STATUS OF CORAL REEFS OF THE WORLD: 2008

EDITED BY CLIVE WILKINSON

GLOBAL CORAL REEF MONITORING NETWORK

Sta tUs o f C o r a l Re e f s o f t h e W o r ld: 2008
Dedication: This book is dedicated to all those people who are working to conserve the coral reefs of the world, either through doing the monitoring or providing the logistical and financial support – we thank them for their efforts. Special thanks to those people who wrote and edited these chapters. It is also dedicated to the International Coral Reef Initiative and partners, especially the Government of the United States operating through the US Coral Reef Task Force for support for the GCRMN by the US Department of State and the US National Oceanographic and Atmospheric Administration.

Note: The conclusions and recommendations of this book are solely the opinions of the authors, contributors and editors and do not constitute a statement of policy, decision, or position on behalf of the participating organisations, included those represented on the cover.

Front Cover: This photo encapsulates the world of coral reefs, in this case in Micronesia where these three boys will be bequeathed damaged coral reefs. The large blue-green humhead or Napoleon wrasse (Cheilinus undulatus) is now listed as endangered on Appendix II of CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora), mainly because it is highly prized in Chinese restaurants: photo courtesy of Darren Cameron.

Back Cover: This is a typical healthy coral reef, in this case Rowley Shoals Marine Park, Western Australia. The corals are abundant and healthy, and there are large schools of algal grazing fish, especially parrotfish and surgeonfish. No your eyes are not deceiving you, there is also a ‘tropical’ polar bear (explanation on page 13). The photo © Suzanne Long/Western Australian Department of Environment and Conservation.

Maps were provided by UNEP-WCMC through ReefBase, The WorldFish Center; we thank them.


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C/o Reef and Rainforest Research Centre,
PO Box 772, Townsville, 4810 Australia
Tel: +61 7 47212699; Fax: +61 7 47722808
www.gcrmn.org

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The International Coral Reef Initiative (ICRI) was conceived at the UN Conference on the Sustainable Development of Small Island Developing States in Barbados in 1994 in recognition of the problems facing coral reefs. As the Australian Ambassador for the Environment, I was pleased to Chair the negotiations that initiated ICRI and again in 1995 in Dumaguete City, Philippines when I Chaired the first ICRI General Meeting that recommended the formation of the Global Coral Reef Monitoring Network. ICRI has declared this year, 2008, as the International Year of the Reef to emphasise the need for urgent action to conserve coral reefs and the associated benefits they bring to people through their rich biodiversity resources. The first GCRMN global status report was produced in 1998, as massive climate change-related coral bleaching was devastating reefs in the Indian Ocean, Western Pacific and Wider Caribbean. We are pleased to report that many remote reefs in the Indian Ocean and Western Pacific, including Indonesian and Palauan reefs, are now recovering rapidly; however many other reefs facing heavy human pressures are recovering slowly or not at all. The world’s coral reefs suffered two major setbacks since 2004: the Indian Ocean earthquake and resultant tsunamis in 2004 caused significant coral reef damage, especially in Indonesia; and 2005 was the hottest year on record throughout large parts of the Caribbean, resulting in extensive coral bleaching and mortality. Some Challenge countries lost more than half of their corals due to bleaching and disease. These events are documented for decision-makers in previous GCRMN reports.

We have joined our neighbouring leaders to launch two major challenges aimed at conserving coral reefs and their biodiversity: the Micronesia Challenge; and the Caribbean Challenge. This process started with the United Nations Conference on Environment and Development (UNCED) in Rio de Janeiro in 1992, when world leaders signed Chapter 17 of Agenda 21, ratified the Convention on Biological Diversity (CBD) and pledged to conserve coral reefs. These pledges were essentially repeated at the World Summit on Sustainable Development in Johannesburg in 2002, and a ‘challenge’ was made within the CBD to significantly reduce the rate of global biodiversity loss by 2010. We responded to that challenge by launching our own regional challenges and also welcome three major marine protected area developments: the Papahānaumokuākea Marine National Monument near Hawai‘i, the Phoenix Islands Protected Area of Kiribati, and the UNESCO World Heritage listing of many reefs in New Caledonia (see boxes pages 224, 195 and 184). The first major output was the Coral Triangle Initiative that includes Indonesia, Philippines, Malaysia, Papua New Guinea, the Solomon Islands and Timor Leste in a partnership to conserve their coral reefs and other marine resources. This was signed at the Asia Pacific Economic Cooperation (APEC) meeting in September 2007 in Australia with the support of other leaders attending (page 55).

Micronesia is immediately adjacent to the Coral Triangle and contains large areas of exceptionally rich biodiversity; but with lower human pressures. The value of this biodiversity is evident to all, including us in Palau. Therefore, as President of Palau, I asked my fellow leaders in the Federated States of Micronesia, Marshall Islands, Guam and Northern Mariana Islands
to take up the challenging target of conserving 30% of our marine resources and 20% of lands and forests by 2020. We launched the Micronesia Challenge in 2006 at the CBD meeting in Brazil, and are now putting words into action to meet this challenge with financial help from the Global Environment Facility, major NGOs, especially The Nature Conservancy and Conservation International, and pledges from various donor countries (page 48).

Caribbean island countries have also responded to the call to conserve their coral reef biodiversity. As Prime Minister of The Bahamas, I was pleased to confirm that the Dominican Republic, Jamaica, Grenada, and St. Vincent and the Grenadines joined the Caribbean Challenge at the 9th Meeting of the Conference of Parties to the CBD in Germany in May 2008. By adopting this challenge, we are committing to protect a minimum of 10% of our marine areas by 2012. Our small island states are very dependent on coral reef resources for both food and tourism income, and without major efforts by our peoples, assisted by international supporters, our reefs will continue to decline. To secure our livelihoods and our reefs we hope other Caribbean countries will also join the Challenge. These regional challenges and international cooperation are supported by the Global Island Partnership (GLISPA), which mobilizes the leadership of island nations and nations with islands to share resources, skills, knowledge and technologies towards action to conserve island resources and sustain livelihoods (page 280).

We are pleased to endorse this Status of Coral Reefs of the World: 2008 report and the recommendations made by 372 people from around the world to conserve their coral reefs. Similarly, we reaffirm our support for the calls made at the World Summits in Rio de Janeiro in 1992 and Johannesburg in 2002, and through our challenges we ask the world to join us in conserving the world’s coral reefs for the future and our children. We must act globally and locally to reduce the pressure humans place on coral reefs through pollution, increased sedimentation, excessive and destructive fishing practices, and mining or infilling of coral reefs. We must also combat global climate change as a new threat resulting in coral bleaching and increasing ocean acidification. And we must work with the people who live near coral reefs and depend on them for food and shelter to ensure they have sustainable and healthy livelihoods.

Penelope Wensley AO
Governor of Queensland, and former Australian Ambassador for the Environment

Tommy E. Remengesau
President of Palau

Hubert Alexander Ingraham
Prime Minister of the Commonwealth of The Bahamas
INTRODUCTION

This Status of Coral Reefs of the World: 2008 report is the 5th global report since the GCRMN (Global Coral Reef Monitoring Network), was formed in 1996 as an operational network of the International Coral Reef Initiative (ICRI). The catalyst for GCRMN was the inability of international agencies to report objectively on the health or otherwise of the world’s coral reefs. The US government then provided initial funding to set up a global network of coral reef workers to facilitate reporting on reef status; and has continued to be the major supporter of GCRMN and ICRI since the first strategies and action plans were developed in 1995. Each report (1998, 2000, 2002 and 2004) has aimed to present the current status of the world’s coral reefs, the threats to the reefs, and the initiatives being undertaken under the umbrella of ICRI to arrest the decline in the world’s coral reefs. These reports have been produced using the data and information from many coral reef experts around the world. For example 372 experts from 96 countries have contributed to this Status report. Many regional, national and local organisations, governmental, academic, NGO and volunteers have supported the functions of GCRMN. The united goal is to inform the global community on the status of coral reefs, the threats to them and, importantly, to list recommendations to improve coral reef conservation. There is widespread recognition that action is needed urgently, not only to conserve the enormous biodiversity on coral reefs, but also to assist local user communities to improve their livelihoods by ensuring the sustainable use of the reefs.

The Management Group of GCRMN have supported the production of Status of Coral Reefs of the World: 2008, although the GCRMN Coordinator, Clive Wilkinson, assumes responsibility for many of the statements, conclusions and recommendations and final wording of the text. The Management Group consists of the following international agencies: Intergovernmental Oceanographic Commission of UNESCO; UNEP – United Nations Environment Programme; IUCN – International Union for Conservation of Nature (and Management Group Chair); Environment Department of the World Bank; Convention on Biological Diversity; ReefBase at The WorldFish Center; Great Barrier Reef Marine Park Authority of Australia; and the Secretariat of the International Coral Reef Initiative (currently the governments of Mexico and US). Much of the strength of the GCRMN is through the partner networks, specifically GCRMN SocMon (Socioeconomic Monitoring Initiative for Coastal Management), the Reef Check Foundation, CRISP – the Coral Reef Initiatives for the Pacific, CORDIO – Coastal Oceans Research and Development, Indian Ocean, and the Reef and Rainforest Research Centre in northern Australia which hosts the global coordination office. These organisations represent thousands of people with the goal of improving research, management, sustainable use and conservation of coral reefs and associated tropical coastal ecosystems, and in assisting coastal people achieve a better standard of life.

