BOBP/REP/86

REPORT OF THE REGIONAL SYMPOSIUM ON MARINE PROTECTED AREAS AND THEIR MANAGEMENT

BOBP For Fisheries Management
BAY OF BENGAL PROGRAMME

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REPORT OF THE REGIONAL SYMPOSIUM ON MARINE PROTECTED AREAS AND THEIR MANAGEMENT

1-4 November, 1999
Alor Setar, Kedah, Malaysia

BAY OF BENGAL PROGRAMME
Chennai, India
2000

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Preface

This document is the report of a regional symposium on marine protected areas and their management, held in Alor Setar, Kedah state, Malaysia, from 1 to 4 November, 1999. It was organised by the Department of Fisheries, Malaysia, with support from the Bay of Bengal Programme (BOBP) and was attended by representatives from the seven member-countries of the BOBP and resource persons from Australia and the Philippines.

The document contains the text of the Alor Setar Declaration passed by the symposium participants and papers presented at the symposium plus brief reports of question-and-answer sessions.

The BOBP is a multi-agency regional fisheries programme that covers seven countries around the Bay of Bengal – Bangladesh, India, Indonesia, Malaysia, Maldives, Sri Lanka, Thailand. The Programme plays a catalytic and consultative role in developing coastal fisheries management in the Bay of Bengal, thereby helping improve the conditions of small-scale fisherfolk in the member-countries.

The BOBP is sponsored by the Governments of Denmark and Japan. The executing agency is the FAO (Food and Agriculture Organization of the United Nations).

Foreword

The Bay of Bengal Programme has carried out several pilot activities on management of marine aquatic resources during its Third Phase (1994-2000). One activity that has aroused great interest throughout the region relates to the Pulau Payar Marine Park in Malaysia. It has enabled the development and testing of methods and approaches to improve the management and conservation of marine parks.

The Regional Symposium on Marine Protected Areas and their Management, held early November 1999, was in a sense an extension of the work in Pulau Payar. It outlined the technical and the institutional context behind MPAs, explored legal and management issues, and evaluated social and economic prospects for developing countries. Four sessions were devoted to "Learnings and lessons".

The 40 delegates from member-countries of BOBP, and from Philippines and Australia who took part in the symposium, found it most instructive. A keynote address by Dr. Bernadette O'Neil of Environment Australia set the tone and outlined several issues. There were papers on management options, the size of MPAs and their impact on bio-diversity, planning, legislation, sustainable financing, enforcement. All of these are reproduced in this report, and will be found useful by scientists and researchers who are studying MPAs.

While a whole lot of issues were discussed, there were some pretty sharp and categorical conclusions as well. The Alor Setar declaration passed by the symposium called for awareness-building on the benefits of conserving coastal and marine ecosystems. It urged multi-disciplinary planning and implementation of integrated coastal zone management. It recommended mechanisms to promote inter-agency co-operation, and a legal framework to facilitate the regulation and management of MPAs.

The Alor Setar resolution also suggested that governments make funds available for the long-term management of MPAs. It suggested cost-sharing among agencies to finance MPAs, scientific research and long-term monitoring to ensure sustainability, and the sharing of knowledge, expertise and experience among MPAs.

Participants came away with a clearer, wider and better-rounded perception of MPAs. What is needed throughout the region is awareness-building and action on more, better and systematically researched and monitored MPAs.

I see this report is a modest contribution to the process.

Kee-Chai CHONG
Programme Coordinator, BOBP

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SYMPOSIUM SUMMARY AND ALOR SETAR RESOLUTION

Some 40 delegates from member-countries, BOBP and Australia took part in this symposium, which was organised by the Department of Fisheries, Malaysia. with support from the BOBP. The symposium objectives were to discuss the need for conservation of fish and aquatic resources and their habitats; provide an overview of the scientific, technical and institutional context behind the use of MPAs for fisheries and aquatic resources management; explore the management strategy of MPAs, evaluate the social and economic prospects of MPAs for developing countries, evaluate and adapt to developing countries any available guidelines on establishing MPAs.

Resource persons were drawn from Environment Australia and the Australian Institute of Marine Science. The Director-General of Fisheries, Malaysia, Dato Mohd Mazlan b Jusoh, inagurated the symposium. He called for pro-active management of the marine environment and its biodiversity. He emphasised the efforts of the Department of Fisheries to create and build awareness on marine conservation, since the establishment of the Pulau Payar Marine Park in 1987. He said that the National Policy on Marine Biodiversity had been launched on 16 April 1998 to help the country implement strategies, action plans and programmes for the conservation and sustainable utilization of its resources.

Dr Bernadette O'Neil of Environment Australia delivered the keynote address on "The need for marine protected areas and marine parks: networks and transboundary management approaches for success." She also presented a paper on "Planning for performance assessment of marine protected areas and marine parks". Mr Al istair Cheal, Coordinator of Reef Fish Monitoring with the Australian Institute of Marine Sciences, presented a paper on "System of Monitoring of Marine Protected Areas and Marine Parks: Suggested Model and Experiences".

Four workshop sessions were devoted to "Learnings and lessons," based mainly on experiences from Malaysia, the Philippines and Australia. A field trip was organised to the Pulau Payar Marine Park.

The Symposium delegates passed the Alor Setar resolution, reproduced below.

The Alor Setar Resolution on Marine Protected Areas

Adopted in Alor Setar, Malaysia on Thursday, the 4th day of November 1999.

Conscious of the importance of fisheries and aquatic resources as an essential sector of development of nations surrounding the Bay of Bengal and the unique and relatively high dependence of millions of fishers and coastal peoples on the ocean and the coastal environment for their food and livelihood security;

Recognizing that marine ecosystems and, in particular, coastal aquatic ecosystems such as coral reefs, seagrass beds, mangroves, estuaries and lagoons not only harbour a wealth of biological resources of immense present and future benefit to humankind but also are the genetic banks of the oceans, which in addition. provide buffers to the coasts and protect them from storm surges, damage and erosion;

Concerned that coastal ecosystems are under increasing threat of degradation of habitats and depletion of resources resulting from unchecked and uncontrolled resources extraction, pollution from land and sea, construction, impacts of tourism and upstream activities such as agriculture and forestry;

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Protected Areas does not in any way reduce focus on the need to conserve and sustain other ecosystems.

7. *Recommend* the evolution of mechanisms to promote inter-agency co-operation and coordination for comprehensive and integrated management of Marine Protected Areas in the context of integrated coastal zone management and development.

8. *Suggest* the need for systematic and integrated planning processes to keep in mind the inter-connected nature of coastal and other ecosystems.

9. *Recommend* the evolution of a legal framework to facilitate and enable the establishment, regulation and management of Marine Protected Areas.

10. *Propose* formulation and rigorous enforcement of rules and regulations with adequate staffing and financial support to promote and ensure compliance.

11. *Recommend* the evolution of legal and administrative mechanisms to adequately regulate and control impacts on Marine Protected Areas from upstream and adjacent activities.

12. *Suggest* that governments make available funds for the establishment and long-term management of Marine Protected Areas using among other sources a larger proportion of cess and duties on economic activities such as fisheries and ecotourism, which benefit directly from Marine Protected Areas.

13. *Recommend the* charging of rational tariffs for eco-friendly activities and use of Marine Protected Areas, which should be used in the maintenance and management of Marine Protected Areas.

14. *Suggest* the need to consider cost-sharing amongst agencies to finance the establishment of Marine Protected Areas, including trust funds, which may be needed to help those whose livelihoods are affected by the setting up of Marine Protected Areas.

15. *Recommend that* managers and technical staff of Marine Protected Areas should be adequately qualified and trained and be empowered adequately to take decisions, both financial and otherwise, to improve the management of Marine Protected Areas.

16. *Suggest the* promotion of scientific research and long-term monitoring to ensure the sustainability of Marine Protected Areas.

17. Strongly recommend the sharing of knowledge, expertise and experience amongst Marine Protected Areas, nationally and within the Bay of Bengal region, in the context of conserving and better managing the Bay of Bengal Large Marine Ecosystem.

SYMPOSIUM PROSPECTUS

"The marine environment – including the oceans and all the seas and adjacent coastal areas - forms an integrated whole that is an essential component of the global life-support system and a positive asset that presents opportunities for sustainable development".

Chapter 17, Agenda 21
1992 Rio Earth Summit

A four-day Regional Workshop on Marine Protected Aras (MPAs) and their Management will be held from 01-04 November, 1999 in Alor Setar, Kedah, Malaysia. It will be conducted by the Department of Fisheries, Malaysia, with support from the BOBP and the FAO/UN.

1. Purpose and Objectives

The Regional Workshop on MPAs is being organised in the context of FAO/BOBP's continuing interest in strengthening the capacities of member countries to conserve and manage their fisheries and other aquatic resources. It will collate, compare notes and share information and learnings on conservation issues, action to promote conservation, and the management of MPAs, including what works and does not work in the management of such resources.

The Workshop will show that MPAs can be a soft, yet robust supplemental broad-based tool or approach to conservation and management of aquatic resources and habitats. The conventional hard narrow-based approaches call for expensive enforcement and patrolling to ensure compliance; MPAs also require enforcement and patrolling, but on a lesser scale, in particular if the community shares in its management responsibility. MPAs can either cover large areas (e.g. the 350,000 km2 Great Barrier Reef Marine Park in Australia) or just a small area (e.g. the uninhabited group of four small islands in Pulau Payar Marine Park in Malaysia). This Regional Workshop, however, will focus on small-area MPAs, including the need for a network of MPAs.

The Workshop will not suggest that MPAs are the panacea to all problems concerning resource depletion, ecosystem degradation and pollution. But they can be a valuable tool for conservation and sustainable use of our marine resources.

The Workshop's objectives are to

1. Discuss the need for conservation of fish and aquatic resources and their habitats; problems relating to conservation; political, legal, economic and consumer actions to promote conservation.
2. Provide a general overview of the scientific and technical considerations and the institutional context behind the establishment and use of MPAs for fisheries and aquatic resources management.
3. Explore the legal and institutional framework and outline of the management strategy of MPAs.
4. Evaluate the social and economic prospects of MPAs for developing countries, with special emphasis on BOBP countries.
5. Evaluate and adapt to developing countries any available guidelines on establishing MPAs.

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2. Participants

The Regional Workshop will be especially useful for middle-level and senior-level policy-makers from government; representatives of industry (notably fisheries and coastal and marine tourism), NGOs, regional/international bodies and others who are interested in conservation issues and in MPAs. It will help them to conceptualise MPAs as a possible tool to bring together disparate stakeholders to manage marine fisheries and aquatic resources, and implement the setting up and use of MPAs around an "easy-to-relate to" visible land mass or water body.

The BOBP will sponsor two official nominees from each member-countn'. Other participants should secure other sources of/linding or meet their own costs.

3. Topics for Discussion

Concepts, Principles, Format and Framework of MPAs as a Supplemental Tool in Managing Fisheries and Aquatic Resources

Purpose, Use, Level of Protection of MPAs

Policy, Legislation, Boundaries and Zoning for MPAs

Monitoring and Management of MPAs

Training and R&D Needs for MPAs

Experiences and Practices of National MPAs

4. Resource Persons

Experts and key resource persons for the Regional Workshop will in part be drawn from Environment Australia, the Australian Institute of Marine Science, universities and other institutions with expertise on MPAs.

5. Background and Rationale

The marine ecosystem and environment harbour a wealth of biological resources of immense benefit to humankind. Besides, coasts buffer and protect the land from storm surges, damage and erosion. GESAMP' estimated (1988) that *ecosystem Junctions and services are worth about $20 trillion annually – a sum that is greater than the entire global gross domestic product!*

The marine ecosystems of many developing countries are, however, under serious attack because of the degradation and depletion of economically important resources, notably fisheries, corals and clean waters. They suffer from unchecked and uncontrolled pollution and destruction ofvital habitats. Pollution results from human activities on land, mainly from agricultural and industrial run-off, deforestation, shipping and harbour construction and development, urban and residential encroachment, oil exploration and drilling.

Of late, luscious tropical corals and coral reefs are being destroyed at an alarming rate both by man (through dynamiting and cyanide poisoning) and by natural causes such as global warming. Close to 60% of the world's reefs are under threat of irreparable damage from unsustainable use, caused by

pollution and over-use. The over-use is a result of incessant demand for seafood and marine recreation from consumers with high purchasing power.

Pro-Active Management Critical

The marine environment can no longer be left on its own, to clean itself, filtering, detoxifying, digesting and absorbing all the waste dumped into it, and healing itself from all the damage inflicted on it. The quality of the marine environment has to be sustained to remove the insecurity of the people who depend on the seas for their food and livelihood. The marine environmental crisis will only get worse before it gets better, because more and more people choose to settle along the coast. This will only aggravate the pressure on coastal ecosystems.

Coastal and marine tourism depends on clean and pristine sea and ocean conditions, so that their manifold underwater marine treasures can be enjoyed. But the tourism industry harms its own cause by taking short cuts to maximise income and profits. There is a need to enlist its co-operation in ushering in a more reasonable and sustainable culture. Fishers are aware that they should not use destructive gears such as mosquito net meshes to catch fish, but they persist for reasons which need to be understood. They should be helped to give up such practices.

Pro-active management of the marine environment is critical and urgent. Past short-sightedness in producer and consumer attitudes toward the management of natural resources must be remedied and reversed.

Situation in the Bay of **Bengal**

Degradation of the seas and oceans in developing countries, notably in the Bay of Bengal, the Straits of Malacca and smaller bays and gulf within the Indian Ocean is visible. But very little is known about the magnitude, and there have been few studies about the specific causes of degradation. More than six million fisherfolk depend on the region's seas for their food and -livelihood security, so healthy, biologically alive and productive oceans and seas are vital. Governments around the Bay have intervened in the management of their resources, but a lot remains to be done.

Needed: A People-Centred Ecosystem-Based Approach

An integrated multi-pronged approach to problem-solving of the marine environmental malaise is needed. It should seek comprehensive management of entire eco-systems through active people participation, especially the local community. In other words, a people-centred eco-system-based approach holds the key to sustainable use and management of the seas and oceans.

One important means of conserving and better managing whole marine eco-systems is the establishment of Marine Protected Areas (MPAs). MPAs are areas of land, water or marine terrain and environment which are earmarked and set aside to ensure that they are not subjected to further resource depletion and/or ecosystem damage. The flora and fauna, species, genetic and eco-system biodiversity of this marine environment are protected and managed for sustainable use. Result: the eco-systems in these designated areas recover, recuperate and rebuild, often acting as a source of recruitment for neighbouring eco-systems.

Though there are already at least more than 1,300 MPAs worldwide, more must be set up to ensure the sustainability of the commonwealth of the oceans and seas.

Empowerment and Participation

Long used to unwelcome do's and donts, fishers, coastal inhabitants, traders, weekend boaters, dive and tour operators and the population in general, often do not relish the idea of MPAs, or respond to it with enthusiasm. They perceive MPAs as valuable areas that will be off-limits to them. Since local community acceptance and active participation are crucial for the success of MPAs, a large enough constituency has to be built up for the management of MPAs – their needs, the benefits they will confer, the approaches they call for. This is a minimum prerequisite for success.

In some BOBP member countries, a few MPAs have already been established or attempted, though their performance has not been entirely satisfactory. There is a need to dissect the performance and analyse the reasons for success or failure. Example: the marine parks of Malaysia appear to be effective while those in Sri Lanka (e.g. Hikkaduwa Marine Sanctuary) are not. In Malaysia, anchovy fishing around the Pulau Payar Marine Park is now carried out round the year; before this park was established, anchovy fishing was viable only three months in the year. Coastal communities in the Philippines, notably on Apo Island, have benefited from marine reserves; stocks have recovered, catches and incomes have improved.

Because MPAs are integral components of Interated Coastal Area Management and whole eco-system management, they can overcome the problems of:

- Poor coordination among government agencies, NGOs as well as industry at one level, and at another level, in conserving and managing activities in the marine environment.
- Poor integration of planning, management and implementation of natural resources conservation, as also the inability to deal with adverse impacts of human activities on land and water, especially in the coastal zone and marine environment, in an integrated manner.
- *Ad hoc* or piecemeal measures concerning fisheries and aquatic resources management – such as stand-alone mesh size regulation, closed seasons or areas, limited entry, catch quotas, size limitations.

6. Registration **and Information**

Early registration is recommended. A sum of RM$ 800 will be collected from non-sponsored participants to cover the cost of hotel and food and workshop materials, a dinner reception and a study tour to Pulau Payar Marine Park (PPMP). Further information may be obtained from:

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SYMPOSIUM PROGRAMME

1 November 1999 (Monday)

0830 — 0900	Registration	Secretariat
Inaugural Session		
0900 – 1030	Opening Ceremony	
0900 – 0910	Welcome Address	Kee-Chai CHONG/BOBP
0930-1000	Inaugural Address	Dato' Mazlan Jusoh/DOFM
Session **I**	Keynote Address *(Chairperson: Kee-Chai Chong/BOBP)*	
1030— 1230	The Need for Marine Protected Areas and Marine Parks: Networks and Transboundary Management Approaches For Success	Bernardette O'Neil/ Environment Australia
Session **II**	Learnings and Lessons *(Chairperson: Kee-Chai Chong/BOBP)*	
1330–1430	Marine Parks of Malaysia: A Tool for Fisheries Resource Management	Kevin Hiew/DOFM
1430–1530	Management Options for Marine Protected Areas	Ridzwan Abdul Rahman
1600–1800	Measuring and Showing Fisheries Benefits from Marine Protected Areas and Marine Parks: The Philippines Experience	Annadel Cabanban/UMS
2000 – 2200	Impact of Size of Marine Protected Areas and Marine Parks on Resources and Bio-Diversity Protection and Sustainability: Need For Movable Boundaries and Network of Protected Areas and Parks	Pauzi Abdullah/DOFM

2 November 1999 (Tuesday)

Session **III**	Learnings and Lessons *(Chairperson: Kevin Hiew/DOFM)*	
0830—0930	Monitoring of Coral Reefs in Marine Protected Areas and Marine Parks	Alistair Cheal/AIMS

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0930 – 1030	Planning for Performance Assessment of Marine Protected Areas and Marine Parks	Bernadette O'Neil/ Environment Australia
1100— 1230	Malaysian Legislation on the Management of Marine Protected Areas and Marine Parks	Abdul Khalil Abdul Karim/ DOFM
Session **IV**	**Learnings and Lessons** *(Chairperson: Ibrahim Salleh/DOFM,)*	
1400— 1500	Managing Conflicts Between! Among Stakeholders	Rathin Roy/BOBP
1500 – 1600	Malaysian Experiences on Marine Parks Management: Public Education for Public Awareness	Ahmad Azahari Ahmad/ DOFM
1630 – 1730	Management of Ecotourism in Marine Protected Areas and Marine Parks	Wan Sabri Wan Mansor/ UPM
1730— 1930	Sustainable Financing of Marine Protected Areas and Marine Parks	Mohd. Najib Ramli/DOFM

3 November 1999 (Wednesday)

Session V	**Field Study Tour** *(Tour Leader: Gulamsarwar Jan Mohd/DOFM)*	
0800 – 0830	Leave Hotel to Kuala Kedah	
0830— 1000	Kuala Kedah to Pulau Payar Marine Park	
1000 – 1100	Management of Marine Protected Areas and Marine Parks at Micro Level	Ab. Rahim Gor Yaman/ DOFM
1100— 1200	Enforcement in Marine Protected Areas and Marine Parks	Salehan Lamin/DOFM
1330 – 1700	Recreational Activities	
1700 – 1800	Back to Hotel via Kuala Kedah	

4 **November 1999 (Thursday)**

Session VI	**Learnings and Lessons** *(Chairperson Raja Mohamad Noordin Raja Omar/DOFM)*	
0830 – 0930	Future of Marine Protected Areas and Marine Parks in Sustainable Resources Management	Kee-Chai CHONG/BOBP

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0930—1030	Discussion in Small Groups
1100—1200	Discussion in Small Groups (continued)
Session VII	Wrap-Up/Follow-Up *(Kee-Chai CHONG/BOBP/Chairperson)*
1445—1600	Group Discussion
1600— 1700	Summary and Recommendations

WELCOME ADDRESS

by Y.Bhg. Dato' Mohd. Mazian b. Jusoh

Director-General of Fisheries, Malaysia

Dr Kee-Chai Chong, Programme Coordinator, BOBP; Mr. Gulamsarwar Jan Mohd, Kedah/Perlis State Fisheries Director; distinguished participants, resource persons and guests, ladies and gentlemen:

Assalamalaikum and a very good morning to all.

It gives me great pleasure to be present here today to say a few words which I strongly believe are pertinent, given the continuing interest of FAO/BOBP in strengthening the capacities of member-countries to conserve and manage their fisheries and other aquatic resources. It is a great pleasure for Malaysia to be chosen once again as host in addressing the issues of marine environment in the Bay of Bengal region. It is indeed a delight to see a gathering of senior officials from all member-countries at this symposium, and I hope that you will be able to share your views and knowledge on Marine Protected Areas and their future. To all the BOBP delegates, I bid you a warm welcome and sincerely hope that you will have a nice and pleasant stay in Alor Setar.

Ladies and Gentlemen

The marine environment harbours a wealth of biological resources of immense benefit to mankind. In this complex ecosystem, each of the marine components has a role to play to maintain the ecological balance towards a healthy and conducive environment. The destruction of any single element in the system will cause imbalance to the system, and at worst, destroy the whole system. Not only do many marine areas support a great diversity of flora and fauna, and natural habitats, but the oceans play an essential role in climatic cycles and other global processes. Marine ecosystems and resources are fundamental to the sustainable development of coastal countries, providing food, minerals, pharmaceuticals and construction materials, and a vast range of other products. Economically, the aesthetically pleasant underwater areas and the associated marine environment provide an area of growth for marine tourism. All these characteristics increase the conservation value of these marine resources.

Despite their seemingly positive value, and their natural beauty, the resources have been subjected to tremendous pressure due to ignorance and irresponsible behaviour. These include unchecked and uncontrolled pollution, over-exploitation, conflicting uses of resources, and destruction of vital habitats.. The marine environment can no longer be left on its own, to clean and heal itself from all the waste and pollutants dumped into it. Pro-active management of the marine environment and its biodiversity is therefore a priority and very important one.

Ladies & Gentlemen

Since 1986, the IUCN Commission on National Parks and Protected Areas (CNPPA) has been promoting the establishment and management of a global representative system of marine protected areas (MPAs). MPAs play a critical role in the conservation of biodiversity, and hence provide a mechanism for Parties to meet the commitments called for by the UN Convention of Biodiversity (CBD), the UN Law

of the Sea, Chapter 17 of Agenda 21, and several other international agreements. Thus, MPAs are growing in importance globally as practical and potentially effective options for the management of fisheries, the protection ofbiodiversity and the generation of income from eco-tourism. The effective management of MPAs to ensure that they meet their declared objectives poses many challenges. Steps must be taken to rectify shortfalls in the management ofexisting MPAs. This was stressed in the recent report on MPAs by the World Bank, IUCN and the Great Barrier Reef Marine Park Authority at the first meeting of experts on marine and coastal biodiversity, held in Indonesia in 1997.

At all levels of MPAs implementation, the strong support of policy-makers and the general public is required.

