

IUCN MARINE

WORKING GROUP ON CLIMATE CHANGE AND CORAL REEFS

*Implementing resilience principles in the
management of coral reefs impacted by climate change*

Terms of Reference

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INTRODUCTION

Background/Rationale

Coral reefs are highly diverse ecosystems that are vital to the welfare of large human populations throughout the tropical world. They are also highly vulnerable to climate change, with 16% of the world's reef suffering serious damage during the global bleaching event of 1998. This Working Group aims to bridge gaps between theoretical science and management application in order to fast-track the development and use of tools that would improve the protection of coral reefs under the threat of climate change and interacting or synergistic human threats. The outputs of the working group will have important relevance for research agendas and conservation programs around the world.

The immediate threat to coral reefs from climate change is acute, and both science and management practitioners are racing to develop knowledge and tools that may help limit the vulnerability of reefs to climate change. Resilience principles currently form the most promising framework to guide research and support adaptation of complex social-ecological systems such as coral reefs.

A series of workshops and meetings held from 2000 to 2005 form the basis for this working group, identifying an increasing need for rapid exchange between management and science communities on the prospects of mitigating the impact of climate change on coral reefs. Coinciding with the workshops and dialogue among practitioners, a number of organizations active in science and management started to develop materials advising managers on what actions to take during a bleaching event and to minimize bleaching on coral reefs. In spite of their being a limited number of specific recommendations for action, the need for best-practice approaches based on available knowledge was identified as a critical need. At the same time a number of scientific papers explored the relationships between physical and environmental factors important in coral bleaching and recovery, and the science of resilience came to the forefront as a framework for both the study and conservation of coral reefs. The relevance of these workshops, management outputs and research syntheses are listed in Appendix 1.

Recognizing the highly dynamic nature of science in this area, the growing risk of climate-induced bleaching and the growing need for sound advice to management, this working group was formulated to facilitate the reciprocal flow of information between scientists and managers to continually update and improve recommended management practices for mitigating climate change threats to coral reefs. At government and inter-governmental levels, policy outputs from the working group will seek to inform at the highest levels the possibilities of mitigating climate change impacts on coral reefs and thereby empower management efforts at local, national and regional levels.

Goal and Objectives

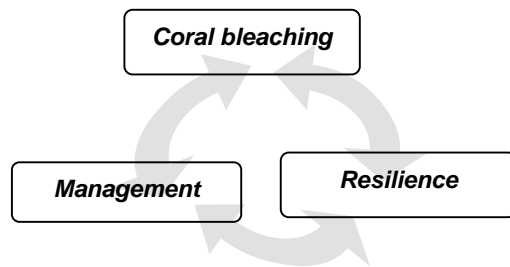
The goal of the working group is to bridge gaps between science and its application in management to fast-track the development and use of tools that would improve the protection of coral reefs under the threat of climate change and interacting/synergistic human threats. Specific objectives are:

- 1) To identify and synthesize knowledge gaps and management issues,
- 2) To provide a mechanism to focus scientific contributions to management, and

- 3) To contribute to a synthesis between resilience, coral reefs and climate change in support of improved management of coral reefs.

Scope

The working group will provide a forum for leading practitioners in coral reef-climate change research (**coral bleaching**) and in ecological studies on reef dynamics and recovery (**coral reef resilience**) to exchange and synthesize ideas and insights to directly support the **conservation and management of coral reefs threatened by climate change**. This three-way exchange of ideas will serve to identify gaps and opportunities in our understanding of this complex system of people and the environment. As a host for the working group, IUCN provides a global reach combining technical, policy and management structures backed up by governments and IUCN member organizations, and targeting the needs of coral reef managers of all ranges of expertise, resources and social/political contexts.



