REEF RESEARCH
INFORMATION SHEET NO. 3

GREAT BARRIER REEF MARINE PARK AUTHORITY

A Research and Monitoring Co-ordination Unit Publication - JULY 2003

The Great Barrier Reef Marine Park Authority (GBRMPA) Science for Management Research Grants encourage research relevant to the management of the Great Barrier Reef Marine Park and World Heritage Area by providing funding to assist students with their PhD or Masters research. The research must contribute towards addressing the GBRMPA's research priorities and key management issues, and may be physical, biological or social science based. In 2003, the GBRMPA awarded the following five grants, of $1000 each.

Key: Researcher, Project title / University / Supervisor / Description of Project.

Ms Shelley Anthony, Determining the cause of rapid tissue necrosis (RTN) in captive scleractinian corals / James Cook University / Dr B. Willis, Dr R. de Nys, & Dr. K. Michalek-Wagner.

A disease known in the aquarium industry as Rapid Tissue Necrosis (RTN) is regularly observed in the Coral Reef Exhibit (CRE) at Reef HQ, Townsville, and has symptoms which strongly correspond to those of Shut-Down Reaction (SDR) or White Syndrome (WS), diseases found on natural reefs. RTN is highly contagious, and susceptible coral species can become infected within hours of exposure to already-infected colonies. Entire colonies are occasionally killed within 24 hours, although the rate of tissue degeneration is highly variable, and may be influenced by environmental conditions. Up to 95% of certain coral species in the CRE die from RTN within 6 months of collection.

In addressing this issue, Shelley's project aims to:

- Identify the pathogen/s responsible for Rapid Tissue Necrosis (if any),
- Ascertain whether RTN and similar diseases are related, and
- Understand the mechanisms involved in triggering outbreaks.

Shelley's work will be conducted mainly in the Coral Reef Exhibit at Reef HQ, which is a 2.5-million litre living experimental reef system. Selected natural reef sites around Townsville will also be observed for outbreaks of RTN (or similar symptoms); however, the speed at which RTN can occur makes it difficult to study outside of captivity. A better understanding of this disease may help to shed light on other disease outbreaks occurring on the GBR.

Ms Line Bay, Identifying and conserving thermal environments on the Great Barrier Reef / James Cook University / Dr M.J. Caley, Prof. R. Crozier & Dr G. Jones.

It is generally recognised that sea surface temperatures are increasing due to the impact of global warming. Elevated sea temperatures could have global effects, however it is unclear whether increased sea surface temperatures are causing heat stress in coral reef fishes on a local scale. Line's work will seek to examine local effects of increased sea temperatures by examining:

- Natural levels of thermal stress in six species of coral reef fish at three locations along the GBR. The stress levels will be recorded at each location during both summer and winter.
- Variation in the levels of temperature stress among northern, central and southern populations of the same six species of coral reef fish.
- The amount of movement between different thermal environments based on the genetic variation among northern, central and southern populations of the same six species of coral reef fish.

An increased understanding of thermal environments and the movement of fish between these will assist in the protection of key species and habitats in the face of global environmental change.

Mr Paul Tudman, Modelling the ecosystem effects of fishing on the coral reefs of the Central GBR / James Cook University / A. Prof. G. Russ.

Understanding how coral reef ecosystems function is central to developing effective management practices for those systems. Paul's project will use dynamic spatial modelling to predict both the direct and indirect effects of fishing on the Great Barrier Reef, in the Central region. The model will also be used to predict the direct and indirect effects of other impacts in the central GBR region such as nutrient and sediment runoff and coral bleaching. Specifically the project aims to answer the following questions regarding the functioning of coral reefs:

- What are the direct and indirect effects of current zoning and fishing practices on the community structure of coral reefs within the central GBR?
- Do the reefs of the central GBR rely on nutrients coming into the reef from external sources or are nutrients recycled?
- What is the variation in food chains between the inner, middle and outer-shelf reefs?

The project will use the quantitative 'Ecopath with Ecosim' computer modelling software to construct a simulation of energy flows within the reef ecosystem. The inputs for the model will be derived from over twenty years of published and unpublished data collected on the reef ecosystem in the Central Great Barrier Reef region.

Mr William Robbins, Growth, Demography and Stock Structure of Queensland Reef Sharks / James Cook University / Prof. J.H. Choat.

Due to increasing global fishing pressure, particularly from the lucrative shark-fin trade, sharks are currently experiencing a world-wide decline in their stocks. The lack of effective management of sharks is compounded by a deficit in specific knowledge on the stock structures and life-history traits of shark species. William's research will try to address this shortfall by gathering growth, demography and stock structure information on three species of currently un-managed sharks. These species, the Whitetip Reef Shark (Triaenodon obesus), the Blacktip Reef Shark (Carcharhinus melanopterus) and the Grey Reef Whaler (Carcharhinus amblyrhynchos) are currently classified by the IUCN as "near threatened". The objectives of this project are:

- To estimate the abundance of reef sharks on the GBR
- To obtain size-at-age (growth) curves and estimate demographic parameters for the three species
- To validate age estimates using standard tagging and oxytetracycline procedures
- To investigate the stock structure of reef sharks on the GBR

By addressing these objectives it is hoped that this project will identify the specific differences in each species' life history, and allow for more effective management practices based upon the individual species' demographics.

Mr Craig Sherman, Genetic diversity in brooding coral: the role of sexual and asexual reproduction in structuring coral communities / University of Wollongong / A. Prof. D.J. Ayre & Dr K.J. Miller.

The link between ecological and genetic processes in corals is one of the most fundamental issues to understanding reef ecology. Corals may reproduce either asexually or sexually, with the predominant means of reproduction having important implications for both localised and widespread genetic diversity of the coral species. Previous studies undertaken on Pocillopora damicornis, a widespread coral which predominantly reproduces asexually, to determine its genetic diversity on the GBR have produced contradicting results that would indicate sexual reproduction as its primary means of recruitment. Craig's research is seeking to clarify why there is no evidence of asexual recruitment in population genetic studies of P. damicornis along the GBR. To achieve this Craig will examine both P. damicornis and the closely related Seriatopora hystrix to assess:

- Are planulae larvae being sexually or asexually produced?
- Genotypic diversity and fine-scale population genetic structure
- Assessing the contribution of gene flow to population structure
- Tests of localised adaptation to particular habitats

An understanding of the genetic diversity in coral is important in a management capacity as it is predicted that genotypic diversity is essential if populations are to persist and adapt to environmental change.

Many of the students who received the GBRMPA 2003 Science for Management Grants are also supported by the CRC Reef Research Centre. More information on these projects may be found on the CRC website at www.reef.crc.org.au

Want more information?
Then visit the Great Barrier Reef Marine Park Authority's web site:
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