds of outputs that Marine RAP will generate include:

- the most comprehensive distribution list for coral reef indicator taxa (reef corals, fishes and molluscs);
- a determination of the degree to which Indo-Pacific reef biodiversity is captured within existing protected areas, including recommendations for establishment of protected areas and other conservation measures in the richest areas;
- an integration of RAP data with information on oceanographic processes, particularly surface currents, that influence the maintenance of a representative sample of marine biodiversity in the coral triangle;
- documentation of the ecological condition of coral reef areas surveyed;
- a revision of distribution patterns of coral reef biodiversity;
- a contribution to the taxonomy of reef indicator groups, especially by adding new species and revising distributions;
- a better understanding of the extent to which patterns of biodiversity in one taxonomic group (such as reef corals) coincide with such patterns in another group (such as reef fishes);
- public awareness about the importance of marine biodiversity and threats to it, especially within the nations of the coral triangle;
- applications of experimental assessment methodologies and technologies; and
- identification of research priorities.

METHODOLOGY OF MARINE RAP

The primary focus of Marine RAP is to provide a critical missing layer of information on coral reef biodiversity, rather than generating data on all coral reef management variables. The most direct approach would be to make an inventory of all species present at a given locality. However, given that it is impossible to undertake a comprehensive inventory, a satisfactory alternative is to concentrate on certain 'key' taxa that function as indicators of overall biodiversity.

The core RAP survey team members are taxonomic specialists who inventory reef corals, fishes, molluscs and a fourth group as proposed by an invited researcher. During the course of each Marine RAP, up to 60 sites are surveyed over a three-week period, with a single 75–90 minute dive at each site. The taxonomic team conducts an inventory of the key indicator groups at each site, encompassing the full range of available substrate types and habitat situations (e.g. shallow reef flat, steep drop-offs, caves, rubble and sand patches, etc.) to a maximum depth of approximately 40 m (the safe limit of recreational diving and the lower limit of most reef-building corals).

Indicator Groups

Marine RAP selected reef corals as one of the most important biodiversity indicators because they provide the major environmental framework for a host of organisms. Without reef-building corals, there is limited biodiversity. This is dramatically demonstrated in areas consisting primarily of sand, rubble or weeds. Fishes are also an excellent indicator as they are the most obvious inhabitants of the reef, are well documented, and moreover they account for a large proportion of the reef's biomass. Fishes depend on a huge variety of plants and invertebrates for their nutrition. Therefore, areas rich in fishes invariably have a wealth of other organisms. Molluscs have been utilised as a third indicator, basically because they are diverse, relatively well known, and conspicuous.

Reef Corals

The methodology usually involves two researchers, one who concentrates on recording as many species as possible at each site and another who collects and/or photographs new, rare or unusual species. In the three CI surveys to date the coral team consisted of Dr John E. N. Veron and Dr Douglas Fenner of the Australian Institute of Marine Science (AIMS).

After each dive the two coral researchers compare observations to achieve consensus on an overall site assessment, and to produce a qualitative assessment of the aesthetic value of the site, together with the rest of the team. Information on what species are missing or uncharacteristically rare from a site can also be as telling as what is there, and both researchers share notes to record this information at each site.

Reef Fishes

The second author of this paper (G. R. Allen), formerly of the Western Australian Museum, is the RAP Science Team Leader and ichthyologist. He records every species encountered at each site on waterproof paper. The technique usually involves a rapid descent to a maximum depth of 40 m, then a slow, zigzag path is traversed on the ascent towards the shallows. The majority of time is spent in the 2–12 m depth zone, which consistently harbours the largest number of species. Only the names of fishes whose identification is absolutely certain are recorded. However, very few (less than about two per cent of the total) are not identified to species level. Visual surveys are supplemented with small collections procured with the use of the ichthyocide rotenone and a rubber-sling propelled, multi-prong spear. The rotenone collections flush out small, crevice and subsand-dwelling fishes (for example eels and tiny gobies) that are difficult to record with the visual technique.

Gerald Allen has devised a method for assessing and comparing coral reef fish diversity. The technique consists of recording the number of species in six key indicator families: Chaetodontidae, Pomacanthidae, Pomacentridae, Labridae, Scaridae, and Acanthuridae. All selected groups are important components of reef communities, have circumglobal distributions closely corresponding with those of coral reefs, and include a representative cross-section of the dominant feeding and behavioural patterns characteristic of reef fishes. Moreover, members of each group are conspicuous diurnal inhabitants that are easily recognized after minimal training. The total number of species in each of the six families for a given dive site, restricted geographic locality (e.g. complex of reefs, bay, island, etc.), or region is combined to obtain an index of coral fish diversity (CFDI). The CFDI allows rigorous comparison of fish diversity throughout the Indo-west Pacific and extrapolation of the approximate total number of coral reef species at a given location by using a simple regression formula. The latter feature is particularly useful for large regions, such as Indonesia and the Philippines, where reliable totals are lacking. Moreover, the CFDI predictor value can be used to gauge the thoroughness of a particular short-term survey that is either currently in progress or already completed. For example, Allen recorded 816 species during a recent Marine RAP at the Togean and Banggai Islands off central eastern Sulawesi, Indonesia. However, according to the CFDI predictor formula a total of 1106 species could be expected, revealing that about 74 percent of the fauna was actually surveyed. Thus, a visual census survey of two-three weeks duration is generally adequate for comprehensive documentation of an area's CFDI species, but usually inadequate for recording the entire reef fauna.

Reef Molluscs

Dr Fred Wells of the Western Australian Museum has served as the mollusc expert on CI Marine RAP surveys. Molluscs were selected to serve as an example of the diversity of other invertebrates and to provide information that can be compared with the data obtained for corals and fishes. They are a good choice as an indicator because they exhibit the largest diversity of any phylum in the marine environment, are relatively well known taxonomically and reliable references are available, and they are ecologically and economically important. Diversity is exceedingly high in the tropical waters of the Indo-west Pacific, particularly in coral reef environments. Approximately 60% of all marine invertebrate species in this extensive area are molluscs. They are particularly useful as a biodiversity indicator for ecosystems adjacent to reefs where corals are generally absent or scarce (e.g. mud, sand, and rubble bottoms).

Other Taxa

On future surveys, a researcher will be invited to test rapid assessment methodologies of different taxa to assess their utility as biodiversity indicators, and to compare the results with the other three core groups.

Reef Condition

Marine RAP also records data on the physical condition of reefs, which complements the biodiversity data. Percentage of coral cover is recorded at each site by means of a 100 m transect at three depth zones (4-6 m, 12-16 m, 20-25 m). The method consists of laying a 100 m tape measure along the contour of the reef and recording the substrate (live coral, soft coral, dead coral, rubble, sand, sponge, etc.) at one metre intervals. This data is incorporated into a numerical reef condition index (RCI) which also includes an assessment of various threat parameters including damage from explosives, cyanide, nets, anchors, cyclones, pollution, eutrophication, coral bleaching, coral pathogens and predators (particularly *Acanthaster planci*), freshwater run-off, siltation and fishing pressure. The resultant numerical index is a valuable tool for comparing sites within a particular region (i.e. over a single survey) or for inter-regional comparisons.

Finally, the Marine RAP team records the abundance of fishery indicators such as the commercially and artisanally important groupers (Serranidae) and snappers (Lutjanidae), as well as larger fishes such as Napolean Wrasse (*Cheilinus undulatus*), sharks and rays. This information helps characterize the extent of local fishing pressure. The presence of other keystone species including turtles and dugongs is also recorded.

2000 AND BEYOND

One of the most astounding results of Marine RAP surveys is the discovery of so many new species. Participating RAP scientists are internationally recognised authorities in the classification of scleractinian corals, tropical molluscs and reef fishes. On the three RAPs to date approximately 50 new species of corals and 12 new species of fishes have been discovered, and numerous new distribution records have been documented, resulting in a better understanding of Indo-Pacific biogeography. Descriptions of the new taxa are either in press or currently being described by RAP scientists and colleagues.

Building on our early results, we are embarking on a vigorous program involving approximately three surveys per year, primarily in Indonesia, Papua New Guinea and the Philippines. At this stage we are endeavouring to achieve a strategic spread of survey points throughout the 'coral triangle' in order to facilitate our regional goals, as well as focusing on individual countries. The goal is to assemble, within five years, sufficient data to achieve a coordinated approach to identifying areas that are critical to marine conservation in South-East Asia.

Lessons and Recommendations

Conservation International's Marine RAP has fostered a better understanding of biodiversity and marine conservation problems in the 'coral triangle', but there is still much to achieve. Some of the primary lessons we have learned during the infancy of the program are as follows.

- There is a large percentage of coral reef species, including large and conspicuous fauna that has yet to be scientifically documented.
- An understanding of coral reef biodiversity patterns in the Indo-Pacific has not been a primary feature of regional coral reef conservation planning.
- Involving local counterpart agencies and individuals in Marine RAP surveys helps the results and recommendations become applied to local conservation efforts.
- Marine RAP surveys are effective in raising local and national awareness about the importance of coral reef conservation.
- Although not a monitoring program, Marine RAP data can serve as baseline information for scientific monitoring.
- Marine RAP surveys can provide timely guidance to major development projects by providing scientific and community input into their design and implementation.
- The results of Marine RAP surveys should be shared widely in the Indo-Pacific region if they are to have maximum impact on regional conservation planning.

Session 9 Report: Coral Reef Assessment and Monitoring

General Recommendations

- Community-level participation/monitoring
- Public awareness raising
- Funding for long-term monitoring
- Capacity Building: Expertise/Technology
- Regional strategy to share results
- Data management: interpretation/distribution for different audience
- Motivation for monitoring and constant data collection
- Decentralisation monitoring activities for effective monitoring
- Active monitoring networks

Lessons Learned and Recommendations

INTEGRATED MANAGEMENT AND LINKAGES TO OTHER INITIATIVES

- Relevance of monitoring data to livelihoods is critical.
- Marine Rapid Assessment Program (RAP) surveys can provide timely guidance to major development projects by providing scientific and community input into their design and implementation.
- Results of marine RAP surveys should be shared widely in the Indo-Pacific region if they are to have maximum impact on regional conservation planning.
- Methodologies to assess damage to corals need to be standardised.
- Integration of monitoring methods is necessary.
- Data interpretation and presentation of the information should take into consideration the audience: general public, scientific community through to the policy makers.
- A logical framework for monitoring needs to be developed.

STAKEHOLDER PARTNERSHIPS AND COMMUNITY PARTICIPATION

- Dedication of individuals is a key factor.
- Community-level awareness raising is necessary and needs to be improved.
- Funding for immediate and long-term monitoring is required; suggest generation of the same through commercial, recreational activities, tourism, accident fees, etc.
- Countries are encouraged to generate funding through local support.

PUBLIC AWARENESS AND EDUCATION, INCLUDING CAPACITY BUILDING

- An understanding of coral reef biodiversity patterns in the Indo-Pacific region has not been a primary feature of regional coral reef conservation planning.
- Community-level awareness raising through various outlets and levels is necessary.
- Involving local counterpart agencies and individuals in marine RAP surveys helps the results and recommendations become applied to local conservation efforts.

DATA AND INFORMATION FOR MANAGEMENT

- Field activities need to be decentralised for better monitoring and data representativeness.
- Monitoring objectives need to be kept relatively simple.
- Key results need to be disseminated quickly for effectiveness.
- The network of countries and sites needs to be enlarged.
- A large percentage of coral reef species, even large and conspicuous fauna, are yet to be described.
- Economic valuation of the coral reef-related resources is suggested.
- Data should be collected to represent the whole area.
- Management needs to be informed of performance indicators.

- Data gathering at various levels and resolutions through broadscale mapping including remote sensing, scientific research, reef check monitoring, community-based monitoring, etc. is suggested.
- Attract more funding for start-ups and develop long-term financing for existing monitoring programs.
- Develop a management package to deliver information through existing networks.
- Support for research at the universities to assist monitoring activities needs to be strengthened.
- Monitoring should be extended to ecosystems (seagrass, mangroves) beyond reefs.
- Assessment through surveys at varying resolutions for information dissemination is suggested.
- Need to collect and collate socioeconomic data and present the same to the managers and the community in a usable format.

SESSION 10: Protected Areas

Chair: Achmad Abdullah
Rapporteurs: Virdin Brown, David Gutierrez
Presenters: Antonio Reina, William Ablong, Guilherme Dutra

Bazaruto Archipelago: Protected Area Development and Management

Antonio Reina

Background Information

The Bazaruto Archipelago is situated about 20 km off the Mozambique coast, in Inhambane Province, between Vilanculos and Inhassoro districts. The Archipelago comprises five tropical islands: Bazaruto (12 000 ha), Benguerua (2500 ha), Magaruque (600 ha), Santa Carolina (500 ha) and Banguè (5 ha). The islands lie between 21°27' and 22°03'S latitude and 35°19' and 35°32'E longitude, the climate is moderately humid with an annual precipitation ranging between 466-1928mm and an average of 978 mm. These islands, composed of beach rock and sand dunes, are highly susceptible to movement caused by natural wind and wave action.

The Archipelago incorporates a wide range of distinct terrestrial and marine habitats including coastal sand dunes, pioneer dune vegetation, sand and rocky beaches. The Archipelago's continental origin is evident on the larger islands, by the presence of mainland fauna and flora – crocodiles, red duikers, red squirrels, samango monkeys, four-toed elephant shrew, night apes and snakes. Over 180 species of birds have been recorded in the Archipelago. The islands are an important stopover for different species of migrating birds. About 45 species of reptiles and amphibians have also been recorded on the Archipelago. There are several lakes on Benguerua and Bazaruto islands where crocodiles still breed. Aquatic habitats include magnificent coral reefs, mangroves and seagrass beds. The largest population of the endangered dugong (*Dugong dugon*) along the east African coast occurs in the Archipelago. Leatherback, loggerhead, green and hawksbill turtles nest on the islands, and ridley turtles occur offshore. Dolphins (spinner, bottlenose, common and humpback) are abundant. Bay mike and right whales are resident, and humpback whales pass the islands on their migration. A wide diversity of marine fish species occurs in the surrounding waters. Over 2000 individual species of fish have been recorded and a remarkable 80% of all marine fish families of the Indo-Pacific region are thought to occur in the waters surrounding the Archipelago. The species of high economic value for islanders include pixie, sand oysters (*Pinctada imbricata*), corals, lobsters, squids, sea cucumbers and shells.

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Population

According to demographic information (1995), the Archipelago supports a population estimated at a total of 2697 people, divided into 580 families:

- Bazaruto–1751 inhabitants, 348 families;
- Benguerua–765 inhabitants, 170 families;
- Magaruque–181 inhabitants, 62 families;
- Santa Carolina–27 inhabitants; and
- the minuscule island of Bangue occasionally supports a temporary fishing camp.

The population belongs to the *tsonga* ethnic group, whose distribution extends from Save River southward. The islanders speak *xitsonga* language, their own distinct dialect. Most of the islanders speak *chitswa,* the language of the Inhambane province and spoken on the mainland. Chitswa is considered to be an important language for communication because of the contact and mobility between the Islands and the mainland.

Social Aspects

As a Marine Park, the Archipelago has limited infrastructure, and limited opportunity for socioeconomic development.

- Within the Archipelago there were three schools: two on Bazaruto and one on Benguera. Now, only the Bazaruto Primary School (on Bazaruto) is operational, providing education to approximately 100 children for the first five years of primary education, i.e., classes 1-5.
- There is a single health post in Bazaruto (a government-run clinic) which does not meet the demands of the local population due to the lack of medicines and of a permanent health worker. To solve the health problems, the island population uses the traditional health services – 'curandeiros' and traditional plants – with which they have a lot of experience.

Economy

The local economy is based on:

- the tourism industry (lodges);
- National Park activities;
- artisanal fishing and exploitation of marine resources;
- small-scale agriculture and domestic livestock; and
- boat construction and transport services.

TOURISM

The Bazaruto Archipelago has for a long time been recognised as one of the areas of highest tourism potential in Mozambique. From the early 1950s, firm foundations were laid in the Region by a local trader and highly successful entrepreneur, Joaquim Alves. There are at present six tourism concessions:

- Bazaruto Lodge and Indigo Bay Lodge on Bazaruto Island;
- Benguela Lodge and Marlin Lodge on Benguerua Island;
- Hotel Magaruqe on Magaruque Island; and
- Hotel Santa Carolina on Santa Carolina Island.

Other relevant developments include a crocodile farm attached to Benguela Lodge on Benguerua Island.

The conservation of the Bazaruto Archipelago is integrally linked to the successful development of sustainable tourism within the Archipelago. Although tourism is usually perceived as having great economic value for local people, in Bazaruto tourism and artisanal fishing must be complementary industries. The financial success of both the tourism and artisanal fishing industries on the islands is crucial to the conservation of the Bazaruto Archipelago in the long term.

The principle that islanders should derive benefits from tourism, to compensate for their loss of land and fishing areas, has generally been supported by the managers of lodges in the Archipelago. Informal agreements were established between the lodges and the Park, under which tourists and tourism developments are already making donations to local conservation efforts and socioeconomic development in the Archipelago. These donations are in exchange for the use of the natural resources. This is seen as an important first step towards making established conservation projects sustainable and financially beneficial to the island community and Park. To date, contributions from the lodges have supported the rebuilding of the school at Sitone, Bazaruto Island and the building of three schools and one clinic on Bazaruto and Benguerua Islands.

Other project benefits from tourism revenue include:

- employment of more community guards;
- protection of certain coral reefs that were set aside for snorkelling and diving; and
- protection of the crocodile nests and the bank of freshwater lakes.

However, the tourism enterprises within the Archipelago are not yet in a position to make substantial contributions to conservation and the island communities. There is also no legal mechanism within the legislation in Mozambique that allows financial benefits from tourism operators to be paid directly to local communities.

ARTISANAL FISHING, EXPLOITATION OF MARINE RESOURCES AND DEPENDENCE OF THE ISLANDERS ON MARINE RESOURCES

Resource harvest used to be controlled through a system of traditional knowledge. Each resource is collected in a certain period of time, and defined closure periods are set by the marine administration services, which is the State authority responsible for licensing artisanal fishing activities and the exploitation of marine resources within the Archipelago locally. There is also a system of allowing the use of reed baskets for harvesting sand oyster. Taboos for woman, like the one that states that a pregnant woman cannot fish, are local ways for regulating the collection of marine resources.

The islanders harvest a wide range of marine resources using various techniques developed over time:

- seine netting;
- stake nets (Gamboas);
- line fishing;
- gill nets;
- sand oyster harvesting (*Pinctada imbricata*, locally known as Mapalo);
- sea cucumbers (*Holothuria scabra*, locally known as Magajojo); and
- crabs, etc.

Artisanal fishing is the main economic activity, absorbing more than 70% of the local community. There are approximately 50 fishing camps – 37 in Bazaruto, 11 in Benguerua and one in Magaruque – which usually use family labour. Despite unsophisticated technology, the fishery meets the demands of the islanders, hotels and crocodile farm. The remnant of the catch is dried and sold on the mainland. Uncontrolled fishing, despite big efforts in law enforcement, is specifically carried out by mainlanders, semi-industrial and industrial fishing groups. Inappropriate technologies, such as gill nets for shark fishing, have had an impact on the stocks of certain species of high economic value, in particular lobsters and sea cucumbers, as well as on the survival of threatened species such as turtles, dolphins and dugongs.

AGRICULTURE AND DOMESTIC LIVESTOCK

Agriculture is predominantly practised by women on a small-scale and as a subsistence activity. The main crops are sweet potatoes, cassava, millet, beans, pumpkin and watermelon. Given the inappropriateness of the soils for agriculture and the irregularity of the rains, new areas of natural vegetation are slashed and burned every year in order to accumulate ash for fertilisation. Slash and burn agriculture, principally on the sand dunes, together with deforestation for wood fuel and construction material, have been the principal causes of deforestation and consequently erosion and the loss of soil nutrients on the Islands. Domestic livestock, especially goats and sheep, are an alternative in times of severe hunger, and act as

a form of saving for emergencies. For the islanders, livestock is a form of inheritance to be handed on from generation to generation. Burning is also used by shepherds to increase the palatability of the mainly sour grasslands and palm wine tapers.

Bazaruto National Park

The Bazaruto National Park (BNP) is the only Marine National Park in Mozambique. The Park currently comprises only the three southern islands – Benguerua, Magaruque and Bangue – and the contiguous 5 km sea area, and was proclaimed a Marine National Park by Ministerial Gazette No. 46/71, while Bazaruto and Santa Carolina Islands were declared 'Surveillance Zones'. Following the creation of the BNP in 1971, there was not an effective occupation by Direcção Nacional de Florestas e Fauna Bravia (DNFFB) until 1989 when the first Warden was appointed. After this the following occurred.

- 1989-1990 – Preparation of a master plan for long-term conservation and development of the Archipelago was financed by WWF-SA (SANF).

- 1990-1994 – Implementation of the master plan, financed by WWF-South Africa, with support from the Southern African Natural Foundation (SANF), the Endangered Wildlife Trust (EWT), and others.

  The implementation of this second phase resulted in several community projects and the appointment of the wildlife guards, known as 'Mugonzice' in the chitswa language (which means Educators) and 'Guardas de Fauna' in Portuguese. The wildlife guards project has been funded since 1990 by EWT. The mission of the community 'Guardas de Fauna' is to inform and educate local people about conservation by promoting practices that are sustainable and discouraging those that could be environmentally destructive. Specific duties of the guards are:
  - promoting the sustainable use of the resources;
  - encouraging the practice of traditional methods of using the resources;
  - patrolling the beaches and terrestrial area;
  - controlling the collection and burning of litter; and
  - monitoring of and preventing, people fishing in the protected areas.

  The guards do not act as law enforcement officers, but are educators. There are a total of nine 'Guardas de Fauna' and four 'Fiscais', the latter being law enforcement officers, on the islands.

- 1995-1998 – Multiple Resource Use Project (MRUP) was funded by the European Union (EU) and managed by the WWF-International and DNFFB, with administration and logistical support provided by the EWT.

  The project comprised a range of field activities aimed at conserving the Bazaruto Archipelago. The goal of MRUP was that:

  'Ecological and social integrity of the Greater Bazaruto National Park is maintained by integrated resource use'.

  The objectives to achieve this goal were to:
  1. declare Greater Bazaruto National Park;
  2. establish and have function a joint structure for the co-management of the BNP by the islanders, DNFFB, and other structures;
  3. establish effective integrated Resource Management and monitoring by communities and DNFFB;
  4. improve the Socioeconomic conditions of islanders; and
  5. implement ecological and socioeconomic research and training programs.

- 1998-1999 – an interim period to allow the continuation of the tasks not finished by the last phase, and the design of the next phase is presently being funded by WWF-International.