Ladies & Gentlemen,

The Malaysian Government has recognised the importance ofMPAs and the need for integrated planning and management of both land and sea to control and minimise adverse impacts on the marine environment. The principle behind the establishment of MPAs in Malaysia is to protect, conserve and manage in perpetuity marine ecosystems of significance in order that they remain undamaged for future generations, and to inculcate public understanding, appreciation and enjoyment of Malaysia's marine heritage. Nonetheless, the establishment of Marine Parks per se is no guarantee ofthe continuing health of the coral reefs and related ecosystem. The conservation of this natural heritage depends on knowledge and understanding oftheir nature and existence, and most important, a collective effort by all to address the issue.

Since the establishment of Pulau Payar as the first Marine Park in 1987, great efforts have been made by the Department of Fisheries to create and increase awareness ofmarine conservation. Environmental education forthe public is vital if there is to be a change in the attitude ofsociety towards the environment. Man must no longer see himself as the master of the earth. Instead he must view himself as a vital component of the planet, responsible and sensitive to the environment. This approach requires man to think ecologically. However, any attempt to convey this message would not be successfully implemented without seeking the co-operation ofothers in order to alleviate the mammoth task ofmarine conservation, and make it successful and fruitful.

To ensure preservation of the country's unique biological heritage, the National Policy on Biothgical Diversity was developed and launched on 16 April 1998. The aim was to give the nation direction to implement strategies, action plans and programmes on biological diversity for the conservation and sustainable utilisation of its resources. It is also the hope and aspiration ofthe Government to transform Malaysia into a world center of excellence in conservation, research and sustainable utilisation of tropical biological diversity by the year 2020.

Ladies & Gentlemen

This symposium is timely for countries bordering the Bay of Bengal, so that they may collate, compare notes and share information and learning on conservation issues, action to promote conservation, and the management of MPAs, including what works and does not work in the management of such-resources. Effective management of MPAs will require collaboration between countries to address common problems and to integrate ecological objectives, ecosystem approaches and biodiversity conservation into regional planning.

I sincerely hope that all participants, especially from member-countries, will take this opportunity to share and discuss in depth the various problems and suggest options for addressing the management strategies of MPAs towards conservation and sustainable use of our shared marine resources.

I would once again like to thank BOBP for reposing confidence in the Department to organise this symposium. I wish the symposium great success. I sincerely hope that the symposium leads to a fruitful outcome, ensuring the proper and efficient management ofMPAs into the next millennium. I appeal to all participants to take time and wander around Alor Setar, enjoy the warm hospitality ofthe Malaysian people and their array of local and international cuisines.

With that, in the name of Allah, the most Gracious and most Merciful, I officially inaugurate this Malaysia - BOBP/FAO Regional Symposium on Marine Protected Areas (MPAs) and Their Management.

Thank you.

LIST OF PARTICIPANTS

Mr Amalendu Mukkherjee	Senior Assistant Secretary Ministry of Fisheries and Livestock Bangladesh Secretariat Dhaka, Bangladesh
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Keynote address:

THE NEED FOR MARINE PROTECTED AREAS (MPAs) AND MARINE PARKS: NETWORKS AND TRANSBOUNDARY MANAGEMENT APPROACHES FOR SUCCESS.

Bernadette O'NeiI
Environment Australia

Introduction

It is a great privilege to be invited here by the Bay of Bengal Programme and the Malaysian Government as the keynote speaker for the Symposium on Marine Protected Areas and Marine Park Management. It is an unusual opportunity to be exposed to and learn from so many countries' experiences in one workshop.

In my presentation I will primarily draw on recent Australian experience and try to place this in an international context. There are lessons to be drawn form each country that is represented here today and hopefully the Australian story will be useful. National experience has shown that marine protected area development is challenging, difficult and expensive, but shared experiences will help with the process.

Why have MPAs?

First, let's define marine protected areas. The IUCN general definition (IUCN 1994) of protected areas applies to marine protected areas as follows:

> An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Development of a national system of MPAs fulfils Australia's international responsibilities and obligations as a signatory to the Convention on Biological Diversity (UNEP 1994) and the major components of the Jakarta Mandate developed under that Convention.

Within the Jakarta Mandate, five thematic issues have been identified:

- Integrated Marine and Coastal Area Management
- Sustainable Use of Marine and Coastal Living Resources
- Marine and Coastal Protected Areas
- Mariculture
- Alien Species

Australia's system also provides a means of meeting obligations under the Convention on Migratory Species (Bonn Convention) and responsibilities under bilateral agreements for migratory birds (JAMBA and CAMBA). It also supports the World Conservation Union (IUCN) World Commission on Protected

Areas program of promoting the establishment and management of a global representative system of MPAs (Kelleher et al. 1995) and recent developments within the Convention on Sustainable Development.

Goals of MPAs – Conservation and resource management

The two main drivers for establishing MPAs consistently emerge as biodiversity conservation and sustainable resource management. We are aiming to conserve biodiversity and natural systems and ensure that economic development and uses of marine resources are ecologically sustainable.

While Australia's national system has as its primary goal:

- to establish and manage a comprehensive, adequate and representative system of MPAs to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems, and to protect Australia's biological diversity at all levels.

The system also has secondary goals to

- incorporate integrated ecosystem management
- manage human activities
- provide for the needs of species and ecological communities and
- provide for recreational, aesthetic, cultural and economic needs of indigenous and non-indigenous people

Interestingly many of the 300-odd MPAs in the Australian national system are declared primarily as fisheries reserves.

Integrated ecosystem management

Marine protected areas are a component of integrated ecosystem management of the oceans. By this we really mean integrated human use management to maintain:

- ecological processes in the ocean including, for example, water and nutrient flows, community structures and food webs, and ecosystem links
- marine biological diversity, including the capacity for evolutionary change and
- viable populations of all native marine species in functioning biological communities.

Urban and infrastructure development in the coastal zone, together with the development of marine industries, continues to place increasing demands on our coastline and oceans.

Ocean ecosystems and their marine biological diversity are core national assets. If we manage their use well, they can meet a broad range of economic, social and cultural aspirations.

One way of maintaining marine ecosystems is to establish protected areas which represent the natural range of ecosystems.

Collapse of marine ecosystems and fisheries internationally, with the associated economic damage and social dislocation, is a stark warning of the vulnerability of marine systems. In Australian waters, the

degrading of our unique temperate seagrasses and serious declines in stock of important commercial fish species such as southern bluefin tuna, southern sharks, orange roughy and gemfish, show that we are not immune from such threats.

Australia has recently made a commitment to ecosystem-based oceans management by developing an Australia's Oceans Policy.

The basis of Australia's Oceans Policy is to:

- meet international obligations under UNCLOS and other international treaties
- understand and protect Australia's marine resources & biological diversity
- establish integrated planning and management of marine resources and
- ensure economic development and uses of marine resources that are ecologically sustainable

The Oceans Policy is to be implemented through development of Regional Marine Plans based on large marine ecosystems.

Management of our oceans purely on a sectoral or industry-by-industry basis will not be sustainable in the long run. We need to recognise and manage for ecosystem health by seeing that activities such as fishing, tourism, shipping, aquaculture, coastal development and petroleum production are compatible with each other and with the ecological health of the oceans.

Under Australia's oceans policy regional marine plans are the basis for integrated management across State and Commonwealth waters based on large marine ecosystems and will integrate environmental, economic, social and cultural interests.

While broad-scale ecosystem-based management has not been achieved yet, our experience shows that committing to and developing MPAs helps this agenda.

MPAs as flexible tools

MPAs are just one of a range of tools available to managers. The art is in choosing the right tool or combination of tools for the job. Integrated management of course makes this a lot easier.

Other conservation/management tools include species-based conservation of marine biota; the regulation and management of marine resource use; the promotion of the principles and practices of ecologically sustainable development; and reduction and management of pollution

MPAs themselves can be established and managed for a range of desirable outcomes as highlighted in the discussion on managing for conservation and resource use.

The World Conservation Union has developed a set of six protected area management categories which are applied to both terrestrial and MPAs (IUCN 1994). They range from strict nature reserve to managed resource protected areas.

While the categories are not a driver for developing MPAs they are a very useful way of being able to understand across internal and national boundaries the reasons for establishing MPAs and the management intentions. They are not a commentary on management effectiveness and should be

interpreted with flexibility at national and regional levels. They are a means of comparison and an assessment of protected areas systems.

The categories imply a gradation of human intervention but are not a hierarchical structure as they all contribute to biodiversity conservation. All MPAs across all management categories must be formally established primarily for biodiversity conservation.

The IUCN Management Categories are:

Ia Strict Nature Reserve: for science

lb Wilderness Area: wilderness protection

II National Park: ecosystem conservation & recreation

Ill Natural Monument: conservation of natural features

IV Habitat/Species Management Area: for conservation through management intervention

V Protected Landscape/Seascape: for landscape! seascape conservation & recreation

VI Managed Resource Protected Areas: for sustainable use of natural ecosystems

Managing human uses in MPAs

Fundamental to deciding what sort of MPAs we will establish is how we manage human use within those declared areas.

Any system of protected areas needs to be accepted and supported by the stakeholders if it is to succeed in its primary purpose of biodiversity conservation. The recognition of social, cultural and economic considerations relating to proposed protected areas is fundamental to the process of determining a system.

There is a range of human activities that may potentially occur within an MPA. Uses within MPAs can range from relatively low-impact activities, such as swimming, to extractive resource use, such as fishing. All these uses need to be managed. Multiple use is simply where there is more than one human use of an area. How you manage this process can be particularly significant if you are managing extractive uses such as fishing or petroleum.

In the Commonwealth waters of Australia's EEZ, we have adopted a case-by-case approach to multiple use issues. This approach aims to ensure protection of biodiversity values while allowing for the management of a range of appropriate uses on a precautionary basis, so that activities are consistent with biodiversity protection.

Four fundamental principles for multiple-use management have been developed for general application to the marine environment and the selection and management of MPAs. They are:

- maintenance of ecosystem integrity
- wealth generation and resource use
- equity and
- participatory framework for decision-making

In consultation with stakeholders, the application of these principles can assist in reaching a negotiated outcome. For activities to take place, they must be consistent with the objectives of an MPA.

Given the range of processes for dealing with management issues, stakeholders have a right to know what principles and processes will apply in discussions relating to MPAs, and how they will be involved in any process concerning areas that interest them. This way community involvement can be maximised. Any proposal for an MPA should involve consultation with stakeholders at the earliest stages of consideration.

Resources need to be allocated to appropriate assessment processes to understand current and potential uses of any nominated area. Then processes dealing explicitly with those uses and any related costs or benefits need to be agreed with stakeholders.

Why have a network of MPAs?

The Convention on Biological Diversity states that a system of protected areas forms a central element of any national strategy to conserve biological diversity. Under the Convention the term network implies that the various components of a system of protected areas of a country or region, may conserve different portions of biological diversity, often using a variety of approaches to management. Again it recognises the flexibility of MPAs to achieve differing outcomes.

What does a network allow that individual MPAs or other fisheries management tools do not allow? PAs are basically islands of protection surrounded by vast unmanaged areas of exploitation. MPAs will not advunce marine conservation in a broader context unless they are declared and managed in a systematic way to take account of the broader ecosystems in which they function.

The advantages of a network are that it encourages the consideration of:

- broader ecosystem context
- integrated management
- designing and implementing ways of co-operation
- sharing resources
- learning from successes and mistakes
- performance assessment across the network and
- building community involvement.

Australia's network: National Representative System of MPAs (NRSMPA)

The characteristics of MPAs in the NRSMPA are that they:

- **have been established primarily for biodiversity conservation**
- **meet one or more of the IUCN management categories**
- must have secure status and
- contribute to representativeness, comprehensiveness, adequacy of the system.

The NRSMPA is based on agreed national co-operation between seven state governments and the federal government. It is being established within a bioregional framework that identifies marine regions across jurisdictional boundaries. The framework recognises the interconnectivity of marine systems, allowing for the marine environment to be understood and planned for on an ecosystem basis.

The NRSMPA is a national system ofMPAs that contains representative samples ofAustralialEs marine ecosystems. Individual MPAs are declared under the appropriate legislation for each jurisdiction. Jurisdictions are at varying stages of development and progress for components of the NRSMPA. Progress across jurisdictions will also be contingent on available resources, determined to some extent by the level of commitment of governments. Cross-jurisdictional co-operation is an essential element in achieving the NRSMPA.

In an attempt to achieve and understand a national system we have agreed Guidelines for establishing the System and have recently developed a three year Strategic Plan with a set of34 Actions. This plan is agreed nationally at Ministerial level.

Development of the NRSMPA

The system's development is based on the following principles:

- apply a bioregional planning framework
- address comprehensiveness / adequacy! representativeness
- include a proportion of highly protected areas
- apply a precautionary approach
- practise effective consultation
- support indigenous involvement and
- use decision making to integrate long and short-term issues.

This set of principles and some agreed processes for how MPAs are developed and managed allows us to find the commonalities in our work which leads to increased cooperation.

Transboundary management approaches for success

Australia shares maritime boundaries with Indonesia, Papua New Guinea, New Zealand, the French Territories, the Solomon Islands, and in the Antarctic also with the Norwegian, French and New Zealand claims. The world's oceans are inter-connected and many of our management concerns are part of a larger regional or global concern that can only be addressed through international co-operation.

Through the Oceans Policy, Australia is committed to participating internationally in bilateral and multilateral arrangements to establish and implement international regimes that are effective in identifying and addressing issues in transboundary ocean management.

Regionally Australia is interested working with countries in the region. In an effort to support Malaysian initiatives to conserve marine biodiversity, two Malaysian scientists identified by the Malaysian Department of Fisheries, will visit Australia during November 1999 to participate in seagrass and

dugong surveys being undertaken by James Cook University (JCU) and the Great Barrier Reef Marine Park Authority (GBRMPA) off the coast of northern Queensland.

Adding to this capacity-building exercise, Australia is also planning a one-week operational training course for Malaysian marine park managers. The training will occur later this year or early in 2000 and will be conducted in Malaysia. Similar planning is under way for a workshop for senior managers on MPA policy development and management and strategic planning for integrated coastal zone management.

While there are many international transboundary issues there is a shortage of international models for transboundary MPAs.

In September 1997 the IUCN launched a major new initiative: Parks for Peace in Transboundary Protected Areas as a Vehicle for International Co-operation. This initiative began with a major international conference in Cape Town, South Africa. One of the outputs of this conference was the Declaration of Principles.

This included support for

- the use of full range of IUCN categories
- fully engaging local and indigenous people
- building strategic partnerships between government, NGOs, private sector and local communities
- integrating initiatives into broader programs for conservation and sustainable development
- effective implementation of international and regional initiatives for biodiversity conservation.

Subsequently a draft Code of Conduct has been developed.

One example of true international co-operation is the Wadden Sea which extends along the North Sea coasts of the Netherlands, Germany and Denmark. It is one of the world's most important tidal wetlands both for species and habitats and for its high recreational value. Situated next to densely populated and industrialised areas, the Wadden Sea is endangered by human activities such as coastal engineering, eutrophication, pollution, gas and oil exploitation, tourism and fisheries.

Some 25 years ago, the Netherlands, Germany and Denmark started initiatives to establish protected areas, national parks and nature and wildlife reserves. This resulted in the protection of the Wadden Sea by an almost unbroken stretch of reserves and parks, through a series of national initiatives in the three countries. Trilateral cooperation was formalised by adoption of the Joint Declaration on the Protection of the Wadden Sea, following three Trilateral Governmental Conferences between 1978 and 1982. The recently adopted Wadden Sea Plan entails political agreements with regard to common policy and management of the Wadden Sea Area.

Transboundary management approaches for success

Within Australia we have found that some elements in the process have assisted in developing transboundary cooperation on MPAs. They are complementary legislation, a memorandum of understanding or similar agreement, a functional inter-governmental committee, an advisory group or groups involving government and non-government representation and a commitment to information and resource sharing.

The recent Australian experience may have some generic lessons. In our national system we have eight governments cooperating and we have established MPAs that straddle internal borders. There are some issues that have arisen in doing this work and probably some lessons that can be applied elsewhere. Taking an ecosystem approach to our establishment and management of MPAs means that we have to think across the boundaries that usually divide us.

At a federal level we are currently cooperating with state governments to declare and manage a number of MPAs:

- Great Australian Bight Marine Park
- Ningaloo Marine Park
- Mermaid Reef/Rowley Shoals
- Solitary Islands
- Macquarie Island

We have discovered that even with commitment and goodwill there are many challenges. I have listed some elements that we have found to be essential to success. Ifa MPA is lobe declared across traditional boundaries with a consistent aim then a complementary legislative base is needed.

A memorandum of understanding or similar document at a high level (ministerial or heads of agencies) can help you work through unforeseen problems that may arise in a joint process.

A formalised structure such as an inter-governmental committee can again provide guidance and a broad base for issue resolution.

An advisory group or groups made up of government and non-government representatives can build support for a proposal and give notice of issues in the broader community that could impact on a process.

A strong conirnitment to information and resource sharing is essential. This relates to planning for an MPA and also managing it.

Some lessons we have learnt in transboundary management cooperation are that goodwill is essential. That it will take more time than you would think. Always have a faliback plan that will allow you to continue with your own priorities if the cooperative venture does not succeed.

Conclusion

We know that while the State and Federal governments of Australia have taken some pro-active steps in establishing MPAs, the challenges to achieving the goals of the National Representative System of MPAs remains daunting. But we see ourselves in an international context for this work.

At the international level, the challenges to achieving meaningful marine conservation were recently acknowleged at the Seventh Session of the Commission on Sustainable Development (New York, April 1999), when it re-affirmed its strong encouragement to States to *establish and manage marine protected areas, along with other appropriate management tools, consistent with the provisions of UNCLOS and on a basis consistent with the program of work under the Convention on Biological*

Diversity and its Jakarta Mandate in order to ensure the conservation of biological diversity and the sustainable management and use of oceans.'

In making a formal statement at the Seventh Session, the Australian Commonwealth Environment Minister noted that there is currently no international mechanism to allow the declaration of MPAs in the high seas. *'... measures will become essential if we are to achieve sustainable multiple use management of the resources of the high seas, their ecosystems and their natural productivity. At stake is the biodiversity and important industries which depend on it. A suggested approach to address this issue, proposed at the Session, would be to utilise the 'Open-Ended Working Group on Oceans', to consider mechanisms that will allow the international community to establish protected areas on the high seas.* '(Robert Hill 1999).

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Question-and-answer session following the keynote address

Dr. Kee Chui Chong - BOBP

Q Have MPAs succeeded? Has the success anything to do with the size of the MPAs?

A. Success depends on the objectives set when setting up MPAs, and is not dependent on the size. However, MPAs have helped conserve the marine environment.

Dr. Kee Chai Chong - BOBP

Q. Has there been any increase in terms of fish size and quantity?

A. It is still not clear, but in total protected areas, a general increase in size and numbers of fish has been observed.

Ms. Thalathiah Saidin - Malaysia

Q. Why is a National Ocean Policy needed since there is already a MPA Policy?

A. A National Ocean Policy is needed to resolve conflicts of usage e.g. between the petroleum industry and the fishery industry. The National Policy covers a wider area than the MPA policy, because MPAs may sometimes be in small pockets.

Ibrahim Salleh - Malaysia

Q. In the setting up of MoUs, who were the signatories?

A. In Western Australia, the MoUs were between different agencies e.g between the Environment Department and the Fishery Conservation Department. MoUs normally define what is to be done and how it is to be done. They increase cooperation among parties involved.

Ibrahim Salleh - Malaysia

Q. Is there any overlap between the Intergovernmental Committee and the Advisory Group set to manage the MPAs and what are the Terms of Reference (TOR)?

A. The MoU signed is normally done at a high level between the policy-makers, while the Intergovernmental Committee consists of people at the implementation level.

Dr Purwanto - Indonesia

Q. What is the level of community involvement in surveillance activities in MPAs?

A. The level of participation is limited but co-operation has been good.

R.A.D.B. Samaranayake - Sri Lanka

Q How many countries are involved in transboundary management of MPAs?

A. Presently the arrangements are being made through interstate legislation to allow transboundary jurisdiction.

Mr. Anser Ali - India

Q. What kind of penalties are being meted out to offenders of MPA regulations?

A. There are penalties, but complementary regulatory arrangements are still needed.

Mr. S. M. Md. Ishaque Bhaiyan- Bangladesh

Q. When an MPA is set up, is there a loss of fishing grounds, especially if a lot of small islands are **turned into MPAs.?**

A. Setting up of MPAs should take into consideration the geographical location and the goals set up.

Thalathiah Saidin - Malaysia

Q. Is the setting up of a national network of representative useful in managing MPAs?

A. It is an effective tool in order to get the commitments of the various parties involved.

R.A. D.B. Samaranayake - Sri Lanka

Q. **Why does Australia use the IUCN category for management?**

A. Australia happens to be one of the parties that agreed to it.

Dr. Kee Chal Chong - BOBP

Q. Why is an MPA regarded as a flexible tool?

A. MPAs can be highly protective of a fishery, but there should be fall back plans should the primary objectives be not met due to some unavoidable reasons.

MARINE PARKS OF MALAYSIA - A Management Tool for Fisheries Resources

By Kevin W P Hiew

Head of Marine Parks Section, Department of Fisheries, Malaysia

Background Information

In 1983, the Government of Malaysia directed the Department of Fisheries to take over the responsibility for establishing and managing marine parks in Malaysia.

The DOF immediately took up research to identify coral reef areas all over peninsular Malaysia, with the intention of declaring them as marine parks.

2. Interim Measures And Establishment Of Marine Parks

As an interim measure, as early as 1983, the waters stretching 8 km from the shore surrounding Pulau Redang in the State of Trengganu were declared as a Fisheries Prohibited Area (FPA). Two years later, waters stretching 3 km from the shore and surrounding 22 islands in the states of Kedah, Trengganu, Pahang and Johor were also declared as FPA under the Fisheries Act, 1963.

Later in 1985, the Fisheries Act 1985 was enacted by Parliament, and provisions concerning marine parks were included in the Act (Division IX Section 41-45).

After much study, research and deliberation, waters stretching two nautical miles from the shore, surrounding 40 islands in the States of Kedah, Trengganu, Pahang, Johor and the Federal Territory of Labuan were legally declared as marine parks, Malaysia, under the Fisheries Act 1985. However between 1983 and 1994, although these waters were not legally declared as marine parks, they were managed administratively as protected waters (FPA). In 1998. waters off two more islands in the state of Trengganu were declared as marine parks.

Besides the marine parks, there are at present three FPAs in the State of Sarawak, two in the State of Malacca and one in the state of Negeri Sembilan.

3. What Is A Marine Park?

A marine park is an area of the sea zoned as a sanctuary for the protection of its marine eco-systems, especially coral reef and its associated fauna and flora.

4. Objectives Of Marine Parks

The main objectives of marine parks are:-

4.1 To conserve and protect the marine eco-system, especially coral reef areas, in order to ensure sustainable use of the natural marine resources in marine park waters.

4.2 To conserve, protect and manage the natural marine ecosystem for the sustainable exploitation of fisheries resources in the coastal waters.

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4.3 To conserve and manage marine parks for research on biodiversity, for education, and for recreation (tourism).

5. Benefits **Of Marine Parks**

The following benefits can be derived from marine parks:-

5.! Fisheries resources are managed by conserving the biodiversity of marine park areas.

5.2 Scientists are given encouragement and opportunities to carry out research on biodiversity, pharmaceutical and other purposes.

5.3 The marine resources, especially coral reefs which are the main attraction for visitors to marine parks, are conserved and protected.

5.4 The marine resources and biodiversity which are over-exploited and face extension including turtles, marine mammals and some big shellfish – will be rejuvenated.

