RESEARCH WORK PLAN 2006-07

Solitary Islands Marine Park

RESEARCH WORK PLAN 2006-07

Solitary Islands Marine Park

INTRODUCTION

The Solitary Islands Marine Park (SIMP) covers an area of around 71,000 hectares, extending from Muttonbird Island in the south to Plover Island in the north, and from the mean high water mark and upper tidal limits of coastal estuaries, seaward to three nautical miles. The marine environment is biologically diverse and contains a unique mix of tropical, subtropical and temperate species. Within the Marine Park these species are found in a variety of habitats, including estuaries, intertidal rocky shores, island fringing and subtidal reefs, sandy beaches, subtidal soft substrate and open ocean. There are also five major islands in the marine park, and a number of other significant rocky outcrops dispersed throughout the marine park. Ecological processes throughout the Marine Park are interconnected with both resident and migratory marine species relying on specific habitats for breeding, feeding and protection.

The marine park also caters for a wide range of user groups and is of social, cultural and economic importance to the area. It is also culturally significant to local Aboriginal communities, with many spiritually significant sites occurring within and adjacent to the Marine Park, coupled with a continuing tradition of cultural resource use.

Research is a key component in the management of the Solitary Islands Marine Park and the research program seeks to expand our knowledge and understanding of the marine environment, provide a regular update on the health of marine ecosystems and the nature and extent of activities occurring in the Marine Park, and indicate the effectiveness of zoning and other management actions.

As identified in the NSW Marine Parks Authority Strategic Research Plan (2005-10), there are a number of key research areas covering a wide range of issues relevant to the ongoing management and assessment of the Solitary Islands Marine Park. The plan also lists a range of priority research issues and these relevant issues are identified under each project.

This Research Work Plan aims to outline the research and monitoring operations that the Marine Parks Authority intends to undertake directly or through collaboration with external research providers during 2006-07 to provide for the conservation and sustainable use of Solitary Islands Marine Park to attain the objects of the *Marine Parks Act 1997*. It refers specifically to projects funded by the Marine Parks Authority and does not include research conducted within SIMP that is funded from other sources.

The research and monitoring projects are categorised under five overall areas.

1. **Biodiversity and ecological processes**
2. **Indigenous and non-Indigenous culture and heritage**
3. **Ecologically sustainable use**
4. **Specific impacts**
5. **Socio-economic impacts**

Mapping and classifying seabed habitats in Solitary Islands Marine Park

Background

The primary goal of the Marine Parks in NSW is to establish a comprehensive, adequate and representative (CAR) system to protect marine biodiversity and maintain ecological processes. In order to maximize the goals of the CAR principles in the Marine Parks design it is important to include biological information at the largest scale practical in the planning process to ensure that all major benthic habitats and communities are represented within higher protected areas (Sanctuary Zones).

Current knowledge of offshore reef and benthic communities within Solitary Islands Marine Park (SIMP) is based on drop-video, grab and sounder information along a set of transects, that in reality cover a very small component of the marine park. In particular, the area of offshore reef that is currently protected within Sanctuary Zone is unknown. As well, the benthic communities on this habitat type are highly variable and this needs to be taken into account to ensure biodiversity is adequately represented within highly protected areas. There is increasing evidence that habitats may act as effective 'surrogates' for species diversity in the planning process provided they are appropriately validated and all representative habitats are included. Therefore, mapping of seabed habitats may be a cost-effective method of diversity assessment for Marine Parks planning and is an important component of the information required for assessment of the effectiveness of the existing zoning arrangements within SIMP.

Objectives

- Obtain detailed bathymetric and seabed habitat maps for the SIMP using a bathymetric side-scan sonar
- Develop a habitat classification system for offshore reefs and other deeper habitats
- Produce a ground-truthed mapping overlay using the habitat classification system
- Determine the proportion of those habitats within higher protected areas
- Potentially identify habitats and benthic communities that have not been previously described within SIMP, and identify habitats not represented within higher protected areas

Contacts

Dr Alan Jordan	NSW Department of Environment and Conservation
Dr Peter Davies	NSW Department of Environment and Conservation
Hamish Malcolm	NSW Marine Parks Authority

This project aims to address the following specific research issues identified in the Strategic Research Plan:

Biodiversity and Ecological Processes

- Map and assess the spatial extent and structure of seabed habitats and key taxa
- Identify unique & sensitive marine habitats and communities

Ecologically Sustainable Use

- Examine the optimum design of marine parks: size, patterns of zoning

Assessment of reef habitat condition in Solitary Islands Marine Park

Background

Low levels of coral bleaching have occurred throughout the past 5 years in the marine park, with occasional minor elevation of bleaching in some species at some sites. A major bleaching event did not occur during that time, although one did occur on the Great Barrier Reef.