Park Management

Park management in our case means a conciliation between conservation and activities that can develop and upgrade the social conditions of the islanders, through the strengthening of their participation as beneficiary agents of integrated management, conservation and sustainable use of the resources. Another objective is to enhance the active interaction between local communities, tourist operators, authorities and other interested parties in order to build an appropriate institutional framework to guide and implement collaborative management in the Archipelago. Our strategy to achieve this goal was to create an effective Management Plan, which in this phase concentrates the activities under the following issues:

- **participative management** – promotion of activities through the local structures (communal and state), and the creation of associations and community interest groups to sustainably use and manage specific resources and manage the Park;
- **park boundary extension** – extension of the Park limits to all islands and the marine environment around them, with restrictions on the use of natural resources;
- **zoning and mapping** of resource use areas with community participation;
- **marine resources management** – improvement of fishing and collection techniques, revitalisation and use of traditional methods to manage the resources, and establishment of pilot programs on species conservation;
- **land resources management** – pilot projects for tree planting, the development of agricultural techniques, such as permaculture and intensive agriculture, in order to minimise the slash and burn practice, and the use of ecologically sensitive areas;
- **benefits** – creation of mechanisms of income generation that also allow the self-sustainability of the Park; the creation of models with local communities and tourist operators that allow the direct transfer of social and economic benefits to the islanders; and
- **awareness and education** – implementation of programs of education directed specially to the resource users in schools, communities and churches.

PARTICIPATORY MANAGEMENT – PROMOTION THROUGH THE LOCAL STRUCTURES (COMMUNAL AND STATE), THE CREATION OF ASSOCIATIONS AND COMMUNITY INTEREST GROUPS TO SUSTAINABLY USE AND MANAGE SPECIFIC RESOURCES AND MANAGE THE PARK

The final aim is to establish a multi-sectorial structure in a self-sustainable environment – a structure that represents all the interested parties, and that is able to properly deal with the management of the Park. However, the communities of the Archipelago live scattered and isolated on four of the five islands. The local and traditional structures are weak and there is also a nearly non-existent state authority in the Archipelago. This situation is aggravated by the disruption of traditional structures because of post-independence policies, the instability of war and refugee exodus.

Within the State, there are also various institutions involved, or with interests, in the Park and their coordination is very difficult, not only for the different interests represented but also because they are at different vertical levels with a complex network of dependency from the local to national level. The private sector is perhaps the most organised stakeholder in the Archipelago. Some lodges were built even before the Park declaration and the business aspect makes them much more effective than any of the other stakeholders. They have been collaborating with the Park authority in some community-related projects, but still no legal binding exists in order to institutionalise direct contributions to the communities.

PARK BOUNDARIES EXTENSION – EXTEND THE PARK LIMITS TO ALL ISLANDS AND THE MARINE ENVIRONMENT AROUND THEM, WITH RESTRICTIONS ON THE USE OF NATURAL RESOURCES

The actual boundaries were established in 1971, limiting the Park to three southern islands (Benguerua, Magaruque and Banguè), the other two islands (Bazaruto and Santa Carolina) being declared as 'Special Surveillance Zones'. Today, it is more than evident that there is a need to declare the whole Archipelago as Marine National Park in order to establish an integrated management system. The potential conflict in resource use between all interested parties can only be solved if the whole Archipelago is treated as an integrated system with equal status for all islands, and with a management plan through which everyone knows and

agrees about their rights and duties. Also, when joining all islands in a conservation unit, better synergies can be established towards self-sustainability of the Park and the transfer of benefits to islanders.

ZONING AND MAPPING OF RESOURCE USE AREAS WITH COMMUNITY PARTICIPATION

This zoning was conceived bearing in mind the ecological biodiversity of the Archipelago, the socioeconomic conditions, the local communities, the different categories of resource users and the management objectives. With this zoning we intend to regulate the user activities and resource monitoring inside the Park.

We considered five zone types

1. Wildlife zone – The first level of protection: no development, infrastructures, roads or vehicle use. Communities can use the following areas for fruit collection or medicinal plants:
   - Banguè Island;
   - all actual and active dune systems; and
   - all forests and vegetation near the dunes.

2. Total protection zone – The second level of protection aimed at specific habitats that need special management due to over-exploitation or in degradation by natural causes. Specific extractive activities can be carried out in:
   - marine areas
     - Coral reefs
     - Seagrass beds;
   - mangroves;
   - some lakes and swamps; and
   - all forests.

3. Restricted to community use zone – The areas defined for community utilisation in economic, social and cultural activities including:
   - intertidal area for artisanal fishing and marine resource extraction;
   - all the inhabited and planted areas;
   - areas for pastures; and
   - areas with historical, cultural and religious value.

4. Intensive use – The areas for the use of services, tourism or other economic development with heavy concentration and impact:
   - tourism concessions;
   - services (health posts, administration, etc.); and
   - landing strips.
5. Multiple use – The zone for the use of islanders and non-islanders, especially fishermen from the mainland:
   - line fishing marine zones.

MARINE RESOURCES MANAGEMENT – IMPROVEMENT OF FISHING AND COLLECTION TECHNIQUES, REVITALISATION AND USE OF TRADITIONAL METHODS TO MANAGE THE RESOURCES AND ESTABLISHMENT OF PILOT PROGRAMS ON SPECIES CONSERVATION

The Management Plan for the Archipelago establishes a set of parameters and activities for every habitat to be observed as follows:

- questions and conflicts;
- objective of management;
- strategy of management;
- activities in zoned areas;
- monitoring;
- success indicators; and
- special monitoring and investigation.

There are detailed management chapters for:

- seashores (beaches);
- intertidal zone (sand banks);
- pelagic zone (turtles and marine mammals, coral reefs, seagrass beds);
- land (mangroves, dunes, forest, savannah);
- fauna (birds, terrestrial mammals, wildlife); and
- freshwater environment (lakes, swamps and salt works)..

In the particular case of coral reefs, the Management Plan states their importance and issues to address, and defines activities and actions as follows.

Questions and Conflicts

- In the Archipelago the reefs are a very important source of subsistence for the local communities, and are also exploited by the mainland fishermen who harvest species of commercial value.
- The reefs are important also as a tourist attraction because of their characteristics and favourable conditions for diving.
- The principal threats are drag-net fishing, semi-industrial fishing, spearfishing and uncontrolled long line-fishing which destroy the reefs.
- Competition and pressure by the mainland fishermen in the coral reef zone employing sophisticated methods.
- Damage caused by uncontrolled tourist activities, i.e. inexperienced divers.
- Removal or extraction of coral.

Objectives

- Protect the biological diversity of coral reefs.
- Protect and conserve areas of unique beauty, and potential income generation.
- Conserve and improve coral reef areas and their fish populations.
- Maintain these areas mainly for diving – for the generation of income from tourism.

Handling Strategies

Habitat Protection

- Based on traditional knowledge and investigation, identify strategic areas that need protection.
- Establish ways that grant an existence of good protection in the critical habitats with, if necessary, changes in zoning and legislation.
- Mark the areas where fishing or inexperienced divers are not allowed.
- Introduce a regular patrol system.
- Establish sanctuary marine areas or time limitations for fishing.

Co-management for Local Regulation of Use and Conservation of Coral Reef Areas

- Involve the guards and local community in monitoring and investigation.
- Establish regulations for involving the investigators in social and community studies of the use of coral reefs.
- Promote the establishment and acceptance of local uses and practices, linking the local community and the Park.

Marine Reserve Protection

- By patrolling with community help, minimise illegal fishing and resource exploitation in the marine reserves.
- Control the population size of predator species, such as marine stars, to avoid the occurrence of pests.

Monitoring, Research and Restoration

- Investigate what causes habitat degradation and decreases in species numbers.
- Establish signs and buoys in the protected coral reefs and marine reserves.
- Evaluate the benefits of establishing buoys in the coral reefs and identify the best areas for them.

Co-Management Systems

- Promote, with local communities and hotels, awareness campaigns about the advantages of total protection or limited use zones.

General Zoning of Coral Reefs and Use Regulations

In general, the areas around coral reefs are subjected to turbulence, so they are dotted with soft and hard coral communities. In the case of the hard corals zone, this area can be open to every kind of diver, with or without experience. The interior areas of reefs are made up of corals that are susceptible to damage caused by divers. In these places, the divers must be competent and the access of inexperienced divers must be prohibited. The tops of reefs and 'coral gardens' (that are shallower areas) where the corals are susceptible to degradation by divers and reef walking, must also have prohibited access to divers without experience and only be permitted for experts.

Local Zoning of Coral Reefs

The areas of coral reefs are divided in two zones:

i. **Protection Zones** – Total protection for marine reserves. The total protection zones will be designated marine reserves, and only non-extractive activities will be permitted. Snorkelling will be allowed. Fishing will be forbidden. Boat crossing will be allowed but anchoring will be forbidden.

ii. **Limited Use Zone** – Limited use by local communities. These zones are for community use only – subsistence or sale to the islanders and hotels.

Activities in the Zoned Areas

Protected Reefs (Diving in the Protected Reefs Zones)

- Before authorisation to access protected reefs is given, divers must demonstrate their experience.
- It is recommended that divers must use diving suits without weight belts to facilitate buoyancy, thus allowing more horizontal diving and reducing the risk that the diver will walk on corals.
- The collection or extraction of any resource – plant or animal – from the coral reefs by divers is prohibited.
- Harpoon fishing is not authorised on the reefs.

Boats Management

- To avoid contact with reefs boats must not anchor in areas around reefs.
- The divers must be taken in small boats.
- The Park Administration will establish places to anchor around the reefs, at a minimum distance of 20 metres.

Zones of Limited Use

The zones will be limited to fishermen from local communities that are licensed to carry out the activity in the pelagic zone, and catch lobster and molluscs for themselves or for sale.

- **Harpoon fishery** is limited to the pelagic zone. It is prohibited to use this technology to catch fish on reefs, resident species or lobster.
- **Lobsters** can be collected, but no extraction of lobsters with eggs is allowed.
- **Molluscs** can only be collected by licensed fishermen, under capture quotas.
- **Holothurians** cannot be collected while studies to determine the population size are being undertaken.
- **Line fishing** can be undertaken by licensed fishermen in these zones.
- **Boat operation and diving** can be undertaken in these zones.
- Corals cannot be extracted for commercial purposes. The extraction of any material for investigation purpose needs authorisation from the Park Administrator.

Monitoring

- An annual monitoring of protected coral reefs must be undertaken. The objectives of this monitoring are:
- evaluation of the actual status of reefs in relation to diversity and species status;
- evaluation of starfish population growth, or of other species that can damage the reefs;
- evaluation of natural damage to reefs and their capacity to regenerate; and

- evaluation of the damage caused by diving and boat anchors, or lines and fishery nets, on or around the corals.

Indicators of Success in Coral Reef Protection

- Maintenance of species diversity.
- Maintenance or increase of the fish population and the accompanying fauna on reefs, without loss of biomass.
- Active participation of local communities in coral protection – agreement of a time limit for the exploitation of fish areas.

Impact of Management Activities on Coral Reefs

- The management team must guarantee the appliance of rules to reef users.
- The management techniques and monitoring established by the Park should avoid the extraction of specimens. If it is necessary to extract specimens for investigation purposes, this must be done outside the marine reserve areas.
- The following management activities can have negative impacts on coral reefs, and must be followed up carefully:
  - Training staff in diving and the introduction to the marine environment.
  - Use of methods in monitoring corals by transects, that can break or create stress for corals, or on other fauna of reefs.

Investigation

The following studies are considered a priority:

- study of the holothurian population dynamics and commercial value; and
- study of fish population, showing the environmental status of coral reefs.

LAND RESOURCES MANAGEMENT – PILOT PROJECTS FOR TREE PLANTING, THE DEVELOPMENT OF AGRICULTURAL TECHNIQUES, SUCH AS PERMACULTURE AND INTENSIVE AGRICULTURE, IN ORDER TO MINIMISE THE SLASH AND BURN PRACTICE, AND THE USE OF ECOLOGICALLY SENSITIVE AREAS

As in the marine environment and the coral reefs example, there are activities and actions for each land area (Mangroves, Dunes, Forest, Savannah) regarding:

- questions and conflicts;
- objective of management;
- strategy of management;
- activities in zoned areas;
- monitoring;
- success indicators; and
- special monitoring and investigation.

This land management is also linked to community land utilisation for agriculture and housing, tourism development, and strict control measures are proposed in order to minimise impacts, especially from the tourism sector.

A freeze on tourism development is widely accepted and is included in the Government National Tourism Policy of 1995. However, pressure is increasing to allow more tourism developments in the Archipelago. Better agricultural practices, including combating slash and burn practices and the control of goat herds in the communities settlements, are also priorities.

BENEFITS – CREATION OF MECHANISMS OF INCOME GENERATION THAT ALSO ALLOW THE SELF-SUSTAINABILITY OF THE PARK, THE CREATION OF MODELS WITH LOCAL COMMUNITIES AND TOURIST OPERATORS THAT ALLOW THE DIRECT TRANSFER OF SOCIAL AND ECONOMIC BENEFITS TO THE ISLANDERS

Communities must have full participation in the management process through local, activity or interest committees, where the key factors are:

- sustainable resource use; and
- full benefit sharing.

These committees should be able to solve conflicts of interest, monitor the resource use and develop from the bottom up to more sophisticated structures of stakeholders, culminating in the Bazaruto Archipelago Management Committee as the superior managing and decision-making structure. It is important to recognise that communities need to see the potential for direct benefits to them before being driven to participate in conservation activities. This is an important milestone in their understanding of the importance of the Bazaruto Archipelago as a special area for wise and sustainable use of natural resources.

To date there is no institutional mechanism that defines the benefits and establishes mechanisms for distribution amongst the various stakeholders. However, there is an informal set-up between the Park, hotels and communities where funds are transferred on a voluntary basis from tourist operators to social infrastructures or directly to community members, depending on the Community Councils' agreements. Studies already undertaken demonstrate that, in the near future, it will be possible to attain self-sustainability with income from the various activities that occur in the Park, and a proposal for benefit distribution is now under discussion including:

- local communities;
- park authority;
- state authorities; and
- wildlife development fund.

Lessons Learned

- Program coordination should be done by Nationals.
- Capacity building is essential and any external assistant should be chosen on the basis that this will be the modality of work.
- The Park team should be held responsible for the programs.
- Time, resources required, and general processes to undertake activities need to be designed taking into account the experience of eight years (wherein over-ambitious objectives turned the Park activities into reactions to log frames and timetables rather than developing more sustainable mechanisms to implement management).
- There is a need to balance the influence of external agencies in the way projects are developed and implemented. The role of an external agency should be one of primarily technical assistance.
- Any project must be framed within a National Program.
- There is a need for a very clear definition of institutional roles at the outset which is agreed, written and widely distributed amongst all participants of the implementation process representing all institutions and agencies involved.
- There is a need to plan for fewer activities that will have deeper impacts.
- There should be resources provided to central and district institutions so that they can effectively participate in and contribute to the project.
- Issues of isolation and logistics need to be carefully considered and thought through during the planning stage.
- Administrative procedures should be spelt out very clearly and put in writing in case of changes in staff.
- Teamwork, particularly at the field implementation level, is essential.
- There is a need to better integrate biophysical and social dimensions.
- There is a need to promote a project culture of 'learning by doing', creating spaces for open analysis and reflection, and being flexible to adapt and change.
- Systematic and consistent liaison with stakeholders is essential.
- Work with communities should facilitate better organisational skills at the local level and should accompany them through a process of finding their own solutions.
- In the work with communities it's important to walk with them, start where they are at and work with them at their own pace, helping each one of them to find their own role and solutions.
- The systematic work with communities must facilitate the development of a local organisation capacity, supporting them in the finding and implementation of their own solutions.

Achievements to Date

- Knowledge of environment and society in the Bazaruto Archipelago are enhanced;
- Good links and a positive image within the communities are established;
- A sense of security, concrete economic/social benefits, and more infrastructure for the community has been provided.
- Money from hotels for community benefits has been distributed.
- *Guardas de Fauna* with local knowledge of the language and culture are fully integrated in the Park activities.
- The proposal for new extended boundaries, legislation and Management Plan for the Bazaruto National Park has been finalized and delivered to Government for approval and publication.
- Several technical documents, as well as reports, have been finalised and presented.
- We have contributed to halting some increased tourism use/development.
- Mechanisms of persuasive power to avoid environmental damage amidst lack of formal enforcement rights have been facilitated.
- Infrastructure, equipment, and personnel have been acquired and developed.
- Field-oriented capacity building has been provided.
- A process of confidence building has been acquired through difficult experiences faced by the Mozambicans that lead to a '*Mozambicanization*' of the process, where the external input will be at temporary consultancy level, leaving the nationals with the responsibility to steer and manage the entire program.
- Environmental/conservation awareness has been enhanced.
- Exposure of Bazaruto Archipelago has increased at national and international level.

Conclusion

The final aim for this Park, an integral sustainable and participatory management system, is still just a little bit of a dream. We know that we have a very beautiful but fragile ecological system, with great tourist and economic potential. We know we have to go along and incorporate the islanders' feelings and rights in every action taken. And we feel that the turning point lies in our capacity to bring together the interests of all stakeholders in a way that everyone is equally provided with capacity to discuss and decide on their matters. We must be armed with patience and perseverance because this is a difficult, long-term process.

Integrated Coastal Management in Negros Oriental, Philippines: Participation in Coastal Habitat Assessment and Management

William E. Ablong[1], Jennifer M. Murphy[2] and Alan T. White[3]

Introduction

THE COASTAL RESOURCE MANAGEMENT PROJECT AND THE COASTAL ENVIRONMENT IN THE PHILIPPINES

Since its inception in 1996, the Coastal Resource Management Project (CRMP), an initiative of the Government of the Philippines funded by the United States Agency for International Development (USAID), has joined many government institutions and non-government organisations in working to thwart the destruction of Philippine marine resources. CRMP's strategic objective is to establish sustainable coastal resource use along 2000 km of shoreline through multi-sectoral, multidisciplinary, integrated coastal management. Building on the experiences of past projects and programs, CRMP aims to effect change on both the national and local levels, simultaneously using top-down and bottom-up approaches. To accomplish this, CRMP applies participatory methods and adheres to a new paradigm of technical assistance that puts major emphasis on non-material interventions, strategic expansion, and sustainability (Courtney & White 1996).

Seventy-five per cent of CRMP's support goes to the local level through six 'learning areas' that CRMP has established in central and southern Philippines (Courtney & White 1996). Within these learning areas, CRMP, which is implemented by the Department of Environment and Natural Resources (DENR), works with the communities, the local government units (LGUs), resource users, non-government organisations (NGOs) and others to establish integrated coastal management (ICM). CRMP defines ICM, which is also referred to as coastal resource management (CRM), as the process of planning, implementing, and monitoring beneficial uses of coastal resources through participation, collective action, and sound decision-making involving all relevant stakeholders and sectors. CRMP's local-level objective is that a municipal management system for sustainable coastal resource use is developed and institutionalised within each learning area. This paper gives an overview of the field process employed by CRMP in advancing toward this objective, using one of the learning areas located in the province of Negros Oriental, as a case study.

DESCRIPTION OF NEGROS ORIENTAL AND ITS RESOURCES

Negros Oriental is located in the Central Visayas region of the Philippines. It is the eastern province of the two-province Negros Island and lies about 620 aerial kilometres from the capital city of Manila. It is bounded to the west by a chain of rugged mountains separating it from its sister province, Negros Occidental, and on the east, the Tañon Strait divides it from Cebu Island. Negros Oriental is the largest province in the Central Visayas, with a total land area of 540 230 ha and it is the fastest growing, with an average annual growth rate of 1.94 per cent (NCSO 1995). Approximately 44 per cent of its 1 025 247 inhabitants live along the coastline and rely on the sea for their sustenance, while the remainder live inland and depend on agriculture for their livelihood. The CRMP learning area in Negros Oriental consists of 102 of the 300 km of provincial coastline. It encompasses nine municipalities and 71 barangays, with a population of 357 688 (NCSO 1995, CRMP 1998).

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Negros Oriental's coastal resources are vast and have great productive potential. The province is a major exporter of fishery products to the Visayas region and parts of Mindanao. In 1997, the province earned about P130 million (US$3.25 million) from fishery products. Moreover, Tañon Strait is one of the top ten richest municipal fishing grounds in the country. The main marine harvests in the province include tuna, anchovies and sardines, with commercial fishers accounting for the highest yield, followed by aquaculture production of milkfish and prawns in fishponds. Municipal fishers constitute the lowest fish producers in terms of harvest. Other sea products of the province which have generated earnings or have good potential for development are: bangus and prawn fingerlings, Eucheuma seaweeds (*E. cottonii*), shells, oysters, mussels, shrimp, crabs, octopus, flying fish, squid, prawns, and sea cucumbers. In addition to the salting and drying of fish that is done in the area, there is the potential to expand processing to include smoking and canning fish.

While most of the fish sold to areas outside the province are pelagic, the coral reef associated fish are primarily sold in the local markets for local consumption. The coral area stretches over 186 km of the provincial coastline and the reefs in the province are characterised as fringing with an estimated reef area of 26.5 sq. km, based on aerial photogrammetry (Montebon 1997). A 1995 survey showed that only 5% of the reefs have excellent cover (more than 75% live coral cover) and 14% have good cover (50–75% live coral cover); the remaining 81% have less than 50% live coral cover (CEMRINO 1995). Overall, there has been a decline in the live coral cover in Negros Oriental from 1981 to 1995 (Table 1). Thus, with the majority of the reefs in suboptimal condition, the level of fish catch for local consumption is well below the potential harvest that could be obtained from healthy reefs.

Table 1: Changes in live coral cover for Negros Oriental from 1981 to 1995

CORAL COVER	1981	1995
50–100%	31%	19%
30–50%	29%	25%
10–30%	29%	30%
0–10%	11%	26%

(Source: Montebon 1997)

Other coastal resources include mangrove areas, seagrass beds, intertidal flats and open water fishing grounds. Mangrove areas cover 5030 ha, including mangrove areas mixed with cropland, fishponds derived from mangrove areas, and mangrove areas in combination with built-up areas or settlements. Because mangroves support nearshore fisheries and provide other functions, mangroves are also a conservation and management priority in Negros Oriental.

Despite the impressive harvests, the marine resources are over-exploited and additional sources of income for fishermen are scarce (Vogt 1997). The impact of such over-exploitation is extensive in the learning area; most families in the coastal areas depend upon fisheries for their livelihood and a greater number supplement their diet with protein from the catch of part-time fishing or the gleaning of shallows at low tide. Furthermore, the use of destructive fishing practices, siltation, and the lack of wastewater treatment facilities are degrading the marine habitats.

Integrated Management in Negros Oriental

PAST COASTAL RESOURCE MANAGEMENT EFFORTS

CRMP's learning areas were chosen based on several criteria, the most important of which were LGU interest and commitment, and a receptive community. Negros Oriental has had a history of involvement in CRM. From 1984 to 1992, the World Bank funded the Central Visayas Regional Project. This project focused on poverty and marine environmental destruction in Negros Oriental and three other provinces, and used community-based resource management to address these issues. Because of the community's interest in and need for coastal management in Negros Oriental, the work begun during this project was continued by the efforts of the provincial governor through the province's Resources Management Division (now the Environment and Natural Resources Management Division), other local officials, the Centre for Establishment of Marine Reserves in Negros Oriental (CEMRINO) and the German Development Service (Ablong and Waltemath 1995). Silliman University has also been active in promoting marine research and conservation. Moreover, Silliman University's experience with its Marine Conservation and Development Program (1985-1987), which assisted local communities in designing and implementing marine reserves, contributed to the collective knowledge regarding community-based resource management (White 1988, White 1989a, 1989b). Thus, Negros Oriental provided CRMP with both a receptive community and a strong foundation from which to begin (Ablong 1995).