5.5 Educational and recreational opportunities are upgraded.

6. **Marine Park Centres**

The waters surrounding the 40 islands are grouped into five marine parks for better administration and management. They are:-

6.1 Pulau Payar Marine Park in Kedah - with 4 islands

6.2 Pulau Redang Marine Park Trengganu - with 11 islands

6.3 Pulau Tioman Marine Park in Pahang - with 9 islands

6.4 Mersing Marine Park in Johor - with 13 islands

6.5 Lanuan Marine Park in W.P. Labuan - with 3 islands

Each marine park has a center which acts as a focal point for the administration and management of the park. It also serves as a base for enforcement in the park areas. Information on the marine park and its fauna and flora is also available for all visitors in the form of posters, charts, slides, videos and others. The centers are used as focal points for marine environmental education, not only for students but also for the general public. The centers can also be used by researchers. The Pulau Redang and Pulau Tioman centers have laboratories with some basic facilities and equipment for scientists. There are also lodging facilities for rangers and scientists in three of the Centres - Pulau Payar, Pulau Redang and Pulau Tioman.

One sub-center at Pulau Tinggi (Johor) has just been completed and should be functional in a month. One more in Pulau Perhentian (Trengganu) is being planned. These sub-centers will also serve as focal points for the administration and management of the marine parks around them. There is a plan for more sub-centers devoted to better administration and management of marine parks during the 8th Malaysia Plan (200 1-2005).

7. Activities which are Encouraged

Activities that do not harm the coral reef and the environment are allowed and encouraged. These activities will also expose participants to the beauty and wonder of the underwater environment and thus increase their awareness and knowledge of the marine environment. It is believed that whoever is aware and knowledgeable about the environment would care for it and help to conserve and protect it. Among the activities allowed and encouraged are scuba diving, snorkeling, underwater photography, swimming, fish-feeding (controlled and limited), sailing! canoeing/non-motorized boating) and jungle tracking.

8. Activities which are Prohibited

Activities that are harmful and destructive to the coral reef and the marine eco-system are prohibited under the Fisheries Act 1985 (Section 43). Some of the prohibited activities are fishing and killing of fish, speargun fishing, collecting of corals, shells and other marine living organisms, collecting of sand, dead corals and shells, littering and polluting, anchoring of boats directly on to the reef, and constructing and erecting a structure (unless permission has been obtained).

9. Management

9.1 Under section 41 A-4| B of the Fisheries Act 1985 (amended in 1993), a National Advisory Council for Marine Park and Marine Reserve has been established.

9.2 This Council is chaired by the Secretary - General of the Ministry of Agriculture. Members are representatives from various sectors such as environmental and business NGOs, local Universities, a commercial firm, Federal and State Government Officers.

9.3 The functions of the Council are:-

a. to determine guidelines for implementation at the national level with respect to protection, conservation, utilization, control, management and progress of marine parks and marine reserve areas;

b. to co-ordinate the development of any area of a marine park or marine reserve with the Federal Government and any body corporate; and

c. to give technical advice to the State Government about any development project on any island which is situated in a marine park or marine reserve area.

9.4 Because of the peculiar situation in Malaysia, where land matter is under the jurisdiction of the State Government, it is important to ensure that development on the islands does not jeopardize the marine eco-system. In order to ensure that development projects on land are environment - friendly, the Council has decided to advise each state that has marine parks to form its own committee to advise the State Government on matters which impact on the marine environment. In this way, it is hoped that development projects on islands would be properly planned and managed and would not harm the marine environment.

9.5 The Department of Fisheries, Malaysia (which is a Federal agency) manages and administers all the Marine Parks of Malaysia on the basis ofbroad policy guidelines set out by the Council.

9.6 The monitoring and enforcement work within the park area is done by marine park rangers with the help of the Enforcement Unit of the Department of Fisheries. Besides enforcing the laws, the park rangers also carry out educational and awareness work, and other general maintenance and administrative tasks at the parks.

9.7 Research work in the parks is done mostly by the research arm of the Department of Fisheries with the help ofthe park rangers. Scientists from local and foreign universities, as well as NGOs, are encouraged and allowed to carry out their research work in the parks.

9.8 Funding: A Marine Park Trust Fund was set up by the Government in 1987 with an initial grant of RM 35,000,000 for the Department to start off the establishment and administration of marine parks. Initially, most ofthe fund was used to acquire assets like boats and vehicles and also build infrastructure such as marine park centers. However, since the mid-90s, the Trust Fund has not been used for such purposes but mostly for the operation and maintenance of parks. Trust Fund regulations allow the Department to collect donations from the public as well as from private companies. The Trust Fund can also raise funds through commercial activities such as sale of posters, T-shirts and books. Since the beginning of 1999, some marine parks have started collecting a 'conservation charge' from tourists who engage in snorkeling and scuba-diving in the marine park waters. Although initially the Department faced some resistance from the private sector, especially from tour operators and chalet/hotel operators, teething problems have now been solved and the department gets good co-operation from them. We have not received any complaint from visitors. In fact many foreign tourists are happy to pay the conservation charge, once they understand what the fund is used for.

10. Conclusions

10.1 The main purpose of establishing marine parks in Malaysia is to conserve and protect the corals and the fish and other living aquatic fauna and flora in the area's marine environment.

10.2 The most important eco-system in the marine park areas is the coral reef. However, the mangrove and mud-flat eco-systems we well as the seagrass beds are also important.

10.3 It is believed that about 40% of the commercial fish caught in the coastal waters (30 nautical miles and below) of Malaysia originate from or make use of the coral reefs. It is therefore important that corals with their abundant fauna and flora be conserved and protected, otherwise a large proportion of the fisheries resources may be lost.

10.4 The protection and conservation of the mangrove swamp, the mud-flats and the sea-grasses is also important, because they enhance fisheries resources in the coastal waters. It is believed that the depletion of fisheries resources in Malaysia is mainly due to the destruction of these habitats.

10.5 There is no doubt that over-fishing and the use of destructive fishing methods contribute to the depletion of fisheries resources in the coastal waters.

10.6 Thus it is very clear that the conservation of these habitats is very important to the economy of the country, both for food and for tourism revenue.

Question-and-answer session following Mr. Kevin Hiew's presentation

Alistair Cheal

Q Has the monitoring programme found any changes in fish and water quality?

A Monitoring programmes did show changes of fish and water quality, especially in areas near the development project during the construction period.

Anadel Cabanban - Universiti Malaysia Sabah

Q **Do you monitor fish catch statistics for areas around the park?**

A Fisheries landing data collected by the Statistics Division of the Department of Fisheries covers all areas, including those in the vicinity of the park. The anecdotal observation of anchovy fisheries around the Pulau Payar Marine park has shown an increase in numbers, but in the island of Pulau Pangkor in the state of Perak, there has been a decline. This shows that establishment of the marine park has increased the fisheries stock.

Kee-Chai Chong - BOBP

Q What percentage of the 40 islands that were declared as a marine park suitable for marine. protected areas? Was the establishment done on an ad hoc basis?

A An intensive study was done for two years on all the 40 islands before marine park was constituted. All the gazetted islands were suitable for the marine park.

MANAGEMENT OPTIONS FOR MARINE PROTECTED AREAS

by Dr Ridzwan Abdul Rahman
Borneo Marine Research Unit

Marine environment

Marine ecosystems and resources are fundamental to the sustainable development of coastal countries. They provide

- food
- minerals
- pharmaceuticals
- construction materials
- support tourism and recreation industry

Marine ecosystems play a vital role in:

- transport
- the culture and lifestyles of coastal people

Threats to Marine Environment

- Pollution
- Over-exploitation
- Conflicting uses of resources
- Damage and destruction of habitats

Loss of biodiversity

> Chapter 17, Agenda 21 in the action Plan of UNCED specifically requires that states should identify marine ecosystems that exhibit high levels of biodiversity and productivity and other critical habitat areas and ensure necessary limitations on use in these areas, through – inter alia – designation of protected areas.

Establishment and management of Marine Protected (MPAs) to conserve marine biodiversity.

MARINE PROTECTED AREAS

Definition of MPA by IUCN:

Any area of intertidal or subtidal terrain – together with its overlying water and associated flora, fauna, historical and cultural features - which has been reserved by law or other effective means to protect part or all of the enclosed environment, is known as a Marine Protected Area.

What is Management?

Management essentially means varying and controlling the human use of a marine protected area or human impact on it.

Effective management of MPA, or indeed of any inshore area, usually involves both land and sea planning which much be integrated, so that adverse impacts can be minimised.

MPA planning should therefore be undertaken within a framework of local, regional and national environmental, social and economic goals.

What is the best approach to management of MPAs?

- First, the objectives of management must be defined:
  - The plan for a highly protected area may have as an objective the exclusion of human influence to permit maintenance or re-establishment of pristine conditions.
  - The plan for a "used" area may have as objective, provision for the sustainable production of food and resources for use by people.

Once the objectives have been established, there are several management approaches to consider; namely:

- Zoning: setting aside different parts of the MPA for different types or levels of use.
- Seasonal Closure of the MPA during a part of the year, such as the breeding season, or for more than a year, in order to allow alternating periods of use and recovery from the impact of use.
- Bag Limit: Determining a permitted level of use, harvest or access within a specific season, and prohibiting harvest or access once that level has been reached.
- Prohibiting or limiting unacceptable equipment.
- Size limits: Establishing minimum and maximum size limits for harvest of species in order to protect breeding stocks.

Zoning

- Depends on objectives for management

Protect ecosystem	Produce protein
Protect processes	Stimulate recreation and tourism
Maintain diversity	Sustain yield
Promote education and research	Protect cultural site
Preserve water quality	Preserve aesthetics
Prevent erosion	Promote rational use and development

Criteria for selection of MPAs (IUCN, World Bank, GBRMPA; 1995)

- Bio-geographic criteria
- Ecological criteria
- Naturalness
- Economic importance
- Social significance
- Scientific importance
- National or international significance
- Practicality or feasibility

Elements in Effective Implementation of Management Plan

- Training
- Education
- Surveillance
- Enforcement
- Monitoring
- Review

Management effectiveness

- High: generally achieved management objectives
- Moderate: partially achieved management objectives
- Low: generally failed to achieve management objectives

Level	MPAs
High	117 (31%)
Moderate	**155 (40%)**
Low	**111 (29%)**
Unknown	923
Total	**1,306**

Reasons for MPAs failing to achieve their management objectives

- insufficient financial and technical resources to develop and implement management plans
- Lack of data for management decisions
- Lack of public support and unwillingness of users to follow management rules

- Inadequate commitment to enforce management
- Unsustainable use of resources occurring within MPAs
- Impacts from activities in land and sea areas outside the MPA boundaries
- Lack of management coordination

Recommendations

- lintegrated management of the marine environment needed
- Science should be applied to management
- Community support must be obtained.
- More people must be trained to manage MPAs
- A balance should be struck between planning, implementation and evaluation
- Sufficient funding needed.

Question-and-answer session following **Dr. Ridzwan Abdul Rahman's presentation**

Kee-Chal Chong - BOBP

Q Do we still need to manage the areas outside the marine protected areas?

A We do need to integrate ecosystems outside and within as one management entity, preferably through the establishment of a large park.

Raihin Roy- BOBP

Q Do you need to compensate people to translocate them due to loss of income from the establishment of marine protected areas?

A Compensation does not occur as people are not translocated. The Department of Fisheries, however, has embarked on a programme to provide various sorts of training for the affected fisherfolk to facilitate their in getting alternative jobs.

Ainul Raihan - Malaysia Institute of Maritime Affairs

Q Declaration of a marine park has the effect of increasing the number of tourists visiting the area. Is there a need to change the objective to reduce the number of visitors in the marine park?

A Even though the number of tourists goes up, there are mechanisms to address the issues. Giving educational material to visitors is one of the approaches to impart knowledge and awareness to them, thus reducing the likelihood that they will damage the environment.

QUANTIFYING AND SHOWING BENEFITS FROM MARINE PROTECTED AREAS FOR FISHERIES MANAGEMENT

by Dr. Annadel S. Cabanban

Borneo Marine Research Unit, Universiti Malaysia Sabah, Malaysia

MPAs are "Closed Areas" in Fisheries Management

Marine Protected Areas (MPAs), synonymously called marine sanctuaries or marine parks, are meant to help conserve ecosystems. In the tropics, MPAs are established to protect coral reefs from destruction and to save diverse fishes and other marine life from overfishing by prohibiting any exploitation within the area. As reefs with attractive marine life, these areas draw tourists. MPAs are regarded as closed areas in fisheries management. The usual criteria for their establishment are excellent coral cover, and diversity and abundance of fishes and other organisms associated with the coral reefs. They are particularly identifiable as spatial closures. However, MPAs could be opened to fishing after a period of protection. That would make such areas temporary closures.

In recent years, community-based resources management incorporated the establishment of an MPA as part of a more holistic approach to nearshore ecosystem management. Other areas of the nearshore waters are open to fishing, recreation, and navigation (Figure 1). Tourism is encouraged in this context, with the MPA as the main attraction, making it an alternative to fishing as an income-generating activity. It is in this context that the benefits of MPAs in fisheries management are discussed below.

How Fisheries Management Benefits from MPAs

In MPAs, fishing effort is prohibited, providing many benefits to conservation and fisheries management (e.g., Roberts, l998a; Roberts and Polunin, 1993; Alcala, 1997; Oakley and Pilcher, in press). MPAs maintain the diversity and abundance of corals and marine life living in them (Russ, 1985), thus conserving diversity. They

(a) protect spawning stocks

(b) enhance catch in adjacent fishing zones through emigration and

(c) provide larvae and recruits to downstream reefs. For these reasons, the establishment of MPAs is regarded as one of the viable options for the sustainability of shallow-water fisheries (Alcala and Russ, 1990).

Some of the benefits from MPAs for fisheries management have been supported by empirical studies. There is strong evidence about the protection of spawning biomass as a result of MPAs in Australia, Philippines, and elsewhere (Bohnsack, 1990, Roberts and Polunin, 1993; Russ and Alcala, 1996b; Mapstone et al., 1997). Since fishing effort is eliminated in MPAs, adults keep on reproducing while juveniles grow into maturity and become part of the spawning biomass. (e.g., Australia Mapstone et al., 1997; Philippines: Alcala, 1981, 1988; Alcala and Russ, 1990). Diversity, density, and biomass of target species of groupers (Serranidae), snappers (Lutjanidae), and emperors (Lethrinidae) increased when the community protected the coral reefs at Apo and Sumilon Islands, Philippines (Russ, *1985;* Russ 1989; Alcala and Russ, 1990; Russ and Alcala, 1996). (However, the abundance of target fishes was not found to differ significantly between closed and open reefs in Australia – e.g., Ayling and

Ayling 1992: Ayling and Ayling, 1994; Mapstone et al., 1997). Fish catches from adjacent marine areas increased after protection and declined when the protection was lifted (Alcala, 1988; Alcala and Russ, 1990; Robertson, 1999; Robertson, 1999).

The increase in yield can be explained by the "spill-over" effect. With protection, individuals of target species are not caught, and therefore have a chance to grow and reproduce (Russ and Alcala, l996). The size structure of populations in closed reefs is higher than in open reefs (Ayling and Ayling, 1992; Ayling et al., 1991). With growth in size, fishes are capable of swimming longer distances, even beyond the perimeters of the MPA. In this manner, biomass from MPAs is exported (Russ and Alcala, 1996). Thus, the yield-per-recruit is higher with protection than without, as simulated for a fusilier (Pterocaesio pisang, a common schooling fish) in Sumilon Island, Philippines (Russet al., 1992; Figure 1). The spill-over effect is difficult to demonstrate but it could be done with tag-recapture techniques, i.e., tagging fishes from the MPA and seeing whether tagged fishes appear in the catches of the adjacent fishing zones.

The replenishment role of MPAs to other reefs is based largely on the knowledge of the biology of marine organisms where gametes and larval stages are pelagic. and on the genetic linkage of populations (Ablan et al., 1999; Roberts, 1998). It is this role that is most difficult to show with empirical studies, because it requires proving a link of recruitment estimates on downstream reefs coming from the marine park. Current studies on larval dispersion from coral reefs around islands challenge this notion. So does the growing knowledge of the biology of larval fishes and the ecology of reef waters. Some larvae are capable of fighting current and maintaining their position (Leis et al., 1996). High percentages (15-60 %) of the marked larvae were found to return to their natal reefs (Jones et al., 1999), and may result from retention on leeward reefs around islands (Swearer et al., 1999). Nevertheless, MPAs are still beneficial, as they provide recruits to natal reefs and to downstream reefs as well (Ablan et al., Roberts, 1998).

MPAs are favorable areas for prompt fisheries management. There is no need for a thorough understanding of the biology of the stock. Estimates of the density of target species would be useful at the start as a reference point for evaluating the benefit of the closure at some point in time. It is also considered easy to enforce; no quotas are set, because fishing is completely prohibited in the MPA.

Quantify benefits for effective management

The benefits of MPAs for fisheries can be quantified for more effective management of the fisheries. In the context of community-based management, quantitative and visual illustrations of these benefits are most useful to convince the community that conservation of reefs can lead to direct benefits for their livelihood and sustainability (Uychiaoco et al., 1999). For the resource manager, quantitative information will facilitate development of management options that are more adaptive to current conditions.

Quantify increase in abundances, biomass, catches, and yield

Abundance and size are variables that show the effect of reef closure on target fishes. These variables have to be monitored inside the MPA, as these data can partly explain the catches harvested outside of the MPA. From the catches, data on these variables as well as the reproductive stage can be collected from the catches.

Good coral cover is correlated with diversity and high abundance of fishes (e.g., Carpenteret al, 1981). Resource managers may opt to monitor coral cover, with the purpose of drawing links between having a protected area with good coral cover and good population of food fishes, and ensuring increased yield from the coral reef fishery adjacent to it.

The most obvious benefit of MPAs for fisheries is the increase in catches of fishes from fishing zones adjacent to it. Groups of fishes targeted by fishermen due to their marketability and high value are a focus of MPA effort. Data must be collected on the composition, size, abundance and biomass of fish catches, the yields of different gears, and the catch-per- unit effort. All these data can show trends in catches, incomes, and the viability of fishing to the community. Positive trends, needless to say, are positive messages that lead to wider community acceptance ofMPAs. For the fisheries managers, this information will allow assessment ofthe effectiveness of the MPA with regard to size (but see below), area of the buffer zone, and level of effort.

Procedure in quantifying benefits

Increase in catch per fisherman, and increase in fish yield for an area, are examples ofbenefits expected from MPAs. These data can be correlated with data collected within the MPA. The strategy found useful in this context in dealing with fisherfolk is the participatory approach. The strategy ensures numerous benefits such as efficiency in the use of resources (Uychiaoco et al. 1999). Monitoring of catch statistics is the main task in quantifying benefits, and fishermen could help the process by providing catch data. Resource managers could investigate other parameters (diversity, abundance, etc.) of populations within the MPA that could explain composition and trends in catches. This participatory approach fosters a sense of ownership and commitment to the MPA, and provides a better assessment of the performance of an MPA for fisheries management. (Robertson, 1999b; Uychiaoco et al. 1999).

Fisheries data collection

The yield each year of the fished area adjacent to the MPA will be estimated. This will involve the mapping and estimation ofthe area by resource managers and scientists. Data on the number offishermen in this area needs to be collected every day. This data and the average catch per fisherman will provide the yield for the area. Long-term data on yields provides the opportunity to assess the benefits that accrue over seasons and years.

The catch statistics to monitor are composition, length and weight of individuals (of target species), and total weight of catches. Local common names can be used but it is important to have specific common names for each species for more detailed analysis by the fisheries manager. Other biological characteristics of the stocks may be monitored if desired (e.g., reproductive stage and stage of development —juvenile or adult). Market values for each species are desirable to estimate the economic value of the fishing ground. These data, when collected on a daily basis for each gear, will provide information on trends through time (see Appendix A and Appendix B).

Collection ofstatistics on tropical fisheries is difficult because of the characteristics of the fishery. It is multi-specific, multi-gear, and small-scale. The catches are not landed directly to designated fish landing sites and, more often than not, some ofthe catch has been apportioned for consumption at home. In this setting, many fishermen are fishing in small vessels (<3 tons GRT). Interviewing all fishermen would

be taxing to the resource manager and participants of the monitoring activity. It is thus important to sample fishermen in the fished area. However, the ideal situation is for each fisherman to document his catch and submit this to the resource manager.

Biological and ecological data collection

MPAs on coral reefs are, more often than not, selected due to the high diversity of corals, fishes, and other marine organisms, abundance of fishes, excellent coral cover, and other positive attributes. Monitoring of specific attributes can allow assessment on whether the MPA has maintained or increased the diversity and abundance of target species. For attributes outside of the MPAs, it is important to collect data on catch composition and the reproductive stage (juvenile, maturing, adult) from catch samples. For parameters inside the MPA, coral cover and abundance and size structure of target fishes are important correlates to catch statistics.

Inside the **MPA**

A non-exploitative method is required for this monitoring of the biological (mainly stage of development) and ecological characteristics of coral reef fishes. The visual transect method involves SCUBA diving and identifying and counting fishes along a 50-100 m line (see ASEAN-Australia Survey Methods English et al., l997). This method can be modified to exclusively focus on target food fishes so that more underwater time would be available for estimating the size of the individuals censused underwater. Percentage coral cover is also estimated using a quadrat that is placed at 5-m intervals. This method requires preparatory training in SCUBA diving for fishermen or any interested member of the community. However, for the purpose of estimating the number of individuals and the sizes of individuals in the MPA, snorkelling could be done (Uychiaoco et al., 1999).

Another method is the Reef Check (Hodgson, n.d.) which is primarily a survey method to assess, mainly, whether a reef is overfished. Reef Check uses a list of species that are desired by fishermen. Absence or low numbers of these species indicates overfishing. Like the previous method, it uses SCUBA and line transect where coral cover and other indicators of man-made pollution (organic pollution from land) or natural threats (explosion of crown-of-thorn starfish population) are surveyed as well.

Outside the MPA

Samples of fishes from catches outside the MPA are to be measured, weighed, and examined. Length-frequency data will be gathered to estimate growth rates. Data on the reproductive stages of the fishes will be taken from gonadal examination to learn about the population structure of the stock.

Simple, informal, and regular dissemination of results

Information on the coral reef fishery adjacent to MPAs should be disseminated to the community. Benefits, in terms of improved catches in composition and abundance, can be shown in a simple and non-formal way. Pictures of fishes, showing an increase in sizes caught in the fishing area, and graphs of catches to show trends are very effective ways. Graphs of numbers of individuals for target species can be shown and displayed in a public place. Information dissemination should be done as often as

possible to continue gaining the trust and confidence of the villagers (Uychiaoco et al., 1999). The ultimate goal is for villagers to be able to protect their reef and fish only in designated zones.

Size of **MPA for fisheries management**

MPA are useful to fisheries management, no matter how small they are, by enhancing fish stocks and increasing yield ofadjacent areas. The Anse Chastanet reserve is only 2.6 hectares in area (150 m x 175 m; Roberts and Hawkins, 1997) but was effective in enhancing local fish stocks (Scaridae, Lutjanidae) after two years of protection. Sumilon Island Fish Sanctuary is only 0.4 km2 (Russ and Alcala, 1996) but the adjacent waters have yielded as much as 24 tons/km2/yr (Alcala and Russ, 1990). Spawning stocks in small MPAs can potentially serve as "sources" of larvae and recruits, replenishing fishing stocks on the natal reef (Jones et al., 1999; Swearer et al., 1999) or downstream (Ablan-Lagman et al., 1999; Jones et al., 1999; Roberts, 1998).

