



GLOBAL CORAL REEF
MONITORING NETWORK

Status of Coral Reefs of the World: 2000

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*“The struggle to conserve coral reefs is now
at a critical stage”*

Al Gore

Vice President, United States of America

CORAL REEFS CONTINUE TO DECLINE

Coral reefs of the world have continued to decline since the previous GCRMN report in 1998. Assessments to late 2000 are that 27% of the world's reefs have been effectively lost, with the largest single cause being the massive climate-related coral bleaching event of 1998. This destroyed about 16% of the coral reefs of the world in 9 months during the largest El Niño and La Niña climate changes ever recorded. While there is a good chance that many of the 16% of damaged reefs will recover slowly, probably half of these reefs will never adequately recover. These will add to the 11% of the world's reefs already lost due to human impacts such as sediment and nutrient pollution, over-exploitation and mining of sand and rock and development on, and 'reclamation' of, coral reefs.

These new assessments show that the problems are most severe in:

- Middle East - 35% lost mostly in the Arabian/Persian Gulf, with a low chance of short-term recovery;
- Wider Indian Ocean - 59% lost with a reasonable chance of recovery for the remote reefs not affected by human pressures;
- Southeast and East Asia - 34% lost with a reasonable chance for slow recovery on the remote reefs, and dire predictions for the future of the remaining reefs; and,
- Caribbean/Atlantic Region - 22% lost due mostly to previous human stresses, hurricanes, bleaching and coral diseases.

In contrast, the extensive reefs in the Pacific and off Australia are in reasonably good health with a positive outlook; unless global climate change events like those of 1998 strike these areas. Indications are that bleaching may recur with severe localised bleaching mortality near Fiji and the Solomon Islands in early 2000.

Regions of the World	% reef destroyed pre 1998	% reef destroyed in 1998	% reef in critical stage, loss 2-10 years	% reef threatened, loss 10-30 years
Arabian Region	2	33	6	6
Wider Indian Ocean	13	46	12	11
Australia, Papua New Guinea	1	3	3	6
Southeast & East Asia	16	18	24	30
Wider Pacific Ocean	4	5	9	14
Caribbean Atlantic	21	1	11	22
Status 2000 Global *	11	16	14	18

* Mean values adjusted for the proportional area in each region of the global total of coral reefs

Coral reef experts from around the world have provided data on current losses and have predicted potential losses assuming a 'business-as-usual' scenario with little effective conservation. They stressed that many reefs lost in 1998 should recover with some clear evidence of slow recovery.

By 1992 10% of the worlds reefs were lost; 30% were in a critical state with predictions of loss in 10 to 20 years without effective management; and a further 30% were threatened with destruction in 20 to 40 years. The global 1998 Reefs@Risk analysis from the World Resources Institute suggested that 27% of the world's existing reefs were under immediate threat of significant damage and a further 31% under a medium level of risk.



CORAL BLEACHING AND MORTALITY IN 1998

The massive coral bleaching and mortality event of 1998 devastated large parts of the Indian Ocean, Southeast Asia and the far western Pacific. The most affected reefs were in the Arabian/Persian Gulf, Kenya, Tanzania, the Seychelles, Maldives, Chagos banks, Sri Lanka and India in the wider Indian Ocean, parts of Southeast Asia, especially Vietnam, the Philippines, Taiwan, southern Japan, and Palau. Many areas reported coral losses of 60-90% over large areas and often down to 30m or more. In the wider Caribbean and parts of the Great Barrier Reef there was minimal mortality after extensive bleaching, and many severely bleached reefs recovered almost fully. There was no bleaching over vast areas of the Pacific. The bleaching was caused by the combination of extremely calm conditions during the 1997-98 El Niño-La Niña events, coupled with a steadily rising baseline of sea surface temperatures in the tropics (increasingly attributed to greenhouse warming). These drove temperatures in parts of the tropics above records for the past 150 years, and bleaching was indiscriminate; impacts were equally severe on pristine, remote reefs as on reefs already under major human stresses.

It will be several years before we can state that reefs will recover, or whether there will be local losses of species, including some rare endemic species. Reef recovery will depend on few or no repeats of the extreme events of 1997-98, and even then, it will take 20 to 50 years before reefs recover to structures resembling those before the bleaching. Recovery will often depend on reducing human pressures through sound management.

TWO PARALLEL AGENDAS TO CONSERVE CORAL REEFS

The events of 1998 indicate that we need two parallel thrusts to conserve coral reefs:

- direct management to reduce human stresses of land-based pollution, shoreline and reef modification, and over-exploitation, including damaging practices like blast and cyanide fishing. The best mechanisms are through integrated coastal management combining policy, legal and economic actions and the establishment more effective Marine Protected Areas; and,
- global action to study the impacts of global climate change on coral reefs and reduce emissions of greenhouse gases.