THE COASTAL RESOURCE MANAGEMENT PROJECT IN NEGROS ORIENTAL

Building on Negros Oriental's high level of interest and past experiences, CRMP embarked on a new period of management, employing the coastal management planning process set forth by White (1997). The steps of this process are: program preparation; secondary information gathering; field assessment/study; database and profile development; prioritisation of issues and analysis of causes; policy and plan formulation; plan/project implementation; and monitoring and evaluation. While this basic framework is standard throughout the learning areas, this dynamic and iterative process is responsive to community input and feedback. Therefore, this cyclical process refines CRM to meet the specific needs of each area. Also, CRMP's approach is to use co-management to address the resource management issues in a manner that integrates all relevant sectors and all the relevant stakeholders, e.g., resource users, the community, NGOs and LGUs. CRMP's experience in Negros Oriental exemplifies the effectiveness of this process for field-level implementation.

CRMP's work in the Negros Oriental Learning Area began in July 1996. After establishing an office within the Center of Excellence in Coastal Resources Management at Silliman University, CRMP conducted a workshop entitled the Coastal Resource Leadership Challenge (CRLC). The CRLC was designed to bring together leaders and potential leaders from all levels of government and from local NGOs to develop and utilize their leadership skills for the advancement of ICM in the learning area. Together the group developed a management plan for the learning area and identified a common vision for Negros Oriental:

> *An agro-aqua province with a strong determination to preserve the natural beauty of the ecosystem through community involvement and enforcement of logging and fishery laws as well as the rehabilitation of denuded areas to conserve, protect and develop the environment geared towards a happy, healthy, clean and progressive Negros Oriental. (Coastal Resource Guidebook for the Province of Negros Oriental)*

In addition, memoranda of agreement between CRMP and participants were drafted. The participants agreed to designate manpower and to allocate a portion of their budget to ICM activities; CRMP committed to providing technical assistance and training for the various aspects of ICM. Local government and NGO commitment and support, both financially and ideologically, is crucial in a collaborative management project such as CRMP, whose goal is for coastal resource management to continue beyond the life of the project.

In keeping with this goal, CRMP has a mandate to work with Assisting Organisations (AOs) to plan, develop, and implement field interventions for coastal management within the learning areas. Among the participants at the CRLC was the Rotarian Martin 'Ting' Matiao Foundation, Inc. (TMF). CRMP chose TMF to be its NGO partner based on its successful development experience in Negros Oriental and its commitment to sustainable resources management. Contracting an existing NGO to undertake such a position within the project is critical to sustaining the progress made by the project beyond the life of the project. In addition to addressing CRMP's concern for sustainability, such a decision also reflects two more principles concerning responsibility and self-reliance, which guide CRMP in its local-level interventions. The three principles are:

1. Encourage partners to lead and CRMP to facilitate CRM activities;
2. Build self-reliance by making do with available resources and adding primarily technical and management assistance value to existing processes and organisations; and
3. Prevent the project from becoming an institution itself.

Working as a community organiser, TMF conducts ICM planning workshops and participatory coastal resource assessment (PCRA) training and implementation. CRMP also works with other local NGOs, including the Young Men's Christian Association (YMCA) and St. Catherine's Family Helper Project.

In addition to these NGOs, Silliman University and local government units have important roles in the ICM process. After identifying local leaders through the CRLC workshop, CRMP trained these leaders in ICM, giving them the tools and background knowledge to undertake ICM planning and activities. Furthermore, this training, primarily for local government units and NGOs, laid a foundation for the necessary vertical and horizontal linkages for successful ICM interventions.

To involve the community in the ICM process from the very beginning, TMF trained local barangay (the smallest political unit in the Philippines) members to conduct participatory coastal resource assessments (PCRAs). These PCRAs not only involve the community in the management, but also draw upon the knowledge of the community through mapping of the resources, gathering of temporal and spatial descriptions of resource abundance which identify both annual and decadal trends, and conducting socioeconomic surveys. Working in two barangays per municipality in the learning area, the data from the PCRAs will be compiled with secondary information to create a coastal environmental profile to be used by decision-makers and community members as a basis for future policy decisions. Also, the data from the PCRAs and secondary sources will provide baselines for subsequent monitoring. An important result of the PCRA are detailed maps for each municipality and selected barangays. These maps are digitised and used for community-level planning. Since monitoring is an essential component of the process, CRMP and the University of the Philippines Marine Science Institute are training local resource users to conduct coral reef and marine sanctuary monitoring.

Following the PCRAs, each targeted barangay conducts ICM planning meetings and drafts a plan to be presented to the LGU. These plans identify the pressing issues, concrete actions to address these issues, expected results, lead agencies, target participants, and sources of funding for implementation. As prescribed by the ICM plan, CRMP and TMF then assist in implementing the actions.

CAPACITY BUILDING

Underlying the ICM process is the need to conduct capacity building. Capacity building is not limited to only human resources capacity, but includes technical, financial, and legal and administrative capacity as well (Cicin-Sain & Knecht 1998). CRMP's work aims to improve the capacity of the area in all these aspects.

A significant component of integrated management is educating the general public about the coastal resources and the management efforts within their area. Marine ecology seminars have been conducted in each municipality within the learning area. The nearly 500 participants consisted of a cross-section of the community, including science teachers, LGU officials, fisherfolk, and the Bantay Dagat (a local deputised sea watch group). The aim was to give community stakeholders basic environmental knowledge regarding their coastal resources, so that they may better manage them. Also, marine ecology is being introduced into the curriculum for Grades 5 and 6 in selected schools this school year by the provincial government with the assistance of CRMP and the Department of Education, Culture and Sports.

The learning area in Negros Oriental also hosted an exhibit entitled 'Our Seas, Our Life'. This free exhibit, produced by the central CRMP office in Cebu with contributions from Silliman University, received close to 50 000 visitors during its 17-day stay in Negros. The exhibit showcased national marine habitats and species, as well as informing the public about the threats to the habitats and species. During the exhibit, CRMP launched its 'I Love the Ocean' campaign. Over 500 people, ranging in age from four to sixty-four years old, registered as members and pledged their commitment to safeguarding the ocean and its resources. The members hold regular meetings and organise events such as coastal clean-ups.

To improve the legal and administrative capacity within the learning area, CRMP and the Legal Environmental Advocacy Programme (LEAP) at Silliman University's College of Law aid the municipal units in drafting ordinances to implement national legislation, as well as local ICM plans. While the existing institutional arrangements and legislation are adequate in many cases, they are simply not being implemented at the local level. The Local Government Code of 1991 devolved new responsibilities to the LGUs, such as jurisdiction over coastal waters out to 15 km, however, many LGUs have not adjusted to these new responsibilities. In addition, ICM plans of the local barangays call for new ordinances to protect their coastal resources. By providing legal orientation sessions, LEAP strengthens the law enforcement capabilities of the Bantay Dagat, a deputised sea watch group charged with enforcing ICM plans and monitoring coastal activities within a municipality or barangay. CRMP is also poised to help implement the new Fisheries Code of 1998 at the local level.

In order to stop over-exploitation of the resources, the technical and financial capacity of the community must also be increased. To do this, CRMP in collaborative agreement with local government and communities, is seeking alternative livelihoods for the resource users through enterprise development. Current projects include ecotourism in Bais Bay and on Apo Island, and mariculture. In Bais Bay, a successful tourist attraction has been built around its abundance of resident dolphins and migratory whales. Apo Island attracts an average of 70 visitors per week, particularly scuba divers, who come to enjoy the underwater seascape that flourishes there as a result of the successful community-based marine sanctuary. The mariculture activities include fish cages, seaweed farming and mud crab breeding. These enterprise development projects are conducted in a manner that is in keeping with CRMP's philosophy of resource management, i.e., the projects aim to be environmentally and economically sustainable by not further degrading the natural resources.

EVALUATION

CRMP's progress towards its strategic objective of enhanced management of renewable natural resources is gauged within the learning area by the number of municipalities (measured as kilometres of shoreline) implementing improved management of coastal resources. To be counted, municipalities need to meet all of the following conditions:

1. resources for CRM allocated by local government units;
2. resource management organisations formed and active; and
3. at least two CRM interventions implemented:
   a. CRM plans adopted;
   b. fisheries and coastal management ordinances implemented;
   c. enforcement units operational;
   d. marine sanctuaries functional;
   e. mangroves under CBFMAs (community-based forest management agreement); and
   f. municipal water boundaries enforced.

In Negros Oriental, CRMP has been monitoring the budget allocations of the LGUs within the learning area for coastal resource management. Table 2 shows that there have been increasing numbers of LGUs allocating funds for CRM activities, with the last two years having eight of the nine LGUs reserving funds for CRM. While there was a decrease in the amount allocated for 1997, 1998 shows a doubling of CRM budgets for the learning area from its previous high in 1996. The types of CRM activities that receive funding from the LGU budgets include CRMP-led training, CRM-related meetings, monitoring of coastal resources and operating expenses for the Bantay Dagat.

Table 2: Annual CRM budgets of municipalities within the learning area

YEAR	AMOUNT ALLOCATED (US$)	NUMBER OF MUNICIPALITIES ALLOCATING FUNDS FOR CRM
1995	14 000	3
1996	37 125	5
1997	25 500	8
1998	74 433	8

(Based on an exchange rate of Philippine Peso 40 = US$1)

CRMP has been instrumental in establishing several management organisations within the learning area (Table 3). CRMP has assisted the LGUs in establishing Bantay Dagat within the barangays and federations of Bantay Dagat at the municipal level. CRMP is providing technical and organizational support to the Department of Agriculture and LGUs as they set up a Fisheries and Aquatic Resource Management Council (FARMC) in each of the municipalities. To date four have been established and five more remain to be completed. The FARMCs will assist in formulating fishery policies and fishery management plans and will assist with the law enforcement of these plans and policies. In addition, there are a number of fishermen's associations that specifically manage and monitor marine sanctuaries. Though not a management organisation itself, CRMP has also established municipal CRM training teams to enhance the management capabilities of groups within the learning area.

Table 3: Management organizations within the learning area

ORGANISATION	NUMBER IN LEARNING AREA
Bantay Dagat	18
Municipal Federation of Bantay Dagat	9
Fishermen's Associations	18
FARMCs (municipal-wide)	4

In only the third year of the project, CRMP has been making steady progress towards implementing several CRM interventions. CRMP facilitated the approval of one marine sanctuary and is supporting nine marine sanctuaries that were established by Municipal Ordinances within the learning area prior to the beginning of CRMP. Although all municipalities have some form of CRM plans, CRMP is conducting planning workshops to develop new CRM plans that are integrated and participatory, ensuring greater success with implementation and compliance. For instance, Dumaguete City, the capital of the province, has ordinances limiting open access through a licensing scheme, yet this has not been implemented. CRMP is working with the municipalities and barangays to create a critical mass and the political will to put these new CRM plans into effect. Overall, CRMP has made progress towards satisfying its performance indicators and hopes to accomplish more in the remaining few years of the project, e.g. establishing more FARMCs and sanctuaries, and passing more CRM ordinances.

Conclusion

LESSONS LEARNED FROM EXPERIENCE

Through its work in Negros Oriental, CRMP has been able to identify several lessons for field-level implementation of co-management projects. These lessons include:

1. **Be strategic in targeting one's assistance.** This applies to both choosing a site, such as a learning area, and one's work within an area. As stated above, a receptive community and local government support are essential to the success of co-management projects. LGU support, both in terms of budget and personnel, has facilitated the rapid progress in organising and implementing CRM-related activities both at the barangay and provincial levels in the learning area. For instance, nine technical staff from the Provincial Agriculture Office have been assigned to six learning area municipalities to assist LGU technical needs for aquaculture development and coastal law enforcement. Due to the size of the Negros Oriental learning area, CRMP found it necessary to focus its efforts on a few clusters within the learning area where interest in CRM was strong. One cluster is in Bais Bay where bay management is of interest to two municipalities. Clusters provide opportunities to test new technology and management practices, and then serve as models of success for the rest of the learning area.

2. **Rely on existing organisations when possible and take advantage of the local resources available.** This includes building on past and present (parallel) efforts of other projects and donors. Also, by enhancing the capabilities of existing groups, such as TMF, and involving them as the community organizers, the sustainability of the progress made by the project is greatly increased. Furthermore, CRMP benefits from the presence of local resources in the Negros Oriental learning area such as Silliman University with its Center of Excellence in Coastal Resources Management and Marine Laboratory.

3. **Involve the community and relevant stakeholders from the very beginning.** By involving the community from the beginning of the project, this motivates them to participate more actively throughout the entire process. Too often projects only involve the community at one stage of the management cycle, and therefore forgo the benefits of time, resources and energy that the community would have been willing to contribute had they been more involved. CRMP involves the community from the initial stages of its work in the learning area by empowering them to participate in the coastal resource assessments.

4. **Create a training team.** It is more effective and sustainable for CRMP and academe to train members of NGOs, such as TMF, and LGUs in ICM and have them be able to train others at the community level and beyond the life of the project. Members of TMF and LGUs participated in CRMP's 10-day ICM training, after which they were able to conduct two shorter ICM courses, training 120 Bantay Dagat chairmen and community leaders.

5. **Provide tangible economic and social benefits.** Projects need to find alternative livelihoods for fishermen and other users of over-exploited resources. Otherwise, the cycle of poverty and environmental degradation will continue. Despite past efforts, poverty still has not been alleviated in Negros Oriental. Enterprise development is therefore a very important component of CRMP's work and its ability to provide tangible economic and social benefits, as is the restoration of fishing grounds to their productive potential.

6. **Recognise the efforts of those involved.** Integrated management requires the participation of many groups and individuals in order to be successful. Recognition of people's efforts will make them more likely to participate again. For example, CRMP acknowledges the participation of individuals and groups in CRM activities in the local and national media when possible.

7. **Make linkages to provide technical assistance and to share knowledge.** Incomplete or inaccurate information leads to poor decision-making. To promote greater information exchange within the learning area, CRMP and others are working to re-establish a provincial-wide CRM coordinating committee.

8. **Educate and inform the public about their natural resources.** The information, education and communication component of ICM is important, because the public needs to have a basic understanding of the marine environment and the threats to it in order to support management policies. CRMP's marine ecology seminars and Our Seas, Our Life exhibit are two examples of CRMP's efforts to raise the level of understanding about the marine environment in Negros Oriental.

These lessons are the result of the work done in the learning area and will shape the future work of the project. Although much remains to be done, CRMP has accomplished a great deal in its efforts to bring the natural resources of the learning area under integrated, sustainable management for the benefit of the people who rely on those resources. CRMP hopes that the work done in Negros Oriental and the other learning areas will provide models, lessons and hope to other areas of the Philippines wishing to undertake co-management of their coastal resources for their own benefit and that of future generations.

Acknowledgements

CRMP is an initiative of the Government of the Philippines that began in March 1996 and is supported by the United States Agency for International Development. CRMP was implemented by the Department of Environment and Natural Resources in partnership with the Department of Agriculture-Bureau of Fisheries and Aquatic Resources, local government units, non-government organisations and other assisting organisations. Technical support and management are provided by Tetra Tech EM Inc. Useful comments in the preparation of this paper have come from Roy de Leon, Michael R. Alcala and Evelyn Deguit.

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Coral Reefs of the Abrolhos Bank, Brazil

Guilherme F. Dutra[1]

The Region of Abrolhos

The Abrolhos Bank harbours the most biologically diverse coral reefs in Brazil, and the entire South Atlantic, and it is the only place where all species of the Brazilian coral reef fauna occur. Although low in diversity, the coral reefs of Abrolhos are exceedingly high in endemism, including 50% of its reef corals and many other unique reef invertebrates. One of the main reef-building species is an ancient genus, *Mussismilia,* itself endemic to Brazil.

Located off of the south-east coast of Bahia State, the Abrolhos reefs arise from a shallow sea floor (depth ranging from 15 to 25 metres) as straight columns, enlarging as they near the surface and forming structures resembling large mushrooms. These structures are referred to as 'chapeirıes', and can measure as large as 50 metres in diameter at their uppermost surface.

Apart from these reefs, the Abrolhos region supports extensive mangroves, sparsely vegetated sandbanks *(restingas)* and tropical coastal forests. The human communities that exploit the natural resources found within these ecosystems live within the coastal zone. Shrimp, coral reef fish and mangrove crabs are the main marine resources harvested.

The reefs are partially protected by the Abrolhos National Marine Park (91300 hectares) established in 1983. The area of the Park comprises the 'Parcel dos Abrolhos' reefs (found in the clearest waters of the region), the five islands of the Abrolhos Archipelago, and the Timbebas reefs, which are located nearer to the mainland.

The Bahia State Government created a protected area (350000 hectares) in 1993 which includes reefs and mangrove areas adjacent to the Abrolhos National Marine Park, but it still requires implementation. During 1999 Conservation International will be helping the State Government develop a management plan for the area.

Main Threats

The Abrolhos region is threatened by three important anthropogenic impacts.

1. **Sedimentation** – Scientific evidence suggests that the deforestation along river basins is degrading large coral reef areas in the Region.
2. **Fishing activities** – Fishing techniques developed in the 1970s are unsustainable, causing a sharp decrease in finfish, shrimp and crab stocks.
3. **Tourism** – This industry has witnessed rapid growth, especially in the Abrolhos Marine Park (where currently 15000 tourists visit per year), and is becoming increasingly important to the regional economy. The fast growth of tourism has affected and continues to threaten the most intensively used areas of the Abrolhos islands. The Abrolhos coastal cities are also expanding as a result of tourism development, impacting nearby mangrove and *restinga* ecosystems.

The Abrolhos 2000 Project

Removing these threats and promoting environmentally sound development are the objectives of Abrolhos 2000, a project initiated by a partnership between Conservation International and the Brazilian Government's Environmental Agency (IBAMA), with support from several donors, including primarily the Inter-American Development Bank.

The project's first step was to develop a Conservation Action Plan for the Region, which was produced through workshops involving local coastal community representatives and many other stakeholders. The main goal of this plan is to conserve the coastal and marine biodiversity of the Abrolhos region.

1. Conservation International do Brasil

One key component outlined in the Action Plan is the creation of economic development options (that are environmentally sustainable), as alternatives to damaging fishing and tourism practices. Another key component involves pursuing coral reef conservation in the broader context of coastal management, particularly by establishing linkages with coastal and Atlantic forest conservation programs.

TOURISM IN ABROLHOS

One priority area for project intervention was the tourism industry, especially in the Marine Park which receives more than 90% of visitors to the Region.

One immediate need was to mitigate the environmental impacts resulting from visitors to the Park. Although visitor guidelines had been developed back in 1987 as part of a park management plan, they were never implemented. As stated in this Management Plan, the carrying capacity for visitors to the park was determined to be 15 vessels/day, each holding a maximum of 15 people. Most of the time, there are nowhere near enough visitors to attain this maximum capacity, but during peak holiday times the number of vessels often exceeds the maximum allowed under the Management Plan. In order to keep the number of visitors within the maximum allowable limit, IBAMA and the tour operators' association met to come up with a solution. The result was that tour operators have agreed to not overbook their excursions, and they understand that offenders will be faced with cumulative fines. Also, as a result of discussions between these two groups, there are now special areas designated for anchorage that will reduce further coral reef destruction.

To remove the additional threats posed by tourists and tour operators, such as the disposal of garbage into the sea and snorkelling and diving outside of designated areas, the Abrolhos 2000 Project developed an educational training program for tour operators. The education program focused on key themes in biology and oceanography, including information on the biodiversity features that make Abrolhos so globally important, and also instructed operators on the laws and correct codes of conduct in the Marine Park. As a result of this educational program, there are far fewer visitor infractions, and fewer conflicts between the Park staff and the tour operators.

Every visitor to the park is received by a trained team of IBAMA staff which gives an orientation speech and hands out folders that describe the importance of the Abrolhos region as well as what visitors can do to help protect it. A walking trip is then offered on one of the islands accompanied by a person from the Park's educational team. While the real purpose of accompanying visitors is to provide additional information about the Park, it also allows Park staff to keep an eye on tourists and make sure they do not harm wildlife or ecosystems. Similarly boat operators help in Park surveillance especially by keeping tabs on snorkellers and scuba divers.

It is important to stress that the funds for the education team come from the tour operators' association. Park enforcement was therefore improved with no added cost to its budget.

The Park has also established an internship program for university students. These interns help the education team in their activities and offer new viewpoints that enhance the daily lives and perspectives of regular Park personnel. Using the skills of unpaid interns also helps to reduce the cost of operating the Park.

Conservation International and its partners have been working on several fronts to integrate the Park into a broader coastal management program. One of the main activities was the production of a Conservation Action Plan for the Abrolhos region. This plan was produced by a diverse array of stakeholders, and defines a strategy for park protection that is in line with the economic and environmental context of the Region. In addition, this project was instrumental in the Government of Bahia's decision to expand the focus of its protected area out from the coastline to include the waters of the Abrolhos Bank. Finally, we are working with the Bahia State Government to develop an ecologically sound tourism plan for the Region.

Conservation International began working directly with the private sector by convening an ecotourism workshop for tour operators from five coastal municipalities. Workshop participants were introduced to important concepts and ways to develop ecologically sound tourism products, and were able to come up with several marketable eco-tours. Conservation International will continue to work with this industry through maintaining and coordinating an association of ecotourism operators.

Lessons and Recommendations

- **Community and stakeholder participation in workshops from the beginning of the process.** The first lesson we learned in implementing this project was that coastal communities and other stakeholders must take part in project design. Direct participation increased their sense of ownership in the project, which in turn provided them with a greater incentive to deliver results.

- **Investment in education and training for tour operators and Park staff in visitor orientation.** Another important lesson, and a recommendation, is that an investment in education and training for tour operators and Park staff in visitor orientation can be a more cost-effective way of enforcement than expensive surveillance. In addition, it promotes better relations between park managers and park users, and helps avoid conflicts.

- **Employment of local people in the Park and for the education team.** In the case of Abrolhos, where Park staff must live on a small island for an entire month, it is especially important to employ local people who feel comfortable in a restricted social environment. Employing people from other parts of Brazil was less successful and these individuals tended to be the ones who had the most conflicts with tour operators.

- **Maintenance of an internship program bringing diversification and reducing costs.** The internship program was also found to be important for improving the management and working atmosphere of Abrolhos Park, especially by bringing new knowledge and diversifying the social environment on the islands.

NEXT STEPS

The goal for the next few years is, with respect to tourism, to maintain working solutions and develop 'best practices' for the tourism industry. Creating environmentally, economically and socially viable standards for the developing tourism industry in Abrolhos will be done by involving tour operators in workshops to define a management plan for the State Park, and soliciting their ideas as to how tourism can be developed and implemented without serious environmental consequences.

We will also expand the local environmental education program to the children of fishermen in all of the coastal towns and cities of the Abrolhos region, starting with Caravelas. The main goal of this program will be to make children aware of the environmental issues faced by their communities and help them propose ways to solve them.