The structure of this Status 2008 report follows previous reports in having 17 node chapters from coral reef regions around the world, with most of the contributions coming voluntarily from people coordinating and associated with these nodes. Also included are an update on cold water coral reefs and two theme papers presenting the latest information on global climate change and how this will affect coral reefs. We have also included a section on new emerging themes and reports from the major project activities around the world; others are to be found as boxes within the regional chapters. The GCRMN Management Group and the many supporters of the GCRMN listed below recommend this Status 2008 report to you and request that you consider the findings and recommendations and join them in seeking more action to reverse the damaging trends that are occurring on reefs around the world.
ACKNOWLEDGEMENTS

Production of this book was only possible through the voluntary contributions of many people who are working to monitor, manage and conserve the world’s coral reefs. We specifically thank them for their generous offer of data, information and time in monitoring reefs, analysing the data, writing these reports, assisting in the editing and proof reading and specifically in reviewing the regional chapters, often at very short notice. This Status 2008 report is presented in 2 formats: this published summary book; and the accompanying CD on which we include much more information and many more references to scientific papers and reports. This report will be lodged on ReefBase, at WorldFish Center, ReefBase Pacific in Fiji which act as the global and Pacific regional coral reef databases, www.reefbase.org and www.pacific.reefbase.org. We wish to thank the reviewers of text for their effort and patience: Rich Aronson, Chris Bartlett, Charles Birkeland, John Bruno, Aude Caromel, Chou Loke Ming, James Crabbe, Leo Dutra, Moustafa Fouda, David Fisk, Alain Friedlander, Edgardo Gomez, Alison Green, Alain de Grissac, Virginie Tilot de Grissac, Stefan Hain, Andrew Harvey, Marea Hatzioulos, Scott Heron, Gregor Hodgson, Les Kaufmann, Mai-Britt Knopff, Judy Lang, Olof Linden, Christy Loper, Jim Maragos, Paul Marshall, Jaun Mate, Tim McClanahan, David Medio, Nyawira Muthiga, David Obura, Jamie Oliver, Russell Reichelt, Chris Roelfsma, Bernard Salvat, Mike Schleyer Charles Sheppard, Posa Skelton, Chris Simpson, David Souter, Robin South, Bob Steneck, Jerker Tamelander, Oliver Taylor, Karenae Tun, Alessandra Vanzella-Khouri, Ernesto Weil, Simon Wilson, Liz Wood. We specifically thank Kim Pritchard, Fiona Alongi, Florence Damiens and Heather Laurie for gathering information, formatting, editing and organising this complex task. Three operational partners of the GCRMN have assisted with this report: Gregor Hodgson and Jenny Mihaly of the Reef Check Foundation; Christy Loper of NOAA who coordinates the Socioeconomic Monitoring Network; Eric Clua who coordinates CRISP, Jerker Tamelander and David Obura, who coordinate CORDIO, and many other colleagues. The Management Group listed below provide substantial assistance, advice and support - we thank them all. The host of the GCRMN, the Reef and Rainforest Research Centre is specifically thanked. Support for the GCRMN primarily comes from the US Department of State, the National Oceanic and Atmospheric Administration via the offices of UNEP in Cambridge and Nairobi. Without this support there would be no GCRMN and this book; thus special thanks go my colleagues in these agencies. Funds to produce, print and distribute this book and distribute it free around the world came from: the Government of the USA (Department of State and NOAA); the Intergovernmental Oceanographic Commission of UNESCO; Great Barrier Reef Marine Park Authority, Australia; United Nations Environment Programme (UNEP); IUCN: International Union for Conservation of Nature; Project AWARE; RRRC - Reef and Rainforest Research Centre; and the Government of Japan. We offer a special thanks to NOAA for developing and maintaining coral-list; this amazing tool has kept coral reef workers connected and informed, and is a source of excellent information and lively debate. Special thanks go to Jim Hendee and his team at NOAA for their hard work and patience in assisting and keeping us under control.

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<tr>
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<td>ICRI Secretariat: Governments of USA and Mexico (3)</td>
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<td>RRRC: Reef and Rainforest Research Centre, Ltd (3)</td>
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<td>The Environment Department, Government of Japan (3)</td>
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The Government of the USA, through the US Department of State (2)
NOAA: National Oceanic and Atmospheric Administration, US Fish and Wildlife Foundation (2)

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<td>CORDIO: Coastal Oceans Research and Development, Indian Ocean.</td>
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<td>IFRECOR: the French Government coral reef initiative (3)</td>
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<td>Project AWARE in Los Angeles, London and Sydney (3)</td>
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<td>CRISP - Coral Reef Initiatives for the Pacific</td>
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<td>GCRMN Scientific and Technical Advisory Committee.</td>
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EXECUTIVE SUMMARY

CLIVE WILKINSON

SYNOPSIS

Coral reefs of the world have effectively marked time since the last report in 2004. Some areas have recovered well after the climate change bleaching in 1998 and human damage; while the Indian Ocean tsunami, more bleaching in the Caribbean, and human pressures have slowed or reversed recovery.

Estimates assembled through the expert opinions of 372 coral reef scientists and managers from 96 countries are that the world has effectively lost 19% of the original area of coral reefs; 15% are seriously threatened with loss within the next 10–20 years; and 20% are under threat of loss in 20–40 years. The latter two estimates have been made under a ‘business as usual’ scenario that does not consider the looming threats posed by global climate change or that effective future management may conserve more coral reefs. However, 46% of the world’s reefs are regarded as being relatively healthy and not under any immediate threats of destruction, except for the ‘currently unpredictable’ global climate threat. These predictions carry many caveats, as explained below.

In 2008, the International Year of the Reef, there is a mixture of good and bad news in this Status of Coral Reefs of the World: 2008 report. Several major events have damaged coral reefs since December 2004 when the previous ‘Status 2004’ report was released. But there have also been major positive steps taken to conserve the world’s coral reefs. Some steps have been forward and some steps backward. Significant backward steps were:

- The Indian Ocean megathrust earthquake and tsunami struck on 26 December 2004 with enormous loss of life and disruption to Indian Ocean countries. There was considerable damage to the coral reefs of the Indian Ocean, but not at a scale comparable to human losses (Box p. 130);
- 2005 was the hottest year in the Northern Hemisphere since 1998 and this resulted in massive coral bleaching and hurricanes throughout the wider Caribbean in 2005 killing many corals and further damaging their reefs;
- Degradation of coral reefs near major centres of population continues with losses of coral cover, fish populations and probably biodiversity. This is certainly happening around the ‘Coral Triangle’, the world’s centre for marine biodiversity (p. 55);
- There is increasing evidence that global climate change is having direct impacts on more and more coral reefs with clear evidence that rising ocean acidification will cause greater damage into the future;
- Socioeconomic assessments are increasing on coral reefs and being used more in management decision making. These assessments are being employed to strengthen or re-invigorate traditional management structures, especially in the Pacific where many traditional management regimes remain intact;
However, coral reef declines will have alarming consequences for approximately 500 million people who depend on coral reefs for food, coastal protection, building materials and income from tourism. This includes 30 million who are virtually totally dependent on coral reefs for their livelihoods or for the land they live on (atolls);

Problems for coral reef managers are increasing, as 50% the world’s population will live along coasts by 2015, putting unsustainable pressures on coastal resources. The reefs they manage will contain less attractive but tougher corals. Rising food and fuel prices, commercialisation of fishing activities and the global financial crisis are resulting in over-fishing and serial depletion of fish stocks in many poor countries; and

The solution remains in establishing more Marine Protected Areas linked into networks and managed by all stakeholders, especially user communities.

Countering such gloomy news, are some major advances:

Two enormous marine protected areas (MPAs) focussed on coral reefs have been declared in the Pacific; the Papahānaumokuākea Marine National Monument covering the North-west Hawaiian Islands and the Phoenix Islands Protected Area (PIPA) were declared by the governments of USA and Kiribati respectively (Boxes p. 224, 195);

Large areas of the coral reefs around New Caledonia have been given World Heritage listing (Box p. 184), and more areas are under consideration elsewhere;

Coral reefs in the Indian Ocean, especially in the Seychelles, Chagos and the Maldives, and Palau in the Western Pacific, have continued to recover from the devastating bleaching of 1998;

In December 2007 President Yudhoyono of Indonesia gained support and funding from world leaders for the ‘Coral Triangle Initiative’ to conserve the coral reef resources of Southeast Asia (p. 55);

This initiative theme was expanded to include Western Pacific countries that border the Coral Triangle when President Remengesau of Palau instigated the Micronesia Challenge with other leaders who made commitments to conserve 20% of the land and 30% of the waters as protected areas in linked networks (p. 48);

Soon after, Prime Minister Ingraham of The Bahamas gathered 4 of his neighbours to form the Caribbean Challenge that seeks to conserve 30% of their coastal resources (Box p. 280);

In addition, there have been other positive activities for coral reefs including:

The International Coral Reef Initiative, currently co-chaired by Mexico and the USA, declared 2008 as the International Year of the Reef and developed major awareness raising campaigns around the world;

The 11th International Coral Reef Symposium assembled 3500 scientists, managers and decision makers in Ft Lauderdale, USA, in July 2008 to bring the power of science to coral reef conservation (p. 43);

Reef Check has organised 20 700 signatures on the ‘Declaration of Reef Rights’ petition launched in the International Year of the Reef;

The Pew Environment Group is working with developed country governments to declare very large areas as no-take marine reserves, including the Coral Sea of Australia, the Northern Mariana Islands, the Chagos Archipelago in the Indian Ocean, and the Kermadec Trench, off New Zealand;
The Executive Summary

The Coral Reef Targeted Research and Capacity Building for Management Program established 4 Centres of Excellence to build science capacity for management (p. 47).

CRISP (Coral Reefs InitiativeS for the Pacific) has expanded operations into 17 Pacific island countries with considerable progress in raising capacity for reef management and socioeconomic assessment (p. 45).

The French and USA governments completed major national coral reef summary reports in 2008; the South West Pacific Node produced a regional report in 2007; the French and SW Pacific Node reports were presented in GCRMN format.

The Global Environment Facility has allocated $100 million as the Pacific Alliance for Sustainability to bring Pacific countries together to conserve their environments. Part of this money is going towards the Coral Triangle Initiative and the Micronesia Challenge.

Germany has launched a new Biodiversity and Climate Research Centre based at the Senckenberg Research Institute in Frankfurt; it will have a significant coral reef component.

A series of Recommendations are listed below.

The Executive Summary: The Status of Coral Reefs in 2008

This Status of Coral Reefs of the World: 2008 report from the Global Coral Reef Monitoring Network summarises what has happened to the world’s coral reefs since 2004 and uses expert opinion of coral reef scientists and managers from 96 countries and states to make predictions on what could happen to coral reefs in the future. This combined expertise also seeks to provide advice to the world’s decision makers on what should be done to allow us to bequeath healthy coral reefs to future generations. The release of this report coincides with the end of the International Year of the Reef (IYOR 2008), which has focussed considerable global attention on coral reefs.

