

REEF RESEARCH INFORMATION SHEET NO. 1



GREAT BARRIER REEF
MARINE PARK AUTHORITY

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The Great Barrier Reef Marine Park Authority (GBRMPA) Augmentative 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 2002, the GBRMPA awarded the following ten grants, of \$1000 each.

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

Ms Karen Arthur, The effects of the toxic cyanobacteria *Lyngbya majuscula* on marine turtles / The University of Queensland / Dr J. Udy, Dr. N. Duke, Dr C. Limpus & Dr W. Dennison.

Blooms of the toxic cyanobacteria *Lyngbya majuscula* have been observed throughout the Great Barrier Reef Marine Park and South-east Queensland in increasing frequency and severity. At present the effects of these toxic blooms on the other marine life has not been the subject of any significant studies. Due to the large range of toxins present in *L. majuscula*, and the significant ecological changes which occur as the result of a bloom, Karen is seeking to investigate this further. Specifically, Karen's project aims to use marine turtles as a model to investigate the direct effect of *L. majuscula* toxins on herbivores, such as the Green Turtle. She will also determine whether the toxins bioaccumulate in carnivorous turtles such as the Loggerhead Turtle.



Ms Mikaela Bergenius, Stock structure of Common Coral Trout, *Plectropomus leopardus*, in the Great Barrier Reef World Heritage Area / James Cook University / Dr B. Mapstone, Dr G. Begg & A. Prof. G. Russ.

Common coral trout, *Plectropomus leopardus*, is the major target species of the reef line fishery in the Great Barrier Reef Marine Park (GBRMP). Currently the localised or regional stock structure of the GBRMP coral trout fishery is not recognised and the whole GBRMP is managed uniformly. This can lead to localised depletion of less productive stocks, erosion of key spawning components, and loss of genetic biodiversity. Through her research, Mikaela aims to investigate the stock structure of the common coral trout in the GBRMP. Her major objective is to determine the regional differences in the earbone (otolith) elemental chemistry (ie the varying levels of elements such as Copper, Lead and Calcium) of common coral trout throughout the GBRMP. This information will then be used for stock identification and the development of spatially-structured fisheries models.

Ms Juanita Bité, The Quality of Seagrass as a Dugong Food Resource: The Importance of the Effects of Season and Water Depth / James Cook University / Dr I. Lawler.

Dugong numbers world-wide have decreased dramatically, with Australian waters now supporting most of the world's remaining dugongs. One of the primary issues for dugong conservation is the state of its food supply. Dugongs are specialist feeders on seagrasses and are thus dependent on this resource for populations to persist. Through field work based around seagrass beds in Hervey Bay (which are comparable to GBRMP seagrass areas), Juanita aims to determine the effects of season and water depth on the nutritional quality of seagrass as a dugong food. Specifically she will be looking at the quality and quantity of the seagrass across a range of depths and conditions. The information Juanita derives should assist in the management of the dugong and its habitats and also help to predict the impacts of flooding on dugongs and their habitats.

Mr Richard Evans, Effectiveness of the Zoning of the Great Barrier Reef and the Reproductive Potential of Reef Fishes / James Cook University / A. Prof. G. Russ.

The GBRMPA currently uses zoning as one of its key management tools throughout the GBRMP. The aim of Richard's research is to test the effectiveness of this zoning on the fringing reefs of inshore islands within the GBRMP. To try and evaluate the zoning's effectiveness, Richard will determine the reproductive potential of 2 groups of fish (*Plectropomus* sp. [coral trout] & *Lutjanus carponotatus* [stripey trout]) in areas of different zonation (ie. Blue (fished) vs Green (unfished) zones), to ascertain if there are any significant biomass differences as a result of the zonation. This project methodology includes using ecological data from surveys, and reproductive data from histology and other sources. It is hoped that as well as assessing the effectiveness of the GBR zoning plans, this project will also:



- demonstrate the ability of marine reserves to increase the biomass of fishery target species (and hence increase offspring production and export to other areas of the GBRMP);
- demonstrate how the zoning plan affects reef fish with different sexual life history characteristics.

Ms Amanda Hodgson, Dugong Behaviour and the effects of Anthropogenic Noise: boats and pingers / James Cook University / Prof. H. Marsh.

