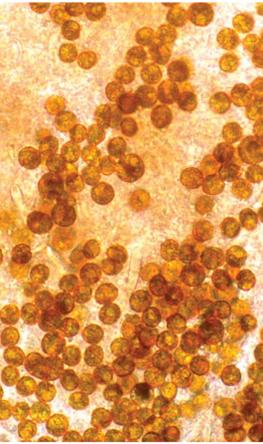


Over one-half of the world's population lives within **100 kilometres of the sea.**

## Coral Reef Targeted Research & Capacity Building for Management

### Coral Bleaching and Local Ecological Responses Working Group

## Understanding coral bleaching



Coral Symbionts  
image: Ove Hoegh-Guldberg



Bleached corals on reefs near the Keppel Islands  
image: Ove Hoegh-Guldberg



Dr Paul Marshall from the Great Barrier Reef Marine Park Authority examining bleached corals on reefs near the Keppel Islands  
image: Ove Hoegh-Guldberg



Bleached corals on reefs near the Keppel Islands  
image: Ove Hoegh-Guldberg

### Goals

- Advance our understanding of the susceptibility and tolerance of corals to rising sea temperatures.
- Improve our understanding of (and the linkages between) physiological stress and the ecological outcomes of thermal stress.
- Enhance management tools by which to identify and monitor stress on coral reefs.
- Develop more reliable projections of the conditions on coral reefs under rapid climate change.

### Outcomes

1. Predictive capability for how and when physical stress (heat and light) combine to cause bleaching and mortality.
2. Improved detection and identification of stress on coral reefs, and an enhanced ability to build resilience of coral reefs to climate change.
3. Development of management strategies to respond to climate change stresses on coral reefs worldwide.

### Working Group Members:

Ove Hoegh-Guldberg (University of Queensland, Chair), Yossi Loya (Tel Aviv University, Co-chair), John Bythell (University of Newcastle), William Fitt (University of Georgia), Ruth Gates (University of Hawaii), Roberto Iglesias-Prieto (Universidad Nacional Autonoma de Mexico), Ron Johnstone (The University of Queensland), Michael Lesser (University of New Hampshire), Tim McClanahan (The Wildlife Conservation Society), David Obura (CORDIO), Robert van Woesik (Florida Institute of Technology), Christian Wild (IOC/UNESCO).

## Implications for Coral Reef Management

- Management is currently ill-prepared to detect and respond to projected increases in coral bleaching and mortality. This project will fill vital gaps in our understanding and will lay the basis for new technologies and capabilities to respond to climate change.
- Improved projections of change will help inform long-term strategies designed to respond to climate change.



Large scale bleaching affected the world's largest continuous coral reef in early 2002. More than 60% of the Great Barrier Reef bleached and up to 5% have been severely damaged.

image: Ernesto Weil



Bleaching refers to the loss of symbiotic dinoflagellate algae, Symbiodinium, within the coral host leading to a bleached, white appearance. Bleaching is a stress response of the coral host and associated with elevated sea water temperature. Over extended time periods a bleached state can lead to death of the coral, and can occur over large areas of coral reef.

image: Ove Hoegh-Guldberg



image: Ove Hoegh-Guldberg

### More information

The University of Queensland is the Project Executing Agency (PEA). More information about the CRTR Program can be obtained from the PEA:

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The CRTR Program is a partnership between the Global Environment Facility, The World Bank, The University of Queensland (Australia), the United States National Oceanic and Atmospheric Administration (NOAA) and approximately 40 research institutes and other third parties around the world. The four sites or Centers of Excellence are **Southeast Asia**: Marine Science Institute of Bolinao, University of the Philippines; **East Africa**: Institute of Marine Sciences, University of Dar es Salaam, Zanzibar, Tanzania; **Mesoamerica/Western Caribbean**: Unidad Academica Puerto Morelos, Universidad Nacional Autonoma de Mexico, Mexico; and **Australasia/South Pacific**: Heron Island Research Laboratory, Centre for Marine Studies, The University of Queensland, Australia.

## Progress to date

1. Generated over 50 publications in peer-reviewed journals such as Science, Nature, and Global Climate Biology on the physiology and ecology of coral bleaching and disease.
2. Held major research workshops and training sessions in several regions including Mexico, Australasia and Indonesia.
3. Investigated and reported on mass bleaching events that occurred recently in Mexico (Sep-Oct 2005) and Australia (Jan-Feb 2006).
4. Improved the current working model of the mechanisms underpinning coral bleaching, disease and mortality.
5. Created a world wide catalogue of the genetics of coral symbionts (Symbiodinium) and have identified potential tolerant combinations of corals and Symbiodinium.
6. Produced a database of over 1300 potential stress proteins from Symbiodinium and have printed a "stress chip" for developing better ways of detecting stress in corals.
7. Improved the current understanding of how light exacerbates the effects of temperature on coral reefs.
8. Established long-term monitoring sites in Mexico, Tanzania and Australia for investigating community dynamics underpinning coral bleaching and mortality.