Next year we will be developing the Management Plan for the Bahia State Park and collecting data about the impacts of fishing activities based on information from local fishermen and scientists. These data will be used to propose zoning maps for discussion with all local fishing communities, which can then help define a sustainable fishing program for themselves.
In the year 2000, the Abrolhos Project will be publicly launched at the inauguration of a new research base. During this same year, we will begin implementing ecologically sustainable alternatives for local fishing communities and a monitoring program for the Region. A national communication campaign will also be directed at the general public, and will feature the importance of protecting the Abrolhos region.

Our strategy in Abrolhos is to invest in local capacity building until the local communities are prepared to continue the process themselves. The project's strategy therefore relies on working jointly with key local agencies to implement activities, and gradually building their capacity to manage components of the project.

Session 10 Report: Protected Areas

Future Challenges in the Promotion of Sustainable Protected Area Management

- Be strategic in the targeting of your assistance.
- Rely on existing organisations when possible and take advantages of the local resources available.
- Involve the community and relevant stakeholders from the very beginning.
- Create a training team.
- Promote the tangible economic and social benefits.

Lessons Learned

Key

I = Integrated Management, coordination and linkages to other initiatives, programs and instruments
S = Stakeholder Partnerships and Community Participation
P = Public Awareness and Education, including Capacity Building
D = Data and Information for Management

Lessons Learned	**I**	**S**	**P**	**D**
Working at different levels at different times is not necessarily sequential	X			
Integrate inputs at all levels	X			
Use existing resources and organisations where possible plus their past experiences	X			
Develop a participation process	X			
Participation by the community and stakeholders	X			
Frame within a national program	X			
Review of the conservation laws	X		X	
Review of the enforcement of laws	X		X	
Integrating socioeconomic information and the environment	X			
Teamwork	X			
Implementing agencies need to be committed to MPA working (where implementing agencies range from community-based to national government)	X			
What is the priority - target MPAs where there are areas in good condition or tackle the degraded ones - Good areas to conserve, and also areas which are critical habitats				
• ICRI would be a good tool to build integrated plans, i.e. needs to be connected • Need to acknowledge cultural and political context and not just the ideal area • Complement other work • ICRI a tool to stop threats and provide further protection • Case-by-case assessment	X			
Take the factor of isolation into account when implementing management through the ICRI – recommended to a charter for conservation of critical coral reef areas or MPAs	X			
Focus on fewer activities that will have a deeper impact	X			
Program coordination should be done by nationals		X		
Capacity building is essential and any external assistance should be chosen on the basis that this will be the modality of work			X	
The park team should be held responsible for the programs	X			
Take account of time parameters to undertake activities				
Balance the influence of external agencies in the development and implementation of projects	X			
Clearly define the institutional roles from the outset	X	X		
Provide resources to central and district institutions so that they can effectively participate and contribute to the project	X			
Issues of isolation and logistics need to be carefully considered during the planning stage	X	X		X
Administration procedures should be carefully considered				X
Integrate biophysical and social dimensions	X			X
Promote project culture of learning by doing, creating spaces for open analysis and reflection and being flexible to adapt to change		X		

Lessons Learned (cont.)	1	S	P	D
Systematic liaison with stakeholders is essential		X		
Work with communities should facilitate better organisational skills at the local level and accompany them through a process of finding their own solutions	X	X	X	
Walk communities through, starting where they are at their own pace, helping each one of them to find their role and solution		X	X	
Work with communities to facilitate the development of a local organised capacity		X		
Be strategic in targeting one's assistance	X			
Recognise the contributions of those involved	X	X		
Make linkages to provide technical assistance and to share knowledge		X		
Educate and inform the public about their natural resources		X	X	X
Community and stakeholder participation in workshops from the beginning of the process		X		
Investment in education and training for tour operators and park staff in visitor orientation		X		
Employment of the local people in the Park and for the education team	X	X		
Maintenance of an internship program with diversification and reducing costs		X	X	
Community participation must be maintained throughout the process from planning to implementation	X	X		
Community must own the process		X		
Identify the community leader (both formal and informal) and the key persons of the community		X		
Ensure enough time for evolution and maturation - incorporate this into the planning process, e.g. 4-8 years		X		
Creative solutions which are culturally appropriate that involve the community		X		
Flexible to change and adaptability		X		
Creative financing		X		
Traditional experience needs to be involved		X		
Important not to have any preconceived outcomes		X		
Have achievable expectations and realistic goals		X		
Continuity of development		X		
Partnerships		X		
Building trust		X		
Need a common ground on which to work		X		
Need to create space and mechanisms to create partnerships and consultation and to bring people together		X	X	
Note to invest in children's education as children can deliver messages to family members			X	
Do not just educate in the classroom, as many lessons can be taken into the field/MPAs/particular area			X	
Teachers need to have knowledge			X	
Train the local community to manage and access to training nationally			X	
Need to understand and assess via focus groups, surveys etc. for common knowledge and awareness and attributes, values etc.			X X	
Increase awareness of universities to contribute to ICRI initiatives, especially in the area of marine conservation			X	
Establish marine conservation studies in regional educational institutions/technical colleges			X	
Work with communities must facilitate the development of local organisations' capacity to find and implement their own solutions			**X**	
Develop the awareness depending on the target group			**X**	
Countries not meeting international treaty obligations			**X**	
Applied research is needed				X
Invest in research in economic and sustainable alternative activities				X
Develop monitoring programs				X
Carrying capacity				X
Traditional management and perceptions of the social value of particular resources				X
Indicators for effective monitoring of participation				X
GIS programs				X

WORKING GROUP REPORTS

The International Tropical Marine Ecosystems Management Symposium was unusual in the way in which it brought together people from the world of management – government, non-government and community action, and science. The first lesson learned was that an additional one or two days could usefully have been added to the Symposium in order to achieve fuller discussion and synthesis of priorities. There was an enormous wealth of experience and an eagerness to share knowledge, discuss issues and identify priorities. Delegates worked long hours and the Chairs and Rapporteurs made prodigious efforts in synthesising reports that captured the contributions and recommendations based on a very wide range of experience. Inevitably, there was considerable overlap in the lessons learned, and gaps and priority actions identified by the four cross-cutting workshops. There were differences in approach and expression that reflected the nature of the issues that the workshops were addressing.

We have not edited the summary reports for consistency of style and removal of overlap. We consider that the different perspectives and the ways in which they identify and express priorities are likely to be helpful to people seeking to design, implement, support and oversight products and programs to improve the management of tropical marine ecosystems.

SESSION 11: Integrated Management, Coordination and Linkages to Other Initiatives, Programs and Instruments

Session Chair/Facilitator: Marea Hatziolos
Session Rapporteurs: Kristina Gjerde
Session Panelists: Arthur Patterson, Per Wramner, Charlotte De Fontaubert, Prasantha Dias Abeyegunawardene

Objective

To utilise selected panellists and outcomes of the 'Priority Issues' Working Group sessions to identify gaps and priority needs in order to foster integrated management, and enhance coordination and linkages to other relevant initiatives, programs and instruments.

Key Recommendations

1. Bridge the gap between global knowledge and local action through creation of national coral reef initiatives.

2. Work with the private sector to develop innovative approaches to ensure that uses of coral reef and related ecosystems are ecologically sustainable.

This session examined priority issues identified in the Regional Reports in relation to the cross-cutting theme – *Integrated management, coordination, and linkages to other initiatives, programs and instruments* – as a means of identifying constraints and opportunities to address priority issues within the current ICRI context. A set of recommended actions for the next four years is presented below. These are based on lessons learned from past experience, gaps in the ICRI process, and under-utilised opportunities to integrate, coordinate and effectively link ICRI with other international programs and instruments.

Crosscutting Themes – Frameworks

Lessons Learned

- Global and regional treaties and programs are key tools in the managers' toolkit for adaptive management.
- The Convention on Biological Diversity is the only legally binding international agreement that encourages conservation and sustainable use of biological diversity. It works through existing national, regional and local bodies to achieve its ends. The Global Environment Facility is linked with the CBD to assist developing countries to implement the Convention.
- The CBD pays great attention to marine and coastal biodiversity. The Jakarta Mandate and its Programme of Work identifies key operational objectives and priority activities in the field of marine and coastal biodiversity. Coral reefs constitute key habitats with extremely high biodiversity and great importance to marine living resources. The International Coral Reef Initiative can be an important instrument to implement the Jakarta Mandate with respect to coral reefs.
- National reporting systems can put pressure on individual countries to take action so they have something to report back to the Conference of Parties.
- Different UNEP Regional Seas approaches, when viewed together, offer a valuable, comprehensive menu of regional activities in support of local initiatives. These approaches need to be better supported financially and need to enhance knowledge management within the UNEP system to further build regional capacity.
- High-level inter-ministerial meetings may provide the essential stimulus to create or re-invigorate regional environment programs such as occurred with the South Asia Co-operative Environment Programme (SACEP). SACEP was then able to mobilise countries to establish a Regional Seas Programme.
- One aspect of the problem of compliance and enforcement of environmental laws can be addressed through regional workshops that highlight the importance of implementing global conventions.
- Who you know matters – it is essential to use contacts and existing networks to pursue ICRI goals. The training course for Marine Protected Area (MPA) managers organised by ICRI and the Great Barrier Reef Marine Park Authority (GBRMPA) served to expand that network.
- International NGOs and institutions need to work better with local NGOs (e.g. Mafia Island case study).
- It is important to recognise the strengths of different NGOs and to work together strategically.
- A good example of different entities working together is the 1995 report of the IUCN, GBRMPA and the World Bank on Global Representation of Marine Protected Areas.
- The Global Plan of Action for ICRI contains sufficient flexibility for government implementation at the regional level.
- A joint strategy development, such as the marine strategy developed by IUCN and the Worldwide Fund for Nature, can sometimes create greater awareness than individual efforts.
- There is a need to identify common issues and cooperatively resolve those issues.
- There is a need to enhance existing and establish new, mutually beneficial partnerships.
- There is a need to work together to develop management training programs that are specific to the needs of MPAs.
- There is a need to exchange information and experiences with each other so that we do not duplicate or reinvent each others' efforts.
- There is a need to openly discuss actions that impact marine areas throughout the Region by identifying management strategies that work and those that do not.
- There is a need to work together to broker fiscal and technical support for poorly funded MPAs.

Gaps Identified

- ICRI and its partners played a major awareness-building role at global and regional levels but the lack of strong, national ICRI policy and program teams hindered using these international instruments to support local management efforts.
- There are many limitations and constraints of the international framework as well, including: (a) treaty obligations and national initiatives require national leadership for implementation; (b) few international regimes provide direct tools for partnership with industry; and (c) there are limitations of human and financial resources to fulfil international mandates and national goals.
- The diversity and wealth of intergovernmental programs and activities make the formulation and coordination of comprehensive regional strategies a complicated process.
- Funding constraints, as expected, were among the most serious obstacles.
- Project learning generally takes place within projects themselves and, in general, is under-utilised beyond defined boundaries.
- Project experience is seldom accessible to new projects.
- Bottom-up approaches can be strengthened by working with local NGOs.
- Communication gaps need to be addressed and mechanisms established for sharing lessons learned through mistakes, as well as successes.
- There is a need for a better integrated, overall approach that includes NGOs, governments, international institutions, the private sector and financial institutions.

Priority Actions

UTILISE GLOBAL AND REGIONAL TREATIES AND PROGRAMS AS KEY TOOLS IN THE MANAGERS' TOOLKIT FOR ADAPTIVE MANAGEMENT

- ICRI should serve as a dynamic bridge between global and regional instruments and managers of coral ecosystems at national and local levels.
- Use the United Nations Convention on the Law of the Sea (UNCLOS) as a comprehensive framework.
- Create national coral reef initiative teams to vertically link international and local stakeholders and horizontally to identify actions at the national level that will implement international programs and support local community management.
- Improve the capacity of national leadership to implement international legal obligations.
- Engage industry pro-actively in national implementation strategies for regional and global treaty and program commitments.
- Strengthen the ICRI partnership with the Convention on Biological Diversity by improving coordination, enhancing national reporting to CBD, and developing funding strategies to the Global Environment Facility.
- Urge the Ramsar and World Heritage Convention Parties to nominate under-represented coral reef and related ecosystems to their global lists.
- Advance species recovery through the: Convention on Biological Diversity; Bonn Convention on Migratory Species; Apia Convention; UNEP Regional Seas framework (e.g. the Cartagena Convention's Protocol on Specially Protected Areas and Wildlife); FAO Code of Conduct for Responsible Fisheries; and Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- Stop overfishing and destructive fishing practices through implementation of the FAO Code of Conduct for Responsible Fisheries and CITES. Study national and regional enforcement measures for species in trade related to coral ecosystems (especially food fish, live rock, curios and aquarium fish).
- Work with the Asia-Pacific Economic Cooperation Council (APEC) to implement measures to stop cyanide fishing as a matter of priority.
- Identify 'particularly sensitive sea areas', designate Areas to be Avoided, apply discharge restrictions, implement routing measures and Vessel Traffic Service Systems and pilotage systems (as appropriate and consistent with the International Maritime Organization (IMO) and UNCLOS). Develop credible national damage assessment methods that will permit recovery of the cost of environmental restoration through the judicial process.

ENHANCE KNOWLEDGE MANAGEMENT WITHIN REGIONS (WITHIN AND ACROSS UNITED NATIONS SYSTEM AGENCIES IN THE REGION), AND WITHIN COUNTRIES (VERTICALLY AND HORIZONTALLY ACROSS PUBLIC AND PRIVATE SECTORS, AND LOCAL COMMUNITIES)

- Reinvigorate networks of MPA and integrated coastal management managers at national and regional levels to share experience both within and between regions.
- Create networks with local/regional leadership that are self-sustaining (financially and with local participants).
- Provide systematic opportunities for exchange visits beyond the local community, peer-to-peer technical assistance, cross-project internships, apprenticeships, collaborative research, access to international science, and participation in international training.
- Engage all relevant sectors and communities in the issue/national knowledge management framework.

DEVELOP COMPREHENSIVE ICRI REGIONAL PROGRAMS TO IMPLEMENT REGIONAL PRIORITIES IN SUPPORT OF LOCAL INITIATIVES

- Improve long-term financial support for implementation of ICRI priorities at regional and national levels.
- Engage high-level decision makers (e.g. ministers) at national and regional levels to provide political commitment to create or reinvigorate regional environmental programs, including ICRI, and implement them at national levels.

BUILD NEW PARTNERSHIPS TO ENGAGE INTERNATIONAL NGOS, GOVERNMENTAL AND INTERGOVERNMENTAL AGENCIES, MULTILATERAL DEVELOPMENT BANKS, LOCAL NGOS AND OTHER PARTNERS

- Use global and regional frameworks, as well as local management goals, to identify common interests, set agendas and build lasting partnerships.
- Work with the private sector on pollution reduction by forming partnerships between government, business, industry and funding sources to implement demonstration projects on the Global Programme of Action for the Protection of the Marine Environment from Land-Based Activities.
- Apply knowledge management in capacity building, integrating the training of diverse sectors together to reinforce networking across disciplines, sectors and public and private organisations.
- Build fundraising capacity by jointly developing proposals to donors, and sharing experiences and proposals as part of exchanging lessons learned.

Recommendations

GLOBAL FRAMEWORKS

- ICRI should provide a more dynamic bridge between the global and regional instruments and the manager of coral ecosystems at national and local levels. The UN Convention on the Law of the Sea provides a comprehensive framework in which to advance this goal.
- Create national ICRI teams.
- Global treaty frameworks that protect coral reefs and associated ecosystems through protected areas, such as the Ramsar (Wetlands of International Importance), World Heritage and Biological Diversity Conventions, need to be strengthened. These vulnerable ecosystems are under-represented in Ramsar and Heritage Convention lists. Contracting Parties are urged to designate suitable areas of their coral reefs, mangroves and sea grasses to these lists. The agenda of the Jakarta Mandate to the Convention on Biological Diversity (CBD) regarding integrated coastal management, marine protected areas and aquaculture, and its national reporting mechanism, offer opportunities for further coral reef conservation.

- Protected species recovery requires stronger national implementation of such conventions, international programs and codes as: Convention on Biological Diversity; Bonn Convention on Migratory Species; Apia Convention; the Caribbean Protocol on Specially Protected Areas and Wildlife and other instruments and programs in the UNEP Regional Seas legal frameworks; the FAO Code of Conduct for Responsible Fisheries; and Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES).
- Over-fishing and destructive fishing practices threaten global food security and the maintenance of the health of coral reef ecosystems. While the FAO Code of Conduct for Responsible Fisheries, and Convention on International Trade in Endangered Species of Wild Flora and Fauna provide a starting framework, new studies and national and regional enforcement must be devoted to species in trade (food fish, live fish, live rock, curios, and aquarium fish).
- New urgency must be given to coordinate local, national and international measures to stop destructive fishing methods, e.g. cyanide fishing and dynamite, and the measures developed through Asia Pacific Economic Community (APEC) working groups to address cyanide fishing must be developed as a matter of priority.
- The International Maritime Organisation provides a framework for safe and ecologically sound navigation and to inform the global shipping community of the sensitivity and vulnerability of these ecosystems. Through these frameworks, States can identify 'particularly sensitive sea areas', designate Areas to be Avoided, apply discharge restrictions, and adopt routing measures, Vessel Traffic Service Systems and pilotage systems. Moreover, managers should develop damage assessment protocols that will be credible in judicial proceedings in order to provide the financial foundation for restoration following spills and groundings.
- The Global Programme of Action for the Protection of the Marine Environment from Land Based Activities (the GPA) is a blueprint for action for governments and their partners who aim to limit impacts on the marine environment. The GPA is organised around the different terrestrial activities and pollutants that must be addressed. It calls for action at the national, regional and international levels. One of the most interesting aspects of the GPA is that it provides governments latitudes in addressing these concerns. For instance, it recognises that action needs to take place at all levels, and specifically provides for the participation of the private sector and NGOs. It emphasises activities that have significant impacts on coral reefs, such as land uses that lead to excessive sedimentation and eutrophication.

REGIONAL MANAGEMENT INITIATIVES

- Among the key components to encourage in regional programs (whether intergovernmental, national, or NGO) are:
  - launch a network of MPA managers;
  - dialogue and partnership with the tourism industry;
  - strengthen watershed management through legally binding protocols, ICZM, ecosystem management and EIAs;
  - launch an MPA training of trainers program;
  - set up a regional expert group on coral reef ecosystems;
  - establish viable working coral reef initiative (CRI) committees at the local and national levels;
  - build a strong multi-disciplinary national team responsible for integrating coral reef conservation into national development activities;
  - document methods and identify best possible standard regional practices;
  - establish or amend legislation and management frameworks, including legislating EIA procedures that empower local communities to manage MPAs and accommodate and incorporate traditional practices;
  - establish a comprehensive monitoring programme, nationally and regionally, to implement the GCRMN and demonstrate the effectiveness of management measures;
  - promote village-based activities focused on empowering local awareness and management of local resources, in this case by linking monitoring by local users to local ecotourism and broader local management priorities; and
  - incorporate cultural and traditional values and practices into national and local levels of management.

KNOWLEDGE MANAGEMENT

- Reinvigorate networks of MPA and ICZM managers at national and regional levels to share experience both within and between regions – networks that are not primarily dependent on outside funding and expertise to survive.
- There should be systematic opportunities for exchange visits beyond the local community, peer-to-peer technical assistance, cross-project internships, apprenticeships, collaborative research, access to international science, and participation in international training.
- Networks will be successful when each member: (a) undertakes responsibility for its membership; and (b) identifies its participation as a critical asset to the function and sustainability of the network.

LINKAGES TO THE CONVENTION ON BIOLOGICAL DIVERSITY AND OTHER INITIATIVES, PROGRAMS AND INSTRUMENTS

- Duplication of efforts should be avoided and harmonisation of work should be pursued through strong coordination between CBD and ICRI.
- The most efficient way for ICRI to promote conservation of coral reefs is to influence bodies that are responsible for or may affect conservation.
- Further strengthen the links between the Convention on Biodiversity and ICRI through more detailed exchange of information between the two Secretariats and closer coordination between the respective work programs.
- ICRI to intensify liaisons with GEF, as financing mechanism for the CBD, to develop project proposals under all four target areas: biodiversity conservation, international waters, global climate change and protection of the ozone layer.
- Need to promote incorporation of coral reef ecosystem conservation into national plans of action under Global Programme of Action.

WORKING TOGETHER BETTER

- Use Global Plan of Action as a venue for governments to work regionally.
- Work with the private sector on pollution reduction by forming partnerships between government, business, industry and funding sources.
- Look for win-win situations for both the private sector and the environment.
- Emphasise capacity building by training local partners in the preparation of GEF and other regional proposals, and coordinate proposals as a means of sharing lessons learned.

Priority Issue Areas

Lessons Learned

MARINE PROTECTED AREAS (MPAs)

- Ecosystem approach: boundaries should be based on natural and physical factors, not political boundaries.
- Principles of ecosystem-based management should be applied from the outset of the planning process.
- Interagency coordinating committees comprised of relevant federal, state, regional and municipal agencies and tribal government officials' representatives are very useful in integrated planing and management.
- Representation: stakeholder advisory committees with equitable representation of all interests are useful tools to engage community participation and support.
- Socioeconomic approach: there is a need to bring socioeconomic considerations into the planning process.
- Marine zoning should be incorporated to eliminate visitor-user conflicts.

POLLUTION CONTROL

- Multiple sources of pollution call for multiple solutions.
- Jurisdictional confusion and limitations lead to difficulties in controlling pollution (effects of deforestation, agricultural run-off).
- Better implementation of the GPA at all levels is needed.
- There is an obvious linkage between coastal development, the private sector and civil society.
- Impacts of pollution tend to spill over to other management areas e.g. fisheries.
- Measures are only taken in response to catastrophes; there are few examples of pro-active behaviour.
- In cases of ship-based pollution, it is difficult to implement the 'polluter pays principle'.
- Particularly Sensitive Sea Areas (PSSAs) can effectively be used to protect sensitive coral areas.
- Better cooperation is called for between ICRI and other regional and international bodies (GPA, Conventions of the Parties etc.).
- There is a need to look at ways of linking coral reef protection with some global atmospheric issues (sea level rise, CO_2 levels etc.).

PRIVATE SECTOR

- Identify stakeholders and incentive structures, and exploit the overlap, for industry and conservation interests: tourism; reef-based mariculture; and marine natural products.
- Identify the drivers/levers that control market behaviour.
- Influence consumers through information/education, certification and eco-labelling.
- Put in place environmental safeguards to regulate private investment and the impacts that arise from the enterprise, e.g. environmental impact assessment, polluter pays principle, zoning, energy and water supply, waste management.
- Make assessment and monitoring of impacts from marine enterprise part of the investment program.
- Identify clear tenure or definition of rights to marine resources – this is an essential factor in promoting green enterprise (can influence willingness to invest and the outcome of benefit sharing arrangements).
- Involve all sectors – public, private, traditional – in developing sustainable marine enterprise.

