

APPENDIX I. SUGGESTED READING

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APPENDIX II. LIST OF ACRONYMS

AFD	French Development Agency
AGRRA	Atlantic and Gulf Rapid Reef Assessment
AIMS	Australian Institute of Marine Science
ASEAN	Association of South East Asian Nations
AUS AID	Australian Agency for International Development
BAPPEDA	Directory of Development Planning Board (in Indonesia)
CATIE	Centro Agronomico Tropical de Investigacion y Ensenanza
CABSMPD	Centre for Applied Biodiversity Science and the Marine Programs Division of CI
CBD	Convention on Biological Diversity
CFC	Chlorofluorocarbon
CI	Conservation International
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COP	Conference of the Parties (to the Convention on Biological Diversity)
CORAL	The Coral Reef Alliance
CORDIO	Coral Reef Degradation in the Indian Ocean
COTS	Crown-of-Thorns Starfish (<i>Acanthaster planci</i>)
CPUE	Catch Per Unit Effort
CRC REEF	Cooperative Research Centre for the Great Barrier Reef (of Townsville, Australia)
CSD	Convention for Sustainable Development
DFID	Department for International Development (of UK)
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organization (of the United Nations)
GBR	Great Barrier Reef
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
GBRRF	Great Barrier Reef Research Foundation
GCC	Global Climate Change
GCRMN	Global Coral Reef Monitoring Network
GEF	Global Environment Facility
GIS	Global Information System
ICAM	Integrated Coastal Area Management
ICLARM	The International Centre for Living Aquatic Resources Management
ICM	Integrated Coastal Management
ICRAN	International Coral Reef Action Network
ICRI	International Coral Reef Initiative
ICRIN	International Coral Reef Information Network
ICRMN	Indian Global Coral Reef Monitoring Network
ICZM	Integrated Coastal Zone Management
IFRECOR	French Coral Reef Initiative
IMO	International Maritime Organisation
IMPAC	International Marine Project Activities Centre
IOC	Intergovernmental Oceanographic Commission (of UNESCO)

IOI	International Ocean Institute
IPCC	Intergovernmental Panel on Climate Change
ISRS	International Society for Reef Studies
ITMEMS	International Tropical Marine Ecosystems Management Symposium
IUCN	The World Conservation Union
LME	Large Marine Ecosystem
MAB	Man and the Biosphere Site (of UNESCO)
MAC	Marine Aquarium Council
MAQTRAC	Marine Aquarium Trade Coral Reef Monitoring Protocol
MARPOL	International Convention of the Prevention of Pollution from Ships
MCPA	Marine and Coastal Protected Areas
MDG	Millennium Development Goals
MEA	Multilateral Environmental Agreements
MPA	Marine Protected Area
NGO	Non-Governmental Organisation
NOAA	National Oceanic and Atmospheric Administration (of USA)
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
PERSGA	Regional Organisation for the Conservation of the Environment of the Red Sea and Gulf of Aden
RAMSAR	International Convention on Wetlands
RAP	Rapid Assessment Protocol
RAP	Representative Areas Program (related to GBR rezoning)
REA	Rapid Ecological Assessments
ROPME	Regional Organisation for the Protection of the Marine Environment
SACEP	South Asia Cooperative Environment Program
SAREC	SIDA Department for Research Cooperation
SCUBA	Self-Contained Underwater Breathing Apparatus
SIDA	Swedish International Development Agency
SIDS	Small Island Developing States
SOI	Southern Oscillation Index
SPREP	South Pacific Regional Environment Program
SST	Sea Surface Temperature
TNC	The Nature Conservancy
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNEP	United Nations Environment Program
UNESCO	United Nations Educational Scientific and Cultural Organisation
UNF	United Nations Foundation
USAID	US Agency for International Development
UV	Ultraviolet Radiation
WB	World Bank
WCMC	World Conservation Monitoring Centre
WCS	Wildlife Conservation Society
WHS	World Heritage Site
WRAS	Web-based Reef Advisory System
WRI	World Resources Institute
WSSD	World Summit on Sustainable Development
WWF	World Wildlife Fund (USA)
WWF	World Wide Fund for Nature (elsewhere)