Network of Permanent MPAs

A network of permanent MPAs is useful for fisheries management for various reasons. MPAs are ecosystem-based management tools for fisheries management. It is better to have permanent MPAs because changes in the ecosystem do not accrue overnight. It takes a few years *(3-10)* for long-term closures to show benefits that cannot be confused with natural variability of recruitment. Increase in stock density as a result ofprotection can easily be eliminated by fishing (e.g., Alcala and Russ, 1990; Robertson, 1999a, Robertson, l999b). Organising open and closed years on the MPA will be difficult to plan and cumbersome to manage (Robertson, ! 999a, ! 999b). Determining the duration of protection, the length of reopening to fishing, and the amount to exploit are difficult to ascertain but are crucial in ensuring that stocks that have recovered will not be fished out in a few weeks after opening. Establishing MPAs within a community is a process that also takes a long time and generates associated costs. When one is established, it is better to keep the benefits of increased spawning biomass and increased catches known to resource-users.

Thus, a network of small and permanent MPAs can provide the above benefits to coral reef fisheries management, considering sources and sinks of recruits in its design (Roberts, 1998). Increasing threats to coral reefs by blast-fishing and overfishing of various forms require the establishment of more MPAs (e.g., Pilcher and Cabanban, MS). Both synergistically cause the decline ofcoral reef fisheries. Protecting the reefs within the context of integrated coastal zone management can alleviate the continued decline of coral reef fisheries.

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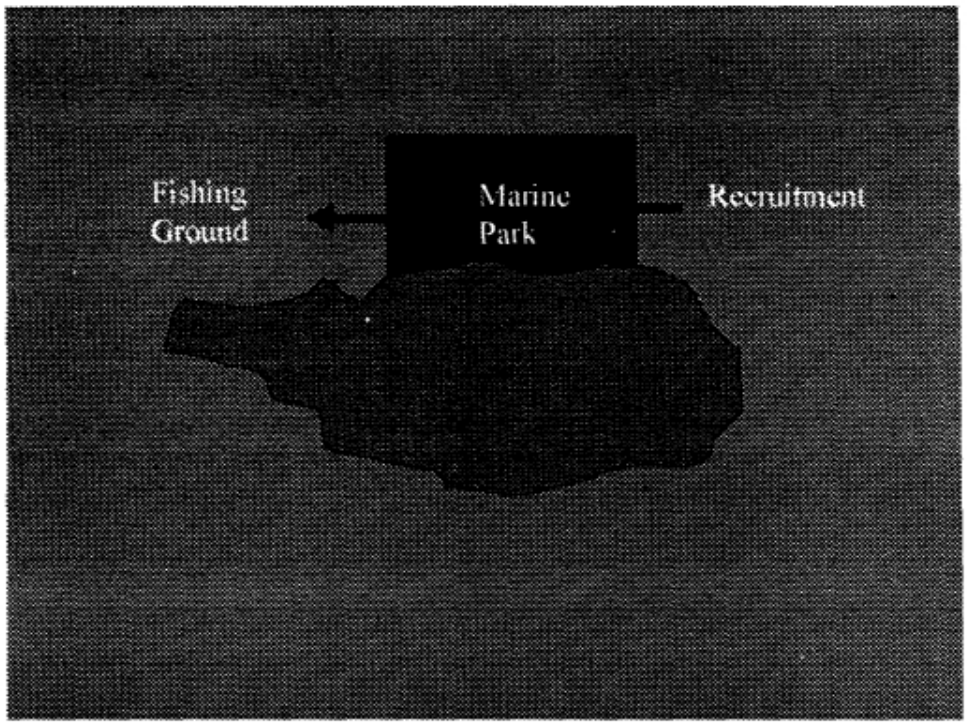
Figure 1 : **Schematic** diagram of a marine **protected area where** fishing is **prohibited. Arrows indicate the direction** of **inputs: recruitment to MPA and spill-over of hiomass to fishing areas and other downstream reefs.**



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Appendix A – Sample Data Sheet for Catch Statistics

Collector _____

Date _____

Fisherman _____

Location : _____

Gear _____

Time/Duration of fishing: _____

Remarks _____

Species	Size (Juvenile/Adult)	Weight	Stage	Notes

Appendix B – Sample Summary Data Sheet Catch Statistics

Species	Number of individuals	Size range	Total weight	State (Juvenile/Adult)

<<

Question-and-answer session following **Dr. Annadel Cabanban's presentation**

Thalathiab Saidin - Department of Fisheries, Malaysia

Q Have fish catches in and around marine protected areas increased significantly?

A Indications are that marine protected areas do increase the income of fisherfolk and increased the resources in the park.

Dr Purwanto - Indonesia

Q Is there data to show that income of fisherfolk in the marine protected areas increases?

A Yes, there are such data.

HOW DOES THE SIZE OF MPAs IMPACT ON BIODIVERSITY?

Need For Movable Boundaries And Network Of Protected Areas And Parks

by Mohamed Pauzi bin Abdullah
Department of Fisheries, Malaysia

The term "Marine Protected Area" is defined as "Any area of intertidal or subtidal terrain together with its overlying waters and associated flora, fauna, historical and cultural features, which has been reserved by law or other effective means to protect a part or all of the enclosed environment". (IUCN)

How **Big** should a Marine Park be?

It depends on what we are going to conserve. For example, coral trout *(Plectropomus leopardus)* requires a home site of 2000 m2 and roams as far as 7.5 km (Samoilys, 1996). Therefore the bigger the park the better. This is not disputed. But if we are given an option of selecting a single large park or several small parks with the same total area for MPAs, we have to carefully weigh several factors.

John W McManus (ICLARM) had proposed in 1994 that the disputed Spratly Islands be made an International Marine Park. It would rival the GBRMP in size, number of reefs and biodiversity, and could generate US$1 billion annually from tourism.

If we go in for several small parks, then each nature reserve should be as small as possible to allow sustained preservation of the target species of the reserve. All remaining resources should be allocated to establishing other reserves important to some other target species (Lahti and Ranta, 1986).

A Single Large Park or Several Small Parks (SLOSS)? When the species area curve is steep, big reserves are preferable. When the curve is shallow, it means more diverse habitats, so several small parks may be preferable.

Pros and cons of SLOSS

If we decide to establish many small reserves, we take the risk that these cannot support populations of organisms that have large home-ranges. Example: large predators or animals with very specialised diets that have to move over large areas. These may still survive if dispersal among the small reserves is easy, if we either space reserves close together or provide so-called habitat corridors. However, when a country has many small reserves, they preserve a wide range of habitat conditions and a considerable number of species. Also, in the event of disaster (oil spills, storms, high sedimentation, extreme heat, disease outbreaks etc.) there is less chance of total devastation if the reserve is spaced out across several locations.

If, on the other hand, only one large reserve is established, we may get a reserve that comprises less variable habitat, and thus fewer species in the total area preserved. But, this does not have to be so if the reserve houses only the best possible habitat. Further, if some species interaction inside the reserve is unstable (e.g if a predator is driving its prey extinct, or one competitor is excluding another species),

the whole business of conservation is jeopardised. Once things go down the drain, there is no neighbouring reserve to re-introduce the animals into.

Species loss through unstable interaction may be prevented in a patch network if the organisms have different dispersal ability. If the endangered prey disperses better than its predator, the prey could always find temporary refuge in another reserve and live there for some time before a predator appears.

So, the choice of either a single large reserve or several reserves depends on what species we are trying to conserve. In reality there will most often be a trade-off or opportunity cost involved. For sure, managing SLOSS questions in real life has to be based on advanced research on local conditions. The theory does little more than show us what can happen under different circumstances. So, we need to know the local circumstances. And as we know, in Malaysia there is still a long way to go before SLOSS or similar advanced methods can be applied for biodiversity management with confidence.

Metapopulation population dynamics:

Habitat fragmentation can shred the living space of animals and plants into such small areas that not a single locality will support a permanent population. However, if there is sufficient dispersal among the habitat fragments to allow recolonisation of empty areas at a rate that outweighs the rate of extinction from occupied patches, a species can survive regionally although it is locally unstable. This called metapopulation population dynamics.

- Management of land ecosystems has shown clearly that management of parks is beneficial. Example: conservation of prairie dogs and butterflies in Finland
- In order to keep up with developments in conservation biology, marine biologists have to explore whether these approaches can bear fruit in the sea. We know for a fact that fragmentation happens in sea just as on land. What we don't know is whether there are metapopulations in the sea. If there are, we will have to manage park networks for sure!

Regional survival through metapopulation dynamics.

Sy.steni Properties

- All populations are temporary.
- New patches are colonised as fast as old ones lose their populations.
- The species survives regionally though it is locally unstable.
- A new demographic variable becomes a focus of interest.

$$\text{Occupancy (P)} = \frac{\text{Occupied habitat}}{\text{Available habitat}}$$

Regional ***survival*** (zero or positive growth rate of occupancy) is ensured when colonisation happens at the same rate as extinction or at a higher rate.

Metapopulation theory has caused a revolution in terrestrial conservation biology

Nature reserves must be studied, and may have to be managed as patch networks

- Empty habitats play a crucial role.
- Habitat loss can be guided to minimize effects of fragmentation.
- A wide range of patterns in population dynamics and distribution can now be understood (e.g food-chain lengths, etc)

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Question-and-answer session following Mohamed Pauzi bin Abdullah's presentation

Dr Purwanto – Indonesia

Q. Having bigger MPAs seems to be better for fishery conservation, but what about the effect on the fishermen?

A. Fishermen in Malaysia, especially in Pulau Payar, are beginning to accept the benefit of MPAs because there has been an increase in landings of fish caught just outside the boundary of the Park.

Thalathiah Said/n - Malaysia

Q. Taking into consideration the conservation ofendangered species, why should we need movable boundaries or bigger MPAs?

A. Movable boundaries can and should be considered depending on the objectives set for the MPAs.

Comment

Air. C. Haridass - India

Instead of increasing the size there is a possibility of placing artificial reefs in order to increase the fish population.

MONITORINC OF CORAL REEFS IN MARINE PARKS AND MARINE PROTECTED AREAS.

Alistair J. Cheal

Australian Institute of Marine Science

Introduction

This paper addresses various aspects of monitoring corals, fishes and other important resources found on coral reefs. Particularly, issues relating to the need for monitoring, appropriate sampling designs, standardised techniques and training in such techniques are discussed with examples provided from existing programs. The relevance of these issues in a global and regional context is also discussed. Even though many of the points raised in this paper apply equally to monitoring in non-protected areas, aspects particularly relevant to management of marine park areas have been highlighted.

Why monitor coral reefs?

The status ofmany marine resources is declining in an unsustainable fashion through over-exploitation, pollution and conversion to other uses. In tropical coastal ecosystems, coral reefs are often one of the most socially and economically valuable resources.However, despite their inherent value, coral reefs are a resource under threat. Wilkinson (1993) made the dire prediction that as much as 70% of the world's coral reefs will be functionally lost within 40 years unless effective management is implemented. There are many more such statistics, all showing similar patterns of over exploitation or degradation (English et al 1997, Wilkinson 1998). Other more chronic stresses due to changes in climatic conditions (rising sea levels, water temperature increases and increased storm incidence) are adding to this threatening scenario. Increasingly over the last few decades there have been major conflicts between developers and community groups, over a variety of issues, reflecting public concern for the resources in question.

Within this general framework of decreasing marine resources and environmental change, managers face the onerous task of sustaining resources while minimising impact to the many user groups such as fisherfolk, tourists, indigenous people etc. However, managers are often not able to niake an accurate and objective assessment of the true status of marine resources due to lack of biological information on just what level of change is occurring. Clearly, quality data are required and this can be provided by a well-conceived and executed monitoring program. Such data can then be used tojustify and substantiate management decisions. For example, marine park zoning can affect people's livelihoods and there is often some degree ofperception from community members that establishment ofmarine park boundaries limits access to resources which are rightfully theirs. Kelleher (1997), pointed out that "when there is a choice ofecologically suitable areas., the dominant criteria for selection ofmarine park area locations, boundaries and management systems will he based on humanitarian, economic and pragmatic considerations. However, where there are few, if any, alternative sites, ecological criteria should be critical and decisive". Clearly in some instances the environment must come first. The making of hard decisions which directly affect user groups, such as limiting fishing access to reefs, can be made and justified only with a background ofsound knowledge which can be provided by monitoring programs. This information can also be used to show concerned stakeholders where the problems lie and promote community support for the management strategy.

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It is also important to note that monitoring data should not always be perceived as indicating a decline in resources, although unfortunately this is often the case. Data can also show resource increases, and as such can be used as a sound basis to reduce zoning restrictions, such as in the case of a recovering fishery, to allow more controlled user access. Monitoring studies can also indicate how reef resources fluctuate naturally in abundance or cover over time. This information provides managers with some ability to assess whether perceived changes due to a human impact issue are within natural limits or are unsustainable. Such data also helps in understanding the effects of natural processes such as storm disturbance and recruitment.

Design of monitoring programs: important considerations

When designing a monitoring program there are a number of considerations that should be addressed. but are all too often neglected, to the detriment of the program itself. The following topics are relevant when designing monitoring programs and have been taken in part from Oxley 1997 (in which, a more detailed account of these topics can he found):

Objectives: All programs should have clearly defined objectives in order to avoid the problem of measuring everything in the hope that some of the data may provide useful information. It is much better to have a program that addressees fewer questions over a limited area and allows for repeated sampling, rather than an extensive program that seeks to answer many questions over a large area with little replication.

Scale: A balance needs to he struck between sampling intensively at the scale of metres or kilometres or sampling less intensively over hundreds ofkilometres. Similarly, temporal sampling requires decisions on whether weekly, monthly or annual samples best suit the objectives. It is important to recognise that only clearly defined questions and objectives will lead to the choice ofan appropriate sampling strategy to detect change at the scale of choice.

Variation sources: It is necessary to be aware of which sources ofvariation are the most important for your study subject. For example, when monitoring fish assemblages, abundance and diversity may he influenced by depth (often different fishes are found on the reef crest compared to the deeper reef slope), reef zone (exposed reef front fish assemblages often differ markedly from those found in calmer lagoon waters), zoning status (those reefs protected as marine parks can support more diverse assemblages) and others. I)epending on objectives, the study should incorporate variation into the design or attempt to reduce it.

Replication: Tropical ecosystems are extremely variable over space and time. Consequently there is a need to take more than one sample at any place and any time to obtain a truly representative measure ofthe target organism(s) and allow valid interpretation of results. Such replication is vital to the success of monitoring studies and should be thought of as an insurance to reduce chances of unreliable data.

Pilot study: Pilot studies are useful to address some of the study questions on a small scale and to allow consideration and quantiflcation of any potential sources of variation. They are a useful way to determine the optimal sampling design for the available resources.

Who will undertake the monitoring, how will the data be analyzed? It is important that there are suitably skilled people to undertake the monitoring. However, it is also necessary that data collection practices be standardised (through regular training) to ensure that observer biases do not lead to real

changes in target variables. There is no point in collecting data unless it is used. One should he aware of how the data will be analysed before beginning to collect data. One should also be aware of the limitations of data.

Example of a long-term monitoring program:

To highlight some important aspects of coral reef monitoring, selected techniques and sample results incorporating lessons learned are described from the long-term monitoring project conducted by the Australian Institute of Marine Science (AIMS) within the Great Barrier Reef(GBR) Marine Park. This project has been running in various forms for the last 15 years, during which time sampling techniques have evolved and have been enhanced, creating one of the most spatially widespread long-term data sets available for a coral reef system. For the most recent, detailed results and study design, refer to Sweatman et al (1998) or the website http:/!www.aims.gov.au. The major interest in this study is to assess regional trends (Figure I) that is, to look for patterns of change which appear to be occurring over wider spatial scales than isolated reefscale events. Within the GBR the major known or suspected agents of disturbance to coral reef systems at regional scales are; large scale nutrient and/or sediment inputs, salinity changes due to flooding, crown of thorns starfish, large oil spills, very large or persistent cyclones and bleaching. However, in more populated nations in the Asia-Pacific region, this list can often be supplemented with other forms ofdisturbance such as destructive fishing techniques (including use of cyanide, explosives and fine mesh nets), physical removal of corals for building and other purposes, and more. With the disturbance agents in mind the objectives are to

1) assess the regional status of coral reef resources,

2) estimate long-term regional trends in these resources and

3) provide managers with a basis for managing the GBR for ecologically sustainable use.

Sampling regime: The study reefs encompass a range of marine park zones, from total preservation zones (no access allowed unless holding a research permit) to areas open to all users operating within general marine park regulations. It is hopedthat the efficacy of some ofthe marine park zoning strategies can be judged from data gathered in this fashion. The sampling regime has been divided into two main areas incorporating "whole reef" surveys for benthic cover and crown-of-thorns starfish (COTS) using the manta tow technique, and "within reef" surveys for benthic and fish assemblages using SCUBA along permanently marked transects (Sweatman et al 1998).

Monitoring techniques;

Manta Tow (Miller 1996): This technique involves towing a snorkel diver around the perimeter of a reef while holding on to a manta board. Every two minutes subjective estimates of the percentage cover or numbers of the following target organisms are recorded: live and dead hard coral, soft coral, COTS and giant clams. Although clams are not fished commercially in Australian waters, it is felt that they are good indicators of water quality as they filter large volumes of water daily. The manta tow technique is quite flexible and other visually obvious target organisms such as sea cucumbers and urchins could also be surveyed if appropriate. Although not generally recommended for surveys of fish assemblages, manta towing could also be used to survey large obvious fishes, such as the giant maori wrasse ***(Cheilinus undulatus)*** which is perceived to be under threat from the live fish trade in the

Asia-Pacific region. As the recorder can generally see from the reef crest to the limit of underwater visibility, the mania tow technique also provides a subjective assessment of the general condition ofa reeL allowing some appraisal of the presence or absence of other unrecorded disturbance agents (bleaching. use of explosives, presence of litter etc).

Manta tow data can provide a range of information about the reef resources in question. Figure 2 shows an example of such results from the GBR. The results clearly indicate where the highest percentage of coral cover and densities of COTS are located spatially around the reef perimeter. This kind of output indicates another use of the manta tow technique: rapid surveys ofa number of reefs to assess on which reefs and where on these reefs resources are most abundant. This may be particularly relevant when seeking to set up an MPA. It is also clear from Figure 2 that over the IS-year period of study on this reef, hard coral cover declined due to the stress of repeated COTS outbreaks. Such information allows managers to acknowledge that a decline is occurring, weigh up social, economic and other relevant factors, and assess whether active intervention, such as physical removal of COTS, is warranted. The strengths and weaknesses of the manta tow technique are presented in Table I. The limited resolution ofthe manta tow technique (Table I) refers to the fact that as cover estimates are recorded in categories (10-20%, 30-40% etc), any variation within these categories cannot be resolved, unlike in the finer resolution video technique described next.

Video Analysis of Benthic Organisms (Christie et al. 1996): This technique involves a SCUBA diver filming a 50m long strip of reef with a video camera (in an under-water housing). The videotapes are analysed on land and used to calculate the percentage cover of the various life forms to the finest taxonomic resolution. The broad benthic group categories used in this technique are; hard coral, coralline algae, soft coral, turfalgae, macro-algae, sponge, abiotic and others (lifeforms that are indistinguishable on the video frame). The hard corals are further sub-divided into lifeform categories (tabulate, branching etc) as some coral species take different forms in different environments and indeed the type of life form provides some clue as to the oceanographic processes acting on a site. As an example ofthe type ofdata which can be derived from video methodology, Figure 3 depicts changes in hard coral cover on survey reefs over a seven year period. From a manager's perspective, the trends are generally heartening, indicating very few major declining trends in cover, In fact, within two regions recovering from natural disturbances, Cooktown/Lizard outer reefs and Capricorn Bunker outer reefs, increases in hard coral cover were dramatic over the study period. However, within the Swains mid-shelf reefs, one reef (highlighted with an arrow), Gannet Cay, declined conspicuously. Investigation of this reefcan now be taken a step further to investigate which types of corals were declining. Figure 4 indicates clearly that branching corals within the genus Acropora declined more than any other lifeform. On further investigation ofmanta tow data, an active COTS outbreak appeared to cause this decline and branching acoporid corals are one of the starfishes favoured foods. In the case of Gannet Cay, such declines may be tolerable given the fact that a number ofother reefs in the region (Figure 3) were unaffected. However, in another region or ifthe reef was perceived to be intrinsically unique, this information could be used as a basis for COTS removal management strategies. As can be seen from this example, such monitoring information can be analysed sequentially to provide sound knowledge of trends in benthic resources leading to informed management. The strengths and weaknesses of the video technique are presented in Table I. However, the strong visual impact of video footage is worth highlighting. The old adage that a picture equals a thousand words is particularly relevant when attempting to make a case for marine management strategies. Many people are unfamiliar with graphical output, but when confronted with clear video footage of a pristine reefor a dead section of reef, the message is unequivocal.

Visual Surveys of Reef Fishes (Hatford and Thompson 1996): This technique involves trained divers recording numbers of reef fishes along transects 50rn long by 5m wide (larger mobile fishes) or 1m wide (damselfishes). New recruits (fish that have been recruited within the current breeding season) are excluded from counts as it is not possible to accurately record both adults and recruits in the same dive. The visual census technique is not suited to highly cryptic species, so the target species are generally conspicuous and cover a varied scale of interest, including commercially important species (such as cods and snappers), indicator species (buterflyfishes) and species belonging to major trophic categories (planktivores, herbivores and coral feeders). Figure 5 exemplifies the kind of results that can be produced from fish counts combined with hard coral data (from video surveys) along the same transect lines. On these reefs hard coral cover had been reduced to very low levels in 1989, presumably by storm events (Doherty 1997). Coincidentally, the number of butterfly fish had been much reduced. These results indicate a number of interesting trends. Firstly, recovery of corals and butterfly fishes did not begin in an undisturbed environment until some five years after the disturbance, but after this time recovery was rapid and highly correlated between the two variables. Furthermore within a 10-year period, the coral cover and numbers of butterfly fishes were comparable to those before the disturbance (AIMS, long term monitoring program, unpublished data). Clearly from a management perspective these monitoring data have provided valuable information on natural rates of recovery and baseline relationships between numbers of butterfly fish (important in the aquarium trade in some countries) and coral cover on those study reefs. The strengths and weaknesses of the visual census technique for reef fishes are presented in Table 1. The issue of limited assessment of diversity (Table 1) from the visual census technique relates to the fact that as only a subset of reef fishes can be accurately counted using this technique. a large number of cryptic species (which may be locally abundant) are unrecorded.

Table 1

Technique	*Strengths*	*Weaknesses*
Manta Tow	Rapid data collection over a wide area	Limited resolution due to subjective categories
		Impractical in poor visibility (<6m)
Video for Benthic Organisms	Permanent record for future comparisons or reanalysis	Expensive to buy and maintain
	Strong visual impact on the government/public	Tape analysis is time consuming
		Requires skilled observers for analysis
		Provides no information on underlying processes
Visual Census for Reef Fishes	Rapid data acquisition	Limited assessment of diversity
	Non-destructive	No information on underlying population processes
		Requires skilled observers

A global perspective on coral reef monitoring.