DESTRUCTIVE FISHING PRACTICES

- Sustainable fisheries practices can only be instituted through new attention to socioeconomic factors such as the provision of alternative livelihood and training in sustainable fisheries practices.
- Control over the introduction of new fishing technology is essential.
- Education of fishers, industry, decision makers and consumers is essential.

Gaps Identified

MARINE PROTECTED AREAS (MPAS)

- Lack of a network of training for trainers and managers
- No strategic approach through Conventions coordination
- Little analysis of what support is needed to form part of Integrated Coastal Zone Management plans
- Few networks at each level of governance
- Lack of political leadership – membership of ICRI to weigh in
- Capacity lacking in many MPAs, particularly enforcement and resource availability
- Coordination at all levels missing in many cases
- Lack of bio-regional planning to identify potential MPAs
- Lack of political and financial support
- MPAs not established as a component of broader biodiversity conservation
- Weak institutional and legal frameworks

POLLUTION CONTROL

- The lack of available information on impacts and scientific uncertainty makes solutions difficult to implement.
- There are not many good examples of successful responses to marine pollution.

PRIVATE SECTOR

- Very little capacity in micro-entrepreneurship (knowledge of financial analysis and brokering deals)
- Few models available of successful enterprises based on marine conservation (success stories not widely documented)
- Few mechanisms available to facilitate partnerships between traditional leaseholders and private sector, due to lack of formal land tenure
- Need for codes of conduct for sustainable tourism and other marine-based enterprise, from the individual entrepreneur to the industry level

DESTRUCTIVE FISHING PRACTICES

- Political support to eliminate destructive fishing practices is inadequate and corruption undermines efforts to establish sustainable fisheries practices.
- The existing legislative and judicial framework, e.g. slow litigation and insufficient funds or penalties, is an insufficient deterrent.

Priority Actions

MARINE PROTECTED AREAS (MPAs)

Goal: Improve the management and sustainable use of fishery resources on coral reefs and related ecosystems through the participatory establishment and use of marine protected areas at both the community level and for larger areas.

- Establish and strengthen MPAs that incorporate fishery no-take zones.
- Establish and strengthen MPAs that incorporate protection of habitats essential to fishery species.
- Use stakeholders, particularly resource users themselves (e.g. fishers), to manage and monitor MPAs set up for fishery management purposes.
- Coordinate fisheries and MPA management. Both MPA and fishery management need to address multiple goals – environmental, social, economic, and political. To be successful, they need acceptance, legitimacy, and a shared vision. The overall goal should aim for maximum sustainable social benefit – not just maximum sustainable fisheries yield.

Goal: Conserve and restore the values and functions of tropical marine ecosystems by applying MPAs in the context of an ecosystem management approach.

- Establish and map MPAs in the context of larger watershed, coastal and marine area planning and zoning, paying particular attention to links among habitat types, land/water influences, and multiple human uses.
- Ensure that appropriate areas include fishery no-take zones, and that these are situated optimally to enhance their management impact and assist surveillance and enforcement.
- Link and network individual MPAs into a system that protects representative and unique habitats, living resources and areas critical to ecosystem functions. This can be done among communities, as well as at the national and regional level.
- Select sites and partners with a view to enhancing replicability and resulting in a multiplier effect.

MARINE PROTECTED AREAS, TOURISM AND THE PRIVATE SECTOR

Goal: Improve the coordination between ICRI and the hotel, cruise ship, ecotourism and other marine-based industries.

- ICRI should formally invite representatives of the tourism industry (World Travel and Tourism Corporation) to join ICRI and engage in a program of independent certification and codes of conduct for sustainable marine tourism.
- ICRI should review and endorse the representatives of the tourism industry, governments and NGOs to develop tourism-based indicators.
- ICRI should review and endorse certification programs (similar to those developed by the Caribbean Alliance for Sustainable Tourism) that facilitate best practices for hotel, cruise ship and ecotourism enterprises.
- ICRI should prepare a formal statement on tourism and marine-based industries to the 1999 session of the Commission on Sustainable Development.
- ICRI should call for transparent pollution reporting by industry and incorporation of coral reef sensitivity into ISO14000 standards for marine-based industry.

MARINE PROTECTED AREAS AND OTHER PRIVATE ENTERPRISE

Goal: Recognise and engage the private sector as an important potential partner in the creation and management of coral reef MPAs.

- Solicit participation by the private sector representatives in meetings, conferences and other planning processes related to the creation and management of MPAs.
- Engage the private sector through economic valuation and market analysis including consumer willingness-to-pay and other incentives, to increase private investment in new products and services.

DESTRUCTIVE FISHING PRACTICES

Goal: Eliminate coral reef destructive fishing practices, such as fishing using cyanide, explosives, and muro ami. Manage trolling, fish trapping, coral collection and netting to eliminate destructive impacts on habitats and ecosystems.

Spotlight on Cyanide

Actions needed in source countries:

- banning cyanide fishing and enforcing the ban (most countries have bans but few are enforced);
- establishing national systems to monitor and regulate (if needed) the live fish export, with special emphasis on especially vulnerable and overfished species such as the napoleon wrasse (*Cheilinus undulatus*);
- strengthening community-based management of local fisheries and education of local fishers in alternatives to cyanide fishing (e.g. hook and line fishing for live food fish and netting aquarium fishes); and
- establishing cyanide detection test facilities at major live fish collection and trans-shipment points, and require cyanide-free certification for export.

Actions to address the unregulated trade in live reef fishes:

- supporting domestic and regional data gathering and sharing on the live reef fish trade;
- implementing monitoring mechanisms at the domestic level to track volume, value and species in the live reef fish trade in both exporting and importing countries;
- supporting in importing countries, the actions of exporting countries to curb the export of fish caught using destructive means. This might include requiring imports to have a cyanide-free certification;
- promoting anti-cyanide policies and practices for the aquarium fish industry in the United States and Europe, and for the live food fish industry in Asia;
- Continuing the partnership of governments, NGOs, and the scientific community to work at local, national, regional and global levels to stop cyanide fishing; and
- encouraging the Asia-Pacific Economic Cooperation Council (APEC) to implement measures to stop cyanide fishing that were developed in its Working Groups in 1997.

POLLUTION CONTROL AND COASTAL DEVELOPMENT

Goal: Reduce jurisdictional limitations that lead to difficulties in controlling pollution of coral reefs and related ecosystems from upstream development.

- Encourage the incorporation of coral reefs and related ecosystems into planning at all levels, from the Global Programme of Action for Protection of the Marine Environment from Land-Based Activities, to National Economic Plans, to municipal plans and village-level coastal management plans.
- Encourage the development of integrated coastal management planning that takes into account watershed/catchment areas, habitats of special concern, coastal zones and offshore marine environments.
- Encourage the development of improved water-quality standards and best management practices for land-use activities that recognise the ecological requirements of coral reef ecosystems.

Goal: Enhance inter-agency coordination in addressing pollution impacts on coastal and marine environments.

- Incorporate coral reef concerns into national plans for implementing the Global Programme of Action through such mechanisms as the Inter-agency Subcommittee on Oceans and Coastal Areas of the Commission on Sustainable Development, which includes both ICRI and GPA partner institutions.

Goal: Address the issue of marine-based impacts such as oil and ship-generated waste and ship groundings, collisions and anchor damage.

- Enlist the aid of IMO as a partner in developing oil and hazardous spill contingency plans, improve safety of navigation (including embedding coral reef hazard maps into electronic navigation systems) and enhance implementation of the International Convention for Pollution from Ships 1973/1978, including especially the provision of port reception facilities.
- Assist national governments in preparing applications to IMO for identification of Particularly Sensitive Sea Areas for significant coral reef regions that are vulnerable to the impacts of international vessel traffic.

Goal: Take advantage of remote sensing platforms and technologies to map and monitor the distribution and health of coral reef and mangrove communities and to identify potential future hazards.

- Employ available remote sensing technologies (aerial, balloons, ships, satellite-based) that are appropriate to the users' needs.
- Call upon space agencies to provide data that can be used to map and monitor the distribution and health of tropical coastal ecosystems.

Goal: Increase the awareness that global oceanic and atmospheric processes may influence the health and vitality of coral reef ecosystems.

- Investigate the importance of atmospheric inputs to coral reef ecosystem vitality including identifying the sources and impacts of atmospheric materials and developing methods that mitigate the production of atmospheric material.
- Investigate the importance of oceanic circulation in transporting suspended and dissolved materials from high latitude areas to the tropics.
- Investigate the impacts of atmospheric degradation on coral reefs (increased ultraviolet radiation and carbon dioxide, and other related issues).
- Investigate the impacts of global warming through field and laboratory studies.

Goal: Test the hypothesis that the declining vitality of reefs may be an indicator of the health of the oceanic ecosystems.

- Increase the level of research and monitoring at nested spatial and temporal scales.
- Include remote sensing, in situ surveys and high precision repeated monitoring of permanently marked stations.
- Develop new technologies for quantifying levels of stress on coral reef organisms.
- Initiate collaborative studies with the physical and biological oceanographic research community.
- Establish monitoring sites along gradients of oceanic environmental quality.

GLOBAL CHANGE/ENVIRONMENTAL SECURITY

Goal: Recognise that the health and vitality of coral reefs is important to all nations because reefs are a fundamental part of the economic life of tropical countries throughout the world.
Raise public awareness that:

- the increase in human population and its implications drive the degradation of coral reefs on local, regional and global scales;
- the continued degradation of coral reefs and their resources may increase the friction between countries and threaten environmental security;
- management effectiveness requires that society address overpopulation and over-consumption of resources; and
- issues of concern include food security, natural disasters, population migration, the illegal drug trade, and the environmental impact of war.

Recommendations

Working Groups: Integrated Management, Coordination and Linkages to Other Initiatives, Programs and Instruments

MARINE PROTECTED AREAS (MPAs)

- Develop a network for management training.
- Promote a strategic approach to MPA establishment through linkages to conventions such as the World Heritage Convention, Ramsar, IMO conventions, and the Regional Seas programs.
- MPAs should be incorporated into wider ICM framework as called for by Chapter 17 of UNCED's Agenda 21.
- Use ICRI leadership to influence establishment and management of MPAs, and to encourage establishment of representation systems of MPAs at national, regional and international levels.

POLLUTION CONTROL

- Need research oriented to developing countries' needs.
- Relate pollution to global climate change/sea level rise.
- Assess effects of pollution on fisheries.
- Develop better and cleaner technology for dealing with waste water.
- Implement GPA at all levels.
- Regional International bodies need to talk.
- Better cooperation needs to take place between ICRI and IMO, particularly with regards to preventive navigational measures (including inserting coral areas in navigational charts).
- National governments can seek to enhance safety of navigation and control marine pollution around reef regions through cooperation with IMO.
- Need more scientific information, which does not preclude immediate action.

PRIVATE SECTOR

- ICRI should formally invite representatives of the tourism industry (WTTC) to join ICRI and engage in a program of independent certification and codes of conduct for sustainable marine tourism.
- Call for transparent pollution reporting by industry and incorporation of coral reef sensitivity into operational practices of marine-based industry.
- ICRI should prepare a formal statement on tourism and marine-based industries to the 1999 session of the Commission on Sustainable Development, with regard to the multi-stake holder dialogue on sustainable tourism (20–21 April 1999).
- Promote research on carrying capacity indices for various coral reef-based activities.

DESTRUCTIVE FISHING PRACTICES

- Eliminate destructive fishing practices by helping to network institutions, organisations, and industry involved in fishing.
- Implement the FAO code of conduct for responsible fishing at international, national, regional, and community levels.
- Culture high-value species for commercial and subsistence markets.
- Provide incentives for sustainable fisheries practices for fishers in both the commercial and subsistence sectors.
- Action is needed in source and importing countries.

- Regional programs and diplomatic pressure must be brought to bear.
- Education of all stakeholders and decision-makers to transform fishing practices and introduce a conservation ethic is necessary.
- Implement a code of conduct and certification program for marine aquarium trade.
- Deny import of any organism that is collected illegally or where there has been use of illegal methods in source countries.

COASTAL DEVELOPMENT

- Encourage development of pilot projects that demonstrate the benefits of ICM to all concerned stakeholders.
- Re-iterate the ICM framework for coral reef management.
- Encourage development of best management practices, manuals and models for coastal activities.
- Coastal planning and permit approval processes should involve early participation of communities/stakeholders and local MPA managers.

GLOBAL CHANGE/ENVIRONMENTAL SECURITY

- Monitoring needs to take place at nested scales.
  - Remote sensing/importance of synoptic perspective allows for ecosystem-based management and modelling.
  - High-precision monitoring (point count) provides statistically valid numerical data on the magnitude and direction of change are needed to convince decision-makers.
  - Local fast action assessment: Rapid assessment techniques (Agra, Reef Check, etc) promote awareness and mobilise community action.
  - Need to develop common formats / Internet access.
  - Scales can be linked through geographic systems analysis (GIS), economic evaluation as a part of this.
- ICRI should call for space agencies to map and monitor the global distribution and health of coral reef and mangrove communities and identify potential hazards to their future. Remote sensing combined with GIS modeling will play an important role in the predictive nature of analysis. Appropriate scale of remote sensing utilising space-based, aerial, local tools.
- ICRI to make statement regarding importance of coral reefs and associated ecosystems for ensuring environmental security.
- ICRI to develop a new definition of 'ecosystem' that allows for a consistent approach to incorporating the full dimension of tropical ecosystems associated with coral reefs.

SESSION 12: Stakeholder Partnerships and Community Participation

Session Chair/Facilitator: Sue Wells
Session Rapporteurs: Ian Dutton, Jackie Alder
Session Panellists: Noah Idechong, Lea Scherl, Peter Espeut

Objective

To utilise selected panellists and case study examples to better understand effective processes of involvement in, and ownership of, management initiatives by a wide range of stakeholders.

Stakeholder Partnerships and Community Participation

Noah Idechong

Pacific Perspectives

- The South Pacific Regional Environment Programme (SPREP) area of the Pacific can be grouped into three sub regions: Micronesia, Melanesia, and Polynesia. They compose 22 island countries and territories, including four metropolitan countries that have had considerable influence and continue to have influence over the rest of the nations.
- Populations tend to be relatively low, with the exception of small islands that tend to have high density.
- Marine tenure is strong and people still have strong links to the land and sea.
- There is strong regional cooperation facilitated by SPREP, FFA, SPC and other regional bodies.
- There is a limited pool of human resource at the national level, which limits efforts to build capacity.
- While it has been accepted that community involvement is important for success, in any conservation initiatives, returning authorities and responsibilities to the communities and clearly defining various roles can be a difficult task.

Some Lessons Learned

- Proper process, although lengthy, is just as important as the message itself, but there is no particular process that can be applied to all.
- Expectations can be very diverse and need to be clearly understood, otherwise they can cause problems later. Objectives need to be clearly defined and understood.
- Perception is an important factor in getting and maintaining support from the community.
- Community participation (not just consultation) in all aspects of management is important.

- What happens in the community does not always follow what is stated in strategic plans.
- Building familiarity and trust among the varied stakeholders is important.
- Communities can be suspicious of thick documents, and the creation of new committees.
- A catalyst (connecting thread) is essential.
- Communities may not necessarily like to be studied.
- Credits shared by all.

Partnerships and Community Participation: Processes Contributing to Sustainable Management

Lea M. Scherl

Most of the tropical marine ecosystems under greatest threat are in developing countries where capacity for management is limited. It has been argued in a number of cases that the most effective approach to management is by developing partnerships amongst a different array of stakeholders (expressed variously as co-management, joint management, collaborative management and partnership management). Central to such an approach must be effective participation of local communities. Of direct relevance to ITMEMS is the fact that the need for partnerships and community participation has been widely recognised in a number of the International Coral Reef Initiatives (ICRI) regional workshops.

Effective participation of stakeholders will, in most cases, require capacity building. Capacity building for effective participation is central to sustainable management, particularly in developing countries. Sustainable management is seen here as

> *effective management of a particular ecological and sociocultural system, undertaken primarily by drawing upon national and local capacities and resources and able to be sustained for a continuous and long period of time.*

The question then is how can we set-up projects and programs that will contribute to the sustainable management of tropical marine ecosystems in the long-term? Table 1 below illustrates that modalities of work, which focus on themes presented on the right hand-side (in contrast to those on the left), are more likely to achieve such sustainability in the long-term. The left and right should not be seen as opposite ends of a continuum, and exclusive of each other. This simply illustrates what is most desirable.

Table 1. Modalities of Work towards Sustainability

WEAKENS SUSTAINABILITY		STRENGTHENS SUSTAINABILITY
Concentration on Activities	vs.	Establishing Processes
Preoccupation with Image	vs.	Developing a Foundation
Doing Alone	vs.	Building Capacity
Acting	vs.	Facilitating
Fighting the Consequences	vs.	Understanding the Causes
Visible Results		**Processes**
(Superficial)		***(Structural Investment)***

In this context of promoting sustainability in the long-term Collaborative Management, as a mechanism to achieve this, is described as in the box below.

> ***Collaborative Management*** *is a range of mechanisms and activities through which stakeholders discuss, and work together towards understanding, the needs related to the management of a particular resource with the aim of ultimately negotiating and agreeing on how roles, rights and responsibilities for such management can be shared.*

Thus Collaborative Management should be seen as much as the process to achieve an agreed position amongst stakeholders on how to best implement management as the agreement itself. Mechanisms and activities that are part of the process of Collaborative Management should be appropriate to each particular context. Bare in mind, as well, that such processes are evolving all the time and should be flexible enough to adapt to changes in circumstances. The important thing is to create a culture of 'learning by doing'.

The process itself has many components, all involving collective understanding and general agreement amongst the stakeholders about:

a. the needs related to management of the bio-physical and social, economic and cultural environment (What is its condition? What are the major threats? What can be done?);
b. what each stakeholder needs to more effectively contribute to management;
c. The most suitable mechanisms for implementing management in that particular ecological, socio-cultural and economic context;
d. how can specific skills be learned and practiced by stakeholders so they can participate in these mechanisms;
e. who can best fulfil what roles, have which responsibilities and rights in implementing management; and
f. how can this process of implementation be monitored and what are the most appropriate indicators of effective management?

Lessons Learned on Important Factors to Foster the Right Conditions to Promote Effective Participation of Stakeholders

RELATED TO LOCAL INVOLVEMENT CONDITIONS AND KNOWLEDGE

- Participation from the most local levels.
- Access to resources.
- Understanding and incorporation of indigenous knowledge and traditional management systems.
- Clear links between local actions and benefits.
- Build on existing local institutions.

RELATED TO LINKAGES AMONGST STAKEHOLDERS

- Processes and opportunities for bringing stakeholders together.
- Facilitation of discussions and conflict resolution.

RELATED TO MODALITY OF IMPLEMENTATION

- Participation from the outset of conceiving an idea.
- Mechanisms for transparency of information and decision-making processes established earlier on.
- Role descriptions for project/programme implementation staff more on the lines of facilitator and coordinator rather than team leader.
- Modality of work of external assistance – 'work from the people and to the people'.
- Participatory monitoring and analysis.

RELATED TO BROADER ENABLING MECHANISMS AND FRAMEWORK

- Conducive legislation and policy.
- Flexibility of institutional mechanisms and re-orientation.
- Mechanisms for sharing benefits across stakeholders.
- Adequate timeframe and funding.

Questions

(These focus on helping to create a broader framework to extrapolate lessons learned from the case-study presentations)

- What contributed to instilling a participatory culture?
- What hindered broad-range participation?
- How can obstacles to participation be dealt with?
- What mechanisms have been more useful for bringing stakeholders together?
- How was any conflict resolution dealt with?
- Have any collaborative management agreements been implemented successfully? What indicators have been used to measure such success?
- Are there national policy and legislative frameworks that support participation and collaborative management?
- Do projects/programs work best if such frameworks are in place? Or have projects/programs provided the impetus to (or placed pressure on) developing such frameworks?

Stakeholder Partnerships and Community Participation

Peter Espeut[1]

The Argument for Stakeholder Management

1. We don't need to worry about places where top-down natural resource management works; maybe we can learn from their experience.

2. In many/most places, top-down natural resource management has not worked and reef resources are over-exploited.
   - Sometimes this is due to the absence of proper law.
   - More often it is because resource-users do not perceive obedience of the law to be in their best interests; because the laws are imposed, the resource users often do not 'own' them.
   - Usually the process is operated by biologists who are untrained in the human sciences (fisheries management is not the management of fish).
   - Often the natural resources are *de facto* open-access.
   - Often the resource-users are from the lowest socioeconomic groups, and exploit the resources at subsistence level or at low levels of return.
   - Usually the high cost of enforcement is out of proportion to the value of the reef resources to be conserved.
   - Usually the levels of community empowerment are low.

3. The option to eradicate poverty to reduce the pressure on the natural environment is usually long term; the reef will probably be dead before that horizon is approached. Conservation of natural resources cannot wait for the national economy to grow itself out of its problems.

4. In a democracy, the option to close off threatened natural resources to extraction in the context of poverty and unemployment is political suicide. There will be flagrant disobedience of the law (the status quo) or widespread civil disturbances.

5. By itself, the option to provide alternatives to natural resource extraction is not likely to reduce pressure on those resources, for as many as adopt the alternatives, in the context of high unemployment new resource-users will take their place.

1. Executive Director, Caribbean Coastal Area Management Foundation, Jamaica

6. Therefore, management of natural resources and of the relationship between the resources and their users is the only workable option. Unless this is done by the stakeholders themselves, it remains top-down management.

The Nature of Genuine Stakeholder Management

1. Genuine stakeholder management (co-management) empowers the stakeholders to participate in the management of the resources they use. Inevitably this means that the power of the state cannot be absolute, but is shared with the stakeholders. This is usually difficult for governments to accept or to implement.

2. Genuine stakeholder management is defined and circumscribed by law. It is not a favour or a concession granted by the party in power, able to be easily reversed after changes of government. It must require parliamentary action to revert to top-down management.

3. Genuine stakeholder management works through a formal social-political institution, such as a Management Council. Informal arrangements approach genuine stakeholder management, but are incomplete.

4. All the stakeholders cannot sit on the stakeholder council, for it must not be too large and unwieldy; so there must be delegates. Every stakeholder must have the opportunity to be a part of the democratic process in choosing their representative. This means that the different stakeholder groups to be represented on the stakeholder institution must first be organized into groups or organizations.

5. The stakeholder institution must guard its democracy jealously, both at Council level and at the level of its member organizations. Any decision of the Council must first be ratified by member associations before it comes into effect. Delegates should not feel that on their own they have the power to take decisions on behalf of their organizations.

6. The boundaries of the resource area to be managed by the stakeholder institution must be clearly defined and should be clearly marked. The type and level of protection may vary according to the nature of the resource and its condition. Marine resources are best protected in the context of marine protected areas.

7. Genuine stakeholder management means that the natural resources managed cannot remain open-access, otherwise they would be insulated from regulation. Some limited-access arrangement must be agreed upon and implemented by the stakeholders. This may involve a license or permit, which may involve a fee. Such arrangements must be strictly enforced, or they will break down. Where resources are over-exploited, then a reduction of levels of exploitation is essential, which may mean a reduction in the number of resource-users. The process to achieve this must be scrupulously fair and without any favour whatever.