APPENDIX III. SECOND INTERNATIONAL TROPICAL MARINE ECOSYSTEMS MANAGEMENT SYMPOSIUM ACTION STATEMENT

INTRODUCTION

“Maintaining the biological diversity, condition, resources, and values of coral reefs and related ecosystems is a matter of global urgency.” “Coral reef survival depends upon the world community acquiring and maintaining the knowledge and capacity to conserve and sustainably use coral reefs and related ecosystems. This requires that all uses and impacts be brought within and maintained at levels which do not exceed these systems’ natural capacity for production and regeneration.”

These statements, in the ICRI Framework for Action adopted in May 1995 at the International Coral Reef Initiative (ICRI) Workshop held at Silliman University in Dumaguete City, Philippines remain true today.

Drawing on the 1995 Call to Action and Framework for Action, the ICRI partnership has facilitated the leveraging and channeling of existing resources among all sectors for the benefit of coral reefs and related ecosystems. Many countries, agencies and individuals have implemented programs in response to the Call for Action. Yet the urgency remains. It has been heightened by widespread coral bleaching resulting from increased water temperatures, and by increased recognition of the crucial economic and social roles of coral reefs in the function and stability of many of the world’s poorest coastal and island human communities.

The plight of coral reefs unites the developed and developing countries and is commanding the attention of governments and the international community. Most recently, The World Summit on Sustainable Development in 2002 called for the implementation of “the program of action called for by the International Coral Reef Initiative.”

ITMEMS2 was held in Manila, Philippines on March 24 to 27, 2003. It brought together 200 people from 36 countries reflecting a broad range of experience of managers, scientists, private sector, non-governmental organizations, development and funding agencies to review progress to share and discuss lessons learned in implementing the ICRI Framework for Action. A specific objective of the Symposium was to identify gaps and priorities for implementation in the ICRI program of action to manage tropical marine ecosystems.

Like the 1995 ICRI Framework for Action and the Action Statement developed at ITMEMS1 in Townsville, Australia in 1998, this statement builds upon and reflects the principles and processes established in multilateral environment agreements and other relevant international programs¹. It has been developed as a succinct statement which should be read and interpreted in light of these documents.

The principles and overarching actions identified in the 1995 Framework for Action continue to provide a valid strategic context.

PRINCIPLES

The ICRI recognizes the following principles:

- Achieving the ICRI's purpose requires the full participation and commitment of governments, local communities, donors, NGOs, the private sector, resource users and scientists; therefore true partnerships, cooperation and collaboration exemplify the ICRI activities.
- The overriding priority is to support actions that will have tangible, positive and measurable effects on coral reefs and related ecosystems and on the well-being of the communities which depend upon them.
- Human activities are the major cause of coral reef degradation; therefore, managing coral reefs means managing those human activities. Individuals whose decisions and actions affect coral reefs—from boardrooms to beaches—need to become aware of and committed to the conservation and sustainable use of coral reefs and related ecosystems.
- The diversity of cultures, traditions and governance within nations and regions should be recognized and built upon in all the ICRI activities.
- Integrated coastal management, with special emphasis on community participation and benefit, provides a framework for effective coral reef and related ecosystem management.
- Developing national capacity to conserve and sustainably use coral reefs and related ecosystems requires a long-term (decadal) commitment. Improvement of coral reef management requires a permanent commitment and an adaptive approach.
- Strategic research and monitoring programs should be an integral part of the ICRI because management of coral reefs and related ecosystems should be based on the most relevant scientific information.
- Actions promoted under this framework should take account of, and fully use, the extensive body of international agreements and organizations that address issues related to coral reefs and related ecosystems. The ICRI will facilitate the leveraging and channeling of existing resources among all sectors for the benefit of coral reefs and related ecosystems.