Over the last 30 years, there has been increasing international concern for the health of coral reef systems. Within the last decade this concern has led to several actions, one of these being the formulation of Agenda 21 at the United Nations Conference on Environment and development in Rio de Janeiro, 1992. This Agenda lays out a plan of action to halt resource declines and elaborates strategies to achieve this goal. Specifically, Chapter 17 of Agenda 21 recognises that there is a need to assess the state of the environment of coastal and marine areas, establish appropriate monitoring programs and co-operate to build capacity at the local level. In response to general concerns and continuing signs of marine resource degradation, in 1994 the International Coral Reef Initiative (ICRI) was initiated to implement the principles of Agenda 21 for the benefit of coral reefs and related systems. ICRI is essentially a global partnership of governments, international and regional organisations, non-government organisations, multilateral development banks and private sector groups. The four broad aims of ICRI are:

I) to strengthen existing programs of coral reef conservation,

2) to incorporate coral reef conservation into development plans,

3) to strengthen capacity for research and monitoring of coral reefs

4) to coordinate international research and monitoring programs. The latter aim has led to the formulation of the Global Coral Reef Monitoring Network (GCRMN), (Wilkinson 1998), which aims to facilitate and coordinate monitoring programs at the government level and the associated Reef Check (Hodgson 1998) which deals with volunteer and community level monitoring.

A regional perspective on coral reef monitoring.

Many nations in the tropical Asian region are experiencing similar marine resource problems arising from four main areas: sedimentation (dredging, land-derived run-off and land reclamation), exploitation (sand, coral, mangrove, fisheries), pollution and tourism (Brown, 1997). In line with the ICRI, more knowledge of change in marine resources in this region is necessary. To achieve this goal, training, education and capacity building within individual countries and local communities is essential.

The recognition that coral reefs worldwide are under increasing pressure from human activities stimulated the formation of the UN EP-lOC-IUCN-WMO Global Coral Reef Task Team in 1990. This team selected standard methods for coral reef monitoring from those developed in SE Asia by Australian and ASEAN (Association of South East Asian Nations) scientists. It was the recognition of the decline of coral reefs by ASEAN scientists that prompted ASEAN to seek assistance from Australia, utilising outputs of the ASEAN-Australian Marine Science Project, Living Coastal Resources component. The aim of the Living Coastal Resources project involving five ASEAN countries – Indonesia, Malaysia, Philippines, Singapore and Thailand – working in collaboration with Australian scientists, was to provide baseline information and establish a regional database and expertise in database management. One result of these projects was the development of a manual of standard survey procedures. These methods were first documented in a UNEP handbook (UNEP 1993), and then in the Survey Manual for Tropical Marine Resources (English et al. 1997). This manual provides a set of methods for reef assessment that can be applied rapidly and efficiently over a wide area by people with different levels of scientific training. Techniques from the survey manual have been adopted by the GCRMN for use in overseas training exercises.

International training in coral reef monitoring techniques

Given the need for capacity-building in many countries, this section details some of the major issues involved with effectively training others in practical coral reef monitoring techniques. Much of this information is based on the experiences of the AIMS long-term monitoring team, members of which have conducted a number of training exercises in both Asia and the Pacific region, in collaboration with the GCRMN.

Aims and philosophy of training: In the Asia-Pacific region relatively few people are trained in monitoring techniques. Consequently outside consultants are often called in, using foreign aid money, to undertake specific tasks. The main goal of any training program should be to produce a pool of personnel throughout the region who are trained to gather data in a consistent and standard manner, and be able to analyse and interpret this data to assist marine resource managers. One effective method to achieve these aims is to conduct regional courses (which may involve participants from a number of different countries) with participants selected for their ability to train others within their own countries or region. The overall philosophy is therefore to "train the trainers" in standard methods and importantly, provide follow-up training and support if required. Standard, globally accepted methods (see section on regional perspectives on monitoring) are taught to facilitate regional and broader scale comparisons.

Workshop structure: The majorobjectives ofthe training workshops are to train participants in standard coral reef monitoring methods and in the handling and basic analysis of data. The ultimate aim is to provide for informed management of reef resources. The course concentrates largely on assessment of benthic resources using the line intercept (LIT) and manta tow (MT) technique, and fish assemblages using the vi3ual census techniques. A detailed description of these sampling methodologies can be found in English et al 1997. The course structure involves theory, data collection, data entry, checking, extraction, analysis and interpretation. Practical aspects of data collection and analysis are emphasised, as is the importance of observer calibration. Experience has shown that to train 10- 12 participants to an acceptable standard, a minimum training period of two weeks is necessary. By the end of this two week period all participants should be able to collect robust data using the MT and LIT techniques, manage MT and LIT data, and understand the rationale for monitoring/benefits for management. One aspect of the AIMS training program which has been extremely well received is the provision of a user-friendly data entry and analysis system known as ARMDES (AIMS reef monitoring data entry system). Monitoring studies can quickly provide large volumes of data, which if not collated in a coordinated fashion can become extremely difficult to analyse and interpret. ARMDES allows for the storage of data, conversion of this data to standard units (ie percentage cover) and simple but clear graphical presentation (Figure 6).

Lessons learned from training courses: A number ofclear issues have arisen as a result of the AIMS coral reef monitoring training exercises:

I. there is a need for information on coral reef resources at both global and local levels.

2. the use ofsimple repeatable methods is well accepted and provides for wide spatial comparisons.

3. the provision of a user friendly standard data base allows a cohesive flow from data collection through to interpretation and report writing.

4. trainers should be available to provide follow-up help, if necessary, in order to reinforce lessons learned in the first courses conducted by the "trained trainers"

5. the enhanced capacity of in-country personnel to monitor their coastal resources is a valuable asset.

Acknowledgements:

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Question-and-answer session following Alistair Cheal’s presentation

R.A. D. B. Satnaranavake – Sri Lanka

Q How badly did Nino affect the coral reef in the Great Barrier Reel?

A It is estimated about 30% of the inshore reefs were affected. Recovery of the affected reefs differs from area to area.

Abdul Rahim – Malaysia

Q How can we get training on monitoring?

A Contact the Australian Institute of Marine Science for further information.

R.A. D.B. Samaranayake – Sri Lanka

Q How fast do coral reefs recover?

A Recovery will depend on factors such as water quality, level of disturbance, and exposure to natural disturbances such as hurricane, and natural predation.

Pauzi Abdullah - Malaysia

Q What technique was used to analyze the image of rapid assessment method?

A The image on the tape was frozen at random stop, frame by frame. On each frame, 5 random points. Data on one of the five points was scored as data point.

Figure 1. Selected regions, marked with boxes, indicating where coral reef monitoring is conducted within the Great Barrier Reef Marine Park.

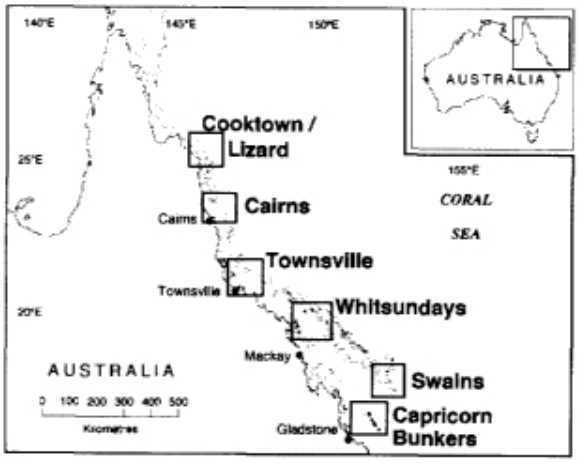

Figure 2. Example of manta tow data from a reef within the Great Barrier Reef. On the left an aerial photograph is displayed showing the size and orientation of the reef, location of fixed transects (solid line) and the manta towpath (dashed line) with tow numbers. The upper figure on the right displays hard coral cover (white bars) and crown of thorns starfish density (black dots) around the reef perimeter in 1998. The lower figure on the right displays mean reef hard coral cover (white bars) and crown of thorns starfish density (black dots connected by dashed lines) over a 15 year period.

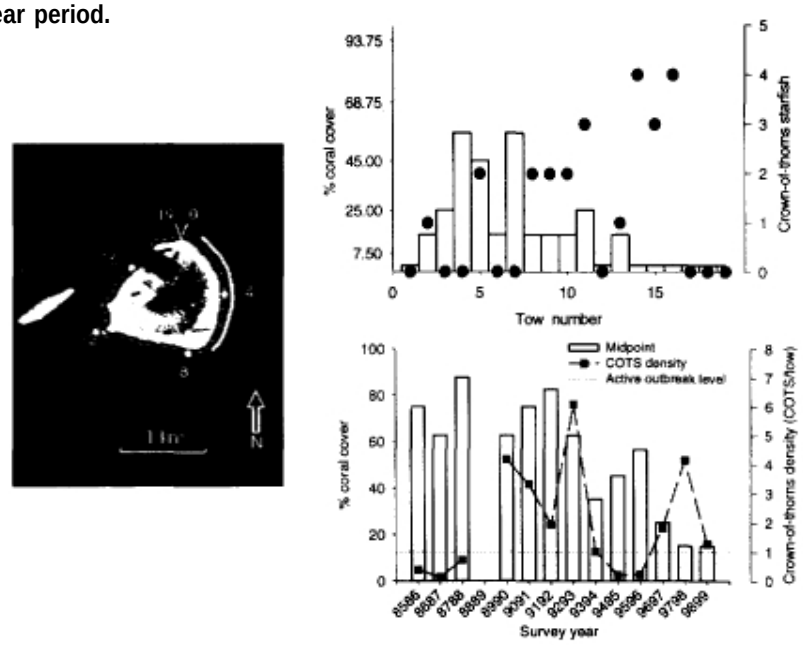

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Figure 3. Summary of changes in percentage hard coral cover on each study reef (each line represents data from the north-east flank on an individual reef) within **the different regions and shelf positions on the Great Barrier Reef, over the last seven years. The arrow points to Gannet Cay reef, which is depicted in more detail in Figure 4.**

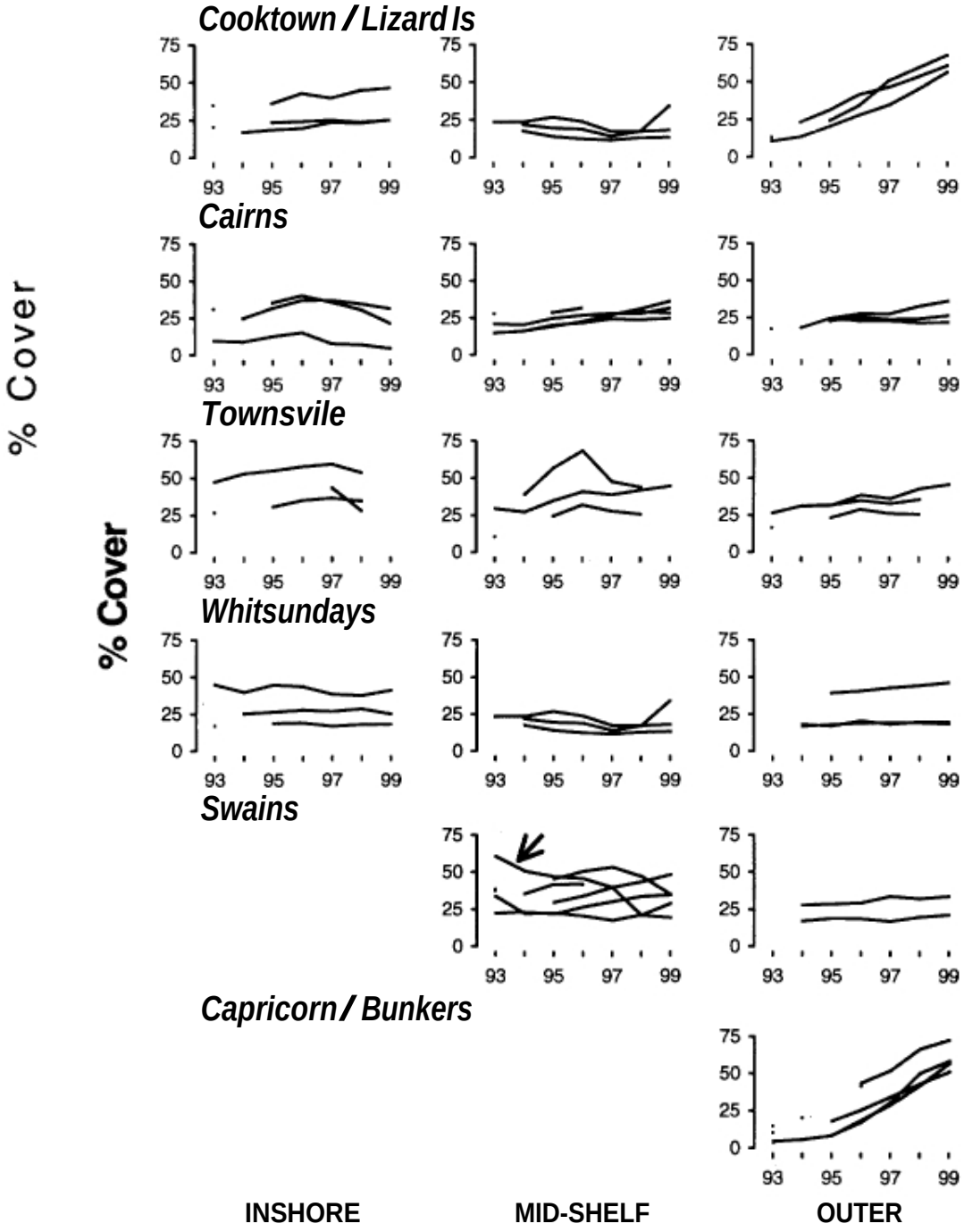

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Figure 4. Changes in hard coral cover at Gannet Cay. Each bar has been broken down into different constituent life forms. For ease of interpretation only the two most rapidly changing life-forms have been described.

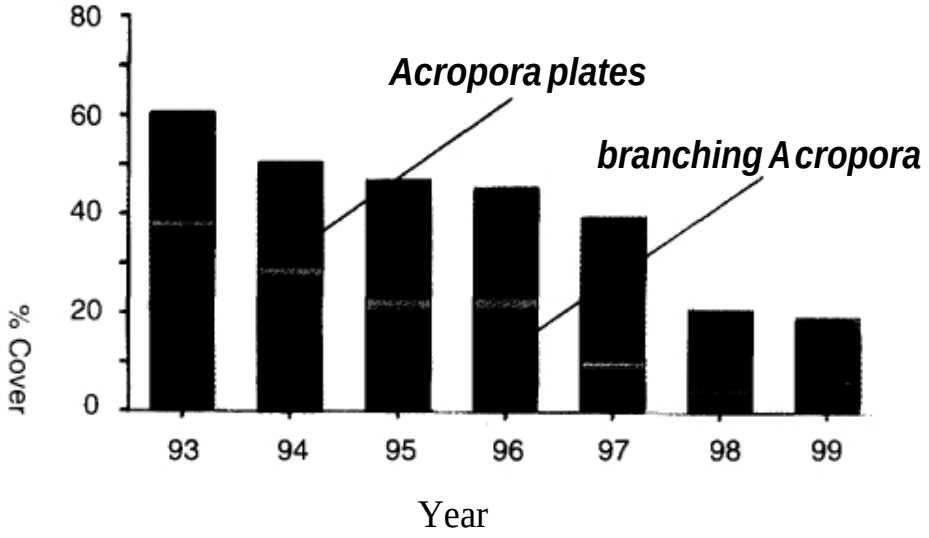

Figure 5. Changes in mean coral cover and numbers of butterfly fish (Chaetodontidae) from four reefs within the Capricorn Bunker sector of the Great Barrier Reef. Bars represent one standard error.

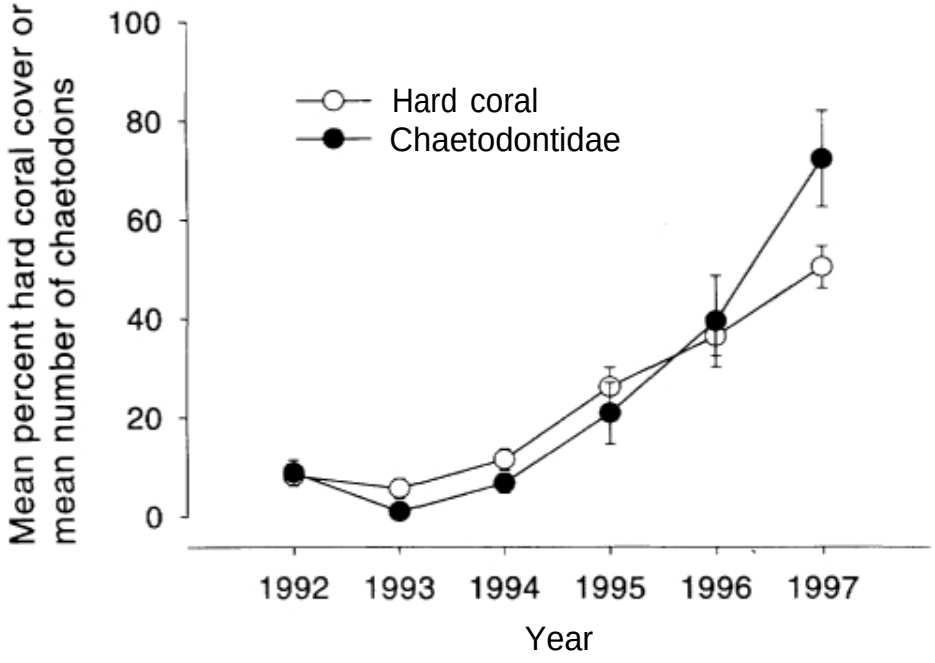

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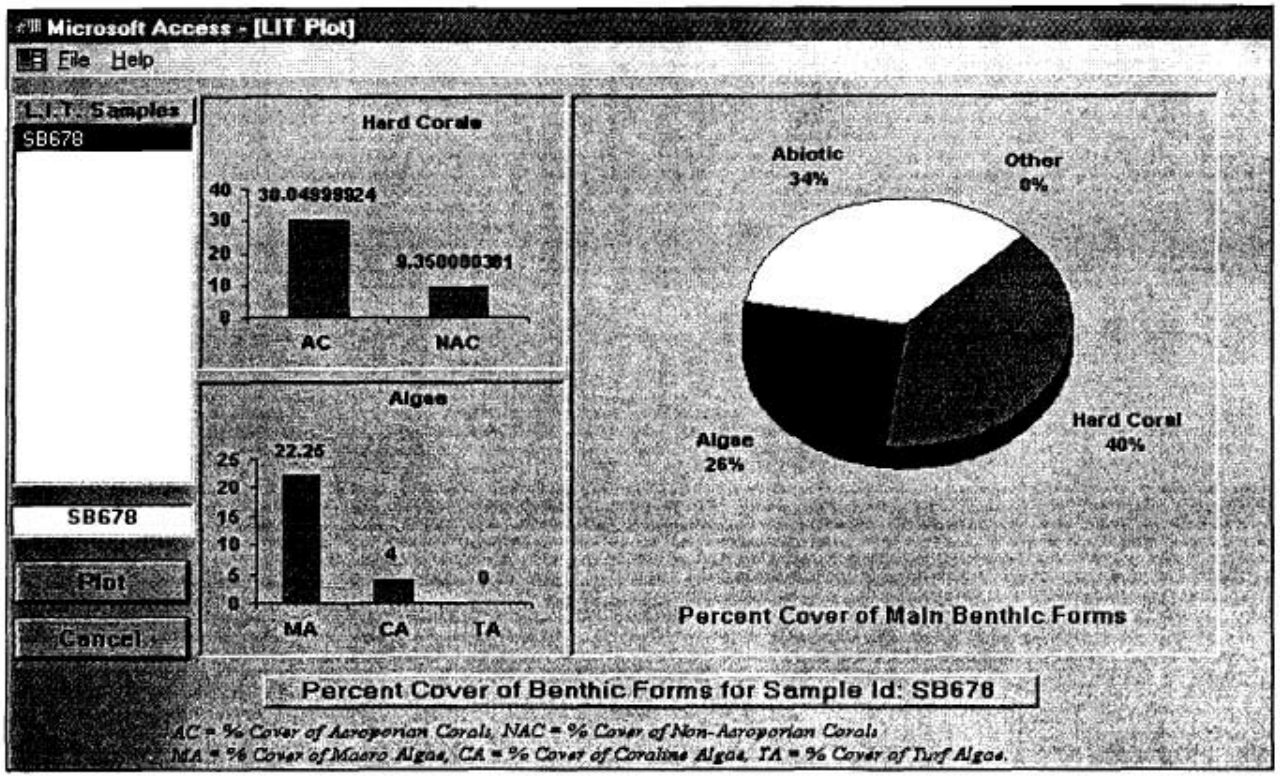
Figure 6. Example of selected graphical output from the AIMS data entry and analysis program ARMDES.



PLANNING FOR PERFORMANCE ASSESSMENT OF MARINE PROTECTED AREAS (MPAS) AND MARINE PARKS

by Bernadette O'NeiI
Environment A usircilia

What is performance assessment of MPAs?

Performance assessment is a way to evaluate the effectiveness of MPAs in meeting agreed goals and objectives.

Performance assessment in the natural environment tends to he surrounded by mystery. In an attempt to demystify the issue, experts involved in a national process within Australia have gone back to fundamentals to understand why and how we should approach this thorny issue. The nature of the marine environment creates some particular problems for such assessment, but this does not mean that we should not attempt the exercise. This will be an incremental process nationally, regionally and internationally. All of us stand to benefit from sharing our experiences.

Stakeholders at all levels – Government, community and industry – quite reasonably want to know what is the MPA agenda and who benefits from this.

As policy makers, managers and people interested in MPAs, we should be able to understand and communicate, for ourselves and stakeholders, what MPAs aim to do for the natural environment and human usage of that environment.

In this talk, lam drawing on some fundamental work on performance assessment and on recent Australian experience in trying to apply performance assessment to MPAs. As we have grappled with this in Australia, some fundamental messages have emerged for us about what to do, what to avoid and where some paths to success might lie.

Why do performance assessment?

As managers we do performance assessment for MPAs

- to help focus activities on agreed goals of MPAs
- to report on MPAs to both managers and stakeholders and
- to help increase our effectiveness as managers in the marine environment

In Australia, we are interested in developing consistent processes for performance assessment at the individual MPA level. This will allow for the collection, analysis and reporting of performance assessment for the system of MPAs at any level, through appropriate aggregation of data.

Challenges in PA for MPAs

There are some fundamental challenges in developing and applying performance assessment for MPAs. Briefly these are:

- understanding the natural environment, including gathering baseline data on natural variability to understand and define acceptable change

- setting objective sand targets for managing our MPAs
- understanding our limitations as managers operating in dynamic and often poorly understood systems
- gaining acceptance of and support for performance assessment and associated activities (monitoring etc)
- engaging our communities in understanding and supporting performance assessment
- working in the marine environment, e.g. on issues of costs and available resources and the impact of environmental conditions.

Dealing with performance assessment challenges

To deal with the challenges presented in this work we need to remember some basic requirements:

- keep in mind why we are doing performance assessment
- commit to performance assessment an integral component of managing MPAs by making it a part of our processes
- have well-designed management planning models to assist in performance assessment
- any performance assessment framework must be adaptive and flexible enough to cater for changing conditions, goals and evolving delivery mechanisms and
- recognise our limitations as managers and keep things simple.