One of the signs of progress in coral reef awareness and monitoring are the numbers of authors and contributors to these Status reports. There were 41 contributing authors in 1998; 97 in 2000; 151 in 2002; and 240 in 2004. In this Status 2008 report there are 372 authors and contributors. These numbers also reflect considerable advances in monitoring in many countries of the world, with some long-term data sets being contributed and reports coming in from countries not reported previously — Timor Leste, island states of the Lesser Antilles and isolated French Islands.

Recommendations for Action to Conserve Coral Reefs

These summary recommendations are based on the 17 regional chapters and the other specialist reports. There are more detailed and specific recommendations at the end of most chapters: these are considered the most urgent by the many authors and contributors to conserve coral reefs for future generations:

- **Urgently combat global climate change**—current rates of climate change pose the greatest threat to the long-term sustainability of coral reefs and human coastal communities. We request that the world community, through their governments, agencies, NGOs, academic institutions and especially business establishments, collaborate to urgently reduce the current rate of emissions of greenhouse gases through reductions in energy use and the development of sustainable energy generating mechanisms or trading systems, and develop technologies to remove these gases, especially CO$_2$, from the atmosphere, to ensure that coral reefs will thrive in the next century.

- **Maximise coral reef resilience** (by minimising direct human pressures on reefs) — the
second major threat to reefs derives from direct human activities: over-fishing and destructive fishing; sediment pollution from poor land use; runoff of nutrients and other pollution; and habitat loss through unsustainable development. Control of these threats, which are damaging reefs around the world especially in developing countries including small island developing states, will improve the resilience of coral reefs in the face of climate change. These countries need assistance to improve local catchment and coastal management by upgrading capacity and providing funds to implement community-based management and develop alternative livelihoods to take pressures off reefs.

- **Scale up management of protected areas** – there is a need to improve the management of existing marine protected areas (MPAs) to accelerate restoration of depleted fish stocks and protect coral reef goods and services that underpin coastal economies and livelihoods. This includes managing adjacent catchment areas to prevent nutrient and sediment pollution to create buffer areas that will reinforce MPA management activities.

- **Include more reefs in MPAs** – a proven and effective governance approach for conserving coral reefs and promoting sustainable use is to include them in effectively managed MPAs; preferably containing a significant proportion as fishery reserves or no-take areas, linked into a network of MPAs, and embedded within a larger governance framework. Developing countries will need assistance in expanding their MPA networks and establishing integrated coastal management (ICM) governance frameworks.

- **Protect remote reefs** – there are many coral reefs remote from continental land masses and human populations that, if they are protected, will be able to act as reservoirs of biodiversity to replenish depleted reefs. We recommend establishing more MPAs to include many of the remote island reefs, like those to the west of Hawai‘i, in Kiribati, and the Coral Sea east of the Great Barrier Reef. Developed countries may have the best resources in governance and enforcement to conserve large remote areas in their territorial waters.

- **Improve enforcement of MPA regulations** – enforceable governance systems will be required to deal with the formidable problem of regulating access to managed ecosystems (including types and rates of resource exploitation). Many countries will need assistance to establish effective enforcement systems that function in different marine coastal and marine environments and do not undermine local cultural values and practices.

- **Help improve decision making with better ecological and socioeconomic monitoring** – there is an urgent need to upscale monitoring, especially with increasing threats of climate change, to ensure that this information is provided to natural resource managers and decision makers so that appropriate actions can be taken to reduce threats to reefs and coastal communities.

**Status Now and Predictions for the Future**

The GCRMN has used the reports from 372 authors and contributors to assess the current status of the world’s coral reefs and make predictions about the future of reefs out to 40 years from now. There are contrasting trends: reefs are recovering from the massive bleaching losses in 1998 in the Indian Ocean and Western Pacific; however, there were similar scale bleaching losses in the wider Caribbean in 2005 and 2006; direct human pressures are resulting in chronic losses on coral reefs near major population centres; while effective coral reef management is reducing threats in a number of countries.

**Reefs Effectively Lost:** Expert opinion backed by extensive monitoring and assessment data suggest that the world has lost the goods and services provided by 19% of the global coral reef area. These
reefs are either so heavily degraded as to be non-functional, or have been polluted or mined out of existence. The comparable figure was 20% in 2004. The decrease of 1% is due to strong coral reef recovery particularly in the Indian Ocean and Western Pacific after the devastating bleaching in 1998. However, recovery is stalled or weak where there are substantial human pressures (over-fishing, pollution, sedimentation and unwise development). Countering that, there were major losses in the wider Caribbean following similarly devastating bleaching, coral diseases and hurricanes in 2005, compounded by on-going degradation from sediment and nutrient pollution and over-fishing and associated damage. Reefs in the heavily populated areas of Asia and the wider Caribbean report most losses. Reefs in the Persian Gulf have been devastated by major coral bleaching events and recently by extensive coastal developments along the Arabian Peninsula. Many reefs in this category are not irretrievably lost and will recover if human stresses can be reduced or if the devastating impacts of coral bleaching, diseases and predators are not repeated in the short-term.

Predictions about the future of coral reefs are particularly difficult as multiple stresses and climate factors impinge on reefs. Thus, we recommend that these predictions be used as a guide, particularly for national, international and funding decision makers to establish priorities for action. These predictions are made on a ‘business as usual’ assumption that there will be no major improvements in remedial management action and not considering the looming threats posed by global climate change. This latter assumption effectively ignores the growing global consensus that climate change seriously threatens the medium to long-term future for the world’s coral reefs.

**Reefs at the Critical Stage:** It is predicted that 15% of the world’s coral reefs are under imminent threat of joining the ‘Effectively Lost’ category within the next 10–20 years, unless effective management actions are implemented. These predictions are based on observed trends over the past decade, on demographic increases in human population pressures, and assessments of the effectiveness of current management. The regions with most ‘Critical Stage’ reefs have not changed from 2004 (predominantly Eastern Africa, South and South-east Asia and the wider Caribbean), where human pressures are regarded as high and increasing in the regional chapters below. This is a decrease from the 2004 estimate of 24% critically threatened.

If current predictions from the Intergovernmental Panel on Climate Change and coral reef experts (see p. 29 & 35) are factored into these assessments, this category or the next (threatened) will contain all of the remaining coral reefs. This is why urgent action is needed to drastically reduce the emissions of greenhouse gases.

**Reefs at the Threatened Stage:** The predictions are that 20% of reefs are under threat of loss in 20–40 years; again with the caveat that management will be ineffective at reversing growing demographic pressures. The location of these ‘Threatened’ reefs is similar to the Critical Stage reefs, and includes those a little more remote from human disturbances or ‘next in line’ for serious exploitation of development. This is a decrease from the Threatened state in 2004 of 26%.

**Reefs at Low Risk:** Fortunately, the regional experts consider that 46% of the world’s reefs are either stable or recovering rapidly and not threatened by significant levels of human stresses. Most of these reefs are either well managed such as the Great Barrier Reef, Bonaire, Bermuda, the Flower Garden Banks and Cuba, or remote from large land masses and human disturbances such as the Red Sea, the Maldives, Seychelles and Chagos in the Indian Ocean, and Papua New Guinea and many small atolls and islands in the Pacific Ocean, along with a few reefs in the wider Caribbean and Atlantic Ocean. The comparable figure was 30% in 2004, with the differences mainly being reefs that have recovered after the 1998 bleaching and the discovery of large areas of deeper reefs, especially in the Northern Caribbean.
Caveats: These status assessments and predictions are based on considerable monitoring data using a range of methods, varying from very detailed species level monitoring to rapid monitoring by trained volunteers (see p. 18). However, it is recognised that monitoring in many countries only covers a small and unrepresentative proportion of the reefs, such that the monitoring data are inadequate for a quantitative assessment. In these cases we have relied on qualitative assessments based on the expert opinion of national and visiting scientists, complemented by information from professional dive guides.

Reefs categorised as lost are not effectively functioning as coral reefs and exhibit many of these criteria: live coral cover has declined radically (to below 5%); many remaining corals are either broken, diseased or covered in sediment; fish populations are seriously over-fished with very few large predators and algal grazing fish; there is clear evidence of pollution with poor quality turbid water; and the reefs are being over-grown with macro-algae, sponges or other organisms favoured by polluted waters. Another caveat is that the predictions of ‘Threatened’ and ‘Critical’ are based predominantly on future human stresses, without considering the threats of global climate change, predicted to be inevitable but without clear timelines. We have assessed the validity of regional assessments in the Table on p.18).

Damaging Events for Coral Reefs 2004 - 2008

Immediately after the Status 2004 report was launched in December 2004, the devastating Indian Ocean tsunami occurred; and 6 months later in 2005 catastrophic coral bleaching enveloped the wider Caribbean. In addition, the level of damaging human activities has continued to increase in parallel with increases in human populations, especially in the coastal tropics. These increases make the task for natural resource managers even more difficult and urgent.

The Indian Ocean Earthquakes and Tsunamis of 2004: The largest earthquake for 40 years struck near Sumatra on 26 December 2004 and spread 1300 km to the Andaman Islands of India. Some reefs in Sumatra and the Andaman Islands were thrust out of the water killing them almost instantly. The resulting tsunamis killed more than 230 000 people in Indonesia, Thailand, the Andaman and Nicobar Islands of India, and Sri Lanka, and devastated their lands and economies. There was significant damage to reefs in Indonesia, Thailand, the Andaman Islands and Nicobar Islands, Sri Lanka and the Maldives, with much of the damage caused by debris from the land or dead coral rubble smashing or smothering other corals. Most of the corals have since recovered but over-fishing and pollution from poor land use and inadequate treatment of wastes remain as major threats (from Wilkinson C, Souter D, Goldberg J (2006). Status of Coral Reefs in Tsunami Affected Countries: 2005. Australian Institute of Marine Science and Global Coral Reef Monitoring Network, Townsville Australia, 154 p.).