ACTIONS

- All those committed to supporting the ICRI and this Framework for Action are called upon to take account of and to act on the following at the international, regional and national levels.
- Support national and regional efforts to establish and coordinate strategies, priorities and programs to implement the ICRI Framework for Action, starting with regional workshops to be held by early 1996.
- Ensure that sustainable management of coral reefs and related ecosystems is considered at future relevant international meetings.
- Develop and/or strengthen national, regional and international mechanisms for gathering and sharing information and expertise on the sustainable management of coral reefs and related ecosystems.

¹WSSD, the U.N. Commission on Sustainable Development, the Convention on Biological Diversity, the U.N. Framework Convention on Climate Change, the Global Conference on Sustainable Development of Small Island Developing States, the U.N. Convention on the Law of the Sea, Convention on International Trade in Endangered Species of Wild Flora and Fauna, Global Program of Action to Protect the Marine Environment from Land-Based Activities, the Ramsar Convention, World Heritage Convention, FAO Code of Conduct for Responsible Fisheries, Regional Seas Conventions and Action Plans, the Convention on Migratory Species,

- Promote improved access to financial and technological resources to enable institutions, regional centers and networks to assist and inform governments, industries and communities.
- Addressing conservation and sustainable use of coral reefs and related ecosystems requires activities in the following areas:
 - Integrated coastal management;
 - Public awareness, education and training;
 - Ratification of or accession to relevant international instruments;
 - Stakeholder participation at all levels; training policymakers and private sector decision-makers in the development and implementation of coral reef management;
 - Marine science and technology;
 - Environmental law, particularly environmental impact assessment regulations; and
 - Assessing the potential for micro-enterprise development and facilitating access to financing on a small to medium scale.”

ITMEMS2 consisted of 20 workshops that considered priority issues or problems of management that had been identified through a questionnaire to managers from all coral reef regions of the world early in the Symposium planning process.

The report of the Symposium contains detailed recommendations of each workshop. This statement has been designed to focus on overarching priorities for action in the next 5 – 10 years to address the four elements of the ICRI Call to Action, which are:

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

The Proceedings of the Symposium contain the recommendations and detailed reports of the discussions of all workshops. This statement is intended to highlight the major issues and recommendations that arose through the discussions at the symposium.

RECOMMENDATIONS ON INTEGRATED COASTAL MANAGEMENT (ICM)

Marine Protected Areas (MPAs)

Marine protected areas and networks of MPAs that implement large-scale and ecosystem-based management are essential for halting and reversing the decline in coral reefs and related ecosystems. Coordinated management of adjacent land areas is essential for effective ecosystem-based management of the marine environment.

Large scale and ecosystem-based coastal management provide a vital suite of tools to ensure sustainable use of coral reefs and related ecosystems. The following are inextricably linked components of such an approach:

- Mitigation of stresses that cause reef degradation;
- Protection of biodiversity and ecosystem processes at all levels;
- Recognition of the concept of “connectivity” and other ecological processes in the marine environment and the consequent importance of developing networks of MPAs that are ecologically connected;

- Incorporation of “no take” reserves to both protect biodiversity and to contribute towards ecologically sustainable fisheries;
- Recognition of the need to address the risk of bleaching impacts and resilience to bleaching effects in MPA and ICM design;
- Recognition of the important role community-managed MPAs play in conservation;
- Recognition that social, cultural and economic factors should drive MPA planning and management;
- Transparency of all processes in the development of MPAs;
- Partnerships and alliances in management including partnerships with community and private sector involvement for sustainable funding; and
- The use of multi-lateral agreements, conventions and similar arrangements to leverage cooperation across boundaries.