Coral reefs are ideal models for management and conservation as they are often discrete with water barriers separating them from the sources of land-based pollution and exploitation. Reefs have high 'charismatic appeal' with the public demanding their conservation. There are no large economic or political lobbies opposing conservation and the massive reef-based tourism and transport industries support conservation. Reefs are strategically important for about 20 members of the United Nations which have natural resources other than reefs and another 70 countries or states have coral reefs which expand their economies and Exclusive Economic Zones. Coral reefs are frequently major discussion topics at meetings of the Conventions on Sustainable Development, Biological Diversity, and the Asia Pacific Economic Co-operation.

International efforts to monitor, research, manage and conserve coral reefs have expanded recently with the formation of the International Coral Reef Initiative (ICRI) in 1994 and the Global Coral Reef Monitoring Network (GCRMN) in 1996. ICRI has compiled the coral reef problems and needs of almost 90 countries during global and regional meetings from mid-1995 to early 2000. The Call to Action and Framework for Action were produced in 1995 and the Renewed Call to Action in 1998, along with many regional recommendations for action to conserve coral reefs (www.environnement.gouv.fr/icri and www.icriforum.org). Major government and agency donors participate in ICRI with the running of the global Secretariat being undertaken by USA from 1995-96, Australia from 1997-98, France from 1999-2000 and by a partnership of Philippines and Sweden for 2001-02. There are two new ICRI networks to conserve reefs: the International Coral Reef Information Network (ICRIN), established in 1999 to raise awareness about coral reefs, particularly targeting senior decision-makers; and the International Coral Reef Action Network (ICRAN) with funding from the UN Foundation to establish demonstration sites around the world showcasing successful MPA conservation projects and serving as major training facilities. The US Coral Reef Task Force was formed in response to President Clinton's Executive Order 13089 in June 1998 to conserve the coral reefs under U.S. jurisdiction and assist in international activities.

STATUS OF CORAL REEFS IN REGIONS OF THE WORLD

Arabian Region: Reefs in the Arabian/Persian Gulf were virtually obliterated by severe coral bleaching in 1996 and 1998, whereas reefs in the Red Sea continue to be healthy, with the major threats coming from tourism, oil industry developments and shipping.

South Asia: Most reefs were severely damaged during the extreme climate events of 1998 and some were totally devastated. Reefs on the Maldives, Sri Lanka and parts of western India lost much of their coral cover, and these losses have added to major anthropogenic damage from coral mining, over-fishing and pollution.

East Africa and Southern Indian Ocean: Reefs off continental Africa and Madagascar are continually damaged by sediment runoff, nutrient pollution and over-exploitation of reef resources. Severe bleaching hit the Comoros, Kenya, Seychelles and Tanzania during 1998, with live coral losses of 80 to 90%, but there are signs of slow recovery. Reefs in the south were only slightly affected.

Southeast and East Asia: The world's largest areas of coral reefs with the highest biodiversity are probably under the greatest threats from human activities, including an explosive growth in damaging fishing activities: blast fishing and the use of cyanide for the live reef fish trade. Coral bleaching caused major losses of corals in southern Japan, Taiwan and Vietnam and parts of the Philippines and Indonesia, with many losses of 30-60%, and some as high as 80-90% with localised extinctions of prominent corals. Co-management with local communities is emerging as the best method to implement sustainable management.

Australia and Papua New Guinea: Australian reefs are generally in good condition and continue to be well managed, with low levels of human impacts. However, sediment and nutrient runoff from over-grazed range lands and increasing fishing pressures are affecting the Great Barrier Reef. Coral bleaching was intense in early 1998, but only on inshore reefs. Crown-of-thorns starfish are again attacking the offshore reefs. Similarly most PNG reefs are in good condition, except for damage from excessive logging and exploitation on some nearshore

reefs. Management capacity and commitment for management needs to be enhanced.

The Pacific – Micronesia, Melanesia and Polynesia: These vast coral reef areas mostly escaped coral bleaching mortality in 1998 with the exception of major losses in Palau, and significant bleaching coral losses in Fiji and the Solomon Islands in early 2000. Most of the reefs are in good to excellent condition, with some damage from development on the high islands and over-fishing around centres of population. Few countries are conserving their coral reefs by establishing marine protected areas, but traditional management of coral reef resources is still active and effective.

The American Caribbean: The US Coral Reef Task Force has catalysed action in Puerto Rico and the U.S. Virgin Islands to overcome serious over-fishing and damage to coastal mangroves and seagrasses. There is greater urgency to conserve Florida reefs from pollution from massive agriculture and growing human populations wanting to enjoy coral reefs, and exploit key target species. There is an ambitious target of having 20% of reef resources managed as no-take reserves within the next few decades.