Coral Bleaching and Hurricanes in the Caribbean in 2005: 2005 and 1998 were the hottest, and most devastating, years for coral reefs since global records started in 1880. In 1998 the damage was greatest in the Indian Ocean, Western Pacific and the Caribbean. In 2005 the damage was confined to the wider Caribbean where coral bleaching and mortality compounded previous bleaching in 1987, 1995 and 1997–1998. Losses were extreme: 51.5% losses of live hard coral cover at sites in US Virgin Islands; more than 50% of coral colonies bleached in Florida, Puerto Rico, the Cayman Islands, St. Maarten, Saba, St. Eustatius, Guadeloupe, Martinique, St. Barthelemey, Barbados, Jamaica and Cuba; up to 20% coral mortality on Barbados; 11–30% mortality in the French West Indies, and Trinidad and Tobago. Also, 2005 was the most severe hurricane season ever with 26 tropical storms including 13 hurricanes, which damaged coral reefs (e.g. coral cover was halved around Cozumel, Mexico). Many stressed and bleached corals subsequently died from coral diseases in 2006 (from Wilkinson C, Souter D, (2008). Status of Caribbean Coral Reefs after Bleaching and Hurricanes in 2005. Global Coral Reef Monitoring Network and Reef and Rainforest Research Centre, Townsville Australia 152 p.).
Executive Summary

Plagues and Diseases: There are disturbing reports of new outbreaks of crown-of-thorns starfish (COTS) devastating coral reefs in the Red Sea around Egypt, along the coast of East Africa in Kenya and Tanzania, in parts of South-east and East Asia (especially in the Philippines, Japan and China), and in the Pacific in Guam, Majuro Atoll (Marshalls), Fiji and French Polynesia. In the past, these plagues have caused massive losses (often in the vicinity of 90%) of living coral cover. Similarly there are reports of outbreaks of the coral eating mollusc (Drupella cornus) on reefs in Western Australia and southern China.

<table>
<thead>
<tr>
<th>Region</th>
<th>Coral Reef Area km²</th>
<th>Effectively Lost Reefs (%)</th>
<th>Reefs at Critical Stage (%)</th>
<th>Reefs at Threatened Stage (%)</th>
<th>Reefs at Low Threat level (%)</th>
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<tr>
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<td>17 640</td>
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<td><strong>15</strong></td>
<td><strong>20</strong></td>
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2. Reefs ‘effectively lost’ with 90% of the corals lost and unlikely to recover soon;
3. Reefs at a critical stage with 50 to 90% loss of corals and likely to join category 2 in 10 to 20 years;
4. Reefs threatened with moderate signs of damage: 20–50% loss of corals and likely to join category 1 in 20–40 years
5. Reefs under no immediate threat of significant losses (except for global climate change).

The table summarises the current status of the world’s coral reefs determined from the regional chapters (below). These estimates were determined using considerable coral reef monitoring data, some anecdotal reports and the expert opinion of hundreds of people associated with the Global Coral Reef Monitoring Network (GCRMN). These assessments should be regarded as indicative, because there is insufficient coral reef monitoring data for many of these regions to make definitive statements on losses and authoritative predictions on the future.
Diseases devastated coral populations throughout the wider Caribbean in the 1980s and 1990s, particularly affecting *Acropora* species, and reducing coral cover significantly. After apparently abating, massive outbreaks of disease accompanied the mass coral bleaching in 2005 and 2006. The severity of these diseases is often correlated with corals stressed by bleaching, being most severe in summer and declining in winter. Coral diseases are being observed more frequently on Indo-Pacific reefs but are not nearly as serious as in the Caribbean.

**Continuing Human Stresses on Coral Reefs:** In the Status 2004 report, we listed the ‘Top 10’ threats to coral reefs under 3 categories. Sadly these continue in 2008 with no signs of abatement: *The ‘Global Change Threats’:* 1) coral bleaching from warmer seawater due to global climate change; 2) rising concentrations of dissolved CO$_2$, also a product of climate change; 3) diseases, plagues and invasive species. *The ‘Direct Human Pressures’:* 4) excess sediments flowing off the land; 5) pollution by nutrients and chemicals, arising from poor land management, agriculture and industry; 6) over-fishing and destructive fishing, especially taking algal grazing fishes, the ‘immune system’ of a coral reef; 7) unsustainable and destructive development of coastal areas. *‘Inadequate Governance, Awareness and Political Will’:* 8) increasing poverty and populations, and loss of agricultural land; 9) poor capacity for management and lack of resources, especially in small island countries; and 10) weak political will, and ineffective oceans governance. The last 7 threats are amenable to local action, aided by donor and developed countries providing some financial and logistical resources. The first 3 threats can only be solved by unified and concerted global action by all governments and people; the Kyoto conference successor, in Copenhagen, December 2009 will determine whether the world is willing to take these necessary steps. The current fear is that the Global Financial Crisis of 2008 will provide an excuse for governments to avoid taking the necessary action in the short-term.

**Major New Initiatives in Coral Reef Conservation**

By the start of the millennium there was increasing recognition that accelerated efforts were required to reverse loss of biodiversity and conserve ecosystems. In April 2002 the Convention on Biological Diversity pledged to significantly reduce the rate of biodiversity loss by 2010, as a contribution to poverty alleviation and to the benefit of all life on Earth. This target was endorsed by the 2002 World Summit on Sustainable Development (WSSD) in Johannesburg and the United Nations General Assembly, and was incorporated as a new target under the Millennium Development Goals. For coral reefs, the WSSD target of establishing networks of marine protected areas (MPAs) encompassing 20% of marine resources by 2012 was critical. We consider that these calls have positively stimulated more effective coral reef conservation.

**Coral Triangle Initiative:** Conservation of the world’s highest biodiversity coral reefs is a target for Indonesia, Philippines, Malaysia, Papua New Guinea, the Solomon Islands and Timor Leste. They formed the Coral Triangle Initiative in 2006 in response to calls by the Convention on Biological Diversity and the WWF to reduce the loss of biodiversity and set up networks of MPAs. President Yudhoyono of Indonesia is marshalling international assistance to conserve the biodiversity, fisheries and food security potential of these vast marine resources surrounding thousands of islands with a current budget of $300 million from governments, UN agencies and NGOs.

**The Micronesia Challenge:** This arose at the same time when Palau, Federated States of Micronesia, the Marshall Islands, Guam and the Northern Mariana Islands pledged to conserve at least 30% of their marine resources and 20% of terrestrial resources by 2020. They seek a budget of $100 million to establish new MPAs and strengthen existing ones to conserve 61% of the world’s coral species, more than 13,000 species of reef fishes, 85 species of birds, 1,400 species of plants; all with considerable cultural significance.
Caribbean Challenge: Caribbean countries accepted the challenge from Micronesia to launch the Caribbean Challenge to conserve biodiversity. The Bahamas, Dominican Republic, Jamaica, Grenada, St. Vincent and the Grenadines have all pledged to conserve 20% of their marine and coastal habitats by 2020 because the livelihoods and cultures of 10 million people depend on these resources. Other countries are also considering joining. A key component will be the creation of a US$45 million Trust Fund to fund rangers, patrol boats, scientific expertise and education programs in new and existing MPAs.

New Large MPAs: Two enormous MPAs in the Pacific were launched in 2006. The Papahānaumokuākea Marine National Monument was upgraded to highly protected status by the USA to take in the 356 893 km$^2$ of the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, designated in 2000. The Government of Kiribati, with help from major NGOs, has created the world’s largest marine protected area by enlarging the Phoenix Islands Protected Area (PIPA), in January 2008, to encompass 410 500 km$^2$. These eclipse the Great Barrier Reef Marine Park, established in 1975 and upgraded in 2004, which has 115 395 km$^2$ as no-take status out of the total 344 400 km$^2$. The Pew Environment Group has commenced a campaign to encourage developed country governments with adequate capacity and enforcement capability to declare very large ocean areas as no-take marine reserves. They have proposed the Coral Sea of Australia and then seek to include the Northern Mariana Islands, the Chagos Archipelago in the Indian Ocean, and the Kermadec Trench off New Zealand.

World Heritage and Coral Reefs: In June 2008, the World Heritage Commission listed 6 large areas of New Caledonia for special protection including 15 743 km$^2$ of coral reefs. They acknowledged that these reefs are of global significance with a large concentration of biodiversity resources. The Republic of the Marshall Islands intends seeking World Heritage recognition for 9 atolls and one low reef island in 2009, and the government of Thailand is investigating a similar proposal for large areas of the Andaman Sea coast with substantial coral reefs.

Polar Bears and Coral Reefs

Putting polar bears and tropical corals into the same sentence is an unusual concept, possibly bizarre. But the linkage of the two charismatic animals, just one species of bear and more than 700 species of coral, encapsulates the position the world faces with global climate change. This dilemma for the world was brought home to me by Bill Eichbaum, a colleague working with WWF in Washington D.C.

Climate change threatens both the Arctic and topical coral reefs; from 90$^\circ$ North to the tropics around 0$^\circ$. These two extremes illustrate that climate change will have dramatic effects at the extremes of the world’s ecosystems, and all ecosystems between them. The threats to these two charismatic animals should serve as warning that global climate change will probably devastate ecosystems across the whole latitude range from the tropics to the Poles. These changes could lead to the extinction of the polar bear *Ursus maritimus* and to the extinction of many of the 700 species of coral. Polar bears and corals are evolutionarily very different; polar bears are at the tip of one mammal branch; while corals still resemble the first ‘modern’ corals that evolved about 35 million years ago. But both the bears and corals have evolved spectacularly well into their current environments, such that they are now totally dependent on these environments. The changes wrought by global climate to alter those environments will threaten their existence and could result in extinction; just a few degrees of warming will be devastating. Kent Carpenter and 34 colleagues reported in Science, in July 2008, that one third of all tropical corals are considered as immediately threatened with extinction using IUCN Red List Criteria. The proportion of corals threatened with
extinction has increased dramatically in recent decades and exceeds most terrestrial groups. Neither bears nor tropical corals will go extinct immediately; we will still be able to see some in zoos and aquaria which will symbolise the losses of these animals in the natural environment. Unlike the photo on the back cover, polar bears will not migrate to coral reefs (that can only happen with ‘Photoshop’).

**Consequences of Global Climate Change for Coral Reefs**

The very serious threats posed by global climate change to coral reefs were confirmed when 3500 of the world’s leading coral reef scientists and managers met at the 11th International Coral Reef Symposium in Florida, in July 2008. The news from these scientists was far from encouraging. Major consequences of increasing greenhouse gases will be:

- more coral bleaching from warmer oceans;
- rising ocean acidification from more dissolved carbon dioxide (CO₂);
- more severe storms; and
- rising sea levels that will drown some coral reef nations.