A disease (that causes rapidly spreading mortality through a colony) was detected through a tagging study. At least 18% of tagged colonies were affected by the spreading disease and in 10% of tagged colonies this disease resulted in total mortality by December 2002. This disease has caused extensive mortality in tabulate Acropora's and Turbinarians, especially at Groper Island and these corals are important components of coral communities in this area.

A number of other coral habitat-modifying influences that were observed during the bleaching program and other studies including coralimorph coverage increasing (anecdotal observations) and out-competing hard coral communities. This can result in reduction in habitat complexity and habitat availability to other plants and animals. This project, conducted in collaboration with Solitary Islands Underwater Research Group and in concert with two PhD studies examining coral disease in Solitary Islands Marine Park, will monitor and increase understanding of the above processes and their effect on reef condition in the SIMP.

Objectives

- Increase knowledge of coral communities in this area and benchmark current reef habitat condition using indicators such as hard coral coverage
- Gain increased understanding of processes that are potentially (negatively) modifying coral reef habitat in this area
- Increase understanding of spatial differences and temporal patterns in sea-temperature in the marine park through a long term monitoring program
- Preliminary assessment of links between catchment run-off and offshore reefs
- Increase community capacity, knowledge and understanding of local marine systems and linkages, including strengthening collaborative ties

Contacts

Hamish Malcolm	NSW Marine Parks Authority
Bob Edgar	Solitary Islands Underwater Research Group

This project aims to address the following specific research issues identified in the Strategic Research Plan:

Biodiversity and Ecological Processes

- Examine habitat condition

Specific Impacts

- Investigate coral disease types and impacts

Reef fish and benthic program within Solitary Islands Marine Park

Background

The zoning plan for the Solitary Islands Marine Park changed on 1st August 2002. A monitoring program on reef-fish density was established to assess the effect of sanctuary zones. Fish densities are compared within and between sanctuary zones and other zones (where fishing can occur) using established transect methods on scuba. A variety of fish categories are used as indicators. The first baseline or benchmark survey was carried out during June – July 2002 immediately prior to commencement of the current zoning plan. Additional methods are used to increase the strength of comparisons, include baited remote videos and timed counts.

Sixteen sites are surveyed annually. The design is balanced for statistical analysis, with half the sites being sanctuaries following rezoning. The influence of size of sanctuary zone can also examined through this study. The same sites are resurveyed each year. Six transects are haphazardly placed and surveyed at each site. Benthic video transects are also carried out biennially at the sixteen sites to examine changes in benthic cover (the proportion of the reef covered by various living plants and animals), with particular focus on hard corals.

Reef-fish diversity is being surveyed at 75 sites from 50 locations within the marine park using timed counts to determine spatial patterns in diversity and indicate unique sites. Eighteen sites are monitored annually to assess diversity within the marine park through time. All species observed are recorded using a log5 estimate of abundance.

Objectives

- Assess the effects of zoning and associated management on specific reef-fish abundance and size composition
- Determine differences in reef-fish community structure on reefs throughout the SIMP
- Evaluate the representation of reef-fish communities within higher protected areas
- Monitor the benthic cover at various taxonomic levels at several sites within various reefs
- Assess the status of threatened, protected and endemic species such as black cod, grey nurse shark and blue groper within the SIMP and monitor their status through time
- Obtain a reef-fish species list (including relative abundance) for the SIMP.

Contacts

Hamish Malcolm NSW Marine Parks Authority

This project aims to address the following specific research issues identified in the Strategic Research Plan:

Biodiversity and Ecological Processes

- Conduct biodiversity assessments of selected taxa
- Assess the spatial and temporal patterns of assemblages

Ecologically Sustainable Use

- Examine the optimum design of marine parks: size, patterns of zoning
- Abundance of key species of fish and invertebrates
- Assess threatened, protected and endemic species

Mud crab (*Scylla serrata*) monitoring program

Background

This study is examining the density and relative abundance of mud crabs *Scylla serrata* within three estuaries in the Solitary Islands Marine Park. Each estuary includes areas that are both open and closed to crabbing. Mudcrabs are fished using 18 traps in each estuary for 3 nights, twice per year. The program commenced in 1999 so it can compare changes in abundance before and after the current marine park zoning scheme was adopted in 2002.

This information will be useful for assessing how the current zoning scheme is performing and for showing the benefits of sanctuary zones. Results to date have already shown strong benefits to mudcrab numbers in sanctuary zones in all three estuaries.