Caribbean and Western Atlantic Islands: Most islands have narrow coastal shelves with over-fishing and sediment and pollution impacting directly on the reefs e.g. Eastern Antilles, Jamaica, Haiti and the Dominican Republic. Exploitation and pollution are much less over the broad shelves e.g. Cuba, Bahamas, Turks and Caicos Islands. Tourist industries on Bermuda, Bonaire, the Cayman Islands and some of the Eastern Antilles are enhancing reef conservation by demanding healthy fish populations and providing alternative livelihoods. Coral cover has decreased on most islands because of coral diseases and pollution e.g. on northern Jamaica coral cover dropped from 52% in the 70s to 3% in the early 90s, with some recent recovery to 10-15%; and on St. Lucia cover dropped from 50% to 25% at 3m depth and from 35% to 17% at 10m. Capacity to conserve reef resources near rising populations is variable; some countries are implementing community-based, or tourism-funded, management and monitoring, whereas others need assistance.





South and Central America: Reefs were seriously degraded during the 1980s and 90s by increased sediment and nutrient pollution on nearshore reefs from deforestation, poor agriculture and diversion of rivers, as well as repeated coral bleaching, coral diseases, and major hurricanes. Offshore reefs are increasingly over-exploited for fisheries, coral rock and sand, resulting in distinct declines of coral cover and fish populations. There is strong willingness to monitor and manage reefs in the region, but capacity varies enormously from advanced to very limited.

CALLS FOR ASSISTANCE FROM CORAL REEF COUNTRIES

- The following issues have been raised by many countries:
- Coral reef monitoring should be expanded with more training and employment of staff, and funding for logistics, monitoring and databases. Monitoring should be encouraged in communities and volunteers to foster ownership;
 - Greater coordination of existing monitoring is needed to ensure that data and information are delivered in a timely manner to the world. The GCRMN will assist with such coordination;
 - Small marine protected areas are often successful, but surrounded by devastation. These need to be networked to include many uses and communities, to address catchment area and trans-boundary problems, and to accommodate industrial and tourism development along with traditional uses;
 - Coral reefs are generally self-repairing systems, however practical and low-cost rehabilitation methods may be warranted where recovery is not proceeding normally. Such methods must be effective at the scale of the damage, and not local 'band-aid' gimmicks;
 - Where traditional rights and management practices exist, they should be recognised and incorporated into state laws to allow for co-management of coastal areas. Many effective traditional conservation practices are being eroded under state and international law and 'western' influences;
 - Legal assistance may be required to balance conservation and development. Many laws from colonial times focussed on sectoral rather than integrated management e.g. optimised fishery or forestry harvesting. Countries need to redraft statutes to remove multi-sectoral overlaps

- in jurisdiction over coastal resources and promote sustainable use, including establishing MPAs; and,
- Many countries are concerned that global climate change may destroy their coral reefs, and they requested assistance in assessing future climate change impacts and alternative energy programs. Coral reef countries strongly urged developed countries to curb greenhouse gas emissions, to save their coral reefs and countries.

FUTURE PREDICTIONS FOR CORAL REEFS

We suggest that 40% of the world's coral reefs will be lost by 2010, and another 20% in the 20 years following unless urgent management action is implemented. While these figures are alarming, recent events show that they may be conservative. The continuation of severe anthropogenic stresses from growing populations and economies and the shock that came with the 1998 mass bleaching event all indicate that urgent action is essential to conserve coral reefs.

The major human threats to coral reefs can be managed by providing alternative livelihoods and educating people about the stresses that degrade coral reefs. If increases in greenhouse gas emissions are confirmed as the trigger for global climate change, then events like the El Niño-La Niña of 1997-98 will recur with increased severity and frequency, and reverse any coral reef recovery. We cannot predict where the next bleaching event will occur, but we know that coral bleaching can obliterate pristine, remote reefs as well as reefs under human stresses. Poor management of human activities on reefs will slow any recovery e.g. over-fished reefs are overgrown with large fleshy algae that prevent coral recruitment.

Already 11% of the world's coral reefs have been lost and a further 16% are severely damaged. Some should recover; others will not and the worse is yet to come with probable significant reductions in coral cover, and biodiversity. Large areas of Pacific coral reefs are under no immediate threat, except for climate change.

"The children of tomorrow have the right to experience the beauty and wonder of coral reef ecosystems. I call on all of us - nations, societies and individuals - to act now to reduce the threats to these remarkable ecosystems. We must ensure that this report marks the beginning of a powerful new age of coral reef protection, not the sad ending to their very existence."