MPA development plan

The components of the national model currently being used in Australia for developing MPAs are:

- an agreed bio-regional planning framework
- establishing national/regional priorities
- identifying and selecting areas/sites
- negotiating with stakeholders
- establishing MPAs
- developing management plan with performance assessment
  - performance indicators
  - monitoring & feedback

A **model for PA of MPAs**

The Australian protected areas best practice model defines a process for MPA declaration, management and assessment. It is based on a logical hierarchy of goals and outcomes. The hierarchy is as follows:

legislation

- strategic objectives

- clear goals
- programmes and activities
- performance measures
- targets
- monitoring
- feedback

What follows is a description of how we are applying the model in Mermaid Reef Marine National Nature Reserve. Mermaid reef is the most northerly reef of Rowley Shoals which lie in the Indian Ocean, 300 km off Broome in north-west Australia. It is one of three emerging shelf-edge reefs with spectacular and unusual topography and life forms. The Reserve is managed jointly with the Western Australian State Government.

PA for a MPA: Mermaid Reef

Expanding on the hierarchy as it applies to this Reserve:

Legislation:

The enabling legislation under which the MPA is declared is the National Parks and Wildlife Conservation Act 1975. It was proclaimed in 1991.

Strategic objectives:

Deriving strategic objectives is a critical first step in establishing a performance assessment system for that MPA. The strategic objectives should reflect management intentions and enabling legislation. They are primarily aimed at addressing the maintenance of biodiversity (species, communities, etc) and/or the ecological integrity (e.g. structure and functioning) but can also include objectives for sustainable resource use or multiple use of the area (e.g. promotion of recreation and tourism).

The objectives of this Reserve are:

- to manage as part of a comprehensive, adequate and representative system of MPAs to contribute to the long-term ecological viability of natural systems
- to ensure its preservation in its natural condition and to protect its special features
- to protect, conserve and manage the wildlife
- to protect against damage
- to encourage and regulate appropriate use, appreciation and enjoyment

Clear goals

There is a need for clearly stated goals that derive directly from the strategic objectives. They translate the ideals expressed in the strategic objectives to achievable goals in the short term or planning cycle. Goals are concrete outcomes, not abstract.

Broadly we need to assess and monitor the condition of the environmental values in relation to the impact of threatening processes within and outside the MPA.

The goals are to:

- maintain high water quality
- minimise damage to coral from boating etc

ensure protection of wildlife from illegal collection and fishing

allow visitor access subject to minimal impacts

educate visitors

encourage research and monitoring to inform management and

minimise impact from exploration and extraction

Programmes and activities

For an MPA this is usually covered in a plan of management. The plan will identify desirable outcomes for the period covered, the outputs or products and services and the inputs needed to achieve these.

Examples drawn from the Reserve plan are:

restrict activities e.g. release of waste from vessels

provide users with educational material

develop a mooring and anchoring strategy

enhance enforcement and compliance by user restrictions, such as fishing and collection

- develop monitoring programs and
- undertake performance assessment to improve management

Performance indicators and targets

Performance indicators measure to what degree your management goals have been achieved. They can be process indicators or outcome indicators.

Performance indicators are useful, because there is a need to assess and monitor the condition of the environmental values in relation to the impact of threatening processes within and outside the MPAs.

Performance indicators can demonstrate trends over time. They are measures to gauge the extent of acli ievement of targets (i.e. desired outcomes).

Fxamples of the performance indicators and targets for the Reserve, and how they fit into the plan are:

I. Goal:

ensure continued high water quality

Programs:

Information for users on waste water restrictions requires sullage tanks to be fitted to vessels

Performance Indicators:

water quality, faecal coliform etc

compliance with no waste discharge regulation

Targets.

faecal coliform not to exceed 150 organisms per/100 ml

all vessels with sullage tanks by mid-2000

2. Coal:

ensure continued pristine condition of coral

Programs:

implement a mooring and anchoring strategy

Performance Indicators:

damage to coral decreases outside mooring & anchoring areas

Targets:

no damage to monitored coral communities by end-2000

Monitoring & feedback

Monitoring relies on agreed performance indicators. Ideally, monitoring should be regular, with data management in place and direct links to management outcomes. Monitoring can provide opportunities for community and industry involvement

There is a need for feedback: mechanisms to ensure that performance information is fed back to managers and contributes to management decisions. Triggers for action need to be developed and agreed.

Examples of monitoring for the Reserve and how it fits into the plan are:

I. Performance Indicators

water quality, faecal coliform etc

compliance with no waste discharge regulation

Monitoring:

twice-yearly monitoring in lagoon of water quality relating to visitation peaks

inspection of vessels for compliance

Feedback:

review management prescriptions for users based on results

2. Performance Indicators:

damage to coral decreases outside mooring and anchoring areas

Monitoring:

twice-yearly monitoring in lagoon of coral damage in designated sites inside & outside anchoring & mooring areas

Feedback:

review mooring strategy & licensing conditions for use as necessary

Performance indicators

Simple performance indicators can tell us a lot about how we are doing. They can help us answer straightforward questions about performance in conservation and resource management. A more traditional science-led approach to performance indicators often leads to a multitude of performance indicators not necessarily linked to management goals. Ongoing funding may not be in place to deliver the outcomes required.

Performance indicators are either process-based or outcome-based. The process-based indicators relate to assessing the organisational efficiency of processes that achieve results .. for example, asset management, visitor satisfaction and corporate services. Outcome-based indicators measure results or the degree to which an environmental goal has been met

There is a significant interest in establishing or moving towards outcome-based performance assessment of protected areas and the management of those areas. However, understanding of how to proceed in practice is limited.

The choice and application of performance indicators must be carefully considered. In particular the performance indicators, and the development of associated monitoring programmes to report against the indicator (i.e. frequency and scale), must be cost-effective. There are limits to what can be done through indicators. To avoid unrealistic expectations these limits need to be identified and articulated.

Levels of PA for a system of MPAs

In Australia, there are a number of levels at which performance assessment is be developed and applied. There is assessment at **MPA, bioregion and system levels.**

The Mermaid Reef example provided details of an MPA level process. Assessment at a bioregional level could include percentage of MPA coverage within a bioregion, what IUCN categories are represented, the degree of achievement against comprehensive, adequate and representative criteria and the degree of effective co-operation between jurisdictions. System level performance assessment will aggregate information from the other two levels and additional system level indicators will be developed.

The assessment of individual MPAs is the responsibility of the jurisdiction as detailed in the discussion on Mermaid Reef. Bioregional reporting requires jurisdictional and cross-jurisdictional reporting. The responsibility for performance assessment of the whole NRSMPA concerns all jurisdictions, and is coordinated nationally by the national environment department.

Lessons for developing performance assessment for MPAs

Some fundamental lessons have emerged from our work on performance assessment in the Australian context. In developing any performance assessment system, we need to define our audience and reporting framework. These factors should influence how the framework progresses.

To be workable, performance assessment must link to agreed strategic objectives and management goals. We need to design achievable processes considering information and data management needs and resource issues. Have an incremental process that builds on available information

Importantly, where possible encourage community and industry involvement and support. This can assist in the practice of performance assessment but has the benefit of building community ownership of the MPA.

And finally, we have found that we need to be adaptive and flexible enough to cater for changing conditions and goals. To operate in a meaningful way in a changing physical and social environment, MPA management must recognise and adapt to reality.

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Question-and-answer session following Dr. Bernadette O'Neil's presentation

Kee-Chai Chong - BOBP

Q Why were some regulations not complied with?

A Two reasons are remoteness of the site and inadequacy of management support.

R.A. D. B. Samaranayake - Sri Lanka

Q Who provides funding for performance assessment?

A It is internally funded as part of the planning process.

R.A. D. B. Samaranayake – Sri Lanka

Q Are you successful in stopping the harvesting of coral reefs?

A There is no coral harvesting activity in Australia.

MALAYSIAN LEGISLATION ON THE MANAGEMENT OF MARINE PROTECTED AREAS AND MARINE PARKS

by Abdul Khalil bin Abdul Karim
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86800 Mersing, Johor, Malaysia

Abstract

This paper looks at how the Department of Fisheries, Malaysia, uses legislation as a tool to manage Marine Parks and Marine Protected Areas. It examines developments concerning the setting up of MPs and MPAs in Malaysia. It discusses the development of the Fisheries Act 1985, which replaced the Fisheries Act 1963 which was inadequate on the subject of management of MPs and MPAs. The paper also refers to a number of sections of the Fisheries Act 1985 and the powers it confers on the Minister and the Director-General of Fisheries, Malaysia, in relation to the various offences covered by the Act.

Introduction

The growing interest in the marine environment has its origin in the 1960s and '70s, when more and more people began to turn to the sea as a form of recreation. In Malaysia, the idea of an area where conservation effort to protect the marine environment could be carried out was mooted in 1983. Before that, destruction of coral reefs and coral life in the name of fishing was rampant and un-regulated. Unchecked trawling activities resulted in a large area of broken corals, some beyond redemption, which could lead to loss of reefs. Other destructive fishing methods include fish blasting and the extraction of corals for the souvenir trade.

Why Marine Protected Areas and Marine Parks were Developed in Malaysia

When the first National Park was established in 1938, it was mainly confined to mainland areas. The marine environment was given little or no attention. However, in 1983, the Ministry of Agriculture, through the Department of Fisheries, was given the responsibility to protect the marine environment -- especially the part that surrounds the offshore islands. Thus the main objectives behind the management of MPAs and MPs are :-

i). to conserve and manage the marine ecosystem for the sustainable exploitation of the marine resource.

ii). to protect and manage the marine environment for the purpose of research, education and **development as a tourism by-product.**

Legislation as a tool for management

a) The revocation of the Fisheries Act 1963

Since the enactment of the Fisheries Act 1963, the fishing industry has seen many changes and breakthroughs. After a period of 20 years, the Department of Fisheries, Malaysia, considered a critical took at the Fisheries Act 1963, necessary. The department decided that more provisions need to be added or amended in line with changes taking place in the industry. Changes made to

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fishing appliances to make them more effective would render obsolete certain provisions of the Fisheries Act 1963.

Certain offences under the Fisheries Act 1963 which attracted prosecution in a court of law are now compounded. This frees the department from the responsibility of taking custody of the offending vessel until it is mentioned in court. The Fisheries Act 1985 which replaced the Fisheries Act of 1963, reflects the growing concern for marine life.

b. The Fisheries Act, 1985

The Fisheries (Prohibited Areas) Regulation 1983 was first enacted under the Fisheries Act 1963. Under this regulation, waters 8km off the islands of Pulau Redang were declared a 'Fisheries Prohibited Area'. No person can collect shells, molluscs, corals or fish except with a license. In 1985, the Fisheries Prohibited Area of Pulau Redang was extended to cover another 21 islands of Peninsular Malaysia. Under this amendment of 1985, the prohibited area was restricted to 3 km from the islands.

In 1985, certain changes were made to the Fisheries Act 1963. These changes gave the Department of Fisheries, Malaysia, more leverage in tackling the problems of illegal fishing. Result: the Fisheries Act 1985 was enacted, replacing the Fisheries Act 1963. Under the Fisheries Act 1985, the Fisheries (Prohibited Areas) Regulations were enacted to encompass three more islands of the coast of Sarawak. As a result, areas 3 km off the islands of Pulau Talang—Talang Besar, Pulau Talang-Talang Kecil and Pulau Satang Besar became – fishing prohibited areas.

c) Setting up of Marine Protected Areas and Marine Parks

The Fisheries Act 1985 includes regulatory functions and enabling provisions aimed at a more dynamic fishing industry. It makes possible the conversion of 'Fisheries Prohibited Areas' into Marine Parks. However, a comprehensive set of rules is needed if the natural beauty of the flora and fauna in the marine environment surrounding the islands is to be conserved. This set of rules was first introduced by way of Section 41 to Section 45 of the Fisheries Act 1985.

These sections paved the way for the establishment of MPAs and MPs and their administration.

i) Section 41 of the Fisheries Act 1985 — Power to Establish Marine Parks

This section provided powers for the Minister to establish MPs in Malaysian fisheries waters. Thus, the Establishment of Marine Parks Malaysia (Pulau Payar) Order of 1989 was gazetted on 8.3.1990, establishing the islands of Pulau Payar, Pulau Segantang, Pulau Lembu and Pulau Kaca as Marine Parks.

Since the Establishment of Marine Parks (Pulau Payar) Order 1989 was gazetted, the Department of Fisheries, Malaysia, strove hard to get all deserving islands to be declared as MPs. Through the Establishment of Marine Parks Order 1994, an area of 2 nautical miles seaward from the outermost points, measured from the low water mark, was gazetted as Marine Park area. This Order converted 38 islands into MPs. For Pulau Kapas, Terengganu, under the same Order, the the MP area is only one nautical mile. Pulau Payar was one of the 38 islands.

ii) Setting up of Marine Prohibited Areas

Though the object of setting up Marine Parks is to conserve and protect the fragile coral life of the marine world, gazettement ofthe islands needs to be done with the consent ofthe respective state governments.

Islands that were identified earlier hut could not be gazetted as MPs by the 1994 Order, were gazetted as Prohibited Areas. In 1998 the Fisheries Regulation (Prohibited Areas)(Arnendment) 1998 gazetted Pulau Besar and Tan jung Tuan of Malacca as Prohibited Areas. At the same time, Pulau Nyireh and Pulau Tenggol ofTerengganu, which were earlier gazetted as Prohibited Areas, were declared as MPs, thus increasing the number of MP islands to 40.

d) Regulations Pertaining to Prohibited Areas and Marine Parks

As enacted in the Fisheries (Prohibited Areas) Regulations Act. l994, the collection of shells, molluscs or corals within the 2 nautical mile area is prohibited. Fishing is prohibited too, unless a license issued by the Director- General of Fisheries, Malaysia, perni its it. The regulations for MPs are governed by Sections 43 and 44 of the Fisheries Act 1985, under which actions or activities deemed to be offences include fishing or attempt to fish, removal or possession of any aquatic animal or plant be it dead or alive, erection of any building structure, extraction of sand, discharging of pollutants. anchoring, destruction or defacing any object in a Marine Park.

i'he regulations set up to manage MPs are clearly more stringent than that for Fisheries Prohibited Areas. Implementing these regulations will go a long way toward realizing the objectives of setting up of the MP.

At the same time, Section 45 of the Fisheries Act 1985 gives the Minister the power to gazette zones for specific purposes. This enables the creation ofa totally protected area for the purpose of conservation, and in some places for the rejuvenation of marine life.

The Fisheries Act 1985 also allows the Director General of Fisheries, Malaysia, to impose any regulations and rules deemed fit for the proper management of MPs and MPAs.

c) Enforcement of the Fisheries Act 1985 in MPs and MPAs

When the Marine Parks of Malaysia was set up with the gazettement of 38 islands (since 1998 it has been increased to 40) the Department of Fisheries, Malaysia. set up five centres to manage all the islands. These centres were set up at:

i) Pulau Payar, Kedah - 4 islands

ii) Pulau Redang, Terengganu - 11 islands

iii) Pulau Tioman, Pahang - 9 islands

iv) Mersing, Johor- 13 islands

v) Labuan, Federal Territory of Labuan -3 islands

Each centre is responsible for monitoring the situation around a certain number of MP islands. The staff are given certain powers to arrest and prosecute offenders when exercising their duties. The most common offences have been illegal intrusions by fishermen and the usage of a spear

gun to fish among the corals around the islands. Other than having to monitor the situation around the islands, co-operation among the chalet operators, dive operators and boat operators has been good. Quite often, these, operators will report to the centres any wrong doing that has been observed by them. This is due to the constant contact the department has through the respective centres with the operators.

Other efforts taken by the Department of Fisheries, Malaysia, to strengthen enforcement include setting up forward bases-cum-inforniation centres. One such base is the Pulau Tinggi Marine Park Centre which began operation in June 1999. Through this centre, operations can be mounted often. Thus the MP islands of Johor can be closely monitored, and actions can be taken more effectively and quickly. This is because Pulau Tinggi is more centrally located among the group of Johor Islands. Another base that is being considered is in Pulau Perhentian, Terengganu.

Future Plans

As more and more emphasis is being given to the conservation and management of the marine environment, there is need for a more comprehensive set of rules and regulations to govern the exploitation of this environment. There is in the pipeline a Marine Park Regulation formulated solely to manage and conserve the marine environment. A Fisheries Act 1985 exists; the department felt that a more comprehensive set of regulations that governs MPs is solely needed. With the enactment of these regulations, more control can be exercised on the exploitation ofMarine Parks. Visitor management will also be given emphasis. This will give field staff more power to control visitors to the MPs. One such ruling relates to collection of conservation charges. Any reluctance by the visitor to pay can be dealt with.

These regulations also encompass regulatory functions to control certain activities within the MP area such as the use of jet skis. Other plans include capacity-building in enforcement techniques and visitor management.

On the whole, legislation can play an important role in managing an MP so that the Park's potential – for research, education or tourism – can be tapped. At the same time, the present generation should not forget that whatever is being done now will affect the future of the marine environment and that our children and their children can still have something to appreciate in the future.

Question-and-answer session following Abdul Khalil bin Abdul Karim's presentation

Dr Purwanto— indonesia

Q Are enforcement authorities being assigned to enforce also other aspects related to park duties, and do communities get involved in surveillance?

A Enforcement is part of the duties performed by park staff. The community does get involved, mostly in providing information to park officials. This co-operation proves useful.

Dr Purwanto - Indonesia

Q Do park officials co-operate with other enforcement agencies?

A There is close co-operation with other agencies through the co-ordination of the Maritime Coordinating Center.

Amalendu Mukherjee - Bangladesh

Q What are the penalties imposed on offences committed in the park?

A The penalty imposed is RM500 (minimum) to RM25,000 (maximum) and or two years ofjail for local offenders. For foreign offenders, the maximum penalty is RM.l ,000,000 (one million)

SM. Mdlshaque Bhaiyan - Bangladesh

Q Apart from the Department of Fisheries enforcing the Fisheries Act *1995,* is there any other agency enforcing it?

A There are other enforcement agencies, such as the Marine Police and Navy, enforcing the Act. But the Department of Fisheries is the only agency that prosecutes offenders.

Haridas - India

Q Is there a separate legislation for fisheries and marine park matters?

A There is only one legislation, the Fisheries Act 1985, which covers all aspects of fisheries and marine matters.

Haridas - India

Q Who has powers to enforce the marine park?

A The powers of the Director General, Department of Fisheries, are delegated to staff at state and local levels.

S. M. Md Ishaque Bhaiyan - Bangladesh

Q Ifthe state government does not agree to gazette protected areas as a marine park, what are the implications in setting the park?

A Under the federal constitution of Malaysia, the federal government may declare any area as a marine park, even if there is no agreement with the state government. But the state's consensus is sought before declaring the area as a marine park.

SUSTAINABLE FiNANCING OF MARINE PROTECTED AREAS AND MARINE PARKS IN PENINSULAR MALAYSIA, SARAWAK AND LABUAN.

By Najib Ramli
Department Of Fisheries. Malaysia

1. Introduction

A 'clean' environment for marine protected areas and marine parks is not cheap. In spite of an investment of millions of Ringgit Malaysia (RM), the task of enhancing the marine environment is not over. Marine Protected Areas (MPAs) and Marine Parks (MPs) are essential to conserve and protect biological diversity and meet a range of national and community needs. The objectives and principles of MPAs and MPs are to reduce unnecessary damage and degradation to the carrying capacity of the marine environment and thus make utilization sustainable. The programme needs to address the temporal gradient of the problem, covering the past, the present and the future (Dutton and Hotta,l995). Its approach is 'good environmental policies are good economic policies - and vice versa' (Peterson, 1997) and 'maintaining a balance between the work of nature and the handiwork of humans' (Razali, 1998).

Malaysia is blessed with a long coastline and offshore islands within the country's territorial waters and a 200-mile Exclusive Economic Zone—a vast and dynamic environment that supports a remarkably rich and diverse biotope for flora and fauna. So far, 40 offshore islands along with the surrounding marine waters have been established and gazetted as marine parks in Peninsular Malaysia and the Federal Territory of Labuan. Waters surrounding three islands off Sarawak, Tanjung Tuan and Pulau Besar off Malacca have been gazetted as Fisheries Protected Areas.

The establishment of MPAs and MPs was initiated in 1983 with the main objective of enhancing fisheries resources (DOF, 1996) by protecting, preserving and managing natural breeding grounds and habitats of aquatic life; allowing for the natural regeneration of aquatic life; preserving and enhancing the undamaged state and productivity of the environment (Ch'ng, 1990). Furthermore, MPAs and MPs can protect reefecosystems and species while generating tourism activity and maintaining the vitality of fisheries nearby (Bryant et al., 1998).

The marine parks establishment was administered and managed by the Fisheries Department, Ministry of Agriculture, under the Fisheries Act of *1985.* The Department of Fisheries is also a part of the National Advisory Council and of the Marine Parks Trust Fund Management Committee which determine the policy for Malaysia's MPAs and MPs. Co-ordination in planning and implementation between Federal and State Governments, NGOs and institutes of higher learning is also undertaken by this National Advisory Council.

This paper will briefly discuss how much public money has been spent on the MPAs and MPs to achieve the goal of protecting, conserving and managing marine environments and encouraging public understanding, appreciation and enjoyment of Malaysia's natural marine heritage by present and future generations. The paper then looks at the potential for financing activities through visitor use concepts (Ch'ng, 1990), Boat tours, scuba diving, snorkeling, and glimpses into marine life, local history and folklore will be an integral part of the total visitor experience. MPAs and MPs provide a setting for

these activities while ensuring that the natural resources are maintained in good condition in perpetuity (Ibid.. p. 16).

2. Tracking Costs

The management of MPs is a new topic for the Department of Fisheries, Malaysia. As an exclusive steward of MPAs and MPs, the Government of Malaysia, via the Department of Fisheries, provides financial allocations for management and development programmes through the Five-Year Malaysia Plan. Realising that the financial allocation from the Malaysia Plans was inadequate, the authorities approved and set up in 1987 the Marine Parks Trust Fund, as an alternative source of funding, with a launching grant of RM 10 million received in 1989.

The Trust Fund was set tip to receive contributions and make payments connected with all activities of Marine Parks and Marine Reserves. The Trust Fund also oversees the sale of souvenirs, books etc. rental ofapparatus. equipment and facilities, and implementation of programmes connected with Marine Parks and Marine Reserves both within and outside the state.

With the allocations provided under the Malaysia Plans and the Trust Fund, various programmes – infrastructure development; personnel and human resource development; administration, management and conservation; education, interpretation, publicity and public awareness; and research and monitoring – were laid out and implemented in stages. The first Marine Parks Centre was established in Pulau Payar (Kedah) during the Fourth Malaysia Plan (1981 - 1985). This was followed by Pulau Redang, Terengganu during the Fifth Malaysia Plan (1986- 1990), Mersing, Johor and Pulau Tiornan, Pahang during the Sixth Malaysia Plan (1991 - 1995) and Pulau Tinggi, Johor, during the Seventh Malaysia Plan (1996-2000). The seventh Marine Park Centre will be built in Pulau Perhentian, Terengganu, in the year 2000. The Department of Fisheries also plans several other Marine Park Centres located in Pulau Tulai and Pulau Seri Buat in Pahang; Pulau Aur/Pulau Besar in Johor; Pulau Kuraman in Labuan; and Pulau Sembilan in Perak, during the Eighth Malaysia Plan (2001 - 2005).