8. In reducing the number of resource-users, it is better to promote attrition rather than ejection. Some mechanism must be found to allow in new resource-users, but slower than the rate of attrition. Natural resource managers cannot take on the problems of the overall economy, but some efforts at the provision of alternative sources of income for those who would otherwise have begun to exploit natural resources, would be in order.

9. Before taking decisions the stakeholders must be provided with the best available information. This implies a level of environmental education at the community level. Indigenous knowledge must also be taken into account.

10. When brainstorming, the scientists/facilitators, etc. should refrain from providing suggestions until those from the community have been brought forward. Strategies which emerge from the resource-users will be 'owned' more than those suggested by outsiders.

11. It is important that the resource-users make a clear connection between the regulations to be enacted and the direct benefits to be gained.

12. Empowering some of the resource-users as wardens or rangers will help to get the point across that the users hold the future of their resource in their hands.

13. The watchword is sustainable resource extraction.

Recommendations: ICRI Strategy for 1999–2003

1. Assist countries to develop concrete coral reef action plans based on the ICRI *Call* to *Action* and the *Framework for Action.*

2. Assist countries to obtain funding to implement action plans.

3. Provide technical assistance to support the establishment of co-managed marine protected areas to encompass coral reefs and related ecosystems worthy of protection.

4. Develop a manual to monitor socio-economic parameters in natural resource management, especially in terms of stakeholder partnerships and community participation in the management of coral reefs and related ecosystems.

5. Provide training for biologists in community organization techniques; provide training for social scientists in natural resource management issues.

6. Maintain a database/skills bank of persons able to conduct training; conduct 'training of trainers'.

7. Publish 'how-to' instruction material related to stakeholder partnerships and community participation in the management of coral reefs and related ecosystems.

8. Pick 'winners', co-managed MPAs likely to succeed, and provide them with technical assistance and funding to ensure that there are at least some success stories. The demonstration effect is important.

9. Publish case studies of successful approaches to stakeholder partnerships and community participation in the management of coral reefs and related ecosystems.

10. Post a desk officer in each region with UNEP to monitor and promote ICRI activities.

11. Support information exchanges and visits between co-managed MPAs to promote hands-on learning.

Working Group Report: Stakeholder Partnerships and Community Participation

Lessons Learned

GENERAL

- General principles of stakeholder partnerships and community participation can be applied widely but the process itself must be designed and adapted to the appropriate cultural, political and socioeconomic setting; a better understanding of what does and does not work is needed.
- The terms 'stakeholder' and 'community' cover a wide range of players and interest groups with different needs; these must be identified and each group treated according to their role and interest in the resource and its management (children can also play a major role).
- A balance is needed between the urgent need for coral reef conservation and management, and the time frame required for effective community participation; many projects have either conservation objectives or development objectives, few address both. More 'DENGOs' (Development and Environment NGOs) would help to resolve this.
- There is still a need for research and improved understanding of social, cultural and economic aspects of coral reef management.
- There is still a need for education and capacity building for community participation right across the board, from communities to governments and external agencies.
- There are still inadequate, long-lasting resources for effective participation and development of partnerships.

RELATED TO IMPLEMENTATION

- Communities and stakeholders should participate from the outset (although participation should not be 'mandatory'), and should be directly involved in management (not just consulted).
- A common 'vision' should be established early in the process to create the necessary impetus, however expectations should be realistic (to prevent later disappointment) and objectives clearly defined and understood.
- Mechanisms for information sharing and transparency of the decision-making processes should be established early.
- Indigenous knowledge and traditional management systems must be fully understood and incorporated into the process.
- Project/program implementation staff are best described as facilitators or coordinators (rather than team leaders) and need to be trained as such.
- Suggestions from the community must be considered along with those of an external agency, bearing in mind that strategies which emerge from the resource users will be 'owned' and acted upon more effectively than those suggested by outsiders.
- Building familiarity and trust among stakeholders and communities is essential.
- An institutional mechanism e.g. Management Council, should be established to ensure sustainable community participation, which should be flexible and able to be adapted to changing needs and management concerns – what happens in the community does not always follow what is stated in strategic plans.
- All stakeholders and members of the community at all levels must democratically be represented in the process.
- Existing local institutions/committees/associations should be used where possible, rather than creating new ones, although new groupings of particular interest groups should be established if these are lacking.
- Mechanisms must be established for sharing benefits to be gained from management strategies.
- Empowering some of the resource users as wardens or rangers will help to get the point across that the users hold the future of their resource in their hands.

- The boundaries of the resource area to be managed by stakeholders must be clearly defined and should be clearly marked.
- Some limited-access arrangement may be needed, implemented by the stakeholders and strictly enforced, e.g. through licensing. Where resources are over-exploited, a reduction in the number of resource users through a scrupulously fair process will be necessary; it will probably be better to use 'attrition' rather than ejection.
- Communities and stakeholders can play an important role in monitoring and analysis.

RELATED TO THE BROADER ENABLING FRAMEWORK

- Requirements for community participation and stakeholder partnerships should be defined/enshrined in national or local legislation and policy.
- Community participation is a long-term process if it is to be sustainable, and an appropriate time frame must be developed and adequate funding allocated.
- Governments are often reluctant to accept or implement an approach involving community participation (comanagement), as this leads to empowerment of the stakeholders and community.
- Where there is unsustainable use, measures to provide alternative sources of income are essential if community participation is to be sustained over a long period of time.
- Donor agencies must understand and develop project implementation models that reflect the importance of community participation and the time required to ensure its establishment as a sustainable process, and must be careful to identify appropriate implementing organisations.

Gaps Identified

PROCESSES, METHODS AND TOOLS FOR STAKEHOLDER PARTNERSHIPS AND COMMUNITY PARTICIPATION

- Poor understanding by stakeholders and particularly local communities of decision-making processes
- Inadequate understanding of how best to develop, adapt and apply culturally- and context-sensitive methods for partnerships and community participation
- Lack of indicators for monitoring and evaluating the effectiveness of partnerships and community participation
- Insufficient recognition and understanding of differences between stakeholders, and of the fact that some, like traditional owners, may need special consideration
- Insufficient recognition that different stakeholders have different rights and responsibilities with respect to resource management
- Inadequate appreciation of the time needed and the complexity involved in promoting, developing and implementing processes for stakeholder partnerships and community participation

CAPACITY FOR STAKEHOLDER PARTNERSHIPS AND COMMUNITY PARTICIPATION

- Poor skills for facilitation of participatory processes in tropical marine ecosystem management
- Inadequate training of government officials and management authorities in methods and processes for community participation and consultation with a wide range of stakeholders
- Inadequate capacity within stakeholder groups to participate effectively and actively in tropical marine ecosystem management

BROADER FRAMEWORK FOR STAKEHOLDER PARTNERSHIPS AND COMMUNITY PARTICIPATION

- Inadequate mechanisms and processes, including legislation and other mechanisms, to empower stakeholders and communities to manage their marine resources
- Inadequate transparency and accountability in the decision-making processes and actions
- Insufficient alternative income opportunities that are appropriate to ensure coral reef conservation
- Lack of balance between reef conservation needs and the needs of local communities and stakeholders

INFORMATION AND UNDERSTANDING

- Inadequate understanding of the importance of social, economic and cultural information in tropical marine resource management
- Lack of information at the community level and in local languages
- Insufficient information exchange and sharing of experiences at and across the global, regional, national and community level
- Insufficient analytical and documented case studies of the processes, methods and tools that contribute to effective stakeholder partnerships and community participation
- Inadequate information available to stakeholders with respect to environmental, social, economic and cultural issues relating to the management of coral reefs and related ecosystems

RESOURCES

- Inadequate understanding on the part of donors and other external agencies of the time scale over which resources should be made available, and of the flexibility that is required to ensure a genuine participatory process
- Scarcity of creative financing models
- Frequent failure to recognise that the aim of sustainable financing must be built in from the beginning of the process

Priority Actions

Resource users and dependent local communities are the key custodians of coral reefs. As such they must be involved from the beginning in all aspects of resource management and be empowered to contribute to the process which can best achieve the conservation and sustainable use of coral reefs and related ecosystems.

DEVELOP, DISSEMINATE AND EXCHANGE INFORMATION AT AND ACROSS THE GLOBAL, REGIONAL AND NATIONAL LEVELS, TAILORED FOR NON-EXPERT/COMMUNITY USE

- Appoint designated ICRI community coordinators to facilitate (via a clearing house) the exchange of information within each UNEP/ICRI region, and to help match donors with project opportunities;
- Establish a web site that contains reference materials and contact directories suitable for access by resource users, communities, local trainers etc.
- Set up a list server which facilitates dialogue between communities and other key stakeholders, including scientists, donors and educators.
- Develop contact directories of persons with skills in community organisation, training, capacity building and development, and directories of organisations and individuals, particularly those available on a volunteer or shared cost basis, to assist local communities in specialist aspects of coral reef management.
- Develop reference manuals and ensuring the dissemination of these and existing reference materials on community participation and stakeholder partnerships, including materials not specifically prepared for coral reef management, but that might nevertheless be relevant.

CREATE BETTER BRIDGES BETWEEN THE HUMAN AND THE BIOPHYSICAL DIMENSION IN THE IMPLEMENTATION OF CORAL REEF MANAGEMENT PROCESSES

- Raise awareness of social science issues, methods and the benefits of this approach among biological and physical scientists, consultants, bureaucrats etc., and conversely raise awareness of biophysical science issues, methods and benefits among social scientists.
- Include social science in training courses, education curricula, extension programs etc.
- Improve the availability and applicability of tools, materials and methods derived from social science.
- Encourage the implementation of management mechanisms and activities in field programs that simultaneously incorporate the social, economic, cultural and biophysical aspects.

- Ensure that national or local tropical coastal management programs (including specific coral reef initiatives) clearly define the process for effective stakeholder partnerships and community participation, including the roles, rights and responsibilities of each stakeholder group, the funding mechanisms to be used, and the monitoring and evaluation process.

DEVELOP AND PROMOTE TOOLS AND PROCESSES FOR EFFECTIVE PARTNERSHIPS AND PARTICIPATION INCLUDING:

- sustainability and performance indicators that can be used by communities to monitor and evaluate trends in social and economic activities and the effectiveness of prevailing management strategies;
- programs to monitor and assess the biophysical health of coral reefs and associated systems that can be used by non-experts and local communities;
- activities, such as exchange visits, through which communities and stakeholders can directly experience management initiatives at all stages of development and implementation, and learn both from their own past experience and that of others to adopt management approaches to new emerging conditions;
- training programs for community members, project implementors and others directly involved in developing a sustainable participatory process that emphasises facilitation and conflict resolution; and
- monitoring indicators for effective participation of a wide range of stakeholders.

ENCOURAGE DONOR AGENCIES, GOVERNMENTS, DEVELOPERS, AND PROGRAM PROVIDERS TO MODIFY THEIR PROCEDURES TO SUPPORT EFFECTIVE COMMUNITY PARTICIPATION AND STAKEHOLDER PARTNERSHIPS

- Ensure that there are conditions in place for the development of long-term processes, from pre-feasibility assessment through to ongoing sustainable mechanisms, thus recognising that stakeholder partnerships and community participation are a 'way of life', not just a 'three-year project'.
- Ensure that programs have specific objectives to establish processes for raising community awareness of the many values of coral reefs, and to undertake capacity building for stakeholders in relevant methods of reef assessment, conservation and sustainable use.
- Engage with local communities via an extension process which is implemented in a way, and at a pace, commensurate with community capacity and local needs, and which is flexible and able to respond to changing political and social conditions.
- Establish better coordination mechanisms among themselves to ensure consistency and efficiency in the assistance provided, and to avoid duplication of effort and the overuse of limited local resources.

Principles

The participants in this session suggested that the following amendments should be made to the PRINCIPLES in the 1995 *Framework for Action.*

PRINCIPLE 1

Achieving the ICRI's purpose requires the **equitable** participation and full commitment of governments, local communities, **traditional owners,** donors, NGOs, the private sector, scientists, and other resource users; therefore true partnerships, cooperation and collaboration exemplify ICRI activities.

PRINCIPLE 2

No change.

PRINCIPLE 3

Human activities are the major source of coral reef degradation; therefore managing coral reefs means managing those human activities. Individuals whose decisions and actions affect coral reefs – from boardrooms to beaches – need to be **empowered to achieve** conservation and sustainable use of coral reefs and related ecosystems.

PRINCIPLE 4

The diversity of cultures, traditions and governance within nations, regions and local communities should be recognised and built into all ICRI activities.

PRINCIPLE 5

Integrated coastal management, **by empowering coastal communities and encouraging partnerships among key stakeholder interests,** provides a framework for effective coral reef and related ecosystem management.

PRINCIPLE 6

Developing national capacity to conserve and sustainably use coral reefs and related ecosystems requires long-term (decadal) commitment. Improvement of coral reef management requires a permanent commitment, **changes in individual behaviour,** and an adaptive, **learning-based** approach.

Working Groups: Stakeholder Partnerships and Community Participation

PRINCIPLE 7

Strategic research and monitoring programs, **incorporating data routinely collected and periodically evaluated by all stakeholders,** should be an integral part of ICRI, because management of coral reefs and related ecosystems should be based on both the most relevant scientific information **and the essential local knowledge and understanding of all stakeholders.**

PRINCIPLE 8

No change.

PRINCIPLE 9 (NEW)

Resource users and dependent local communities are the key custodians of coral reefs; as such they must be involved, from the beginning, in all aspects of coral reef management and be empowered to contribute to the process which can best achieve conservation and sustainable use of coral reefs and related ecosystems.

SESSION 13: Public Awareness and Education, Including Capacity Building

Session Chair/Facilitator: Peter Hunnam
Session Rapporteurs: Malcolm Turner, Floyd Homer
Session Panellists: Stephen Colwell, Lauretta Burke, Diane Tarte

Objective

To utilise selected panellists and case study examples to review existing activities, facilitate the sharing of experience and identify capacity-building needs.

Building Public Awareness about Coral Reefs

Stephen Colwell[1]

Building public awareness about coral reefs should be an integral part of any coral reef conservation and management plan. Although the details of your public awareness program will vary depending upon your situation and your resources, the following suggestions summarize some of the lessons that have been learned in prior public awareness campaigns.

1. Identify specific target audiences for your message.
2. Learn as much as you can about your audience.
3. Shape the message to address the interests and concerns of your audience.
4. Use simple, direct language (explain details later).
5. Match the messenger to the message.
6. Use images when possible – coral reefs are photogenic.
7. Use numbers – as long as you can back them up.
8. Try multiple approaches and media to send the same message.
9. Repetition increases impact. Repetition increases impact.
10. Use symbols, mascots or logos to build interest.
11. Adapt existing materials when feasible.
12. Maintain communication among the different groups trying to build public awareness.

Working Group Report: Capacity Building, Awareness Raising and Education

Lessons Learned

- Establish baseline information/data on public awareness of all stakeholder groups.
- Identify the target groups and establish clear and measurable objectives.
- Target each group at an appropriate level with specific/relevant approaches.
- Conduct regular and ongoing reviews and evaluations of effectiveness of awareness.
- Provide follow-up to awareness campaigns to reinforce the message and sustain the efforts.
- Use simple and fun approaches or methods for awareness raising.

1. Executive Director, CORAL – The Coral Reef Alliance

- Foster a sense of ownership to develop greater responsibility.
- Utilise research as an extension and education tool and involve the target group in the process.
- Engage the general community through non-government organisations.
- Predictive mechanisms used to determine future impacts currently lack credibility and community support.
- Apply the principles of ecosystem-based management from the outset in the planning process.
- Use a public process to establish ecosystem-based management objectives and restoration goals based on our best understanding of the concept of sustainability.
- Utilise an adaptive process in the absence of information; use the best science available upon which to base decisions.
- Establish an integrated planning process but do not let the rigour of the process dominate the activities.
- Recognise from the outset that humans are a part of the ecosystem and that our activities, or effects of our activities, cannot be separated from any holistic approach to management.
- Incorporate socioeconomic information into the planning process – this is essential.
- Listen to, and attempt to understand, all points of view in an ecosystem management planning process.
- Encourage integration of sectoral and central institutions. Inter-institutional agreements can be effective when used.
- Make politicians, decision-makers and all stakeholders aware of the ecological and economic benefits of the ecosystem and the need for its sustainable use.
- Undertake strategic planning, which is vital, early in the process.
- Start with a small-scale and simple approach, then progress to bigger operations for higher demonstration value.
- Work with communities should facilitate better organisational skills at the local level and accompany them through a process of finding their own solutions.
- Although small case studies show independence from government, ultimately there is no way to effectively operate without some partnership and coordination with government, NGOs and donors.

Gaps Identified

- 'Green' certification of hotels, dive and tour operators as a means of promoting awareness
- Determination of which existing certification program is appropriate to coral reef conservation
- Development and use of tools for linking reef use and conservation
- Local or regional 'Coral Reef Initiative' to help promote local ICRI action
- Lack of accessible and widely promoted database or meta-database of information relevant to coral reef management
- Endorsement/support for education/awareness programs to be of at least 10 years duration as a means of ensuring success

Priority Actions

CAPACITY BUILDING IN DEVELOPING COUNTRIES

Issues

- There is a general lack of capacity at very basic levels in developing countries.
- Many capacity-building efforts focus only on government management agencies.
- A lack of coordination between donor projects leads to duplication and/or gaps in capacity building.
- There is a lack of well-trained local level managers and institutions with sufficient management capacity, limited accessibility to scientific information for managers and the public, and difficult communications.
- Local communities need to be empowered/enabled to manage their own environment and develop, where appropriate, a sense of ownership.

Outline Action Plan

- Upgrade capabilities of existing trainers and educators - schoolteachers (especially primary), NGOs, government, private sector.
- Train additional 'trainers' such as community 'facilitators'.
- Provide synergy to national programs by incorporating active participation of NGOs, the media and the private sector, in consideration of the plurality of society. Offset the gaps in national capacity in certain areas through available expertise among NGOs, the media and the private sector.
- Share training modules for capacity building.
- Encourage and support mechanisms to coordinate efforts of donor projects.
- Encourage donor agencies to sign onto goals and ideas of ICRI.
- Require organisations conducting aid projects to make significant efforts to coordinate the projects. This should also be part of the scoring (assessment) procedure to select implementors.
- Identify and build on local traditional and cultural practices and knowledge.
- Increase efforts to support sustainable livelihoods in local communities.

Approaches

- Build on success to date: collate/evaluate/adapt/translate existing tools and methods.
- Develop new tools and methods as necessary.
- Promote awareness and ensure availability of tools and methods.
- Make innovative use of public media for education (TV, radio).

DEVELOPMENT OF AN INVENTORY OF EDUCATION/AWARENESS MATERIALS AND DETERMINATION OF REPOSITORY OPTIONS

Issue

- A wide range of public awareness materials exists but is often difficult to access.

Action

- The International Coral Reef Initiative is to support the setting up of a centralised inventory of public awareness, educational and capacity-building materials, preferably in association with existing organisation(s). This should be available in both electronic form (web site) and hard copy to make it accessible to all supporting coral reef initiatives worldwide.

Outline Action Plan

- Develop a centralised inventory of public awareness, educational and capacity-building materials on a Web page, based on ICRI or International Year of the Ocean site.
- Design inventory as a matrix – types of people, places, activities, materials.
- Incorporate search engines (keywords).
- Recruit a coordinator to drive the effort.
- Query documents and photo holders about copyright requirements (sharing good photos).
- Develop a physical address for mail requests.
- Examine distribution of materials (costs, packaging) – this is a challenge in developing countries.
- Develop interactive site and user-friendly template for users to be able to add new materials.
- Build up inventory from national and regional groupings (languages, dates etc.) and translation of inventory.
- Incorporate training in use of materials.
- Produce user-friendly (fewer graphics) inventory for countries with low-power computers.
- Produce an inventory, not a repository, of materials.

ESTABLISH AN EFFECTIVE SYSTEM TO SHARE KNOWLEDGE AND LESSONS FROM OTHER PROGRAMS AND PROJECTS

Issue

- Lack of knowledge of other programs and initiatives reduces capacity.

Outline Action Plan

- Define framework for information collection.
- Develop global network links with regional networks (use existing).
- Compile an inventory of programs and projects.
- Identify and promote examples of world best practice.
- Encourage institutions to release internal documents that will assist regional programs.
- ICRI could find a partner to take responsibility for the global network.

Case Studies: Public Awareness and Education, including Capacity Building

PRINCIPLES AND GUIDELINES FOR AWARENESS RAISING AND CAPACITY BUILDING – MONITORING AND EVALUATION

Action

- Utilising the ICRI network, encourage the sharing of experiences in public awareness, education, and capacity building, including monitoring and evaluation methodologies.

Outline Action Plan

- Within each region, ICRI members could identify and develop a node to collate the regional and local experiences on principles and guidelines for capacity building, education and awareness raising.
- Develop an education sub-node at the regional level.
- Develop information repositories at the regional level.
- Carry out monitoring and evaluation at the regional level.
- ICRI secretariat to facilitate links between regions.
- At next ITMEMS, include session on principles/guidelines/monitoring and evaluation.

ACCREDITATION SCHEMES

Objective

- To raise awareness and reward organisations that are employing good practices.

Outline Action Plan

- Use ICRI to define guidelines relevant to coral reefs and different user groups (sea-based and land-based), activities (snorkellers/divers/boaters/ ships), land use (hotels/agriculture/manufacturing), construction/development.
- Develop an inventory of existing accreditation schemes for sample guidelines, and seek partnership(s) for implementation.
- Develop 'ICRI' endorsed guidelines.

Approaches

- Use awards program to raise the profile of ICRI and publicise good programs.
- Identify targets – Tourism (cruise ships, hotels, dive operations), farmers/land users, recreational users/clubs.
- Develop a sponsored international/regional scheme through existing programs.
- Use the programs that receive awards as case studies.
- Employ third-party verification or peer evaluation.
- Consider regulatory (mandatory) and voluntary schemes.
- Publicity is an important element.
- Could link the promotion with a training initiative.
- Scheme organiser needs to have authority – an established marine authority, industry association or government agency.
- ICRI could focus on a few categories of awards (government, NGO, tourist organisations, hotel etc.).
- Could do this annually or link to four-year ICRI cycle.

SESSION 14: Data and Information for Management

Session Chair/Facilitator: Charles Ehler
Session Rapporteurs: Annadel Cabanban, Eddie Hegerl
Session Panellists: Nyawira Muthiga, Herman Cesar, Leah Bunce

Objective

To utilise selected panellists and case study examples to define the priority data and information needs for implementing and evaluating management initiatives, and to identify mechanisms for bringing the science and management of coral reefs into a closer working relationship.

Who Uses What, and Why? – Incorporating Socioeconomic Assessments into Tropical Marine Ecosystem Management

Leah L. Bunce[1]

Purpose

- Discuss the socio-economic side of information management and how adding this component can contribute to the success of marine management.
- Suggest points for discussion for developing a framework for ICRI and the international community.

What Are the Benefits of Socioeconomic Information?

- It allows adaptation of management programs.
- It gains users' support, compliance, assistance – Public Participation.
- It illustrates the value of marine management.

What Is 'Socioeconomic Information'?

- Usage patterns
- Characteristics of the users
- Users' perceptions
- Relations amongst users
- Socio-cultural values.