ITMEMS2 recommends that:

- Countries develop targets to significantly protect ecological processes, habitats and biodiversity through the establishment of MPA networks and integrated coastal and marine management.

Co-management

The social benefits (quality of life, education etc) to local communities of optimal tropical marine ecosystem management have not been fully recognized. Participatory planning and decision-making are recognized as critical elements for success in integrated coastal management. To be successful, management of tropical marine ecosystems should include full participation and involvement of local resource users giving due consideration to the needs of indigenous people.

A key element for successful community participation, information dissemination and education is understanding the local context, including the premise that community participation in management may work best in small, localised MPAs. Co-management relationships need to be flexible and can involve a variety of stakeholders (i.e. private sector, academe, government, non-government, community-based organisations, and others), but the interests of local subsistence resource users must be at the forefront.

ITMEMS2 recommends that:

- There should be formal recognition of traditional management practices and their institutionalisation into government policy;
- Participatory planning and decision making should incorporate clearly defined and accepted inter-agency, stakeholder, bilateral and multi-lateral partnerships and be part of a formal or informal agreement between the stakeholders;
- There be more recognition of the social values (both economic and non-economic) of wise practices for the management of tropical marine ecosystems;
- Programs emphasise poverty alleviation by promoting sustainable livelihood strategies in coastal communities dependent on coral reefs; and
- The local context be recognised as a key element for successful community participation, information dissemination and education.

Achieving Sustainable Fisheries

ITMEMS2 recognizes that management for ecologically sustainable fisheries is a critical issue in protection of coral reefs and related ecosystems and that: reef-associated fisheries are critically important for food security and livelihoods for coastal communities around the tropics.

ITMEMS2 further recognizes that many reef associated fisheries are already seriously overexploited and recommends:

- Urgent commitment to sustainable management of reef associated fisheries for long-term persistence including maintenance of biodiversity;
- Engaging those relevant international fishery instruments and regional fishery organizations charged with trade, enforcement, equity and management of reef-associated resources to comply actively with their mandates and to set and oversee long-term goals;
- Working towards the establishment and implementation of more no-take MPAs to contribute towards sustainable management; and
- Developing and applying a suite of tools to complement and enhance the effectiveness of no-take MPAs, including:
 - Conserving and managing fish spawning aggregations through robust strategies. Whenever possible, these should include complete or managed protection. A Call to Action on this issue is provided in attachment 1;
 - Encouraging sustainable mariculture, which avoids reliance on wild capture of juveniles for mariculture stock or of fish or other lower trophic level species for feed; and
 - Monitoring as an essential part of management to determine directions for action, provide feedback of information to local communities, to identify trends in catches, to provide a basis for adaptive management and evaluating management performance. This should include both fisheries dependent and independent data.

Coral Bleaching

Coral reefs of the world have been deteriorating from coral bleaching and mortality due to warming seas. Managers, scientists and policy-makers at ITMEMS have agreed that they can address these trends by adopting a number of risk minimising strategies.

ITMEMS2 recommends that:

- Resilience of coral reefs be supported through good MPA and ICM design, MPA networks, and by reducing threats within management control;
- Risk of bleaching impacts be factored into management by incorporating the principles of comprehensive representation and replication in the design of MPAs and MPA networks;
- Flexibility to respond to bleaching threats be incorporated into all coral reef management plans;
- Managers, scientists and policy-makers play an advocacy role towards influencing policy related to climate change;
- The extent and severity of bleaching events and degree of subsequent recovery be documented and reported on to raise the understanding and awareness of the public and policy makers of the environmental and socio-economic impacts of bleaching; and
- Documentation and mitigation of the negative effects of climate change on other tropical marine species and ecosystems (eg mangroves, turtle and seabird nesting, diseases, planktonic ecosystems) be promoted.

Restoration and Rehabilitation

It is clear from many reports of the condition of the world's coral reefs that efforts to restore or rehabilitate damaged ecosystems are an increasingly important management issue, particularly to those close to major cities and heavily populated coasts. While it is preferable and most cost-effective to prevent or minimise damage as far as possible, restoration and rehabilitation techniques are being developed.