Mudcrabs are an ideal species as an indicator in this marine park, as they are a popular target by both commercial and recreational fishers in areas open to crabbing, and not crabbed in the closed areas. Mud crabs also have a short life span (3 to 4 years) and their numbers can (potentially) increase quickly in response to changes in zoning protection. This program also includes monitoring the relative abundance of mudcrabs in 4 ICOLL estuaries twice per year using nine traps per ICOLL over a single night.

Objectives

- Monitor and compare mudcrab densities in zones 'open' and 'closed' to crabbing, before and after zoning changes in 2002, to assess the influence of sanctuary zones in the three largest barrier estuaries in SIMP
- Monitor and compare relative abundance of mudcrabs (# crabs caught per trap) in four ICOLL's in SIMP to assess the influence of the sanctuary zone in Station Creek and the trapping closure in Arrawarra Creek
- Assess the influence of marine park zones by comparing the size (length, width) and sex ratio of mud crabs within and between different zones
- Monitor mudcrab populations (density / relative abundance) within areas open to fishing in SIMP, as a locally important fisheries resource
- Obtain information on patterns of use and compliance by fishers

Contacts

Dr Paul Butcher	National Marine Science Centre
Hamish Malcolm	NSW Marine Parks Authority

This project aims to address the following specific research issue identified in the Strategic Research Plan:

Ecologically Sustainable Use

- Examine the optimum design of marine parks : size, patterns of zoning
- Investigate the effectiveness of marine parks in increasing propagation, identifying areas of sources or sinks, extent of spillovers
- Age, growth, reproductive biology and movement of selected invertebrates
- Abundance of key species of invertebrates

Recreational fishing competition survey of Solitary Islands Marine Park

Background

Many local fishing clubs have carried out competitions within the Solitary Islands Marine Park over the past decade. Clubs require a Marine Parks Authority permit to carry out this activity, and these permits have certain reporting conditions.

Club members are required to list the types of fish they catch, the number and weight and a grid location from where they were caught. A considerable amount of data has been submitted over the past decade, with at least sixteen clubs having held permits. Ten clubs currently hold permits to hold fishing competitions in the marine park.

These data were analysed in 1997 by NSW Fisheries researchers, under a FishCare Grant and were recently analysed in 2004 by the Marine Parks Authority. This current project will involve improving data collection, ongoing entering of data, further analysis of data and interpreting the results, and continuing to provide that information back to the fishing clubs.

Objectives

- Enter existing competition data into a database to capture electronically
- Examine temporal trends in catch and species being caught (any changes in CPUE)
- Build on results from the analysis in 1997 and 2004
- Provide feedback to the clubs and redesign data collection sheets to an updated system that enables comparison with existing data.

Contacts

Hamish Malcolm	NSW Marine Parks Authority
Dr Paul Butcher	National Marine Science Centre

This project aims to address the following specific research issue identified in the Strategic Research Plan:

Ecologically Sustainable Use

- Examine the distribution and composition of recreational fishing catch and effort

Assessing patterns of human activity and use in Solitary Islands Marine Park

Background

Understanding patterns of human use and activity within the marine park is an essential tool for management planning, for interpreting research data, and for compliance assessment.

For example, during the last rezoning process in the Solitary Islands Marine Park, there were a number of claims regarding headlands, beaches and reefs that had a traditionally high level of use by recreational fishers. These claims could not be validated or discounted because there was no information as to patterns of activity in the marine park. This project aims to rectify this situation and provide an analysis of vessel and other activity through GIS mapping analysis.

Information as to whether illegal activity is occurring in different locations will also enable more effective allocation of enforcement resources, as well as assist in gaining prosecutions.

This project will establish broad patterns of human activity and use in various habitats in the marine park by combining information recorded during routine patrols as well as from questionnaire and observation surveys. This includes information from a study in 2002 on vessel activity in the southern end of the marine park.

A questionnaire survey, carried out over the past 3 summers since the marine park was rezoned, provides valuable and specific information on the existing marine parks advisory material, facilities provided by the MPA (e.g. moorings and signage), demographics, and levels of user satisfaction. This is enhanced by a study on human perceptions and demographics in the northern end of the marine park in 2003. This information has direct application to management in allocating resources and developing communication materials.

Objectives

- To describe broad patterns of human demographics, activity and use within the marine park, using a combination of observational mapping and questionnaires
- To assess vessel use and activity on reefs with marine park monitoring sites
- To assess the extent of illegal activity at specific locations
- To assess levels of user satisfaction with the marine park and improve management strategies and allocation of resources

Contacts

Nicola Johnstone NSW Marine Parks Authority

This project aims to address the following specific research issue identified in the Strategic Research Plan:

Ecologically Sustainable Use

- Examine the distribution and composition of recreational and commercial fishing catch and effort
- Assessment of usage, impacts and threats of anthropogenic activity on habitats

Socio-economic influences

- Social & economic value of MPA's