The Role of Social Scientists

- To be the marine manager's link to the community.

1. International Program Office, National Ocean Service, National Oceanic and Atmospheric Administration, USA

Recommendations

- Socioeconomic monitoring and research
- Socioeconomic impact assessments
- Social scientists on staff
- Training in socioeconomic methodologies and incorporation into management
- Dissemination of information from demonstration projects
- Incorporation of this information into management and decision making.

Questions for Discussion

- To what extent have you reaped the benefits of socioeconomic information?
- Why are socioeconomic assessments so rare? What are the impediments?
- To what extent do these socioeconomic variables affect your management?
- Is the given framework an exhaustive list? What needs to be added or subtracted?
- Why aren't social scientists playing a greater role?
- What do you need to incorporate socioeconomics?

Working Group Report: Data and Information for Management

Using the experiences and expertise of participants and drawing on the lessons learned from the Priority Issue Sessions and Regional Reports, this session addressed the lessons learned, gaps, and priorities for action with regard to data and information for management. These components relate to social, economic, and biophysical data and information. Communities are defined here to include researchers, policy-makers, resource managers, and resource users.

Lessons Learned

- Knowledge is important in empowering communities in managing resources.
- Participatory research and monitoring play an important role in empowering the community. It is important to integrate different levels and types of monitoring activities (scientists, managers, stakeholders).
- We should ensure that, in addition to determining the economic advantages of sustainable use, the benefits of sustainable use filter down to the people who have changed their lifestyles and abandoned destructive practices.
- Communities and users need to be involved in monitoring (increases understanding/ownership of results of monitoring).
- Monitoring is relevant to the community.
- Improved institutional capacity is important to use information effectively in many regions, nations and sites.
- Appropriate methods are needed to manage resources effectively.
- The use of appropriate methods is needed to evaluate threats.
- Private individuals will support environmental initiatives when socioeconomic benefits are tangible.
- It is important to demonstrate the effectiveness/benefits of no-take zones.
- Quantitative analysis of financial implications to both the private sector and national economies is needed to provide incentives.
- Baseline studies and monitoring of marine resources provide verification of the effectiveness of MPAs.

Gaps Identified

ASSESSING THE STATE OF THE SYSTEM

- Lack of global awareness of the value of coral reefs
- Low global awareness of tropical marine ecosystems
- Inefficient monitoring programs
- Inadequate information for measuring land-based sources of pollution
- Inadequate international actions on transboundary marine issues
- Lack of global knowledge of catastrophic events
- Inadequate global knowledge of status of reefs

SETTING PRIORITIES AND DECISION MAKING

- Lack of appropriate information for management
- Inadequate institutional capacity for using data and information for management
- Poor coordination and integration of regional information networks
- Inadequate research directed toward management needs
- Inadequate cross-disciplinary knowledge and understanding
- Lack of socioeconomic information for management
- Inadequate awareness of the value of socioeconomic information
- Lack of monitoring tools for local communities
- Inadequate funding for long-term monitoring
- Inadequate knowledge of the impacts of resource use
- Inadequate capacity to identify flora and fauna of tropical marine ecosystems
- Inadequate information on the effectiveness of restoration activities

PERFORMANCE CRITERIA

- Inadequate performance indicators for management
- Inadequate capability to determine management success

Priority Actions

IMPROVE GLOBAL CAPACITIES FOR ASSESSING THE STATE OF CORAL REEFS AND OTHER TROPICAL MARINE ECOSYSTEMS

- Increase global awareness of the value of, and threats to, coral reefs to the same level of awareness of tropical rainforests.
- Focus habitat assessments on tropical marine ecosystems other than coral reefs, such as seagrasses, mangroves and saltmarshes.
- Develop appropriate monitoring programs that focus on effectively measuring indicators of ecosystem change.
- Improve understanding of, and encourage effective management actions to deal with, the impacts of land-based sources of marine pollution, particularly urban and agricultural sources, on tropical marine ecosystems.
- Encourage governments to establish programs to deal with transboundary ecosystem management issues, such as the South China Sea and the Meso-America Reef Corridor.
- Expand the GCRMN's capacity for assessing biological, cultural and economic impacts of catastrophic events like large-scale coral bleaching.
- Update the GCRMN 1998 Status of Reefs report in time for the 9th International Coral Reef Symposium.

IMPROVE MANAGEMENT CAPACITIES FOR SETTING PRIORITIES AND MAKING DECISIONS

- Improve the transfer of user-friendly information to managers and users in an appropriate language and timely manner.
- Strengthen institutional capacity for using information by providing training programs and essential resources, such as computers and field equipment.
- Establish compatible and comparable regional information networks to share and store data.
- Use case studies to illustrate where scientific information has been used to influence management decisions.

- Conduct cross-disciplinary training to facilitate the understanding and sharing of the knowledge of eachother's disciplines among natural scientists, social scientists and managers.
- Link socioeconomic information with biophysical information, including traditional knowledge, as an essential part of ecosystem-based management.
- Raise awareness of socioeconomic values by developing a baseline manual, training programs, and attracting more social scientists to participate in ICRI.
- Develop quick, simple, inexpensive tools that allow local communities to monitor their own resources.
- Articulate the reasons for long-term monitoring to politicians and funding agencies using examples of best monitoring practice.
- Determine the costs and benefits of resource uses in tropical marine ecosystems, including the benefits of sustainable practices and the costs of destructive practices.
- Urge governments and academic institutions to support taxonomic studies and training that will assist the management of tropical marine ecosystems.
- Review and evaluate global experiences of the effectiveness of tropical marine ecosystem restoration.

DEVELOP AND IMPLEMENT PERFORMANCE CRITERIA FOR MANAGEMENT SUCCESS

- Design outcome-based performance indicators for ecosystem management.
- Specify measurable management targets that can be evaluated through outcome-based performance indicators.

CALL TO ACTION – ICRI 1998

Renewed Call to Action

'Coral reefs are in serious decline globally, especially those near shallow shelves and dense populations.'
ICRI Call To Action, June 2, 1995

The contents and message of this document were endorsed by over 300 delegates from 49 nations at the International Tropical Marine Ecosystems Management Symposium in November 1998. This document represents a renewed global call for action on the continuing decline in the health of the world's coral reefs.

The Global Problem Continues

Coral reefs and associated seagrass and mangrove ecosystems are amongst the most biologically productive and diverse on Earth. In addition to the economic benefits of coral reefs, these ecosystems sustain the social fabric and cultural values of many coastal communities around the world. The threats to coral reefs and related ecosystems place in jeopardy the sustainable development of many communities, global biodiversity and the health of the oceans. Global concern for the coastal and marine environment is reflected in Agenda 21 of the United Nations Conference on Environment and Development (UNCED) and more recent initiatives, including the Jakarta Mandate of the Convention on Biological Diversity (CBD) and the Global Programme of Action for the Protection of the Marine Environment from Land-based Activities (GPA).

The deteriorating condition of coral reefs around the world continues to be a source of grave concern. Improved monitoring data and detailed predictive studies presented at the International Tropical Marine Ecosystems Management Symposium indicate that, in the four years since the publication of the first International Coral Reef Initiative Call to Action, the state of coral reefs and associated marine ecosystems has worsened significantly.

Human activities threaten the majority of coral reefs in all regions of the world. The 1998 'Reefs at Risk' study found that '58% of the world's reefs are potentially threatened by human activity – ranging from coastal development and destructive, over-fishing practices to over-exploitation of resources, marine pollution and run-off from inland deforestation and farming'. Reef Check surveys conducted in 1997 and 1998 found that most reefs are severely over-fished with most high-value organisms missing.

In addition, the recent impacts of 'natural' events on coral reef ecosystems, such as widespread coral bleaching (documented through the Global Coral Reef Monitoring Network), catastrophic storms, and crown-of-thorns starfish, provide an alarming overlay to the increasing human impacts. Over the last 14 months to November 1998, 40-50% of the world's reefs have been hit by severe to catastrophic bleaching. Infestations of crown-of thorns starfish have been reported in 26 countries in 1996-1998.

The International Coral Reef Initiative

The International Coral Reef Initiative (ICRI) is a partnership among nations and organisations seeking to implement Chapter 17 of Agenda 21, and other international Conventions and agreements for the benefit of coral reefs and related ecosystems. The Initiative was established in order to stop and reverse the global degradation of coral reefs and related ecosystems. The ICRI partnership and approach thus far has been to mobilise governments and a wide range of other stakeholders in an effort to improve management practices, increase capacity and political support, and share information on the health of these ecosystems.

The first International Coral Reef Initiative Workshop was held in the Philippines in June 1995. Its aim was to enable countries, donors, and development and funding agencies to work with coral reef managers, private sector representatives, non-governmental organisations and scientists to develop a Call to Action and a Framework for Action for achieving sustainable management of coral reefs and related ecosystems.

The Call to Action highlighted the significance of coral reef ecosystems to sustainable development. 'Coral reef ecosystems offer benefits to humankind beyond those realised for food production, tourism, recreation, aesthetics, and shoreline protection. Capable of sustaining innumerable coastal communities worldwide, these ecosystems also have great economic, social, and cultural importance to nations, and to entire regions. As competition among multiple uses of reef resources increases, so too will their significance to the human populations that depend on them.' Continuing degradation of coral reefs and related ecosystems and their resources may increase the conflict amongst users and threaten environmental and food security. Coral reefs are the life support system for the existence of small island developing states and many coastal communities of developing tropical countries.

The purpose of the Call to Action was, and remains, to mobilise governments and the wide range of other stakeholders whose coordinated vigorous and effective actions are required to address the threats to reefs. The Framework for Action calls for action in four major areas:

- **integrated management;**
- **capacity building;**
- **research and monitoring; and**
- **review.**

The Dumaguete City workshop (Philippines, May–June 1995) set in place a strategy for subsequent action under ICRI, including endorsement of the need for periodic review of the extent and success of ICRI implementation as an essential element of the ICRI strategy.

ICRI Achievements 1995–1998

Since the first ICRI Workshop significant progress has been made in implementing the elements of the ICRI Call to Action and Framework for Action. This resulted from the action of many involved stakeholders and through many large and small efforts from the local to the global level.

Governments of ICRI partners and non-government organisations (NGOs) raised the profile of coral reefs in the major international fora. The Initiative was endorsed by the Parties to the Convention on Biological Diversity, the Ramsar Convention on Wetlands of International Importance, the Commission on Sustainable Development (CSD), the United Nations Environment Programme (UNEP) – which emphasised the importance of the Regional Seas Program to ICRI, the Intergovernmental Oceanographic Commission, and the scientific community at the Eighth International Coral Reef Symposium in Panama. Agreement was reached on The Global Programme of Action for the Protection of the Marine Environment from Land-based Activities which bears directly on reducing a major source of threat to reefs.

Regional action plans have been developed in all regions of the world: Tropical Americas; the Pacific; the East Asian Seas; South Asia; Eastern Africa and the Western Indian Ocean; and the Middle East. Regional, and also national and local coral reef initiatives were created based on the elements of the Framework for Action and ICRI regional strategies. The regional reports presented at the meeting and contained in the workshop report evaluated the state of implementation of numerous coral reef activities in each region. However, the lack of national level commitments to coral reef programs in some countries hindered implementation of global and regional achievements. While UNEP and several of its Regional Seas Programmes have been productive ICRI partners, the ongoing role of UNEP and the function of regional coordination needs strengthening and identified resources.

Growing partnerships with the scientific and NGO communities were particularly effective in advancing ICRI goals. Borne of their strong commitment, the 1997 International Year of the Reef, followed by the 1998 International Year of the Ocean, broadened awareness and commitment around the world and created a new sense of urgency for conservation and sustainable use of coral reef ecosystems. The Pacific Year of the Reef and the launch of the Reef Check voluntary monitoring network are just two of the many innovative activities of the International Year of the Reef. Each continues to generate action and the information and awareness needed to support that action.

The international science community continues its leading role in the development of new initiatives to better assess the state of coral reef ecosystems and to engage the public in these efforts. Reef Check has involved recreational divers in over 40 countries to obtain a scientifically valid picture of the impacts of humans on reefs, while also raising public awareness. The ICRI Global Coral Reef Monitoring Network (GCRMN) was established under the Intergovernmental Oceanographic Commission, the World Conservation Union (IUCN) and UNEP, and made significant progress in implementing coral reef monitoring around the Indian Ocean and South Asia, and in parts of Southeast Asia, the Pacific Ocean and the Caribbean where the Caribbean Coastal Marine Productivity network is already monitoring reefs in 18 countries. The GCRMN and Reef Check have now combined forces to form a comprehensive monitoring program. The lack of sustainable funding sources continues to jeopardise the viability of these efforts.

The Global Coral Reef Monitoring Network, Reef Check, ReefBase, the Representative Assessment of Management Parameters and other efforts have increased our understanding of the state of reefs. This meeting has reviewed the results of monitoring efforts in all regions of the world produced by Reef Check and the GCRMN and heard reports on significant efforts to use rapid assessment techniques to survey coral reef ecosystems.

It is also clear that many local communities around the world continued or initiated efforts to find sustainable means to use the marine resources upon which they depend. Many more require the education, capacity building, training and finances necessary to begin to realise this possibility.

Since 1995 bilateral and international development resources have continued to be directed at projects related to coastal management, sustainable coastal development, biodiversity conservation and other relevant activities. These activities have not been systematically enumerated but it is clear that some funding priorities have been shaped by ICRI goals. Furthermore the World Bank has shown its strong commitment to building the ICRI partnership by hosting a major coral reef symposium and other efforts. A study conducted by the World Bank in Indonesia has increased our understanding of the economic value of reefs to local, regional and national economies.

We must continue and strengthen this progress in the face of clear evidence of increasing threats to coral reefs and related ecosystems. Fortunately, evidence suggests that reefs have a high capacity for recovery; if pressures are reduced there is hope that the health of many reefs will rebound.

The International Tropical Marine Ecosystems Management Symposium – Building the Foundation of New ICRI Action

The International Tropical Marine Ecosystems Management Symposium (ITMEMS) was held in Australia in November 1998. The Symposium provided a forum for the review and evaluation of ICRI implementation. The review was conducted within a framework of the four ICRI cornerstones: integrated management, capacity building, research and monitoring, and review. The Symposium also provided an opportunity to identify shortcomings in the global ICRI strategy and for delegates to give guidance to the Secretariat and ICRI partners on the future direction of the Initiative.

ITMEMS 1998 Proceedings

Participants at ITMEMS reaffirmed the importance of reefs to their cultures, communities and economies, and the strong relationship between healthy reefs and the sustainable livelihoods of many sectors of society.

Initially, participants used case study examples from around the world to address a series of issues related to the management of tropical marine ecosystems.

- Coastal Development
- Pollution Control
- Fisheries and Protected Areas
- Protected Areas and the Private Sector
- Tourism and Protected Areas
- Destructive Fishing Practices and Collecting Methods
- Coral Reef Assessment and Monitoring

They analysed both the successes and failures of these case studies to identify lessons learned for each of the above issues.

The detailed case studies and lessons learned are contained in the proceedings of ITMEMS.

As a second step, participants focused on four cross-cutting needs that underlie all management efforts in an effort to expand the scope of the Framework for Action. These important needs were reiterated in all regional strategies developed through ICRI.

- Successful integrated management requires coordination and linkages to other programs, initiatives and legal instruments.
- Stakeholder partnerships and community participation are essential elements for effective management and require the development of culturally sensitive processes of empowerment.
- Public awareness and education, including capacity building, are required to highlight the problem and to support effective management.
- Data and information, in accessible and understandable forms, and from a wide range of sources, are fundamental to successful management.

As a major outcome of ITMEMS participants examined these needs, identified lessons learned and gaps in our understanding, and developed priority actions which are set out in the Working Group Reports.

Origin of International Tropical Marine Ecosystems Management Symposium Delegates

American Samoa
Australia
Bangladesh
Barbados
Brazil
Cambodia
China
Colombia
Cook Islands
Cuba
Dutch Antilles
Egypt
Fiji
France
French Polynesia
Germany
India
Indonesia
Jamaica
Japan
Kenya
Kiribati
Madagascar
Malaysia
Maldives
Marshall Islands
Mauritius
Mexico
Mozambique
Netherlands
New Caledonia
New Zealand
Palau
Papua New Guinea
Philippines
Poland
Puerto Rico
Samoa
Seychelles
Singapore
Solomon Islands
Sri Lanka
Sweden
Switzerland
Tanzania
Thailand
United Kingdom
United States of America
Vietnam
Yemen

International Tropical Marine Ecosystems Management Symposium Delegates

GOVERNMENT AND INTERNATIONAL ORGANISATIONS

Australian Agency for International Development (AusAID)
Australian Institute of Marine Science (AIMS)
Caribbean Coastal Area Management Foundation
Caribbean Fishery Management Council
Convention on Biological Diversity
Department of Agriculture and Rural Development, Vietnam
Department of Agriculture, Forests, Fisheries and Meteorology, Western Samoa
Department of Environment, Fiji
Department of Environment and Conservation, Papua New Guinea
Department of Environment and Natural Resources, Philippines
Department of Ocean Development, India
Environment and Conservation Division, Solomon Islands
Egyptian Environmental Affairs Agency
Environment Agency of Japan
Environment Australia
Fisheries Department of Malaysia
Great Barrier Reef Marine Park Authority (GBRMPA)
Indonesian Directorate General of Tourism
International Center for Living Aquatic Resource Management (ICLARM)
Kenya Wildlife Service
Marine Parks Centre of Japan
Mexico Ministry of Environment
Ministere De L'Amenagement, France
Ministry of Environment, Cambodia
Ministry of Environment and Forest, Bangladesh
Ministry of Fisheries and Agriculture, Maldives
National Aquatic Resources Research and Development Agency, Sri Lanka
National Oceanic and Atmospheric Administration (NOAA)
New Zealand Ministry of Foreign Affairs and Trade

Office of Environmental Policy and Planning, Thailand
Regional Environment Programme of the Indian Ocean Commission
Republic of the Marshall Islands Environmental Protection Authority
Royal Forest Department, Thailand
Service De L'Environnement, New Caledonia
Seychelles Fishing Authority
South Asia Cooperative Environment Programme (SACEP)
South Pacific Regional Environment Programme (SPREP)
State Ministry of the Environment, Indonesia
United Nations Department of Economic and Social Affairs
United Nations Environment Programme (UNEP)
United States Agency for International Development (USAID)
United States Department of Land and Natural Resources
United States Department of the Interior
United States Department of State
The World Bank

NON-GOVERNMENT ORGANISATIONS

Association Parc Marin De La Reunion
The Australian Conservation Foundation
Australian Marine Conservation Society
Caribbean Action for Sustainable Tourism
Conservation International
Coral Cay Conservation Limited, United Kingdom
The Coral Reef Alliance (CORAL)
The Cousteau Society
Fundacao Natureza em Perigo, Mozambique
Indonesian Biodiversity Foundation Kehati
International Marinelife Alliance
Koutu-Nui of the Cook Islands
Marine and Coastal Community Network, Australia
The Nature Conservancy
North Queensland Conservation Council
O Le Siosiomaga Society Inc., Samoa
Palau Conservation Society
Queensland Conservation Council
World Conservation Monitoring Centre (WCMC)
World Conservation Union (IUCN)
World Resources Institute (WRI)
Worldwide Fund For Nature (WWF)

The Call to Action

The following Call to Action was approved by the ICRI Executive Planning Committee (EPC) and the participants of the International Planning Workshop on Friday, June 2, 1995. The participants at ITMEMS reaffirmed the words of the Call to Action on Thursday, November 26, 1998.

International Coral Reef Initiative Call To Action

Renewed Call to Action ICRI 1998

The nations and organizations supporting the International Coral Reef Initiative (ICRI) urge attention to the following issues.

The Global Problem

Coral reefs are in serious decline globally, especially those near shallow shelves and dense populations. It has been estimated that 10 per cent of the earth's coral reefs have already been seriously degraded and a much greater percentage is threatened. If allowed to continue, this decline is likely to lead to the loss of most of the world's reef resources during the next century.

The Threats to Coastal Ecosystems

The reasons for the decline in reef health are varied, complex, and often difficult to accurately determine. While natural events – such as storm damage, predator infestations, and variations in temperature – have some impact on reef ecosystems, human activity is a primary agent of degradation. Contributing factors include:

- direct impacts from activities such as resource extraction, in-filling, over- harvesting, and diving and boating activities, as well as nutrient enrichment and toxic pollution;
- inadequate planning and management of coastal land use, including upland activities;
- potential adverse effects of climate change, including temperature and sea-level changes, alteration of natural patterns of precipitation, tropical storms, and ocean circulation; and
- population growth, increasing pollution and increased uses of the fragile resources will accelerate the decline in coral reef ecosystems, with societal and ecological effects extending beyond reef environments.

The Significance of Coral Reef Ecosystems

Coral reef ecosystems offer benefits to humankind beyond those realised for food production, tourism, recreation, aesthetics, and shoreline protection. Capable of sustaining innumerable coastal communities worldwide, these ecosystems also have great economic, social, and cultural importance to nations, and to entire regions. As competition among multiple uses of reef resources increases, so too will their significance to the human populations that depend on them.

Coral reef ecosystems are among the most biologically productive and diverse in the world; they also serve as indicators of environment health. These facts were recognized at the 1992 United Nations Conference on Environment and Development, where coral reefs and associated systems were accorded a high priority for protection in Agenda 21.

Reducing the Threats

Threats from human-related impacts can be minimised or eliminated through:

- improved and sustained management practices;
- increased national and local capacities for coral reef ecosystem management;
- increased political support for managing coral reef ecosystems; and
- the sharing of existing important and new information related to maintaining the health of these ecosystems.

The ICRI governments endorse the following measures to be implemented through global, regional, and national actions.

Coastal Management

- Incorporate integrated coastal management measures into local, national, and regional coastal development plans and projects and support their long-term implementation.
- These measures will serve as the framework for achieving the sustainable use of, and maintaining the health of, coral reefs and associated environments.
- Develop coral reef initiatives (regional, national and/or local). These should use an ecosystem-based, integrated approach that encourages participation and includes programs for community-based management or co-management of reef resources.

Capacity Building

- Establish regional networks to share knowledge, skills and information.
- Develop and support educational and informational programs aimed at reducing adverse impacts of human activities.
- Establish information exchanges with stakeholder communities.
- Improve developing nations' access to bilateral, multilateral and other forms of financial and technical support for coral reef management.

Research and Monitoring

- Use regional networks to achieve better coordination and cooperation among national research programs.
- Promote linkages between regional and global research and monitoring networks such as CARICOMP (Caribbean Coastal Marine Productivity), PACICOMP (Pacific Coastal Marine Productivity) and GOOS (Global Ocean Observing System).
- Support research and monitoring programs, projects or activities identified as essential to managing coral reef ecosystems for the benefit of humankind.
- Promote the development and maintenance of a global coral reef monitoring network.

Review

- Periodically review the extent and success of implementation of actions identified in the initiative.

The nations and organizations supporting ICRI call upon all other relevant, international entities, governmental and nongovernmental organizations, including the private sector and scientific communities, to undertake the actions above.