Climate change is proceeding faster than in previous ice-age transitions and coral reefs and corals are falling behind and suffering fever-high temperatures and rising acidity. There are some hopeful signs, but no single, easy remedy.

Coral reefs may be the first marine ecosystem to suffer extreme damage and possible collapse from climate change. Two major, ocean-scale bleaching events hammered home the message that warming oceans associated with global climate change pose a major, and probably THE major threat to the future of coral reefs and their associated organisms around the world. The extreme El Niño/La Niña switches in the global climate in 1997–1998 resulted in the most extensive coral bleaching and mortality ever recorded, with approximately 16% of the world’s coral reefs being effectively destroyed (approximately three quarters of these have subsequently recovered). Coral losses were greater than any in recorded history because 1000 year old corals were killed. And in 2005 many coral reefs of the wider Caribbean were devastated when a series of major ‘hot-spots’ developed during the northern summer of 2005. There was extensive coral bleaching (experts quoted in the regional chapters report more than 50% bleaching with half of these corals dead soon after or due to coral diseases striking the weakened corals in 2006); 2005 was a record hurricane year, which also resulted in considerable coral reef losses.

Since 1998, many coral reefs of the Indian Ocean and Western Pacific have shown remarkable recoveries in coral cover. For example, the Chagos Archipelago, some outer islands of Seychelles, the Maldives, Bar Reef on Sri Lanka, and Palau now have corals at levels approaching pre-1998 cover. The major questions are whether the 1998 and 2005 events were singular events or harbingers of more doom in the future. Sadly, the evidence and predictions from the Intergovernmental Panel on Climate Change 2007 report indicate that similar destructive events are certainly more probable as the world’s climate heats up.

NOAA satellites reveal tropical oceans have warmed at a significantly faster rate during the last 10 years (see p. 35), suggesting that there are only 8–10 years left to turn the tide because, if atmospheric CO₂ concentrations reach 450 ppm, seawater will become more acidic, thereby threatening the existence of coral reefs as we know them. Healthy and resilient coral reefs can respond vigorously to damage; but climate change stresses are eroding that resilience. For example, ocean acidification will prevent juvenile corals settling and make adults more fragile (see p. 29).
“YOU DON’T KNOW WHAT YOU GOT ‘TIL IT’S GONE”

These words from the classic 1970 song, ‘Big Yellow Taxi’ by Joni Mitchell, may describe the situation we find ourselves in now. In the past few years, coral reef scientists have reported that some animals, e.g. crinoids (feather stars) in the wider Caribbean, that were previously common on their coral reefs are now absent. Another report states that the abundant sea snakes on coral reefs off Western Australia have apparently disappeared. The loss of these animals off coral reefs may be an example of the miner’s canary, warning us of many more unintended consequences of global climate change. There are convincing anecdotal reports that crinoids have ‘disappeared’ from many coral reefs in Florida, as Billy Causey reported in the GCRMN report on the bleaching in the Caribbean in 2005 (reference above). When diving began along the Florida reef tract in the 1960s and 1970s, many colourful crinoids were seen and photographed on shallow reef, like Looe Key Reef, and especially on deep reefs from 20–40 m. However, none were found during 6 hours of survey diving in 2001 on deep reefs at 20 m and 30 m. Repeat surveys have failed to find any crinoids, however, researchers still see crinoids in the Tortugas Ecological Reserve. Thus crinoids are still found on reefs well to the west of Florida, but not on the reefs directly offshore. Steve Gittings from NOAA has observed a major decline in ophiuroids (brittle stars) at Conch Reef in the Upper Florida Keys.

Similar evidence has come from Netherlands Antilles in the far south of the Caribbean. Dave Meyer reported at the 11th International Coral Reef Symposium that the previously abundant comatulid crinoids that flourished on Bonaire and Curacao in the early 1990s were declining drastically by 1996 and that, in 2007, sites that once had many crinoids are now practically empty. Five species of crinoids were common in shallow waters and at least 2 species occurred down to 30 m depth. The reasons for the decline are unclear and were comparable on the lightly populated Bonaire to the more heavily populated Curacao. Thus a finger is being pointed at the climate change associated bleaching in 1995: the loss of these major filter feeders raises new concerns and should stimulate surveys and monitoring of crinoids and other reef biota throughout the world. The question is asked: are multiple stressors like higher levels of nutrients and other pollutants from the land combining with warmer waters to cause these losses of feather and brittle stars? Are echinoderms the ocean equivalent of frogs, warning us of more extinctions to come?

Other animals may also be disappearing off reefs. The coral-like animal, Ricordea florida (a corallimorph, or called ‘false coral’), occurred in large patches on shallow reefs such as Looe Key Reef in the 1960s and 1970s. The first signs of loss were in the early 1980s with virtually none in the shallow waters when detailed and regular monitoring started in 1996.

There were at least 9 species of sea snakes in the shallow waters of a cluster of reefs that form Ashmore Reef in the Indian Ocean, about 800 km west of Darwin. These reefs sit on the edge of the continental shelf and sea snakes were recorded as ‘super abundant’ in previous surveys. For example, more than 400 specimens were collected in a week by the RV Alpha Helix in 1972. Mick Guinea reports that now sea snake numbers have so decreased that one sea snake may be seen per week. The reasons for the losses are unknown on Ashmore (but no losses on nearby Hibernia, Scott and Cartier reefs), but there are hypotheses: the channels have silted up and sand banks now cover many coral heads; sea surface temperatures are increasing (see p. 35); or over-exploitation of some species has also had a ‘downstream’ affect on the sea snakes, although fish populations appear healthy.
Status of Coral Reefs of the World: 2008

Status of Coral Reefs of the World by Regions

Indian Ocean

- Persian Gulf, Arabian Sea and Gulf of Oman: There has been minimal recovery in reefs of the Persian Gulf and Gulf of Oman after climate related devastation in 1996, 1998 and 2002, and massive cyclone 'Gonu' in mid 2007. Massive coastal development on the Arabian Peninsula side is also resulting in coral reef losses. These reefs appear amongst the most damaged in the world with the lowest predictions for recovery. Coral reef research and monitoring continues to lag behind other parts of the world, with Iran seeking to improve reef monitoring and management activities in the Node states;

- Red Sea and Gulf of Aden: The reefs continue to be in good health with gradual increases in reef awareness. There have been some localised losses from coral bleaching and crown-of-thorns starfish, but generally coral cover remains high to very high. Countries have developed action plans, however, there are major disparities in capacity and economics between relatively wealthy countries and those emerging from recent wars;

- Eastern Africa: Along the coastline there is a mix of reef recovery and reef degradation as management efforts are directed towards controlling the effects of rapidly growing populations and involving local communities in coastal management. All countries are increasing their networks of MPAs in line with the WSSD calls. Kenya and South Africa share the lead in monitoring activity, but all countries are improving management capacity and legislation;

- Indian Ocean Islands: Reefs in the south-west of the ocean continue to recover after devastation in 1998. Some reefs of the Seychelles and Comoros that suffered major damage in 1998 have probably regained about half the lost coral cover; there has also been virtually no recovery on others. There have been major advances in awareness and the declaration of new MPAs, but the problems confronting governments and communities with increasing development and populations continues to nullify positive activities. There has been a reduction in monitoring sites and the flow of information, and little is known on the status of seagrass and mangrove areas.

- South Asia: The poor situation in South Asia continues as a mix of reef decline as large human populations further damage the coral reefs, adding to damage that occurred in 1998; governments are increasing their efforts, but will they be too late? However, there has been amazing recovery of the reefs of the western Maldives, Chagos, Lakshadweep Islands of India and on north-west Sri Lanka, with seemingly locally extinct corals making major recoveries e.g. some reefs have gone from less than 5% coral cover to 70% in 10 years. The 2004 Indian Ocean earthquake and tsunami caused significant reef damage at some sites, but many are recovering.

Asia and Australia

- South-east Asia: The Coral Triangle Initiative in Indonesia, Philippines, Eastern Malaysia, Papua New Guinea, Timor Leste and the Solomons has been initiated in an attempt to reverse the massive degradation of these reefs at the global centre of reef biodiversity. We include the first data for Timor Leste. Over-fishing, increasing sedimentation and urban and industrial pollution from rapid economic development are accelerating reef degradation faster than governments and NGOs can implement conservation. More than 50% of the region’s mangroves have been lost.

- North-east Asia: Coral reefs have shown an overall decline since 2004 with most reefs coming under significant levels of human pressures, as well as bleaching and COTS
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There are a few reefs with high coral cover, such as Dongsha Atoll between Taiwan and China. Increased coral reef monitoring and research, including the establishment of a regional database, is occurring in Japan, Hong Kong, Taiwan and Hainan Island in China, and the region is stimulating more awareness and cooperation by having held the Asia Pacific Coral Reef Symposium in Hong Kong in 2006 and planning another for Thailand in 2010.

**Australia and PNG:** Reefs of Australia continue to be well managed and relatively stable with no major climate change or cyclone events damaging the reefs since 2004. Management continues to set the benchmark for best practice, both in Eastern Australia on the Great Barrier Reef and, more recently, off Western Australia. Particular features are the effective partnerships between coral reef science and management. The situation is the reverse in Papua New Guinea with inadequate coral reef conservation and monitoring, with most of this being performed via large NGOs working with local communities. PNG still has vast areas of healthy and biodiversity-rich coral reefs but human pressures, both from within and externally, are increasing.