ITMEMS2 recommends that:

- The focus of restoration and rehabilitation be on removing threats and applying methods to accelerate natural recovery processes in tropical marine ecosystems that otherwise have little potential for recovery to restore fisheries and protect tourism assets;
- A systematic review be made of restoration and rehabilitation methods and initiatives to evaluate effectiveness in recovering damaged ecosystems, overall cost, area coverage, and the contribution towards the effectiveness of MPAs and ICM. This review could also be used as an education tool; and
- A network of managers, scientists, practitioners and local communities be established to share information and develop guidelines on appropriate restoration and rehabilitation practice;

The Role of the Private Sector

Active engagement with the private sector is critical for long-term success in sustaining and conserving coral reefs and related ecosystems.

ITMEMS2 recommends that:

- The concept of the 'Private sector' be interpreted broadly to include all individuals, groups and enterprises of the formal and the informal economy, at local, national and international levels that use, impact, extract and exploit coral reef resources;
- Private sector involvement incorporate arrangements that maximize the flow of benefits for local stakeholders;
- Good practice examples of partnerships between the public and private sector in marine conservation (ecotourism, aquarium fish trade, pharmaceutical companies etc.) be identified and documented;
- Governments create a policy, legal, regulatory and institutional framework that creates incentives and removes disincentives for private investment in marine conservation and for ecologically sensitive resort construction, water & waste management, dive operations; and
- Effective international certification, labeling and awards for good practice partnerships in coral reef conservation and fisheries be promoted.

Enforcement

Without effective enforcement, MPAs and ICM programs will not provide their intended benefits to the marine ecosystems and the communities that depend upon them. There is an urgent need for greater recognition by government, funding agencies and NGOs that effective enforcement of marine resource use regulations is considered essential by both local communities and marine managers, and requires much greater financial and political support.

There is a widespread view from communities and managers across all tropical marine regions that the damage caused by and profitability of marine resource crimes are not recognized by the judicial system.

ITMEMS2 recommends that:

- Government, funding agencies and NGOs recognise that effective enforcement of marine resource use regulations is considered essential by both local communities and marine managers and requires much greater financial and political support;
- MPA and ICM planning explicitly incorporate consideration of compliance issues from the outset of the planning process;
- Fines and penalties for illegal acts be set at levels where they act as true deterrents rather than being considered by offenders as a cost of doing business;
- MPA and ICM planning explicitly recognise that local compliance can increase dramatically if communities are aware of and involved in MPA management and if they can invest in sustainable use; and
- MPA and ICM managers address the urgent need for greater communication, collaboration and sharing of lessons learned between countries on the issue of marine enforcement.

RECOMMENDATIONS ON CAPACITY BUILDING

Sustainable Financing

Lack of appropriate, sustainable funding mechanisms is a significant challenge to effective coral reef management. A fundamental issue is to address the local nature and the long time frames needed to address many management issues. Although many issues are national or regional in scale, much can be achieved through small amounts of funding that are effectively targeted.

ITMEMS2 recommends:

- Establishing Debt-for-Nature Swap initiatives aimed at marine biological diversity and coral reefs in particular;
- Establishing secure trust funds, endowments, and other financing mechanisms available over extended timeframes;
- Further exploring financing options that marry improvements in community well-being with improvements in ecosystem health, such as some MPA user fees, conservation concessions, and supplemental livelihood initiatives;
- Developing small grants programs to support local management in all coral reef regions;
- Continuing support for key priorities for monitoring and strategic research; and
- Developing strategic partnerships to more efficiently and sustainably fund and implement marine conservation.

Training/Awareness

Perhaps the greatest impediment to coral reef conservation is the lack of human capacity available for management and lack of awareness about coral reef values and threats.