Approved June 2, 1995

ITMEMS Statement on Coral Bleaching

A summit meeting on coral bleaching by world experts on coral bleaching held in Townsville on 24 November 1998 released the following statement on the status of reefs following the 1998 global coral bleaching event.

Tropical sea surface temperatures (SST) in 1997-98 have been higher than at any other time in the modern record. Record SST increases over the tropics in the past 15 years are not explained by existing climate models. The coral bleaching associated with the high sea surface temperatures has affected almost all species of corals. Loss of some corals more than 1000 years old indicates the severity of this event. Associated reef invertebrates have been severely affected by unusually high sea temperatures.

Global coral bleaching and die off is unprecedented in geographic extent, depth and severity, though it is highly spatially variable. The only major reef region spared from coral bleaching appears to be the Central Pacific. In some portions of the Indian Ocean, mortality is as high as 90 per cent.

Coral bleaching is a general response to environmental stress, particularly high temperature but also high irradiance, fluctuating salinities, silt or combinations of these factors.

High seawater temperature may be related to global warming. According to the Intergovernmental Panel on Climatic Change (IPCC) 1998, global temperature has significantly increased since 1860. Corals live on the upper edge of their temperature tolerance, with high temperatures directly damaging aspects of their physiology. Thus, an increase by about 2 degrees Celsius as predicted by IPCC for the next 50 years is of concern. We do not know how much of this temperature increase will affect the tropics, or whether corals can adapt to predicted temperature increases.

Current projections of global warming suggest there will be increased frequency of coral bleaching and coral mortality.

These events will eventually have important negative consequences for biodiversity, fisheries, tourism and shore protection provided by coral reefs.

There is a need for a cross-disciplinary research effort (including ecologists, climatologists, chemists, oceanographers and remote sensors) to evaluate the immediate and ultimate causes of coral bleaching, its link to climate change, and the effect of coral bleaching on the ecosystem as a whole.

ITMEMS recommends that a multi-disciplinary taskforce be immediately set up to thoroughly inform the IPCC on coral reef issues prior to their next report due in 2001.

Advisory Statement on the Crown-of-Thorns Starfish (COTS) Issue

At the International Tropical Marine Ecosystems Management Symposium (ITMEMS), a meeting of over 200 marine managers and scientists, management options with regard to the Crown-of-Thorns Starfish issue were reviewed. The following states the conclusions and recommendations for the management of the COTS.

Acanthaster planci is a naturally occurring reef inhabitant. Over the last two years (1996–98), 26 Indo-Pacific nations have reported some level of COTS outbreak. Understanding the causes of the periodic outbreaks of COTS is critical to the effective management of the reef ecosystems. To date, scientific studies into the most commonly suggested possible causes of the outbreaks have been unable to produce adequate evidence implicating human activities in this periodic phenomenon. A precautionary approach involving strategically directed monitoring, research and management activities is required to ensure that any possible long-term deleterious effects of COTS outbreaks (should they occur) can be identified and appropriate responses be initiated. Currently, the recommended policy with regard to COTS outbreaks is not to interfere with starfish populations on a large scale unless it can be shown that outbreaks are caused or exacerbated by human activity. In the absence of adequate proof to establish the suggested causal links, there is no justification for attempting large-scale controls of what could be an entirely natural cycle. The current recommended policy on controls of *Acanthaster planci* is as follows.

- Local-scale controls of COTS may be permitted in areas important to tourism or science. Such controls by any method must be consistent with management plans of the relevant environmental authority and must be approved by them.
- Local-scale controls using injection of toxic substances have been shown to be effective in protecting small areas of reef. Recent research has identified sodium bisulphate or 'Dry Acid' (a common swimming pool additive) as an effective and environmentally acceptable agent for locally controlling COTS. The compound is biodegradable and does not affect other reef biota. The injection technique is currently being used on numerous reefs worldwide, including in the Great Barrier Reef. The Great Barrier Reef Marine Park Authority and the CRC Reef Research Centre are the centres for information exchange on this issue.
- If the injection tools or materials are not available to managers, the preferred alternative method of control is to physically remove the entire animal from affected reefs, and dispose of them properly on land.
- There are potentially high risks associated with certain control measures. Therefore, research or implementation using untried biological and chemical controls of crown-of-thorns starfish should not be supported other than in identifying potential agents whose application is consistent with the policy above.
- Sufficient effort should be committed to ensure that the controls are effective in reducing COTS populations to sustainable densities. Incomplete efforts may result in prolonged infestations with subsequent greater loss of coral cover.
- In the event a causal relationship between human activity and crown-of-thorns starfish outbreaks is established, the management authorities should use all their power and influence to regulate that activity. The goal should be minimising the activity's effects on crown-of-thorns starfish populations, and the ecological effects of outbreaks.

Both ongoing monitoring and targeted research into the causes of outbreaks are essential for providing the necessary short and long-term information upon which effective management can be based. Management and research results should be increasingly shared among the international reef community through existing organisations and networks. These efforts will aid management and understanding of this critical global phenomenon.

In the absence of satisfactory evidence implicating human activities in the causation of starfish outbreaks, this consensual policy of limited intervention remains a logical and realistic approach to managing the issues.

APPENDICES

International Secretariat

ICRI

INTERNATIONAL
CORAL REEF
INITIATIVE

International Tropical Marine Ecosystems Management Symposium (ITMEMS)

23-26 November 1998, Townsville, Australia

Program

Monday 23 November

Plenary - ICRI Overview and Progress

Goal: To review actions taken to date on a global and regional basis to implement the objectives of ICRI.

Morning 9:00 a.m. - 12:00 p.m.

Session 1 — Official Opening

Objective: To welcome participants to the Symposium, provide an historical perspective of ICRI and to give guidance for the deliberations of the meeting.

Afternoon 2:30 p.m. - 5:30 p.m.

Session 2 — Regional Reports

Objective: To summarise progress, achievements and challenges encountered in each of the ICRI regions since the Dumaguete City workshop in May/June 1995.

Session Chair/Facilitator: ***Richard Kenchington***
Session Rapporteurs: ***Simon Woodley***

2:30-3:00 Caribbean - **Regional Report for the Tropical Americas on Activities and Programmes Relevant to the International Coral Reef Initiative (ICRI)**
Jeremy Woodley

3:00-3:30 Pacific - **International Coral Reef Initiative (ICRI) Pacific Activities**
Lucille Apis-Overhoff

3:30-4:00 *Afternoon Tea*

4:00-4:30 East Asia - **A Review of Actions for Coral Reefs in the East Asian Seas**
Shoutao Cao

4:30-5:00 **South Asia - A Review of the Progress in Implementation of Management Actions for the Conservation and Sustainable Development of Coral Reef Ecosystems in South Asia**
Arjan Rajasuriya

5:00-5:30 **East Africa - Coral Reef Programs of Eastern Africa and the Western Indian Ocean**
Nyawira Muthiga

Tuesday 24 November

Morning 8:30 a.m. - 9:00 a.m.

Keynote Address: **Marine Protected Areas in the New Millennium**
Nancy Foster

Priority Issues - Concurrent Working Groups

Goal: To share experiences and lessons amongst coral reef practitioners and policy makers of recent efforts to address the priority issues facing managers in the conservation and sustainable use of coral reefs and related ecosystems.

Morning 9:00 a.m. - 12:30 p.m.

Session 3 – Fisheries and Protected Areas

Objective: To utilise case study examples to identify lessons learned and future challenges in the promotion of sustainable coral reef fisheries.

Session Chair/Facilitator: ***Nancy Foster***
Session Rapporteurs: ***Andrew Smith, Lakaseru Boyke***

1. **Effectiveness of Temporary Reef Closures to Replenish Reef Fish Stocks in the Great Barrier Reef**
John Robertson

2. **Monitoring and Evaluation of Reef Protected Areas by Local Fishers in the Philippines: Tightening the Adaptive Management Cycle**
Andre Uychiaoco

3. **Participatory Coastal and Marine Management in Quintana Roo, Mexico**
Juan Bezaury

Session 4 — Pollution Control

Objective: To utilise case study examples to identify lessons learned and future challenges in the promotion of sustainable coastal development practices and protection from point and non-point sources of pollution.

Session Chair/Facilitator: ***Jatna Supriatna***
Session Rapporteurs: ***B. Subramanian, Karen Koltes***

1. **Water Quality Management Initiative: The Great Barrier Reef Marine Park Authority**
   Sheriden Morris

2. **The Role of the Florida Keys National Marine Sanctuary in the South Florida Ecosystem Restoration Initiative**
   Billy D. Causey

3. **Integrated Management of Bays and Coastal Zones in the Wider Caribbean Region: Facts and Needs**
   Manuel Alepuz

Session 5 — Protected Areas and the Private Sector

Objective: To utilise real case study examples to identify lessons learned and future challenges in the promotion of sustainable coral reef protected area management in cooperation with the private sector.

Session Chair/Facilitator: ***Anthony Hooten***
Session Raporteurs: ***Adrianne Waterman, Nancy Daschbach***

1. **Sustainable Coastal Tourism in the Caribbean and the Private Sector Perspective**
   Kelly Robinson

2. **Dive-Tourism and Stewardship of Small-Scale Coral Reef Marine Protected Areas**
   Stephen Colwell

3. **The Chumbe Island Coral Park Project: Management Experiences of a Private Marine Conservation Project**
   Sibylle Riedmiller

Session 6 — Tourism and Protected Areas

Objective: To utilise real case study examples to identify lessons learned and future challenges in the promotion of sustainable tourism development.

Session Chair/Facilitator: ***Lolita Gibbons***
Session Rapporteurs: ***Stacey Tighe, Perry Alino***

1. **The GEF Egyptian Red Sea Coastal and Marine Resource Management Project – A Decade of Effort, Experience and Trade-Offs Required to Achieve Marine Tourism and Marine Conservation Goals**
   Meriwether Wilson

2. **Making Tourism Work for the Bonaire Marine Park**
   Kalli De Meyer

3. **Tourism Management in the Great Barrier Reef, Australia**
   Hilary Skeat

Afternoon 2:00 p.m. – 5:30 p.m.

Session 7 – Destructive Fishing Practices and Collecting Methods

Objective: To utilise real case study examples to identify lessons learned and future challenges in the promotion of sustainable coral reef fishing practices and collecting methods.

Session Chair/Facilitator: ***Hassan Maniku***
Session rapporteurs: ***Jeffrey Low, Lida Pet-Soede***

1. **Silencing the Dynamite Fishers along the Tanga Coast, Tanzania**
   Solomon Makoloweka

2. **Participatory Coastal Development Planning in Bolinao, Northern Philippines: A Potent Tool for Conflict Resolution**
   Liana Talaue-McManus

3. **Mafia Island Marine Park, Tanzania: Implications of Applying the Marine Park Paradigm in a Developing Country**
   Greg Andrews

4. **Bridging Community Needs and Government Planning in the Togean Islands, Central Sulawesi, Indonesia**
   Sari Surjadi

Session 8 – Coastal Development

Objective: To utilise real case study examples to identify lessons learned and future challenges in the promotion of sustainable coastal development.

Session Chair/Facilitator: ***Miguel Rolon***
Session Rapporteurs: ***Deb Callister, Chandima Wickramasinghe***

1. **Integrated Coastal Management in the Philippines: Testing New Paradigms**
   Catherine Courtney

2. **Community-Based Coastal Resources Management in Indonesia: Examples and Initial Lessons from North Sulawesi**
   Brian Crawford

4. **Protected Areas on the Gulf of Aqaba, Egypt: A Mechanism of Integrated Coastal Management**
   Ahmed Shehata

Session 9 – Coral Reef Assessment and Monitoring

Objective: To utilise selected panelists and case studies to identify lessons learned and future challenges in the promotion of sustainable coral reef monitoring and assessment mechanisms.

Session Chair/Facilitator: ***Russell Reichelt***
Session Rapporteurs: ***Shutao Cao, Pradyumna Kotta***

1. **Reef Check Global Survey Program: The First Step in Community-Based Management**
   Gregor Hodgson

2. **Establishment of Coastal Ecosystem Monitoring Programmes: Lessons Learned by CARICOMP**
   Jeremy Woodley

3. **Development of the Global Coral Reef Monitoring Network (GCRMN) in South Asia: Preliminary Lessons**
   Jason Rubens

4. **Conservation International's Marine Rapid Assessment Program (RAP)**
   Tim Werner

Session 10 – Protected Areas

Objective: To utilise real case study examples to identify lessons learned and future challenges in the promotion of sustainable Protected Area management.

Session Chair/Facilitator: ***Achmad Abdullah***
Session Rapporteurs: ***Virdin Brown, David Gutierrez***

1. **Bazaruto Archipelago: Protected Area Development and Management**
   Antonio Reina

2. **Integrated Coastal Management in Negros Oriental, Philippines: Participation in Coastal Habitat Assessment and Management**
   William Ablong

3. **Coral Reefs of the Abrolhos Bank, Brazil**
   Guilherme Dutra

Wednesday 25 November

Morning 9:00 a.m. - 12:30 p.m.

Fostering a Sustainable ICRI - Concurrent Working Groups

Goal: To identify gaps in the global approach of ICRI and to set an agenda for the future conservation and sustainable use of coral reefs and associated ecosystems.

Session 11 – Integrated Management, Coordination and Linkages to other Initiatives, Programs and Instruments

Objective: To utilise selected panelists and outcomes of the 'Priority Issues' Working Group sessions to identify gaps and priority needs in order to foster integrated management, and enhance coordination and linkages to other relevant initiatives, programs and instruments.

Session Chair/Facilitator: ***Marea Hatziolos***
Session Rapporteur: ***Kristina Gjerde***

Session Panellists: ***Arthur Patterson, Per Wramner, Charlotte De Fontaubert, Prasantha Dias Abeyegunawardene***

Session 12 – Stakeholder Partnerships and Community Participation

Objective: To utilise selected panelists and case study examples to better understand effective processes of involvement in, and ownership of, management initiatives by a wide range of stakeholders.

Session Chair/Facilitator: ***Sue Wells***
Session Rapporteurs: ***Ian Dutton, Jackie Alder***

Session Panellists: ***Noah Idechong, Lea Scherl, Peter Espeut***

Session 13 – Public Awareness and Education, including Capacity Building

Objective: To utilise selected panelists and case study examples to review existing activities, facilitate the sharing of experience and identify capacity-building needs.

Session Chair/Facilitator: ***Peter Hunnam***
Session Rapporteurs: ***Malcolm Turner, Floyd Homer***

Session Panellists: ***Stephen Colwell, Lauretta Burke, Diane Tarte***

Session 14 – Data and Information for Management

Objective: To utilise selected panelists and case study examples to define the priority data and information needs for implementing and evaluating management initiatives, and to identify mechanisms for bringing the science and management of coral reefs into a closer working relationship.

Session Chair/Facilitator: ***Charles Ehler***
Session Rapporteurs: ***Annadel Cabanban, Eddie Hegerl***

Session Panellists: ***Nyawira Muthiga, Herman Cesar, Leah Bunce***

Afternoon 2:00 p.m. - 5:30 p.m.

Plenary - Reporting on the Outcomes of Working Groups

Objective: To provide a forum for reporting and general discussion on the outcomes of the Working Groups.

Session 15 – Working Group Summaries - Sessions 3 to 10

Working Group summaries for sessions three to ten will be presented by the relevant session Chairs/Facilitators.

Thursday 26 November

Morning 9:00 a.m. - 12:30 p.m.

Session 16 – Working Group Summaries (continued) - Sessions 11 to 14

Working Group summaries for sessions 11 to 14 will be presented by the relevant session Chairs/Facilitators.

Plenary - Preparing for the Future

Goal: To utilise the outcomes of the Working Groups to develop a blueprint for ICRI action over the next four years leading up to ITMEMS II.

Session 17 – Overview of Symposium Deliberations and Agreement on an Action Statement and Communiqué

Objective: To gain agreement on an Agenda for the future conservation and sustainable use of coral reefs and associated ecosystems, including an Action Statement and Communiqué, based on the deliberations of the Symposium.

Farewell statements and closure.

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List of Acronyms

ADB	Asian Development Bank
AFSC	American Friends Service Committee
AGRA	Atlantic and Gulf Reef Assessment
AN	Acuario Nacional, Dominican Republic
ANET	Andaman and Nicobar environment Team
AOC	American Oceans Campaign
ASK	Amigos de Sian Ka'an, Mexico
BATA	Bazaruto Archipelago Tourism Association
BEST	Bahamas Environment, Science and Technology Commission
BNP	Bazaruto National Park
BNT	Bahamas National Trust
BOBP	Bay of Bengal Programme
BREEF	Bahamas Reef Environmental Educational Foundation
BHF	Blue Hole Foundation, Bahamas
BMP	Bonaire Marine Park
BSRS	Brazilian Society for Reef Studies
BVI	British Virgin Islands
CaMPAM	Caribbean Marine Protected Areas Management
CANARI	Caribbean Natural Resources Institute, St. Lucia
CARICOMP	Caribbean Coastal Marine Productivity
CEHI	Caribbean Environmental Health Institute
CAST	Caribbean Action for Sustainable Tourism
CBCRM	Community-based Coastal Resource Management
CBD	Convention on Biological Diversity
CBFMA	Community-Based Forest Management Agreement
CCUNRM	Consortium of Caribbean Universities for Natural Resource Management
CDC	Conservation Data Centre, US Virgin Islands
CES	Co-operative Extension Service, US Virgin Islands
CEN	Caribbean Environment Network
CEP	Caribbean Environment Programme
CEPNET	Information Systems for the Management of Marine and Coastal Resources
CHA	Caribbean Hotel Association
CHICOP	Chumbe Island Coral Park
CIDA	Canadian International Development Agency
CII	Clean Islands International, Bahamas
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CORAL	Coral Reef Alliance
COTS	crown-of-thorns starfish
CMS	Centre for Marine Sciences, Jamaica
CPACC	Caribbean: Planning for Adaptation to Global Climate Change
CRLC	Coastal Resource Leadership Challenge workshop
CRMP	Coastal Resources Management Project
CSD	Commission on Sustainable Development
CZMP	Coastal Zone Management Project, Belize
CZMU	Coastal Zone Management Unit, Barbados
DNFFB	DirecÁ„o Nacional de Forestas e Fauna Bravia
DPNR	Department of Planning and Natural Resources, US Virgin Islands
EAST	Environmental Association of St. Thomas and St. John
ECC	Eastern Caribbean Centre of the University of the Virgin Islands
ECO	Earth Communication's Office
EEAA	Egyptian Environmental Affairs Agency
EIA	Environmental Impact Assessment
EU	European Union
EWT	Endangered Wildlife Trust

EWO	Environmental Watch Organisation, Jamaica
FIP	Fisheries Improvement Project, Jamaica
FOE	Friends of the Environment, Bahamas
FFI	Flora and Fauna International
FGNMS	Flower Gardens National Marine Sanctuary
FKNMS	Florida Keys National Marine Sanctuary
FMSEA	Florida Marine Science Educators Association
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GCFI	Gulf and Caribbean Fisheries Institute
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GIS	Global Information System
GEF	Global Environmental Facility
GPA	Global Programme of Action for the Protection of the Marine Environment from Land-based Activities
GR	Green Reef, Belize
IBAMA	Brazilian Government Environmental Agency
ICAM	Integrated Coastal Area Management
ICLARM	International Centre for Living Aquatic Resource Management
ICM	Integrated Coastal Management
ICRI	International Coral Reef Initiative
ICZM	International Coastal Zone Management
IDRC	International Development Research Center
IOC	International Oceanographic Commission of UNESCO
IRRM	Integrated Reef Resources Management
IMO	International Maritime Organization
INVEMAR	Instituto de Investigaciones Marinas de Punta de BetÌn
IHEI	International Hotels Environment Initiative
IRF	Island Resources Foundation, St. Thomas, Virgin Islands
ITMEMS	International Tropical Marine Ecosystems Management Symposium
ICRMN	Indian Coral Reef Monitoring Network
IMF	International Monetary Fund
IMO	International Maritime Organization
IOC	Inter-governmental Oceanographic Commission
IUCN	World Conservation Union
IYOR	International Year of the Reef
KORDI	Korea Ocean Research & Development Institute
LBSMP	Land-based Sources of Marine Pollution
LEAP	Legal Environmental Advocacy Programme (Silliman University)
LGU	Local Government Unit
MBMPT	Montego Bay Marine Park Trust, Jamaica
MIMP	Mafia Island Marine Park
MOET	Ministry of Education and Training, Bahamas
MPA	Marine Protected Area
NARA	National Aquatic Resources Research and Development Agenc
NCP	National Campaign Plan
NCRPS	Negril Coral Reef Preservation Society, Jamaica
NCS	National Conservation Strategy
NCS	Nature Conservation Sector
NEMAP	National Environment Management Action Plan
NGO	Non-government Organisation
NRCA	Natural Resources Conservation Authority, Jamaica
NTPICM	National training Program on Integrated Coastal Management
MRUP	Multiple Resource Use Project
NOAA	National Oceanographic and Atmospheric Agency
ODA	Overseas Development Agency
OW	Ocean Watch, Bahamas
PAHP	Pan-American Health Organisation
PCRA	Participatory Coastal Resource Assessment

PISCES	Population Interdependencies in the South China Sea project
PYOCR	1997 Pacific Year of the Coral Reef
RCP	Regional Campaign Plan
RWAP	Regional Wetland Action Plan
SACEP	ICRI workshop for the South Asian region
SANF	Southern African Natural Foundation
SAP	Strategic Action Program
SAREC	Swedish Agency for Research Co-operation in Developing Countries
SEA	St. Croix Environmental Association
SEACAM	Secretariat for Coastal Area Management (Mozambique)
SEAFDEC	Southeast Asian Fisheries Development Center
SBF	Siwa-ban Foundation, Belize
SEMP	Strategic Environmental Management Plan
SIMAC	Sistema Nacional de Monitoreo de Arrecifes Coralinos en Colombia, Colombia
SMARU	Sustainable marine and Aquatic Resources Utilization Program
SMMA	Soufriere Marine Management Area, St. Lucia
SPAW	Specially Protected Areas and Wildlife Program
SPREP	South Pacific Regional Environment Programme
STRI	Smithsonian Tropical Research Institute
TDA	Transboundary Diagnostic Analysis for the South China Sea (TDA)
TEN	Togeans Ecotourism Network
TNC	The Nature Conservancy, USA
UNEP	United Nations Environment Programme
UNDP	United Nations Development Program
USAID	United States Agency for International Development
UM	University of Miami
UMS	University Malaysia Sabah
UNCED	United Nations Conference on Environment and Development
UNCLOS	United Nations Convention on the Law of the Sea
UP	University of Pernambuco, Brazil
USVI	United States Virgin Islands
UT	University of Texas
URJ	University of Rio de Janeiro, Brazil
UVI	University of the Virgin Islands
UWI	University of the West Indies
VIMAS	Virgin Islands Marine Advisory Service
VINP	Virgin Islands National Park Service
WB	The World Bank
WCMC	World Conservation Monitoring Centre
WCPA	IUCN World Commission on Protected Areas
WRI	World Resources Institute
WWF	World Wide Fund for Nature
WWW	World Wide Web
XCC	Xcalak Community Committee

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