**Pacific Ocean**

**Micronesia:** There has been good recovery of reefs in Palau and increasing efforts at reef monitoring and conservation in all countries. The Micronesia Challenge (p. 48) has raised considerable awareness of problems facing coral reefs and stimulated considerable capacity building, monitoring and conservation through the establishment of more MPAs including the massive PIPA World Heritage site. These reefs have remarkable recovery potential, thus the outlook remains encouraging;

**South-west Pacific:** Climate-related coral bleaching continues to be the greatest threat to reefs of the South-west Pacific as human impacts, although growing, are not resulting in major reef loss over large scales. The University of the South Pacific and the CRISP program (see p. 45) are building more capacity for monitoring and conservation, with the Locally Managed Marine Area network developed in Fiji leading the way in the establishment of community managed MPAs: periodically harvested reserves have significantly higher target fish biomass than fished areas. Large reef areas of New Caledonia have gained World Heritage recognition;

**Polynesia Mana – South-east Pacific:** This is also the situation in the South-east Pacific (Polynesia) with no major changes since 2004 and a gradual increase in reef awareness and conservation activities. There are many coral reefs surrounding uninhabited islands with climate change bleaching and ocean acidification as the only threats. These are considered as ideal targets for the creation of ‘reservoir’ protected areas to protect species threatened with over-exploitation or other human stresses;

**US Pacific:** The USA recognised the global importance of the North-west Hawaiian Islands and have declared the Papahānaumokuākea Marine National Monument MPA. Management is increasing around the Main Hawaiian Islands, but over-fishing and sediment pollution continue as major threats. The depletion of aquarium species is being addressed through the establishment of industry recognised MPAs;

**The wider Caribbean:** These reefs suffered massive losses during the major climate related events of 2005 with all regions of the Wider Caribbean affected by record coral bleaching and hurricane damage.

**US Caribbean:** Reefs of the US Caribbean are the focus of increased scientific and conservation efforts and results are variable with some improvements but also major
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<th>Region</th>
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This table summarises the extent of data collection and an assessment of the reliability of methods used to generate the data in coral reef countries and states around the world. Three levels of monitoring are recognised: High Level at species/genus level for corals and fish with high level reliability and repeatability, usually performed by trained scientists; Medium Level at ‘lifeform’ or similar category with moderate to high reliability and possibly with irregular repetitions, and performed by scientists or well trained volunteers and dive operators; and Lower Level, either performed with timed swims or manta tow, or employing semi-trained volunteers, this category also indicates that large areas have not been observed. The Coverage details the extent of monitoring within the country that feeds into the Confidence category, which is a subjective assessment of the confidence that can be placed on these assessments.
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coral reef losses. The reefs immediately adjacent to Florida are showing minimal recovery as pollution and excessive tourism threats impede management efforts. More remote reefs, like the Tortugas and Flower Garden Banks are quite healthy, but Puerto Rico and the US Virgin Islands are threatened by over-fishing and pollution from the land, all compounded by coral bleaching and disease. The US Congress is currently revising the ‘Coral Reef Conservation Act’ to include reef restoration, strengthened international reef conservation programs and partnerships;

- **Northern Caribbean and Western Atlantic:** Reefs in the Northern Caribbean were also severely damaged in 2005 despite some increases in conservation efforts. There is a wide disparity in the economic status of these countries with some wealthier states applying considerable conservation efforts, such as Bermuda and the Cayman Islands, whereas others have minimal capacity and political will for conservation, e.g. Haiti. There are some encouraging signs of coral recovery after major losses in the 1980s and 1990s, especially around Jamaica, but unusually frequent and intense hurricanes are affecting reef recovery;

- **Lesser Antilles:** The 2005 coral bleaching caused major damage in the Lesser Antilles where coral cover was reduced by about 50% on many reefs. Recovery has been slow, or non-existent, in reefs under high human pressures. Algal cover has increased and coral diseases have been particularly prevalent since 2005. Most of these small islands depend heavily on their coral reefs for tourism income and fisheries and this awareness is increasing calls for reef conservation. This will be advanced considerably by those countries joining the Caribbean Challenge;

- **Mesoamerican Barrier Reef and Central America:** There has been a similar decline in reef status along the Mesoamerican Barrier reef, after a long series of losses that started in the 1980s. Bleaching and especially hurricanes in 2005 caused considerable destruction around Cozumel. The trend is for decreasing coral cover (averaging around 11% since 2004), and some reefs have lost more than 50% coral cover. Major programs have considerably raised capacity and improved management of MPAs but sedimentation and over-fishing continue to impede reef recovery;

- **Southern Tropical Americas:** Finally there is a mix of good and bad news about reefs in the Southern Tropical Americas. Areas close to land continue to suffer from pollution and sediment runoff, however, many more remote reefs are showing increases in coral cover. There have been some increases in monitoring management activities, especially in efforts to conserve the reefs of Brazil.

Les estimations présentées dans cet ouvrage rassemblent les opinions de 372 chercheurs et gestionnaires de 96 nationalités, spécialisés dans l’étude et la gestion des récifs coralliens. Selon ces experts, le monde a presque perdu 19% de ses récifs coralliens ; 15% des récifs restants risquent sérieusement de disparaître dans les 10 à 20 prochaines années et 20% de plus sont menacés de disparition dans 20 à 40 ans. Ces estimations ont été réalisées sans prendre en compte les menaces liées au réchauffement climatique, ni les moyens qui pourraient être mis en place afin de préserver efficacement les récifs et leurs ressources. 46% des récifs mondiaux sont cependant considérés comme étant en bon état et exempts de menaces de destruction immédiate, à l’exception de celles liées au réchauffement climatique, actuellement difficiles à prévoir.


- Si le tremblement de terre et le tsunami du 26 Décembre 2004 ont coûté la vie à de nombreuses personnes et affecté grandement les pays de l’Océan Indien, ils ont été également synonymes de dégradation des récifs coralliens de la région. Cependant, l’échelle de ces dégradations n’est pas comparable à celle des pertes humaines. (Box p.130)


- Un nombre croissant d’études tend à prouver que le réchauffement climatique mondial a des répercussions directes sur de plus en plus de récifs coralliens. En outre, il apparaît clairement que l’acidification progressive des océans provoquera des dommages de plus en plus graves dans le futur.

- Les études socio-économiques concernant les récifs coralliens sont de plus en plus nombreuses et s’avèrent être davantage prises en compte dans la gestion des récifs coralliens afin de renforcer et de revivifier les méthodes traditionnelles de gestion, en particulier dans le Pacifique, où nombre d’entre elles sont demeurées intactes.
Le déclin actuel des récifs coralliens aura des graves conséquences pour environ 500 millions de personnes, dépendant directement des récifs et de leurs ressources pour se nourrir, protéger leurs côtes, obtenir des matériaux de construction et bénéficier des retours financiers de leurs activités touristiques. Ce chiffre inclut les 30 millions de personnes dont l’habitat et le mode de vie dépendent exclusivement des récifs coralliens.

Les gestionnaires des récifs coralliens vont devoir faire face à des problèmes de plus en plus nombreux: la population vivant sur les côtes ne cesse d’augmenter et devrait atteindre 50% de la population mondiale d’ici à 2015, exerçant dès lors une pression non soutenable sur les ressources côtières. De plus, l’augmentation du prix des produits alimentaires de base et du prix du pétrole, ainsi que l’actuelle crise financière mondiale se traduisent, dans de nombreux pays pauvres, par une surpêche chronique et un épuisement des stocks de poissons. Enfin, à terme, les récifs gérés seront moins attractifs, car constitués d’espèces coralliennes moins nombreuses (mais plus résistantes). Une telle évolution obligerait également à reconsidérer les activités touristiques liées aux récifs coralliens.

Etablir davantage d’Aires Marines Protégées, reliées entre elles afin de former de véritables réseaux et gérées par tous les acteurs concernés, en particulier par les communautés riveraines, demeure la meilleure solution.

Face à ces résultats inquiétants, certaines avancées ont vu le jour :

- Deux immenses Aires Marines Protégées (AMP) consacrées aux récifs coralliens ont été établies dans le Pacifique: le Monument National Marin de Papahānaumokuākea, couvrant les îles du nord-ouest d'Hawaï et l’Aire Marine Protégée des Iles Phœnix, déclarés respectivement par les gouvernements des États-Unis et de Kiribati (Boxes p. 224, 195) ;

- Les récifs coralliens a la Nouvelle-Calédonie ont été classés au Patrimoine Mondial de l’Humanité (Box p.184). D’autres récifs ont été portés candidats.

- Dans l’Océan Indien, et en particulier aux Seychelles, aux Chagos et aux Maldives, comme à Palau dans le Pacifique Ouest, l’état des récifs coralliens a continué à s’améliorer depuis le phénomène dévastateur de blanchissement de 1998.

- En Décembre 2007, le président indonésien, M. Yudhoyono, a rassemblé des soutiens et des fonds provenant des dirigeants du monde entier en faveur du projet « Initiative pour le Triangle de Corail » afin de conserver les ressources des récifs coralliens du Sud-Est asiatique. (p. 55)

- Cette initiative a été étendue aux pays du Pacifique Ouest, qui bordent le Triangle du Corail, lorsque le président de Palau, M. Remengesau, a lancé, avec d’autres dirigeants politiques, le « Challenge de Micronésie », s’engageant ainsi à consacrer 20% de la terre et 30% des eaux qui sont sous leur contrôle à des aires protégées organisées en réseau. (p. 48)

- Peu après, le premier ministre des Bahamas, M. Ingraham, a rassemblé quatre de ses confrères des pays voisins pour former le « Challenge des Caraïbes », visant à conserver 30% de leurs ressources côtières. (Box p.280)

D’autres actions encourageantes en faveur des récifs coralliens ont également été menées, dont :

En juillet 2008, le 11ème Symposium International sur les Récifs Coralliens a rassemblé, à Fort Lauderdale aux États-Unis, 3 500 scientifiques, gestionnaires et décideurs politiques avec pour objectif un développement des recherches scientifiques au service de la gestion et de la conservation des récifs. (p. 43)

Reef Check a rassemblé 20 700 signatures en faveur de la pétition intitulée “Déclaration des Droits des Récifs Coralliens”, lancée lors de cette Année Internationale des Récifs Coralliens.


L’Initiative Corail pour le Pacifique (CRISP) a développé ses actions dans 17 pays insulaires du Pacifique. Des progrès considérables sont à noter quant au développement de compétences et d’expertises locales. (p.45)


The Global Environment Facility a accordé 100 millions de dollars au fonds « Pacific Alliance for Sustainability » afin de rassembler les pays du Pacifique pour la conservation de leur environnement. Une partie de ce fonds sera allouée à l’Initiative pour le Triangle de Corail et au Challenge de Micronésie.

L’Allemagne a lancé un nouveau centre de recherche consacré à la biodiversité et au climat, au sein de l’Institut de recherche de Senckenberg à Francfort. L’étude des récifs coralliens sera l’un des thèmes majeurs de ce nouveau centre.