ITMEMS2 recommends:

- Increasing efforts to build human capacity in critical areas, including MPA management, enforcement, and ICM;
- Developing targeted education/awareness programs for key audiences including legal institutions, government officials, and resource users;

- Continuing and strengthening efforts to raise public awareness on reef values and ecological complexity and the serious ecological, social, and economic losses caused by lack of stewardship;
- Recognising the role of NGOs and other partnerships as important catalysts for increasing capacity for management. Mechanisms to ensure accountability of all partners should be included in partnership agreements. There also needs to be planning for long-term continuity of introduced practices and management; and
- Enhancing community participation and providing training to stakeholders on sustainable resource management.

Networking/Partnerships

Partnerships and networks that increase the efficiency of information exchange are vital strategies in effective coastal management.

ITMEMS2 recommends:

- Increasing support for peer group exchanges;
- Developing and documenting good practice demonstration sites;
- Fostering partnerships across multiple boundaries, disciplinary, jurisdictional, cultural, etc;
- Promoting the development of networks at all levels for capacity building and exchange of experiences and good practices;
- Promoting partnerships so that donor funding in conservation does not compete with, but complements and supports private sector and community investment in marine conservation; and
- Recognising the role of NGOs and other partnerships as important catalysts for increasing capacity for management;

RECOMMENDATIONS ON RESEARCH AND MONITORING

Research And Monitoring Programs

Well-designed and targeted research and monitoring programs are essential components of tropical marine ecosystem management to maintain biological diversity, natural resources, ecosystem condition and the values of coral reefs and related ecosystems.

ITMEMS2 recommends:

- Continued commitment to high quality research and monitoring for tropical marine ecosystem management;
- That research and monitoring programs be highly targeted towards supporting decision makers on key issues;
- That all elements of research and monitoring should incorporate the full involvement of, and respect for the range of knowledge and skills available from the whole community, including scientists, resource users, indigenous people and members of the general community;
- Global evaluation and adoption of existing protocols for management related research and monitoring and development of new protocols where needed;
- Long-term monitoring of environmental and social conditions. This information is essential to provide early indications of emerging issues, measures of background

- (natural) variation and long-term trends and impacts; and
- Encouraging multidisciplinary research in which socio-cultural-economic and biophysical components are integrated and complementary.

Information Coordination and Dissemination

A major obstacle to effective management and conservation of tropical marine ecosystems is the lack of awareness, and access to existing information and experiences of other managers. There is a wealth of information resources scattered among various organisations but much of it is inaccessible.

ITMEMS2 recommends that:

- Summary data and results including performance evaluation from all relevant projects should be made available on ReefBase, FishBase, and other widely accessible venues to promote information exchange, and transparency to and among stakeholders;
- A centrally coordinated certification and accreditation system should be established to ensure data quality standardisation and documentation. This should include guidelines for data storage safeguards, security, metadata, and the development of a core set of variables and formats;
- There should be a formal obligation (specified in permits, grant agreements etc.) for non-sensitive data to be made publicly available in a variety of formats as soon as possible;
- A code of conduct for data collectors and information managers be developed to ensure maximum free flow of data and proper regard to security for sensitive data;
- Information systems be client-oriented, able to provide for demand-driven requests for information in both digital and hard copy formats. Websites storing data in digital formats must be recognised as key data storage access facilities requiring similar levels of support as traditional libraries; and
- As a matter of priority, a global inventory of tropical marine ecosystem databases/information systems should be created and made publicly available.

Communication

Awareness of management activity, the responsibilities and rights of resource and MPA users and the issues that management must address is essential for effective, planning, implementation and enforcement. Communication is essential to the success of every project and should start before and continue after it.

ITMEMS2 recommends that:

- All projects include a communication strategy that is carefully planned, feedback driven, adequately funded and involves outreach activities, and that this should be required by donors; and
- Communications are designed and presented in a culturally relevant form and focus on positive actions, which can be taken. Formal educational activities from pre-school to specialised professional courses are an important means of communicating specific information and promoting alternative practices.