The following aspects will form the focus of the group’s structure and activities:

1. **Climate change and coral bleaching** – incorporate the latest information from research on coral bleaching into management options, tools and practices; revise these as new knowledge is generated; and feed priorities and emerging questions from management to researchers;
2. **Resilience** – interpret and promote research on climate change and coral bleaching into a resilience framework; articulate management questions and challenges into a socio-ecological systems (SES) resilience framework to facilitate research; collaborate with leading resilience experts to develop practical products oriented to assist managers with broadly ranging skills and expertise to ask and answer questions on climate change and resilience-based management.
3. **Management** – build on latest management practices, training and concept development; provide more efficient knowledge transfer between researchers and management practitioners; develop training opportunities to build capacity in coral reef management and conservation; promote uptake of key messages in policy circles to support and empower effective management of coral reefs at all levels.

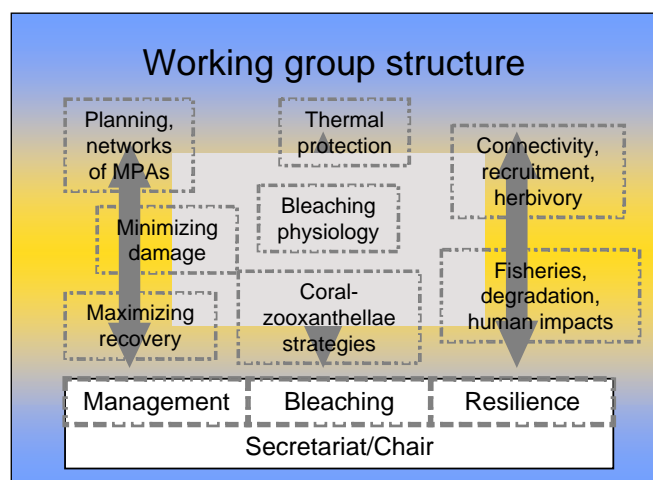
THE WORKING GROUP

The working group will address the steps in the linked questions at right, at each point addressing current knowledge and gaps in science, capability in management and recommendations for management (and see Appendix 2). Where significant effort is already being applied by existing programmes, the working group will add to those where possible while prioritizing gaps not receiving sufficient attention.

- is the reef exposed to thermal stress?
- is coral bleaching weak or severe?
- is coral mortality low or high?
- is recovery fast or slow?

Working group structure

The working group will mirror this three-part structure of bleaching dynamics, resilience and management. A Steering Committee (SC) of leading practitioners will include a member from each field plus 2-3 others, a representative of the working group secretariat and the chair. The SC will advise the chair and secretariat in the scope and running of the group and be instrumental in defining and promoting the scope of work of the group.



Working group members will be sought among leading scientists and management practitioners whose work provides source material within the scope of the working group, thereby contributing

to debate on issues, syntheses, conclusions and recommendations for management and policy. Depending on their interest and desired level of commitment, members might contribute within one specific area (such as controls on SST patterns conferring thermal protection) or across a broader set of topics. Through their ongoing work, members will provide key linkages for the working group to other projects and initiatives with similar objectives to ensure synergy and coherence of outcomes, limit overlaps or conflicts and potentially provide testing opportunities through management trials or research.

Working group operations

Provisionally, we anticipate two main modes of enquiry on priority topics:

- workshops, at which a sub-section of the working group comes together to debate the particular issue. These might be stand-alone meetings or part of a larger meeting, and documentation will include a short summary of the contribution of each attendee, a record of discussions and synthesis of conclusions on the science noting both coherent and conflicting results, key recommendations that can be made for management and policy, and gaps in knowledge and management that could be addressed by research and/or management trials.
- review or synthesis documents, where sufficient information is in the literature, or there is too much of a gap to enable a synthesis, to make key findings as outlined above for the mini-workshops.

Outputs from each of these methods (see below) will be used to compile a synthesis of the topic as final reporting on the project, and frameworks of management and policy recommendations, as joint outputs from the working group as a whole.

Where a topic is being sufficiently covered by an existing programme the working group can explore whether it can contribute to the topic and add value, and to summarize findings from that programme into the matrix of questions addressed by the working group.