**Recommandations pour la conservation des récifs coralliens**

Ces recommandations sont un résumé basé sur les 17 chapitres régionaux du livre ainsi que sur les rapports d’autres spécialistes. Des recommandations plus spécifiques à chaque région sont détaillées à la fin de la plupart des chapitres. Sont présentées ici les actions que les auteurs et contributeurs considèrent comme urgentes et plus que nécessaires afin de conserver les récifs coralliens pour les générations futures:

**Combattre d’urgence le réchauffement climatique:** la vitesse actuelle d’évolution du réchauffement climatique place ce dernier au premier rang des menaces portées aux récifs coralliens et aux communautés humaines côtières sur le long terme. Nous demandons à la communauté internationale de collaborer, au travers de ses gouvernements, agences, ONG, institutions académiques et en particulier de ses entreprises, afin de réduire d’urgence le taux actuel d’émissions de gaz à effet de serre. Une telle réduction ne peut se faire qu’à travers une diminution de la consommation énergétique, le développement de mécanismes d’incitation -à l’instar des marchés de droits à polluer-, de technologies permettant la production d’une énergie durable et de réduire la quantité de ces gaz injectés dans l’atmosphère (CO₂ en particulier). Ces mesures sont indispensables pour assurer la pérennité des récifs coralliens jusqu’au siècle prochain.
Maximiser la capacité de résilience des récifs coralliens (en minimisant les pressions humaines directes sur les récifs) : la menace essentielle depuis des décennies pour les récifs résulte des activités d’origine anthropique affectant directement les récifs: surpêche et pêche destructrice, pollution par sédimentation due à un mauvais usage des terres, pollution par nutriments ou autres, destruction des habitats due à un développement non durable. Contrôler ces menaces, qui portent atteinte aux récifs dans le monde -tout particulièrement dans les pays en développement, petits territoires insulaires compris-, permettrait de les protéger et d’augmenter leur récupération à la suite d’effets négatifs dus au réchauffement climatique. Ces pays ont besoin d’aide afin d’améliorer l’aménagement de bassins versants et leur gestion côtière. Pour cela, de meilleures connaissances et compétences dans ce domaine leur sont indispensables, ainsi que des fonds, clés d’une gestion basée sur les communautés locales, développant des modes de vie alternatifs et réduisant par là même les pressions appliquées aux récifs.

Étendre la gestion d’aires protégées: Améliorer la gestion des Aires Marines Protégées (AMP) existantes est indispensable si l’on veut restaurer les stocks de poissons qui s’épuisent et protéger les biens et services que représentent les récifs, sources de soutien aux économies et modes de vie côtiers. Pour ce faire, il est nécessaire de contrôler les bassins versants adjacents afin de prévenir toute pollution par apports de nutriments ou de sédiments et de créer des zones-tampon améliorant la protection des récifs.

Inclure davantage de récifs au sein des AMP: Inclure davantage de récifs au sein d’AMP gérées efficacement est un outil de gouvernance qui s’est avéré être une mesure positive pour garantir leur conservation et leur exploitation durable. Ces AMP devraient contenir une proportion significative de zones de cantonnement de pêche et zones de protection absolue, reliées entre elles en réseau et soumises à un plan de gestion à plus large échelle. Les PED ont besoin d’assistance pour mettre en place leurs réseaux d’AMP et les bases d’une gouvernance préalable à toute gestion côtière intégrée.

Protéger les récifs isolés: de nombreux récifs coralliens se situent loin de toute terre et de toute population humaine. Protégés, ces récifs pourraient jouer le rôle de réservoir de biodiversité afin d’aider à reconstituer les récifs épuisés. Nous recommandons d’établir davantage d’AMP afin d’y inclure une large proportion de ces récifs isolés, à l’instar de ceux situés à l’ouest d’Hawaï, ceux de Kiribati ou encore de la Mer de Corail au large de la Grande Barrière de Corail. Les pays développés sont probablement ceux qui possèdent les meilleurs moyens de gouvernance et de mise en application pour établir de plus vastes aires marines protégées isolées.

Améliorer l’application concrète des législations concernant les AMP: le manque d’application concrète des systèmes de gouvernance reste un problème majeur à résoudre: différents zones et niveaux d’exploitation des ressources doivent être mis en place et respectés grâce à une surveillance effective. De nombreux pays ont besoin d’aide pour établir des systèmes de surveillance effectifs en fonction des différents environnements marins ou côtiers, et ce, tout en veillant à respecter les pratiques et valeurs locales.

Améliorer la prise de décision politique grâce à un meilleur suivi environnemental et socio-économique: face aux menaces croissantes liées au réchauffement climatique, il est urgent d’investir davantage dans l’étude et le suivi des récifs afin de s’assurer que des données plus complètes soient transmises aux gestionnaires de ressources naturelles et décideurs politiques. Ainsi aux seraient prises des actions appropriées pour protéger, au sein d’AMP, les récifs qui s’avèreraient être les plus résistants face au changement climatique.
SEALS ON CORAL REEFS:
EXTINCT IN THE CARIBBEAN, THREATENED IN THE PACIFIC

Several hundred years ago, the coral reefs of the Caribbean had 6 times more fish than today and this change is linked to the extinction of the Caribbean monk seal, *Monachus tropicalis*, in 1952. Scientists examined 17th and 18th century records of 13 colonies across the Caribbean with large seal numbers. The seals downfall was because sailing ships targeted these colonies to replenish meat supplies, harvest the fur and collect seal oil to lubricate sugar plantation machinery. By the end of the 19th century, the low numbers made harvesting uneconomical; however, natural history museums and private collectors plundered the last populations on the remote atolls for their skeletons. For example, a natural history expedition in 1911 to Mexico killed 200 seals, and virtually destroyed one of the few remaining colonies. Scientists have calculated that there were 233,000 to 338,000 monk seals throughout the Caribbean, with adult seals eating 245 kg and juveniles eating 50 kg fish per year. They calculated that fish populations on most Caribbean reefs to support these seals would be 4 to 6 times larger than current populations — similar to fish populations on remote Pacific reefs.

The demise of the seals and severe over-fishing occurred in parallel, providing more evidence that a major threat to Caribbean coral reefs is past and present over-fishing. Any other flow-on effects to reef ecosystems resulting from the extinction of monk seals are unknown. Disruption of food chains, particularly the removal of major predators, often results in major impacts with the possibility that some species could take advantage of the lack of predation and dominate the reefs; a topic of considerable conjecture (from McClanachan & Cooper, 2007. Proceedings Royal Society of London B, Doi:10.1098/rspb.2007.1757, published online).

Seal populations are also under threat at their last remaining refuges in the Pacific. Populations of the Hawaiian monk seal, *Monachus schauinslandi*, have dropped by 60% since they were first estimated in the 1950s (reported in 2004 global status report). Hopefully, the declaration of the Papahānaumokuākea Marine National Monument will provide sufficient protection to prevent these monk seals following their Caribbean cousins into extinction.

The situation with the two eared ‘seals’ on the Galapagos Islands is quite different. Fur seals (*Arctocephalus galapagoensis*) were nearly hunted to extinction in the 1800s for their rich fur, even though the peak population was probably only 50,000: in 1905 a California Academy of Sciences expedition did not find a single fur seal. Fortunately, hunting stopped and populations have bounced back from the brink of extinction, especially because these fur seals mainly eat offshore squid and do not compete directly with the inshore fishing industry. They, however, do suffer population crashes during very strong El Niño events. The Galapagos sea lion (*Zalophus wollebaeki*) was not targeted by early sealers, however, they compete with fishermen for inshore food resources and populations may be declining due to this competition, increases in disease, and some sea lions are killed illegally to extract the penis to sell in Asia as an aphrodisiac (from Scott Henderson, s.henderson@conservation.org)
Resumen Ejecutivo
Estado de los Arrecifes Coralinos del Mundo: 2008

Translation PEDRO ALCOLADO AND ALESSANDRA VANZELLA-KHOURI

Los arrecifes coralinos del mundo han efectivamente marcado el tiempo desde el último informe en 2004. Algunas áreas se han recuperado bien después del blanqueamiento a causa del cambio climático en 1998, mientras que en el Océano Índico más eventos de blanqueamiento y presiones humanas han demorado o revertido la recuperación.

Los estimados obtenidos a través de las opiniones de 372 científicos y administradores de arrecifes coralinos de 96 países, indican que el mundo, efectivamente, perdió 19% de los corales existentes; que 15% están seriamente amenazados de perderse en los próximos 10 a 20 años y que 20% están en peligro de desaparecer en 20 a 40 años. Estos últimos dos estimados se hicieron bajo el escenario de “condiciones normales”, sin considerar las sombrías amenazas del cambio climático mundial o que un manejo efectivo en el futuro podría conservar más arrecifes coralinos. Sin embargo, hay un 46% de los arrecifes coralinos del mundo que se consideran saludables, y bajo ninguna amenaza inmediata de destrucción, excepto por la amenaza “actualmente impredecible” del clima mundial. Estas predicciones implican muchas salvedades como se explica abajo.