RECOMMENDATIONS ON REVIEW AND PERFORMANCE EVALUATION:

Methods

Maintaining and improving management depends upon good information on the implementation of management measures and their effectiveness in achieving the objectives of management.

ITMEMS2 recommends that:

- Management performance evaluation systems be based on clear performance targets and conform to the principles for management performance evaluation² including provision for stakeholder participation in establishment of performance targets and evaluation; and
- The quality of management performance evaluation systems be monitored to ensure acceptability, reliability, compatibility, and conformity to indicators, processes and other related evaluation protocols.

Resources and Allocation

Design of performance monitoring and evaluation systems must be done in the context of limited resources and competition with other elements of management.

ITMEMS2 recommends that:

- A specific financial resource (5-15%) of total budget be allocated for monitoring and management performance evaluation; and
- Funding agencies and governments use results of management performance evaluation;
 - as a basis for allocating further or continued management initiatives funding assistance;
 - as an incentive for high quality or disincentive for poor quality performance; and
 - in providing further capacity building assistance.

² The report of the ITMEMS2 performance evaluation workshop includes suggested principles for management performance evaluation.

Attachment 1: Call for Action

Reef Fish Spawning Aggregations Need Protection

A Threat to Sustainable Reef Fish Fisheries

Many commercially valuable reef fishes are particularly vulnerable to overexploitation because they form spawning aggregations that are highly predictable in time and location. These aggregations, and in some cases the migration routes to and spawning aggregation sites, are easy to find and target by fishers. The evidence is unequivocal that spawning aggregations can decimate rapidly by heavy fishing, resulting in serious declines in the fish populations they serve. Moreover, they are increasingly being targeted globally, particularly in the Pacific Ocean for commercial salted and chilled fish and for lucrative live fish export markets. Best known is the example of the Nassau grouper, *Epinephelus striatus*: a significant number of Nassau grouper aggregations are depleted in the western Atlantic, and some have possibly disappeared completely. The species is listed as endangered on the IUCN Red List of Threatened Species. Evidence is growing of aggregation depletions in SE Asia and the western Pacific.

Spawning aggregations are critically important for maintaining fish stocks and may thus underpin fisheries that contribute significantly to livelihoods in coastal communities, as well as to food supply. However, little management has been implemented to protect reef fishes when they spawn, despite the widely recognized need to protect spawning areas in marine protected areas. Unmanaged aggregation fishing is clearly non-precautionary. Management options include combinations of spatial and/or temporal controls, such as short-term, seasonal closures during the aggregation period, closures of aggregation sites, incorporation of aggregation sites into marine reserves, and various controls on catch and effort.

Specific recommendations

- Ideally, fishing of aggregations should be avoided unless part of important local traditional or subsistence fisheries;
- If spawning aggregations are fished for subsistence, they should be closely monitored and carefully managed;
- Fishing of spawning aggregations should not be permitted for export/commercial markets;
- Spawning aggregations should be included routinely in fishery management plans and marine protected areas design;
- The potential impacts and benefits of tourism on fish aggregations should be evaluated, especially to determine the possible disturbance caused by tourism activities;
- Education is needed to increase understanding of the biological and fishery importance of spawning aggregations and their vulnerability to fishing; and
- Extreme caution should be exercised not to make public information on the specific locations of aggregation sites that cannot be adequately protected from exploitation.

Key recommendation: fish spawning aggregations should be conserved, through robust management strategies. Whenever possible, this should include complete or managed protection, to ensure persistence of the populations that form aggregations, the integrity of reef ecosystems and the livelihoods and food supply of communities that depend on aggregating species.

This statement and other documents from the International Coral Reef Initiative are available from: <http://www.icriforum.org/> or on ReefBase <http://www.reefbase.org>