These marine park centres are established to play the role ofmarine park administration, management and enforcement. Further, the centres will take care ofvisitor orientation, information and interpretation. The centres provide visitors with all the information necessary (Ch'ng, 1990). Every marine perk centre, which houses staffquarters, a laboratory, an administrative building and ajetty, fully supports the management and conservation of the marine environment and its resources.

Beside marine park centres, other infrastructure development carried out include boat-berthing buoys to reduce damage to corals due to anchoring; jetties, pontoons, marking and mooring buoys; audio-visual information and an exhibition facility; education and public awareness materials and surveillance boats. These assets were acquired in stages as the development ofthe marine parks progressed. Between 1985 and 1999, the Department of Fisheries, Malaysia, put in tremendous effort toward the development and upgrading of MPAs and MPs.

Subsequently, personnel for marine parks were established only in 1986, when 62 posts of various categories were filled (DOF, 1996). The posts filled to date are insufficient for carrying out the field responsibilities of marine parks which are expanding rapidly. There are only 62 staff in the 40 parts giving a staff/park ratio of 1:6:1. To make marine parks function more effectively, the staff ratio should be 3:1. This necessitates an increase of staff to 129 persons or an increase of 67 persons in the short term (ibid.p. 14).

3. Government Spending

Till date, the Government has spent almost RM 21.6 million on the development of a marine park centre and the acquisition of surveillance boats, as shown in Table I below. Furthermore, RM 12,98 million was spent on the acquisition of other assets such as diving equipment, computers and computer software, marker buoys and mooring buoys, audio-visual equipment, rest floats, pontoons, life jackets, life buoys, laboratory equipment and land vehicles (4WD).

Table 1: Location and Cost of Marine Park Centres in Malaysia

Slate	*Location*	*Year Built*	*Year Operational*	Cost *(RM)*
Kedah	Pulau Payar	1985	1988	1,000,000
Terengganu	Pulau Redang	1987	1990	2,800,196
	P. Perhentian	2000	2001	2,000,000
Johor	Mersing	1992	1995	1,459,100
	Pulau Tinggi	1998	1999	1,600,000
Pahang	Pulau Tioman	1992	1994	6,218,848
	24 units of boats (Boston Whaler)			6,5 19,000
	Total cost			**21,597,144**

The Government of Malaysia also meets the management maintenance cost which includes emoluments for staff travel allowances, maintenance of assets and equipment. honorarium, fuel, and activities relating to conservation, education and research. On an average, RM 0.56 - 0.65 million is allocated yearly for management cost, adding tip to almost RM 6,25 million during the Sixth and the Seventh Malaysian Plans. In addition to the allocation under the Malaysian Plan, between RM 1.0 million and RM 1.6 million is allocated under the Trust Fund for similar purposes.

Nevertheless, it is quite impossible to be precise above how much money should be spent on the MPAs and MPs to achieve their objectives. However, it is estimated that RM *34,58* million was spent on the development of infrastructure and other assets (capital cost/fixed cost) while between RM 1,6 million and RM 2,25 million will be spent yearly towards management and niaintenance cost (variable cost).

4. Changing Perception of MPAs and MPs

Marine parks have experienced an upsurge of visitors in recent years. In 1990 the number ofvisitors to the Pulau Redang Marine Park centre (Terengganu) and the Pulau Payar Marine Park Centre (Kedah) was 4,375. The number soared to 20,637 in 1993 and 125,040 in 1996. In Pulau Payar Marine Park centre alone, the number of visitors recorded in 1993 and 1996 was 13,025 and 90,307 respectively. These numbers will increase in the near future as tourist arrivals to Malaysia are anticipated to grow at an average annual rate of 9.6% in the next five years (Nordin et al 1997).

In view of the increase in visitors, MPAs and MPs must develop new and dynamic sustainable uses of the environment and adequately meet financial obligations. Though the management of MPAs and MPs is motivated by the philosophies of conservation and protection, of late there has been increasing pressure to manage the areas for profit. This phenomenon has been spurred by the increasing number of visitors and by the public's increased willingness to pay for leisure and recreation services (Nordin, 1997). Thus with proper planning and implementation, tourist development can bring about significant economic benefits to the country and to the communities as a whole; and to the management of MPAs and MPs. Direct revenue can be earned in several forms for the benefit of management. Or at least the development and management cost could be subsidised.

Subsequently, MPAs and MPs have faced the problem of dwindling federal allocations, mounting maintenance demands and limited funds that make effective management difficult. Their success depends on the development of clear fund raising and investment strategies. Entrepreneurial programmes to attract more visitors should be carefully designed to reduce dependence on federal allocations without harming the environment.

5. Sustainable Financing Approach - User Use And User Pay

MPAs and MPs provide a variety of compatible outdoor recreational opportunities for park visitors. **The** objective is to provide a total experience that allows recreation with relaxation, and a deep appreciation and understanding of the natural resources and the environment of both the marine park and the island (Ch'ng **K.L.,** 1990). Furthermore, most MPAs and MPs have people living in adjoining areas. There are many visitors as well. The association of people and protected areas determines the level of environmental degradation. Thus, the successful establishment and maintenance of protected areas will depend on a co-operative relationship between the people, the managers and the areas concerned. (Davey et al., 1998). 'Stakeholders' as these people are called, play a major role in determining the future of the protected areas. As beneficiaries of environmental products, they must help better the environment.

Listed below are some suggestions for fee/levy/charge that MPAs and MPs could levy. No amounts are mentioned; a thorough study must be done before implementation. All aspects -- social, economic, political and legislative – must be taken into account before action is taken.

5.1 Entry Fee For Visitors

In Malaysia, an entry fee was introduced from January 1999 in the Marine Parks of Kedah; from March 1999 in the Marine Park of Terengganu; and from June 1999 in Marine Parks of Pahang and Johor. The entry fee imposed is RM5.00 per adult and RM2.50 per child, student or pensioner. The validity of the entry fee is 'per entry' in marine parks of Kedah and 'five days entree' in the marine parks of Terengganu, Johor and Pahang. So far about RM 0.60 million has been collected from all the Marine Park Centres.

5.2 Deposit For Commercial Boats

Commercial boats include passenger boats and cargo boats that ply within and into the waters of MPAs and MPs. It is suggested that their yearly rates be based on the size or the gross registered tonnage (GRT) of the boats.

5.3 Entry Fee For Personal Boats - Local And Foreign

Local and foreign personal boats such as yachts and other water craft are required to pay an entry fee based on the size or tonnage registered.

5.4 Fee For Building Structure And Pontoon

A deposit, permit and license are required to set up any building, structure, mooring buoy, or pontoon on the waters of MPAs and MPs regardless of usage. A permit is issued for construction, while a license is for operation. A license is then renewed every 12 calendar months, while the deposit remains as a security or bond. The amount of deposit, permit and license will depend on the area of waters used and the purpose of each structure.

5.5 Insurance Coverage For Visitors

All visitors are required to arrange for personal accident insurance coverage for the duration of the visit. The idea of insurance coverage is to emphasise public awareness about safety.

5.6 Renting Of Facilities And Equipment

Visitors may rent equipment such as tents and campsite, cookstoves, diving and snorkeling equipment, laboratory and research equipment, exhibition facilities etc.

5.7 Alliance Contract With Private Enterprises

An alliance with private enterprise would be a useful way to raise funds. Private companies would pay to get their products designated as 'official drink', 'official diving equipment', 'official insurance coverage' and so on.

5.8 'Twin Parks 'Approach For Research, Education And Interpretation

Park management will benefit through funding and grants. Local and overseas universities and NGOs are always willing to participate, because MPAs and MPs facilitate research, data and information collection.

5.9. Joint Ventures and Voluntary Programme

Joint ventures and voluntary programmes in research, education, publicity, interpretation and awareness will save a lot of money in terms of RM/man hour. Individuals, entrepreneurs and corporate bodies are quite willing to volunteer their services.

6. Sustainable Financing Approach — Privatization Of Tourist Facilities & Services And Development

The issue of privatization of tourist facilities and services in Marine Parks of Malaysia is very recent. Such a move would balance conflicting interests - preservation and use. Although privatization is a useful tool, it is neither a panacea nor an end in itself (Larnri and Basintal, 1997). A case-by-case approach is therefore suggested on the issue. Several areas regarding tourist facilities and services could be considered for full privatization in the near future, such as;

6.1 lease of assets such as staff quarters/chalets, submersible boats, camping grounds, laboratories, canteens/restaurants, public toilets,jetties, diving equipment, exhibition halls etc. Lease ofassets involves transfer of the right to use the assets for a specified period in return for a specified payment (ibid.p.,4 1);

6.2 Management contract for public toilets, chalets, camping grounds and canteens; and

6.3 Maintenance services, such as entry fee collection, building maintenance and security. This will allow park personnel to concentrate on conservation and protection activities.

7.0 Conclusion

MPAs and MPs in Malaysia are already subjected to heavy use. While the Department of Fisheries is concerned with resource and environment management and conservation, park management and people management are given insufficient attention. People are visiting MPAs and MPs because of better marketing, rising income levels and the increased need to 'escape' to pristine areas. A dynamic use of this phenomenon must balance visitor development and resource conservation. The anticipated increase in number of visitors by 9.6 % for the next five years demands that the Department of Fisheries Malaysia change the conventional perception ofMPAs and MPs. The modern perception is that MPAs and MPs contribute to economic development in sustainable ways.

Further, the high capital cost and the variable cost of sustaining MPAs and MPs and the major constraint of limited funds may hinder management and conservation programmes. Therefore, sustainable financing through 'users pay' arrangements and privatization is the only option for self financing or at least supplementing Government allocations.

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Question-and-answer session, discussion following Mr. Najib Ramli's presentation

Annadel Cahanbans - Universiti Malaysia Sabah

Q Is there any programme to reduce funding for the Marine Park Trust Fund because it is to be a self-financing effort?

A The intention of setting the Marine Park Trust Fund is for achieving a status of self-financing in the near future.

Ahmed Hafiz - Bangladesh

Q Is there a plan to reduce the number of fishermen staying on the island that is surrounded by the marine park?

A There are plans to reduce fishing effort by providing training to facilitate fisherfolk venturing into other sectors such as tourism.

Mohamad Faiz - Bangladesh

Q What is the mechanism used to increase fish catches if there is a plan to reduce the number of fisherfolk?

A Reduction in the number of fisherfolk engaged in fishing activities actually increases the income of the fisherfolk as fishing effort is optimized.

Rathin Roy - BOBP

Q Is an environment cess on tourists being considered?

A The conservation charge now imposed on tourists entering the marine park could be considered a cess.

Comments:

Kevin Hiew Wai Phang - Malaysia

Until 1996, the Marine Park Trust Fund did not receive any funding from the government., but before 1996, the federal government allocated about 38.5 million Ringgit Malaysia.

Dr Annadel Cabanban - Universiti Malaysia Sabah

There is a multiplier effect due to the establishment of parks.

Alistair Cheal - Australian Institute of Marine Science

Be very cautious in relying totally on tourists to increase the income of the local people, as the sector could get out of hand if not controlled properly.

MANAGEMENT OF MARINE PROTECTED AREAS AND MARINE PARKS AT THE MICRO-LEVEL

by Ab. Rahim Gor Yaman
Head of Unit, Marine Park Terengganu, Terengganu State Fisheries

Preface

This paper discusses various management approaches at the micro level or local level of Pulau Redang Marine Park that is situated on the East Coast of Peninsular Malaysia in the state of Terengganu. Management approaches such as information management, research management, planning management, zoning management, resource management, and visitor management were discussed.

Pulau Redang Marine Park

Pulau Redang archipelago, located at 5°44'to5°50'N latitude and 102°59'to 103°5'E longitude, is a group ofnine continental islands (map l and 2). The largest island is Pulau Redang, with an area of 25 km sq., and is located 22.4 km off the coast of Merang, and 45 km from Kuala Terengganu. Within three nautical miles to the north-east ofPulau Redang there are seven other smaller islands. All of these are inhabited, except for Pulau Pinang, an island located to the south of Pulau Redang. The Department of Fisheries Marine Park Centre is located on the north-east tip of Pulau Pinang.

The archipelago of Pulau Redang was first declared as a Fisheries Protected Area in 1983 as an interim measure to protect the rich natural resources found in the area. The Fisheries Protected Area extended 8km seaward from the shore of Pulau Redang. However, the waters extending two nautical miles from the shore of four islands with the Pulau Redang archipelago was declared as Marine Park in 1994. Seven other areas located to the north and south of Pulau Redang archipelago were also Marine Parks. In 1990, the Pulau Redang Marine Park Centre was established. It acts as a day-to-day management centre for the central part of Marine Park in the state of Terengganu. It is equipped with a visitor centre, a laboratory, and accommodation facilities, water and electricity supply.

The goal of the Pulau Redang Marine Park is to protect, conserve and manage in perpetuity marine environments of significance and to encourage public understanding, appreciation, and enjoyment of the natural marine heritage by present and future generations (Ch'ng, 1990).

Pulau Redang is blessed with rich natural resources: the tropical forest and the fringing reefs. In 1990, about 94.3% (20,250 ha) of the land on the island was a state forest reserve. The forest reserve consists of low hill forest (81%), beach forest (12%), and mangrove forest at 1.4%. The built up area covered 3%(75 ha) and was primarily the site of the village of Kampong Redang (Ab. Rahim, 1996).

The island is known for its extensive fringing reefs, which are better than those of other islands off the coast of Terengganu. Pulau Redang archipelago is home to more than 55 genera of corals; approximately 100 fish species have been identified in the coral reefs (Ridzwan, and Mohd Ibrahim, 1986). At least 57 species of marine algae have been identified from the Pulau Redang waters (Ridzwan and Sharifah Nora, 1996).

Pulau Redang is a major green turtle *(Chelonia mydas)* nesting site. It was estimated that the green turtle makes up 90% of the nesting population on Pulau Redang, while 10% are hawksbill turtle

(Eretmochelys imbricata) and olive ridleys *(Lepidochelys olivacea)*. There are four nesting sites in the Pulau Redang archipelago, all of which are protected under state law.

The population of Pulau Redang is over 2,500. All of them reside at Kg Pulau Redang. There are *56* boats owned by the islanders residing on Pulau Redang. About 89% (50) of the fishing boats are licensed for traditional gears, the other 11% (6) for commercial gears. The 11 resorts operating on Pulau Redang offer 603 rooms.

Information Management

The objective of information management is to consolidate and improve the availability and accessibility of information not only on resources and ecosystems within the area, but also to understand the nature of use and users in the area.

Management approaches to manage information are:

- Development of a database on research and monitoring programs that were conducted in the marine park. Although large bodies of data exist for some areas, they are of varying quality and have never been collated and interpreted. The database will be useful to identify gaps in knowledge; prioritise areas for future research and monitoring; and assess the cost-effectiveness of previous expenditure on research-related programmes.
- Development of a database for various stakeholders; boat operators (fishing, cargo and transport), dive operators, resort operators. These databases are useful for distributing information to visitors, tour operators, and the state tourism office. Enquiries about services provided in the Marine Park could be easily handled with the aid of these databases.
- Establishment of a repository centre for research and for monitoring environmental impact assessment reports. Researchers who were given research permits to conduct research in the park are required to submit reports for publication.
- The information collected will be easily accessible and useful to park planners and policy makers, scientists and stakeholders. There are plans for on-line access to these databases.

Research Management

The objective of the park is to promote research and scientific study in an effort to gather information that will be useful in planning and management of the park.

Management approaches used so far to achieve the objectives:

- Established a laboratory facility at Pulau Redang Marine Park. It was the first offshore research base facility operated by the Department of Fisheries when it was established in 1991. The facility is open for both local and foreign researchers. At the moment bench fees are charged for use of the facility, which has been fully utilised by the Department of Fisheries and local universities and occasionally by foreign researchers. There are plans to fully equip the facility to meet increasing demand.
- Established formal ties with local universities in an effort to promote co-operation for research in the marine park. There is an ongoing arrangement with two local universities to conduct

training programmes for final year bachelor students at the park. Postgraduate students were encouraged to conduct research. Accommodation was provided at the park to facilitate researchers. Incentives in terms of allowances were paid to final year students who conduct attachment training programmes at the park as a partial fulfilment of the final year course. Local universities have been using the park centre as a base for field work.

- All research activities in the marine park need special approval from the Director General of Fisheries. For foreign researchers, approval from the Prime Minister's Department is also needed. The approval is extended to the park centre where records of all research permits are kept.

- Extractive sampling of natural resources in the park is strictly controlled. All research will have a condition: a marine park staff and research officer from the Fisheries Research Institute will take part in field trips carried out as part of the research. Their task is to learn about, record and verify the amount of samples taken within the park. Samples need special approval from the Department of Fisheries to be taken outside the country.

- Established park reference centre by collating all information generated from research activities in the park. As part of the research permit approval, all researchers are required to provide a copy of the report or publication that arises from the research in the park. Information gathered from the research activities was used to revise the management plan and use it in the planning processes.

- Providing research funding through intemal and external funds. The Department of Fisheries through the Marine Park Trust fund has been funding research and monitoring conducted in the park. DOF also actively solicits funding from state government and private sectors to sponsor various research programs. Local NGOs were used to raise funds for collaborative research and monitoring programs.

- Trained park staff to conduct research and monitoring programmes. Park staff were involved in the monitoring of water quality, coral reef, crown-of-thorns and holothurids.

  Water quality is monitored monthly at seven permanent monitoring stations in the park. Monitoring stations were set up at impacted areas adjacent to resorts or the development project site. Control stations were set up in areas far away from any disturbance to coastal development.

  Coral reef monitoring was conducted by the Department of Fisheries in collaboration with local universities and NGOs (Mohamad and Japar, 1992). Since 1998, DOF has conducted a Reef Check Program involving volunteers as part of the effort to regularly monitor the status of the coral reef.

  Crown-of-thorns starfish population was monitored monthly – at least five sites within the park. The choice of monitoring sites is based on reports obtained from dive operators in the park. The Crown-of-thorns monitoring and culling programme has been an ongoing programme since 1991 (Graph 1).

  Monitoring of key species and species of special interest such as holothurids and crown-of-thorns starfish were conducted monthly. Holothurids is an important species that has been harvested extensively in the west cost of Peninsular Malaysia for food and folk medicine. Although holothurids is found in abundance in the park, close monitoring is required to find out the abundance. Monitoring of holothurids was started in 1998.

Planning Management

The objective of planning management is to co-ordinate planning among various state and federal agencies that had a rote in approving development projects.

The jurisdiction for land matters is under the state government, while the water surrounding the island comes under the Department of Fisheries, a federal agency. The Department of Environment, another federal agency, has jurisdiction over matters pertaining to pollution control and environment impact assessment.

Management approaches at the planning stage are:

- Develop a management plan for the park (Ridzwan and Mohamad, 1987, and Aikanathan and Wong, 1994).
- The park is represented in various state committees pertaining to planning and development of islands surrounded by the Marine Park. The Terengganu Marine Park Unit is a technical committee member the Island Development Committee, the Terengganu State Tourism Development Committee and the Environment Impact Assessment Committee. The proactive involvement of the Marine Park Unit at the state planning level has resulted in reducing unwanted impact from approved projects.

  The Island Development Committee was created in 1997 as a Federal Government initiative to provide a structural plan for most islands in Peninsular Malaysia. In the state of Terengganu, three islands – Pulau Perhentian, Pulau Redang, and Pulau Kapas – were under the purview of the committee. Apart from providing the structural plan, the committee also emphasises the setting up of terrestrial protected areas and protection of catchment areas on the island. The Department of Town and Country Planning has completed the structural plan for each of these islands.

  The State Tourism Development Committee is an approval body for all tourism projects, including projects on the islands surrounded by the Marine Park. Any approval, if granted, is conditional on the project fulfilling the requirements of various state and federal agencies. If the projects require an Environment Impact Assessment report, fulfilling it will be referred to the Environment Impact Assessment Committee, chaired by the Department of Environment.This committee also functions as the project monitoring committee.
- A revised zoning plan and management plan to address new issues and to incorporate new findings. Revision of the size of the Pulau Redang Marine Park was done in 1992. The research zone was revised in 1991; under this revised zone, Pulau Lima, initially proposed as research zone in the management plan established in 1987, was declared as a recreation zone. Revision of recreation zones was done every year, as the areas have to be left undisturbed for at least a year to allow for regeneration.

Zoning Management

The objective of management through zoning is to separate the areas for various activities to avoid user conflicts and minimise impacts on areas of significant importance such as nesting sites, restoration and research zones.

The management approaches are to divide the park area into two major zones – core zone and buffer zone. Within the core zone, special zones were set up to protect critical habitats from damaging activities, intensive use is confined to areas that could sustain it, and incompatible activities are separated to avoid conflicts. Zones that were established are research, nesting, rehabilitation, and recreational zones.

Core Zone

The core zone is an area one nautical mile off the shore, and covers alithe coral reef areas. Fishing, and collection ofcoral and shell are prohibited within the core zone. Construction ofany facility within this zone needs a special approval from the Director-General of Fisheries. Apart from that, the project needs to prepare an Environment Impact Assessment report and get approval from the Department of Environment to conduct any project, such as dredging, beach nourishment, building of port or fish landing facilities, and building ofajetty or marinas (Environment Quality Act 1974).

Park staff regularly monitor any construction work within the core zone. As not all construction work gets the necessary approval before starting the project, the project will be informed about the need for an Environment Impact Assessment report and approval from the relevant agencies.

Buffer Zone

A buffer zone is an area ranging from one to two nautical miles, established to safeguard the core zone from activities occurring outside the core zone. Within the buffer zone, fisherfolk residing on the island who possess valid traditional fishing permits are allowed to fish using hook and line during the north-east monsoon season (November to January).

Research Zone

A research zone is set aside mainly for research purposes. Access to the area is limited to researchers. At Pulau Redang Marine Park, a research zone at Pasir Akar has been established mainly for research on giant clam. Initially, when the management plan for Pulau Redang Marine Park was established in 1987, Pulau Lima, the island furthest away from Pulau Redang, was identified as a research zone (Ridzwan and Mohamad, 1987). However, due to great pressure from dive operators, the area was zoned as a recreational zone as it offers as one of the best dive sites within the archipelago of Pulau Redang.

Seasonal Closure Zone

A seasonal closure zone is established at four areas off the turtle nesting beaches at Pasir Cagar Hutang, Mak Kepit, Mak Simpan and Pasir Akar. Access to these areas during the turtle-nesting season (March to September) is prohibited. Visitors were not allowed to be in the water within 500 meters from the nesting beach during the nesting months. To ensure that there is no poaching of turtle eggs, local residents on the island were engaged to guard the nesting beaches.

Rehabilitation Zone

A rehabilitation zone has been established to allow for natural regeneration of damaged coral reef areas. To facilitate recovery ofdamaged areas, disturbances from recreational activities were minimised

by not allowing access to the area. At Pulau Redang Marine Park the rehabilitation zone was set up at Pasir Akar since 1993. Annual monitoring of the resources was conducted to assess the recovery. Even though recovery has occurred, the area is still closed, as it is also a research area for giant clams.

Recreation Zone

Recreational zones were established in areas of special interest to the visitor, such as swimming, snorketling and diving. Floating boundary markers were used to demarcate the swimming and snorkelling areas. Boat access to these areas is prohibited to ensure safety and minimise accidents. Diving areas are confined to areas where there are mooring buoys. Park staff regularly monitor coral reef status at the vicinity of the marker buoys. The buoys are shifted to a new area if it is found that the coral reef shows signs of damage. This approach has been practised to ensure that any particular area is not used excessively.