One of the World Heritage values of the GBR is its role as a feeding ground for large numbers of dugongs. Increased boat traffic and the proposed use of acoustic alarms (pingers) on gill nets and shark nets, increase the noise levels in these regions and thereby have the potential to decrease the quality of these important habitats. At present there is little scientific evidence which quantifies these impacts. Amanda's research aims to obtain basic information about dugong behaviour and to assess the effects of noise from human activities on dugong behaviour. Primarily her project will focus on noise sourced from boats and pingers, with the objective of building on the current limited knowledge about dugong behaviour using a new observation technique (video footage taken from a tethered helium blimp). It is hoped that the information gained will allow Amanda to determine if underwater noise threatens the survival of dugong populations through boat strike, disturbance and/or alienation from their required habitats.



Ms Nadine Marshall, A Conceptual and Operational Understanding of Resource Dependency / James Cook University / Dr M. Fenton.

The introduction of any new environmental management policy can have significant social and economic consequences for individuals and communities. Historically natural resource management (NRM) agencies have not effectively addressed consideration of social issues in resource planning. To provide a better understanding of how to include the socio-economic information into the formulation of NRM policy, Nadine's project aims to examine the issue of resource dependency from the perspective of commercial fishing in the Great Barrier Reef Marine Park. To achieve this Nadine's objectives are to:

- Define resource dependency and community resilience
- Develop a better understanding of:
 - the relationship between fishers and the fisheries resource,
 - the historic response of communities to change affecting access to the fisheries resource, and consequently develop a better understanding of community resilience
 - community resilience by examining the influence of factors such as the strength of ties (eg. networks) that fishers have with their families, other fishers, their community, and various government agencies on community response to change.
- Develop indicators of 'resource dependency' and 'community resilience' and guidelines to predict the likely response of communities to policy change.

The information to come from this project will be of considerable benefit to Fisheries Managers, the fishing industry, GBRMPA and other stakeholders.

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 incentives from the lucrative shark-fin trade, there are major concerns over the sustainability of shark stocks worldwide. The lack of effective management of sharks is compounded by a lack of information on the stock structures and life-history traits of shark species. William's research will try to provide information on the growth, demography and stock structure information on three species of currently under-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 3 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 James Sheppard, Foraging ecology of Dugongs: Implications for management / James Cook University / Dr I. Lawler & Prof. H. Marsh.

Dugongs are seagrass specialist feeders and an understanding of the interaction between dugongs and their food supply is crucial to their conservation. Previous studies have indicated that long distance movement is a common feature of dugong behaviour. James aims to increase the understanding of routes taken on these long journeys and to provide insights into whether movement corridors exist between bays in the GBRWHA. To achieve this he will use satellite technology to track the habitat use of up to 60 dugongs at a resolution of a few metres. Through the information gained from this field work, James will model and map dugong habitat use in the inshore waters of the GBR and assess the relative importance of different seagrass meadows and parts of meadows. The information gained from James's work will have important implications for the management of activities which impact on dugongs and their habitats, such as Indigenous hunting, commercial gill netting, and boating.

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 in 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 the population genetics of *P. damicornis* along the GBR. To achieve this Craig will examine both *P. damicornis* and the closely related *Seriatopora hystrix* to assess:

- Whether planulae larvae are being sexually or asexually produced,
- Genotypic diversity and fine-scale population genetic structure
- The contribution of gene flow to population structure
- Extent of localised adaptation to particular habitats

An understanding of the genetic diversity in coral is important in a management capacity as genotypic diversity is important in determining whether populations are to persist and adapt to environmental change.





Ms Pakamas Thinphanga, An evaluation of the status of marine environments in the Great Barrier Reef region using the structure and taxonomic composition of nematode communities as a bioindicator / James Cook University / Dr M. Sheaves.

High nutrient and contaminant concentrations contained in run-off from urban and agricultural activities are placing increasing pressure on important marine habitats along the GBR. Historically, larger marine species have been used to monitor the biological effects of environmental change in the marine system. Pakamas however, seeks to explore the largely neglected area of using nematodes as indicators of the overall health of the marine system in the GBR. Nematode traits, such as their abundance, ubiquitous distribution, rapid generation times and fast metabolic rates, mean that they rapidly respond to changes in localised conditions. To establish nematodes as an effective indicator she aims to determine the impact of anthropogenic discharge on nematode assemblages by examining their community structure and taxonomic composition. She will then relate any observed patterns of nematode species distribution to measured environmental variables, including both natural and anthropogenic factors. This research has the potential to provide previously unavailable information on the impact of disturbance on the GBR ecosystem.

Many of the students who received the GBRMPA 2002 Augmentative 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

FOR MORE INFORMATION ON RELATED TOPICS:

www.gbrmpa.gov.au

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