IH302 Thermal induced rapid coral mortality in Indonesia

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Coral reefs are an invaluable resource that millions of people worldwide are dependent upon. They provide a variety of 'ecosystem services' including the production of food, building materials, income, coastal protection and cultural heritage. Quantifying the worth of these benefits is very difficult due to the vast number and the many unknowns, Costanza *et al*., (1997) has put a value of approximately $30 billion per year in net benefits from these habitats. Coral reefs are especially important to isolated underdeveloped areas such as the islands of Indonesia. Here communities are very remote and do not have easy access to external resources or outside trade. People survive on the reefs making their homes out of the corals and gaining their main source of protein from the fish. Communities like this are very susceptible to reef destruction and may not be able to survive without them.

Coral reefs are under threat from a number of anthropogenic induced changes such as; overfishing, coastal development, tourism and climate change (Burke et al. 2002). These impacts cause corals to become stressed and may lead to a breakdown in the symbiotic relationship between Cnidarian host and algal symbiont, the outcome of which may result in coral bleaching. Coral bleaching is initiated by the breakdown of this relationship and is characterised by the paling of coral tissue, loss of algal symbiont and in severe cases the loss of host tissue and the death of the coral colony. The demise of coral reefs is one of the greatest environmental disasters mankind is facing with some scientists predicting that 33% of all coral species will be lost within the near future.

It has been suggested that corals with a higher skeletal density are able to tolerate thermal stress through numerous mechanisms of acclimation thereby enabling the species to track environmental conditions (a sub-lethal response). However many other, often functionally important, species have limited acclamatory potential and rapidly die off during relatively small changes in temperature (just a few degrees above the long-term monthly average).

This project will assess such rapid thermal mortality and compare the responses of a range of species collected from a range of sites to determine possible implications of environmental anomalies on the biological and physical structure of reef systems. Coral fragments will be installed in to laboratory aquariums, where the environmental conditions can be carefully controlled and manipulated. A range of laboratory skills will be utilised such as fluorometry to assess photosynthetic efficiency, spectrophotometry to assess chlorophyll concentration and microscopy to analyse symbiont cell densities. The experimental component of the research is laboratory based but opportunities exist for both diving and snorkeling elements to be included.

Suggested Reading

Baker, A. C., Glynn, P. W. & Riegl, B. (2008). Climate change and coral reef bleaching: An ecological assessment of long-term impacts, recovery trends and future outlook. *Estuarine, Coastal and Shelf Science.* **1–37.**

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Ritchie, R. J. (2006). Consistent sets of spectrophotometric chlorophyll equations for acetone, methanol and ethanol solvents. *Photosynthetic Research.* **89:27–41.**