En 2008, Año Internacional de los Arrecifes, hay una mezcla de noticias negativas y positivas en este reporte Estado de los Arrecifes Coralinos del Mundo: 2008. Varios eventos de importancia han dañado los arrecifes coralinos desde diciembre de 2004, cuando se publicó el reporte anterior “Estado de 2004”. Sin embargo, se han dado pasos muy positivos para conservar los arrecifes coralinos del mundo; en esencia, unos pasos adelante y otros atrás, tales como:

- El enorme terremoto y tsunami del Océano Índico el 26 de diciembre de 2004 golpeó con una enorme pérdida de vidas y destrucción a los países de la región. Hubo daño considerable a los arrecifes de coral, pero no comparable a la magnitud de las pérdidas humanas (Recuadro p. 130);
- 2005 fue el año más caliente en el Hemisferio Norte desde 1998, que resultó en un blanqueamiento masivo de los corales, así como en huracanes a lo ancho del Gran Caribe que mató muchos corales, dañando aún más sus arrecifes;
- Los arrecifes coralinos cerca de grandes centros de población, continúan perdiendo cubrimiento de corales, poblaciones de peces y, probablemente, de biodiversidad. De hecho, esto está sucediendo alrededor del “Triángulo de Coral” el centro mundial de biodiversidad marina (p. 55);
- Existe evidencia creciente de que el cambio climático está causando un impacto directo en más y más arrecifes coralinos, con claras señales de que la acidificación creciente del océano causará daños mayores en el futuro;
- Las evaluaciones socioeconómicas en arrecifes coralinos están incrementando y se utilizan más en la toma de decisiones para el manejo. Estas evaluaciones se están empleando para fortalecer y revigorizar las estructuras tradicionales de manejo, especialmente en el Pacífico donde los regímenes tradicionales de manejo permanecen intactos;
Sin embargo, el deterioro de los arrecifes coralinos tendrá consecuencias alarmantes para aproximadamente 500 millones de personas que dependen de ellos para la alimentación, protección costera, materiales de construcción, e ingresos del turismo. Esto incluye 30 millones que dependen casi totalmente de los arrecifes coralinos para su sustento o como terreno sobre el que viven;

Los problemas para los que manejan los arrecifes coralinos están aumentando ya que 50% de la población mundial vivirá a lo largo de las costas hacia el 2015, lo que impondrá presiones insostenibles sobre los recursos costeros. Los arrecifes que queden y que ellos manejen contendrán corales menos atractivos pero más resistentes. Los incrementos en los precios de los alimentos y de los combustibles, así como la crisis financiera mundial, están resultando en sobrepesca y el agotamiento en serie de las poblaciones de peces en muchos países pobres; y

La solución sigue siendo el establecimiento de Áreas Marinas Protegidas más efectivas, vinculadas en redes y manejadas por todos los actores interesados, especialmente las comunidades que viven de los arrecifes.

Oponiéndose a tales sombrías noticias, hay algunos avances importantes:

Se han declarado dos enormes Áreas Marinas Protegidas (MPAs) para los arrecifes coralinos del Pacífico: el Monumento Nacional Marino Papahanaumokuakea, que abarca las Islas Hawaianas del nordeste, y el Área Protegida de las Islas Phoenix (PIPA), declaradas por los gobiernos de los Estados Unidos de América y Kiribati, respectivamente (Recuadros p. 224, 195);

Grandes áreas de arrecifes coralinos alrededor de Nueva Caledonia han sido añadidas a la lista de Patrimonio Mundial (Recuadro p. 184) y están bajo consideración más áreas de otros lugares;

Los arrecifes coralinos en el Océano Índico, especialmente en Seychelles, Chagos y las Maldivas, así como Palau en el Pacífico Oeste, han continuado recuperándose después del blanqueamiento devastador de 1998;

En diciembre de 2007, el Presidente Yudhoyono de Indonesia ganó el apoyo y el financiamiento de líderes mundiales para la “Iniciativa del Triángulo de Coral” para conservar los arrecifes coralinos del Sudeste Asiático (p. 55);

Esta iniciativa fue expandida para incluir los países del Pacífico Oeste que bordean el Triángulo de Coral, cuando el Presidente Remengesau de Palau, instigó el “Reto de Micronesia” comprometiéndose junto con otros líderes a conservar un 20% terrestre y 30% de las aguas como áreas protegidas vinculadas en redes (p. 48);

Poco después, el Primer Ministro Ingraham de las Bahamas reunió a cuatro de sus vecinos para formar el “Reto Caribeño” cuyo fin es conservar 30% de sus recursos costeros (Recuadro p. 280).

Adicionalmente, ha habido otras actividades positivas para los arrecifes coralinos que incluyen:

La Iniciativa Internacional de Arrecifes Coralinos, actualmente co-presididas por México y los Estados Unidos de América, declaró el 2008 como Año Internacional de los Arrecifes Coralinos y desarrolló importantes campañas de concienciación alrededor del mundo;

El XI Simposio Internacional de Arrecifes Coralinos reunió 3,500 científicos, encargados de manejo y tomadores de decisiones en Fort Lauderdale, Florida USA en julio de 2008, para fortalecer la ciencia de la conservación de los arrecifes coralinos (p. 43)

Reef Check organizó 20,700 firmas sobre la “Declaración de los Derechos del Arrecife”, petición que fue lanzada en el Año Internacional de los Arrecifes Coralinos;
El Grupo Ambiental Pew está trabajando con los gobiernos de los países en desarrollo para declarar extensas áreas como reservas marinas de no-extracción incluyendo el Coral Sea en Australia; el norte de las Islas Marianas; el Archipiélago de Chagos, en el Océano Índico, y Kermadec Trench, al nordeste de Nueva Zelanda;

El Programa de Investigación y Creación de Capacidades para el Manejo de Arrecifes Coralinos (Coral Reef Targeted Research and Capacity Building for Management Program) estableció cuatro Centros de Excelencia para crear capacidad científica para el manejo (p. 47)

CRISP (Iniciativa para los Arrecifes Coralinos del Pacífico) ha expandido las operaciones a 17 islas del Pacífico con progreso considerable en la elevación de la capacidad para el manejo y la evaluación socioeconómica de los arrecifes (p. 45)

Los gobiernos de Francia y los Estados Unidos de América elaboraron en el 2008 resúmenes importantes de informes nacionales; el Nodo del Pacífico Sudoccidental produjo en el 2007 un informe regional. Los informes de Francia y del Pacífico SO se presentaron en el formato del GCRMN;

El Fondo para el Medio Ambiente Mundial (GEF) ha dedicado $100 millones a la Alianza del Pacífico para la Sostenibilidad, para unir a los países de este Océano con el fin de conservar su ambiente. Parte de este dinero se está destinando a la Iniciativa del Triángulo de Coral y al Reto de Micronesia.

Alemania ha lanzado un nuevo instituto para la biodiversidad y el clima en el Instituto Senckenberg en Frankfurt, que tendrá un importante componente sobre arrecifes coralinos.

**Recomendaciones Para la Acción Hacia la Conservación de Los Arrecifes Coralinos**

Este resumen de recomendaciones se basa en los 17 capítulos regionales y los reportes de otros especialistas. Al final de la mayoría de los capítulos hay recomendaciones más detalladas y específicas. Lo que sigue es lo que muchos autores y quienes contribuyeron consideran urgentemente necesario para conservar los arrecifes coralinos para las generaciones futuras:

**Combatir urgentemente el cambio climático mundial** – las tasas actuales del cambio climático imponen la mayor amenaza en un futuro a largo plazo para los arrecifes coralinos y las comunidades humanas costeras. Pedimos que la comunidad mundial, a través de sus gobiernos, agencias, ONGs, instituciones académicas y especialmente las entidades comerciales, que colaboren para reducir urgentemente la tasa actual de emisión de gases de invernadero por medio de reducciones en el uso de energía y el desarrollo de mecanismos de generación de energía o sistemas de comercio sostenibles, y desarrollar tecnologías para eliminar estos gases de la atmósfera, especialmente CO2, para asegurar que los arrecifes coralinos prosperen en el próximo siglo.

**Maximizar la resiliencia de los arrecifes coralinos (minimizando las presiones humanas directas sobre estos)** – la segunda amenaza en importancia a los arrecifes proviene de las actividades humanas directas; sobrepesca y pesca destructiva; contaminación por sedimentos provenientes de mal uso del suelo; escorrimento de nutrientes y otros tipos de contaminación; y pérdida de hábitats causada por un desarrollo insostenible. El control de estas amenazas, que están deteriorando los arrecifes en todo el mundo, especialmente en países en desarrollo incluyendo los pequeños estados insulares, mejorará su resiliencia para enfrentar el cambio climático. Estos países necesitan asistencia para mejorar el manejo de sus cuencas y costas fortaleciendo capacidades y otorgando fondos
para implementar manejo comunitario y desarrollar alternativas de vida que reduzcan la presión sobre los arrecifes.

- **Mejorar el manejo de las áreas protegidas** – es necesario mejorar el manejo de las áreas marinas protegidas existentes (AMP) para acelerar la recuperación de las poblaciones de peces agotadas y proteger los bienes y servicios de los arrecifes coralinos que sostienen las economías y medios de sustento costeros. Esto incluye el manejo de las cuencas adyacentes a fin de evitar la contaminación por nutrientes y sedimentos y así crear áreas de amortiguamiento que reforzarán las actividades de manejo de las AMPs.

- **Incluir más arrecifes en las AMPs** – un enfoque de gobernanza comprobado y efectivo para conservar arrecifes coralinos y promover su uso sostenible es incluirlos en AMPs manejadas con efectividad; preferiblemente que contengan una proporción significativa de reservas pesqueras, vinculadas a redes de AMPs y dentro de un marco más amplio de gobernanza. Los países en desarrollo necesitan asistencia para expandir sus redes de AMPs y establecer marcos de gobernanza para el manejo integrado costero.

- **Proteger arrecifes lejanos** – hay muchos arrecifes coralinos lejanos de las masas continentales y poblaciones humanas que, si se protegen, serán capaces de actuar como reservorios de biodiversidad para reabastecer arrecifes degradados. Recomendamos el establecimiento de más AMPs para incluir muchos de los arrecifes de islas remotas, como las del oeste de Hawai, las de Kiribati, y las de Coral Sea al este de la Gran Barrera de Arrecifes. Los países desarrollados pueden tener los mejores recursos de gobernanza y cumplimiento para declarar áreas protegidas remotas de mayor tamaño.

- **Mejorar el cumplimiento de las regulaciones en las AMPs** – Se requerirán sistemas de gobernanza capaces de implementar regulaciones para hacer frente al gran problema de regular el acceso a los ecosistemas manejados (incluyendo tipos y tasas de explotación de recursos). Muchos países necesitarán asistencia para establecer sistemas de cumplimiento efectivos, que funcionen en diferentes ambientes marinos y costeros y que no debiliten los valores y prácticas culturales locales.

- **Ayudar a mejorar la toma de decisiones mejorando el monitoreo ecológico y socioeconómico** – con las crecientes amenazas del cambio climático, existe una necesidad urgente de mejorar el monitoreo suministrando información a los gestores de recursos naturales y tomadores de decisiones para que se ejecuten acciones apropiadas para reducir las amenazas a los arrecifes y comunidades costeras.