Zoning Processes

Imparting a sense of ownership to the zoning plan among stakeholders is important as a mechanism to increase their willingness to voluntarily abide to the developed plan. Stakeholders were involved in planning processes through public consultation. Apart from getting information and feedback from stakeholders, information is collated from research and monitoring programmes and from observation and by the park staff. Once a consensus is reached, a public notice is issued both in the form of printed materials and a broadcast made through a local radio station.

Resource Management

The object of resource management is to provide special protection to aquatic flora and fauna, protect, preserve and manage breeding natural grounds and habitats, and allow for natural regeneration of depleted resources.

The two main resources in the park are fisheries and mangroves. Managing fisheries resources in the park is the job of the Department of Fisheries while the Department of Forestry manages mangrove resources.

Most of the effort at managing fisheries resources has been devoted to stopping the illegal fishing that occasionally occurs within the park. Fishing in the park is prohibited, except for local fisherfolk. The exemption is only for the monsoon months (from November to January) and only for the hook and line fishing method within the buffer zone.

Managing the fishery resources of the park is of prime importance. Management approaches used to manage the fisheries resources are:

- Enhance habitats by installing various types of artificial reefs to increase the fisheries stock. The artificial reefs not only enhance the habitat, but also deter encroachment of illegal fishing trawlers. There are four artificial reefs within the waters of Pulau Redang Marine Park.
- Replenish declining stocks through the establishment of hatcheries. In 1998, a pilot project was conducted to breed giant clams with the aim of replenishing the stocks in the park. It is an ongoing research programme, and there are plans to start the hatchery operation in 2000 A.D.

- Establish special zones (seasonal closure and rehabilitation zones) to minimise disturbance to the resource during the breeding season and also for the stock to regenerate and replenish.

- Provide ample human resources to manage the park. There are 23 staff in the Pulau Redang Marine Park, of whom 10 are technical staff (6 management staffs and 4 research staffs), and 13 boat crews and general workers.

- Provide enough logistic support such as boats and accommodation facilities for the park. There are three patrol boats, two transport-cum-research boats and two utility craft dedicated to the Marine Park of Terengganu. Patrol boats are stationed at the park centre all the time to facilitate surveillance and enforcement by the park staff.

- Conducts regular surveillance and enforcement exercises. Regular checks are conducted on fishing gears that were laid illegally in the park area. Any fishing gears found were confiscated and disposed of.

- Target enforcement activities on areas normally used for illegal fishing activities. A radar station was installed at the park centre to monitor movement of boats in the park, especially in areas that were normally encroached by fisherfolk. With the aid of radar, a method was developed to identify possible fishing activity by trawler boats.

- Reduce the number of fisherfolk in the fishing industry. There is a natural tendency for the younger generation to prefer the tourism industry to the fishing industry. To facilitate the involvement of fisherfolk in tourism, programmes to train fisherfolk as boat engine drivers and helmsmen were conducted by the Department of Fisheries. Fisherfolk were also trained as divers. Priority to attend this training was given to fisherfolk residing on islands that are within the park.

Visitor Management

A major part of park management effort has been devoted to managing people, especially visitors. The number of visitors at the Pulau Redang Marine Park Centre has been increasing since it was established in 1990 (graph 2). From less than 10,000 (1990-94), the number of visitors has gone up to 23,000 (1995), 35,000-38,000(1996-98) and 45,000(1999). Beginning March 1999, the Department of Fisheries has started charging visitors to the park at the rate of RM5.00 for adults and RM2.50 for students, and pensioners. The fee charged did not keep visitors away.

The objective of visitor management is to encourage recreational uses that are compatible and within the carrying capacity of the natural resources available in the park.

Management approaches used to manage visitors are:

- Impart knowledge and increase awareness and understanding of visitors about the park. The park visitor centre is equipped with an exhibition area, an audio-visual room and a counter service facility. A regular video show reminds visitors about park regulations.

- Get the co-operation of tour operators and tour guides to accompany visitors to the park. Most of them are familiar with the park and its regulations.

- Urge resort operators to disburse information, deliver briefing, and show educational videos at the resort. The Department of Fisheries supplies brochures, videos and regular news to resort operators as incentives.
- Improve visitor safety by establishing boundary markers and mooringbuoys at major recreational areas. Resort operators were asked to 'adopt' the boundary markers and mooring buoys in the vicinity oftheir resorts. The 'adoption' scheme has given the resort operators a sense of ownership and helped to minimise the cost of maintenance and the loss of facilities.
- Improve the safety of visitors, especially divers, by getting the co-operation of dive operators and providing qualified dive guides for all diving activities.
- Establish mooring buoys at diving sites. Help dive and snorkelling operators to use different areas within the park to avoid overcrowding at any particular site. There are plans to tender dive sites on an annual basis to dive operators as part ofa programme to impart a sense ofownership and responsibility to resource users.
- Encourage stakeholders to develop and provide new recreational activities, especially those associated with tropical forests, for the benefit of visitors.

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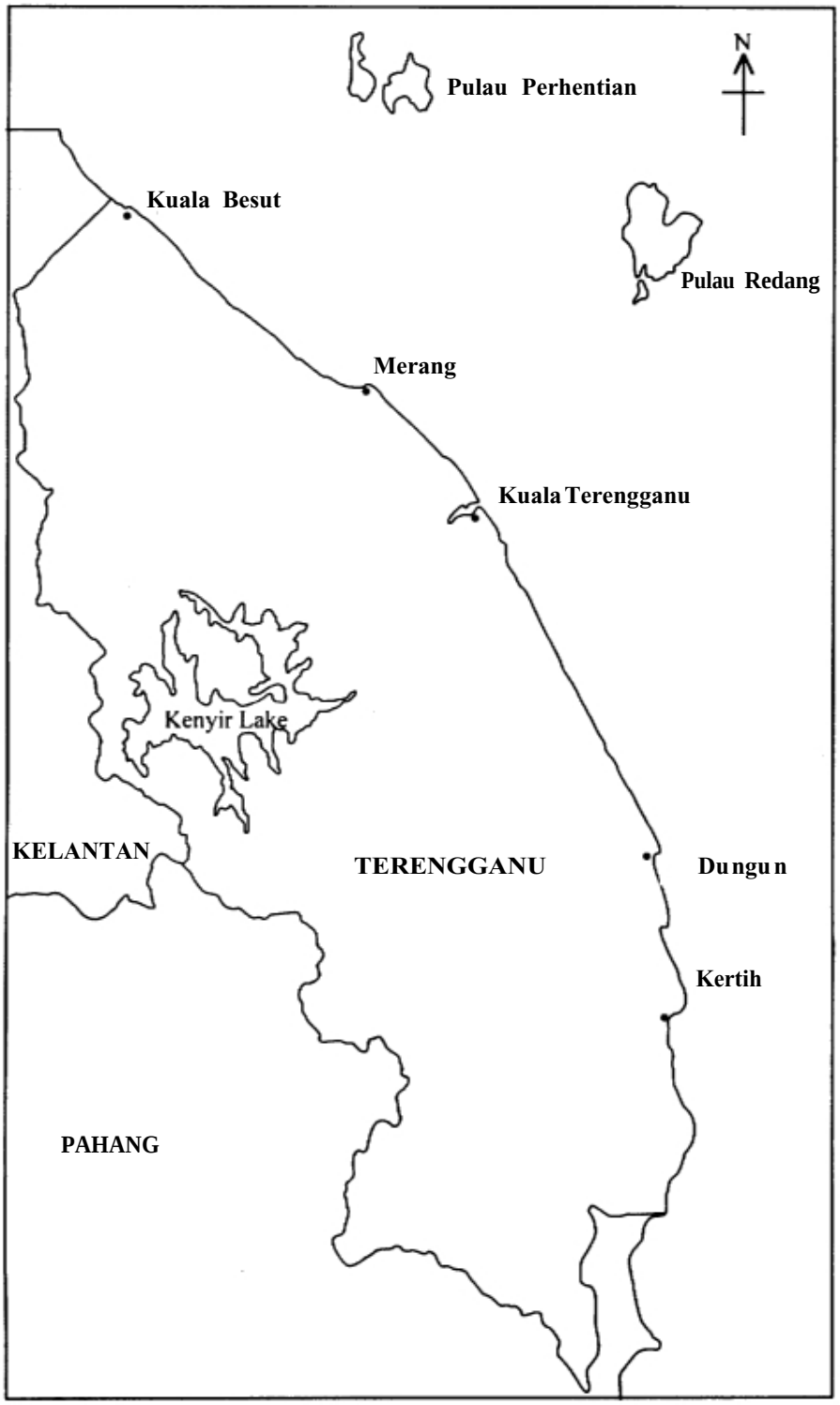
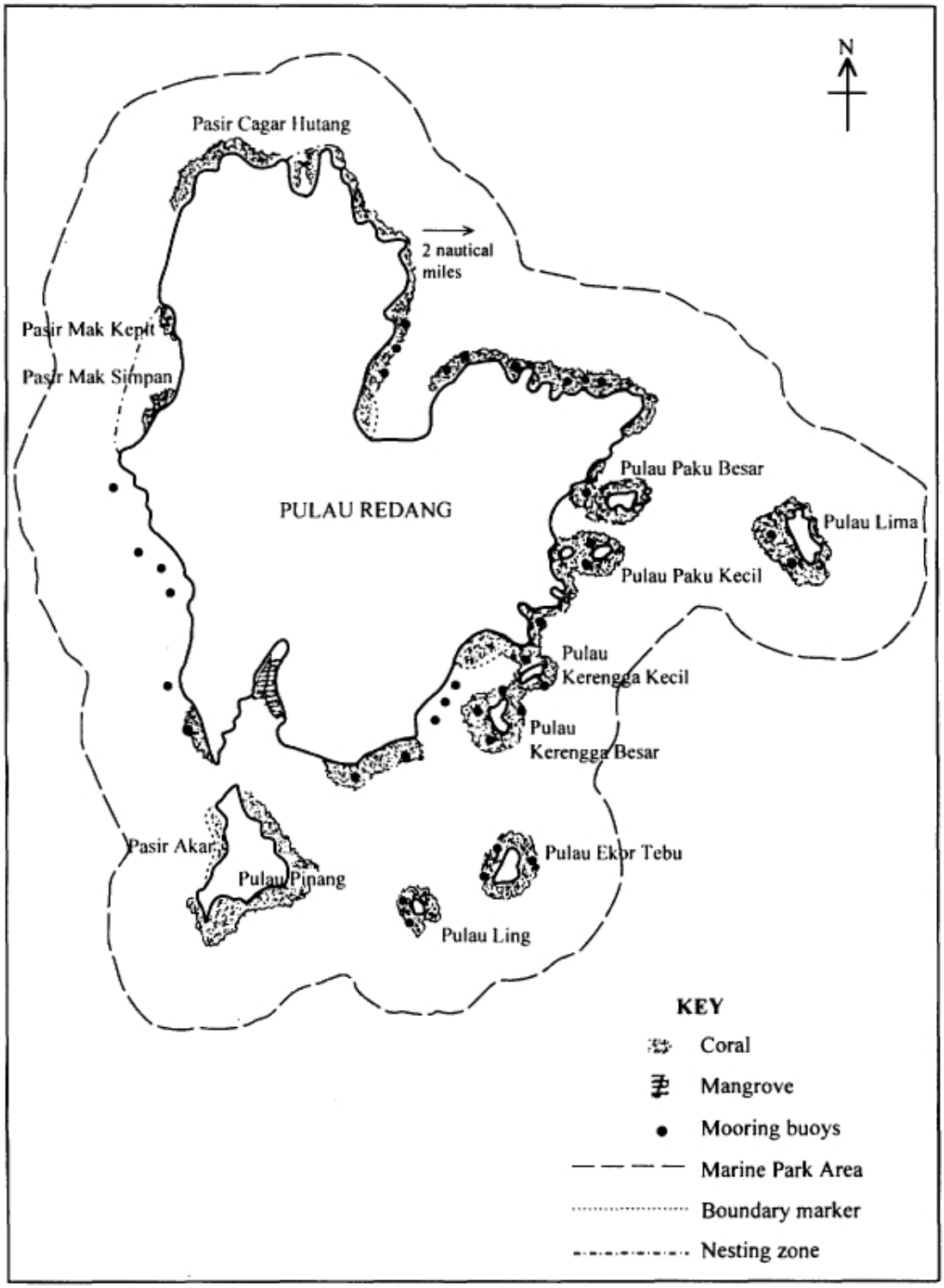
Map 1 : Location of Pulau Redang Marine Park



Map 2: Pulau Redang Marine Park



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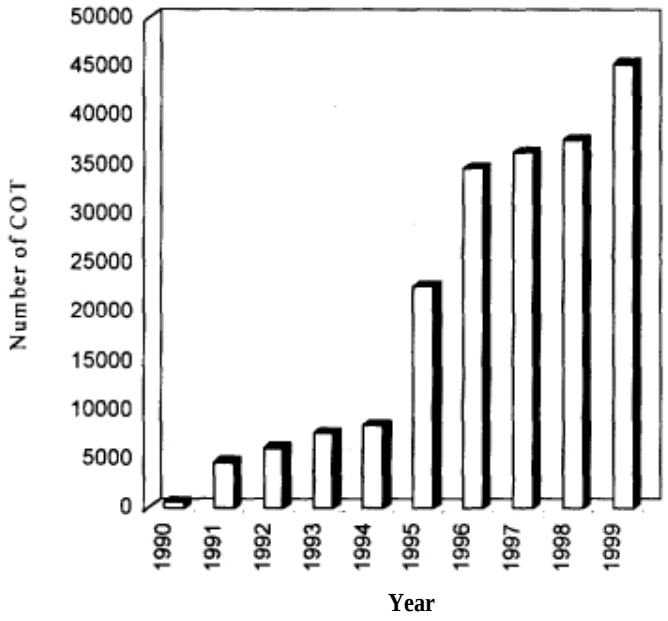
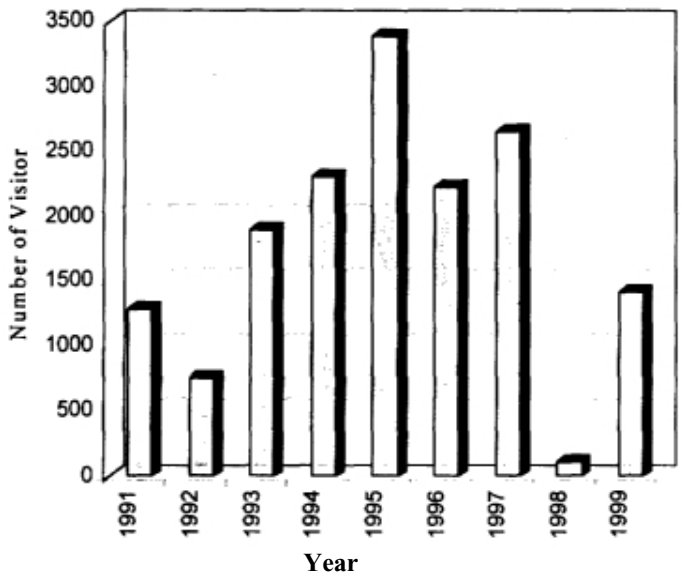
Graph 1: Number of Visitors at Pulau Redang Marine Park Centre from 1990 to 1999 (September)



Graph 2: Number of Crown-of-Thorns collected at Pulau Redang Marine Park from 1991 to 1999



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Question-and-answer session following Mr. Ab. Rahim Cur Vaman's presentation

Bernadette O'Neill - Australia

Q. Did any significant impacts result from the increase in the number of visitors to the Marine Park?

A. There are no significant impacts, as the co-operation of the stakeholders in managing the visitors and maintaining the park has been very good.

Bernadette O'Neill - Australia

Q. Is there any difference in the number of visitors coming to the park since the implementation of the conservation charge?

A. Even though the visitors have to pay the conservation charge, there has been no marked change in the number of visitors to the park. Instead, records show a steady increase in visitor numbers.

Ainul Raihan - Malaysia

Q. Has there been any negotiation with the hotel operators about visitor numbers? What about the pollution of the beach by the visitors?

A. The hotel operators do not like to limit visitors. So far, the park has been able to sustain the number of visitors, But the department is still looking towards the future to find ways and means of effective visitor management. As for the pollution from visitors, the co-operation has been good. and so far there has been no significant damage done. It is believed that the carrying capacity has not been reached. There could however be some kind of pollution from the discharge of ballast waters by the boats, but it is minimal and the department is monitoring the situation.

Annade! Cabanban- Universiti Malaysia Sabah

Q. What are the parameters for monitoring the coral reef?

A The parameters used are coral cover and life forms. There have been 11 transect lines set for these. So far there has been no major change in coral cover. The only time there has been any difference was during the coral bleaching phenomenon last year.

Comments:

Alistair Cheal - Australia

The Great Barrier Reef Marine Park Authority has stopped using the concept of carrying capacity but is instead going for the concept of Least Acceptable Change (LAC). It is suggested that this technique be used.

ENFORCEMENT IN MARINE PROTECTED AREAS AND MARINE PARKS

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1.0 Introduction

Fisheries constitute a vital source of food, employment, recreation, trade and economic well-being for our people, both for present and future generations. The wealth of aquatic resources was assumed to be an unlimited gift of nature, something fishing communities at large still seem to believe. However, with increased knowledge and the dynamic development of fisheries, especially with the introduction of trawt nets, this myth has faded in the face of the realization that aquatic resources, although renewable, are not finite and need to be properly managed. Thus, it is of utmost importance that fisheries be properly managed so as to ensure sustainable exploitation, equitable allocation of natural resources and increase production, while protecting the aquatic marine habitat from pollution and degradation.

2.0 Management of Fisheries

The Department of Fisheries is responsible for the development and management of the national fishery sector with the mission to bring about changes in the country's fishery sector so that it operates in a commercial, modern, progressive environment, and ensures adequate supply of sources for the country's needs. To ensure effective management of the marine resources, a legal framework was promulgated through the Fisheries Act which was gazetted in the year 1985. This Act also includes the management of the Marine Protected Areas (MPA) and Marine Parks (MP). In enforcing the Act the Department of Fisheries has passed on a heavy responsibility to the Resouice Management And Protection Division, particularly its Resource Protection Branch, to ensure that stakeholders (fishermen) adhere to the stipulated fisheries regulations. It has been seen that lack of management in the fisheries sector has led to over-capacity and over-fishing and thus to depletion of fisheries resources. And there is a general consensus that fisheries management is not easy to implement and enforce. Realizing this, the Department of Fisheries is trying to come up with comprehensive fisheries management schemes and regulations. Meanwhile, a lot of effort is also being directed towards conservation and rehabilitation of fisheries and aquatic habitats. Example : the setting up of the MPAs and MPs. And to ensure that these fragile areas are being protected, enforcement activities are being vigilantly carried out.

3.0 Fisheries Enforcement

In 1980 Malaysia proclaimed an exclusive economic zone, thus increasing its fisheries waters from 47,000 square nautical miles to 160,000 square nautical miles. This proclamation makes enforcement of the maritime laws more challenging than before. In addition, with the gazetting of MPAs and MPs, effective enforcement is necessary, since these areas are considered fragile habitat.

3.1 The Resource Protection Branch

3.1.1 Function

The Resource Protection Branch has been entrusted with the following functions;

* To carry out patrolling to enforce the Fisheries Act 1985, Exclusive Economic Zone Act 1984 and other regulations.

* To monitor and provide protection to fishing vessels and fishermen while at sea.
* To plan and carry out joint operations with other maritime enforcement agencies such as the Navy and Marine Police.
* To receive, compile and analyse under-cover fisheries data, public complaints and take appropriate follow-up action.
* To control and prevent disputes among the fishing community.

3.1.2 Organization And Activities

The Resource Protection Branch represented an arm under the Resource Management and Protection Division of the Department of Fisheries, Malaysia. Apart from its role of enforcing Fisheries Act 1985 and its Regulations, the Branch also protects the interest of fishermen and local fishing vessels while they are fishing at sea. To ensure its effectiveness, the Branch is being administered through the Operation Control Centre (PUKAOP) and 26 Base Stations situated throughout Malaysia. PUKAOP operates 24 hours a day and is prepared to receive any information, complaints or Search And Rescue (SAR) reports from local fishermen which require prompt action.

To carry out the task of patrolling, the Resource Protection Branch is also equipped with a total of 101 patrol boats of various sizes and endurances (capabilities). Besides that, the Branch also works closely with the Maritime Enforcement Coordinating Center (MECC), which is placed under the National Security Division of the Prime Minister's Department in monitoring our nation's waters from encroachment by foreign fishing vessels.

The enforcement activities carried out to curtail offences under the Fisheries Act and Regulations are of two kinds:

(i) *Scheduled Enforcement:*

These are planned activities carried out with certain objectives, based on analysis of information collected.

(ii) Unscheduled Enforcement:

Enforcement activities consequent to information about offences still taking place which call for prompt action.

3.2 Offences in The Marine Protected Areas And Marine Parks

What is a Marine Park?

An area of the sea, two nautical miles from the shore, set up as a sanctuary for the coral reef community. The community is considered as possibly the most productive ecosystem in the world, with its diversity of aquatic flora and fauna. Coral reefs are also important breeding and nursery grounds for many commercially important species of marine organisms and fish.

The offences enlisted under the Fisheries Act as follows;

(I) Any person who in any marine park or marine reserve in Malaysian fisheries waters, without the permission of the Director General in writing-

(a) fishes or attempts to fish;

(b) takes, removes or is in possession of any aquatic animal or aquatic plant or part thereof, whether dead or alive;

(c) collects or is in possession of any coral, dredges or extracts any sand or gravel, discharges or deposits any pollutants, alters or destroys the natural breeding grounds or habitat of aquatic life, or destroys any aquatic life;

(d) constructs or erects any building or other structure on or over any land or waters within a marine park or marine reserve;

(e) anchors any vessel by dropping any kind of weight on, or by attaching any kind of rope or chain to, any coral, rock or other submerged object; or

(f) destroys, defaces or removes any object, whether animate or inanimate, in a marine park or marine reserve.

4.0 Issues and Problems of Enforcement

Some of the issues and problems in carrying out enforcement are:

4.1 Areas of Coverage

The MPAs and MPs are located in a vast area and hence it is quite impossible to cover the whole area at a single point of time.

4.2 Limitation of Assets

Limitations of our surface assets plus the vast maritime area of more than 160,000 square miles to be covered, curb our enforcement activities.

4.3 Apprehending Offenders

Vessels involved in illegal trawling and using banned gears are usually designed and equipped with engines which allow these vessels to move and manoeuvre very fast even in very shallow waters. This makes enforcement difficult.

4.4 Prosecution And Disposal of Confiscated Vessels

Offences which are brought to court normally take a long time to prosecute. Taking charge of the offended vessels is therefore difficult.

5.0 Conclusion

Long-term sustainable use of fisheries resources is the overriding objective of conservation and management. Hence, it is of paramount importance that proper management of the resources be implemented. An effective and administrative framework needs to be established. Here in Malaysia, a legal framework in the form of the Fisheries Act was gazetted in *1985* for this purpose, thus enabling enforcement.

Although substantial effort had been publicised on the importance of MPAs and MPs as a tool to conserve fisheries resources, offences still occur. Hence, enforcement in these areas is still needed.

A possible future approach is to involve the stakeholders themselves in managing the MPAs and MPs under the Community-Based Fisheries Management Program which the Department of Fisheries is pursuing.

Number of Offences in Marine Parks – 1999

Marine Parks		
Pulau Payar	Pulau Tioman	Pulau Redang
7	12	1