First steps – 2006

A prioritization of topics to cover within the working group will be achieved through consultation within the steering committee and as members join the working group. This will be conducted through:

- a) compiling current knowledge of the field into a logical structure from which research hypotheses and management questions can be raised and related to each other (see Appendix 2);
- b) consultation with managers through ITMEMS (October 2006) and R2 training sessions in East Africa (May 2006) and South Asia (January 2007) on priority issues and areas of uncertainty for them;
- c) querying potential members through a questionnaire to indicate areas in which their work is contributing to the subject of the working group, priority questions and topics in which answers may be produced in the life of the project, and their desire to participate in the deliberations and outputs of the working group.

The results of the above consultations will be debated at a first meeting in early 2007 of the Steering Committee and some working group members. This will provide an opportunity to agree on a priority set of questions and how to address these within the time and budget of the working group. A workplan for conducting the reviews and workshops, contributions of different members and support arrangements from the working group budget will also be drawn up at this time.

Workshops and technical reviews – 2007 - June 2008

Sub-groups identified in the priority-setting above will each work on their core topic through a workshop process or review. Each sub-group will identify a range of outputs/deliverables under the classes identified below, focusing on generating a final set of general and specific recommendations for management and policy.

Findings and outputs – July-December 2008

Based on the findings of the various components of the working group, an overall synthesis will be compiled under the guidance of the Steering Committee and key members. Outputs will comprise a broad set of publication types oriented towards documenting working group findings, contributing to scientific literature and generating outputs useful for management and policy (see Outputs/deliverables below). Primary scientific and technical reporting will be targeted to occur during the 11th International Coral Reef Symposium in Florida in July 2008.

Taking advantage of IUCN's members network of governments and international organizations, a policy synthesis and briefs and programme for streamlining the uptake of technical recommendations at policy levels will be prepared. Policy and management outputs will be targeted for release at the 5th IUCN World

Conservation Congress, to take place in Barcelona in November 2008. The outcomes of the project will also be used to identify any continuing and follow-on activities to be pursued by the working group and IUCN.

Outputs/deliverables

Outputs from each activity under the working group will be targeted at generating management and policy-oriented tools. Reflecting the goal of the working group as a forum for discussion and synthesis, 4 types of outputs are identified:

- a) general outputs and information resources such as summaries of specific areas of knowledge, annotated bibliographies, collections of related materials etc. that assist the group and others in accessing the literature and documenting the *status quo*;
- b) reviews and technical reports from sub-groups developed as workshop proceedings and/or joint-author reviews. These will be published by the working group as IUCN Technical Reports and where appropriate with joint institutional hosting with members’ organizations. Where possible, syntheses of findings will be prepared by sub-group members for peer-review publication;
- c) contributions to management tools including training and information materials, resilience indicators and protocols for their use and updates to current materials offered by members of the group and modules on the subject for courses (e.g. for MPA/ICZM managers).
- d) policy synthesis and briefs, and an outline for streamlining uptake of technical recommendations at policy levels at government, intergovernmental and convention levels relevant to biodiversity, sustainable development and climate change.

Outputs will be made publicly accessible through networks provided by group members, including IUCN publications series and website, reporting of the 11th ICRS and 5th WCC, Reefbase, the Resilience Partnership and others. Peer-review outlets for all scientific/review outputs will be targeted.

Workplan and milestones

The initial trajectory of the group will be set by feedback and outputs from the session “Building Resilience into Coral Reef Management” at ITMEMS (October 2006) and a meeting of stream organizers and working group participants during ITMEMS. This will identify the activity areas to be covered until June 2008, with technical outputs being presented during the ICRS in July 2008 in Florida, and management/policy outputs to be presented at the IUCN World Conservation Congress in Barcelona in November 2008.