Al Gore



The Global Coral Reef Monitoring Network is part of ICRI - the International Coral Reef Initiative. The goals of the network are:

- to provide data and information on status of coral reefs of the world; and,
- to raise awareness in all stakeholders on the status of reefs and the need for urgent action.

The GCRMN is:

- a global network of people, governments, institutes and NGOs monitoring coral reefs in over 80 countries or states, with another 20 countries set to start.
- a partnership of monitoring programs including Reef Check, CORDIO, CARICOMP, AGRRA.
- a coordination mechanism for publishing results for decision makers & public.

The GCRMN encourages and coordinates monitoring by:

- communities, fishers, schools, colleges, tourist operators and tourists using Reef Check methods & protocols.
- government environment or fisheries departments, and universities with higher resolution methods (e.g. English et al. 1997).
- researchers with high resolution scientific monitoring for specific questions.

Major supporters of GCRMN:

- US Department of State and National Oceanic and Atmospheric Administration;
- DFID (UK Department for International Development);
- Sida and SAREC of Sweden;
- Governments of France, Australia and Japan.

Co-sponsors:

- IOC-UNESCO – Intergovernmental Oceanographic Commission of UNESCO;
- UNEP – United Nations Environment Programme;
- IUCN – The World Conservation Union;
- The World Bank;
- AIMS – the Australian Institute of Marine Science;
- ICLARM – The World Fish Centre; and,
- ReefBase, the global coral reef database.

The GCRMN Network consists of independent Regional Nodes (based on UNEP Regional Seas areas) and other groupings, which coordinate training, monitoring and databases in participating countries and institutes:

- Middle East – assisted by Regional Organisation for the Conservation of the Environment of the Red Sea and Gulf of Aden (PERSGA) and Regional Organisation for the Protection of the Marine Environment (ROPME).
Contact: Fareed Krupp (fareed.krupp@persga.org)
- Southwest Indian Ocean Island States Node – Comoros, Madagascar, Mauritius, Reunion and Seychelles with European Union, Indian Ocean Commission, Global Environment Facility
Contact: Lionel Bigot (lionelbigot.arvam@guetali.fr)
- East African Nodez – Kenya, Mozambique, South Africa and Tanzania via CORDIO in Mombasa with KMFRI and KWS
Contact: David Obura (dobura@africaonline.co.ke)

- South Asian Node – India, Maldives and Sri Lanka supported by UK Department for International Development
Contact: Emma Whittingham (reefmonitor@eureka.lk)
- South East Asia – all countries independent,
Contact: Chou Loke Ming (dbsclm@nus.edu.sg); or, Hugh Kirkman (kirkman.unescap@un.org)
- SW Pacific 'IOI-Pacific Islands Node' – Fiji, Nauru, New Caledonia, Samoa, Solomon Islands, Tuvalu, Vanuatu
Contact Robin South (south_r@usp.ac.fj); or, Posa Skelton (skelton_p@student.usp.ac.fj)
- SE and Central Pacific – the 'Polynesia Mana Node' – Cook Islands, French Polynesia, Kiribati, Niue, Tokelau, Tonga, Wallis & Futuna with French support
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- Micronesia - the 'MAREPAC Node' – American Samoa, Marshall Islands, Federated States of Micronesia, Northern Marianas, Guam, Palau
Contact: Bob Richmond (richmond@uog9.uog.edu)
- Hawaiian Islands – US Pacific Node
Contact: Dave Gulko (david_a_gulko@exec.state.hi.us)
- U.S. Caribbean Node – Florida, Flower Garden Banks, Navassa, Puerto Rico, U.S. Virgin Islands
Contact: Donna Turgeon (donna.turgeon@noaa.gov)
- The British Overseas Territories in the Caribbean. Supported by DFID UK.
- Northern Caribbean and Atlantic – Cuba, Dominican Republic, Haiti, Jamaica, and Bahamas
Contact Jeremy Woodley (woodley@umimona.edu.jm)
- North Central America & Mesoamerican Barrier Reef System - Mexico, Belize, Guatemala, Honduras
Contact: Philip Kramer (pkramer@rsmas.miami.edu), Ernesto Arias-Gonzalez (earias@mda.cinvestav.mx), or Marea Hatzioiols (Mhatziolos@worldbank.org)
- Eastern Caribbean – OECS plus Trinidad and Tobago, Barbados
Contact: Allan Smith (smitha@candw.lc)
- French Caribbean Islands
Contact: Claude Bouchon (claud.bouchon@univ-ag.fr)
- The Dutch Antilles
Contact: Kalli de Meyer (kdm@bonairelive.com)
- Southern Tropical America Node - Costa Rica, Panama, Colombia, Venezuela and Brazil
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Web sites

www.icriforum.org www.environnement.gouv.fr/icri
www.aims.gov.au/scr1998 www.coral.noaa.gov/gcrmn