	06-q3	06-q4	07-q1	07-q2	07-q3	07-q4	08-q1	08-q2	08-q3	08-q4
Documents/planning	xxxx									
Content, SC setup		xxxx								
ITMEMS, UNFCCC		xxxx								
SC meetings			xx						xx	
Report			xx				xx			xx
Workshops/reviews			xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		
Scientific outputs, ICRC Florida									xxxx	
Policy/management outputs, IUCN WCC										xxxx

Roles and Responsibilities

A simple working group structure will be adopted. The primary work will be conducted through a series of sub-group activities with independent workplans and designated outputs. Each of these will be led by an activity leader. Overall coordination will be through the Secretariat and Chair. A Steering Committee of key members will assist the chair/secretariat and working group to function in a conceptually cohesive fashion. Key roles and responsibilities for each of these are presented below:

<p>Steering committee</p> <ul style="list-style-type: none"> o act as advisor in establishment and functioning of the working group, to supportguide the chair and mediate actions of the working group. o Assist where relevant in consensus building within and across themes and activities of the working group. o Assist with identifying suitable reviewers for working 	<p>Chair</p> <ul style="list-style-type: none"> o A primary role in the conceptual integrity, content, conclusions and delivery of outputs of the working group. o Work with group members to identify primary topics for group activities and gaps for further work. o Build synthesis and consensus among working group
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<p>group outputs, and conduct reviews as possible.</p> <ul style="list-style-type: none"> o Link group activities to related initiatives globally. 	<p>members and outputs.</p> <ul style="list-style-type: none"> o Editing, review and synthesis of outputs. o Represent the Working Group.
<p>Members</p> <ul style="list-style-type: none"> o The substance of the working group is the information and work experience that members bring to the group, and the published literature. o Participate in relevant working group activities and contribute to outputs, with some taking leadership role for specific activities/sub-groups. o Identify future projects and frameworks to test the hypotheses and questions generated by the working group 	<p>Secretariat</p> <ul style="list-style-type: none"> o Coordinate the workplan and administration of working group activities o Facilitate communication and flow of information between group members and monitor work flow. o Coordinate, plan and edit outputs. o Organise logistical requirements for working group meetings

REFERENCES

Reference documents that underline the relevance and formulation of the IUCN working group on coral reef resistance and resilience to climate change.

<i>Workshops and proceedings citations</i>	<i>Relevance</i>
2000. CORDIO workshop, Kenya. Wesmacott et al. 2000.	First publication to advise on general approaches to managing bleaching on coral reefs.
2000. Internatinoal Coral Reef Symposium, Coral Bleaching impacts.	Addressed ecological and socio-economic impacts of bleaching and the need to look at management and policy frameworks for future mitigation.
2001. MPA bleaching workshop. Salm and Coles 2001.	Explored the range of levels from oceanographic to biological to management factors that need to be addressed in mitigating bleaching impacts to coral reefs.
2003. Workshop on Climate Change and Corals, Hawaii. Phinney et al. 2006	State of the science review of all aspects of coral bleaching.
2003. World Parks Congress – resilience session.	Built the case for developing training materials of practical approaches based on resilience principles for managers to apply in protected coral reefs from bleaching.
2004. World Conservation Congress – Dangerous climate change and side meetings	The IUCN CC provided the first forum for a broad discussion on setting up a working group on this topic focused on streamlining passage of information to management.

<i>Management products</i>	<i>Relevance</i>
R2 (2005)	CD-based training material for educating coral reef managers on options for managing/limiting bleaching impacts to coral reefs, including aspects of MPA network design and prioritizing/maximizing refuge properties related to resistance to bleaching and ecological resilience.
Oliver et al. (2004)	Design of a monitoring programme for application in Indonesia of a monitoring protocol before, during and after a coral bleaching event.
Marshall and Schuttenberg (2006)	Guide and training resource for coral reef managers to establish a comprehensive early warning, monitoring, communications and response programme around coral bleaching events.

<i>Scientific Publications</i>	<i>Relevance</i>
West and Salm (2003), Obura (2005)	Synthesis publications exploring the contribution of different environmental factors at various stages of coral bleaching events caused by thermal stress, incorporating aspects of protection, resistance, tolerance and resilience.
Nyström and Folke (2001), McClanahan et al. (2002), Bellwood et al (2004)	Review and synthesis publications applying resilience principles to coral reef ecological processes.
Folke et al. (2002), Hughes et al. (2003)	Synthesis publications using resilience principles as an organizing framework and common denominators between research and management issues on coral reefs.

Full citations

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