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**RESEARCH WORK PLAN 2008-09**

**Port Stephens-Great Lakes  
Marine Park**



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## Port Stephens-Great Lakes Marine Park

### INTRODUCTION

The marine environment in the Port Stephens-Great Lakes Marine Park (PSGLMP) is biologically diverse and contains a diverse range of primarily temperate species which are found in a variety of ecosystems and habitats, including estuaries, intertidal rocky shores, subtidal reefs, sandy beaches, subtidal soft-sediments, seagrass beds and open ocean. Ecological processes throughout the region are interconnected with both resident and migratory marine species relying on specific habitats for breeding, feeding and protection. The region also caters for a wide range of user groups and is of social, cultural and economic importance to both local communities and tourists.

Research is a key component in the development of zoning arrangements within the Port Stephens-Great Lakes Marine Park. Monitoring and research provide information to make informed management decisions for the conservation and sustainable use of the park mandated by the *Marine Parks Act 1997*. Marine Parks Authority research and monitoring programs are guided by a strategic research framework and a strategic research plan. This provides a vision and structure for the development of research and monitoring programs that contribute to a 'whole-of-government' approach to the sustainable management of marine resources in NSW.

The strategic framework includes two overarching priorities for research and monitoring. These are the need to:

1. Identify and select the location and nature of marine parks and their zones
2. Monitor and evaluate the effectiveness of marine park zoning and related management arrangements

The program also aims to expand our knowledge and understanding of the marine environment, detect unforeseen changes to the health of marine ecosystems and also report on the nature and extent of activities occurring in the Marine Park. All of this information is essential in order to maximise the effectiveness of zoning and other management actions while minimising socio-economic and cultural impacts.

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**

This 2008-09 Research Work Plan outlines the research and monitoring projects that the Marine Parks Authority intends to undertake directly, or through collaboration with external research providers. It refers specifically to projects funded or supported by the Marine Parks Authority and does not include research conducted within the Marine Park that is funded solely from other sources. The Marine Parks Authority actively works with other government agencies and

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universities to identify priority projects and seek external funding for research. Additional projects may be added to the plan during the year as further resources become available.

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# Benthic fish assemblages in deep water habitats of the Port Stephens-Great Lakes Marine Park

## Background

Seabed habitats are frequently used as a surrogate for spatial patterns in marine biodiversity, however, there is little information on the fish diversity and composition associated with many habitats in intermediate depths (20 -60 m) within the PSGLMP. The recent swath mapping of the region has identified considerable areas of rocky reef in depths >20 m throughout the marine park, some of which is represented within sanctuary zones.

Differences in species composition and population structures of fish in deeper reefs will be investigated using Baited Remote Underwater Video (BRUV) systems, a technique commonly used throughout Australia to examine fish assemblages at sites not suitable for diving. Standardised baits are used to attract fish to a viewing area, being recorded horizontally by a video camera. Using this system, information can be obtained on relative abundance and fish diversity on habitats deeper than can be routinely accessed through diver visual census.

The use of depth to divide rocky reefs into different habitat types for marine park zoning purposes assumes that assemblages of fish differ at increasing depths across the continental shelf. This has been commonly found at many sites throughout world but requires testing within the Port Stephens region to ensure zoning arrangements provide adequate protection to the full range of fish species. This is particularly important as deep reefs are commonly targeted by commercial and recreational fishers and BRUV allows for monitoring of these deeper benthic habitats. The study will also provide useful data on the abundance of fish in several of the sanctuary zones prior to and after the enforcement of the zoning plan. It is a program that is expected to continue as part of a core monitoring program to evaluate the effectiveness of the marine park zonings.

## Objectives

- To determine the composition and relative abundance of fish species on intermediate depth reefs within the PSGLMP
- To establish baseline information within sanctuary and habitat protection zones prior to implementation of the zoning plan and follow this through time

## Contacts

Assoc. Prof. William Gladstone      University of Newcastle

Dr Alan Jordan      NSW Department of Environment and Climate Change

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**

- Abundance of key species of fish and invertebrate
- Examine the optimum design of marine parks

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## Evaluating the benefits of protection to fish and macroinvertebrates on shallow rocky reefs within the Port Stephens-Great Lakes Marine Park

### Background

Currently most marine parks in the State have conducted underwater visual census projects examining densities and size frequency of reef fishes and selected mobile macroinvertebrates. Those within the Solitary Islands Marine Park and Jervis Bay Marine Park have collected several years of data in order to measure the effectiveness of biodiversity conservation in marine parks. This monitoring network has been designed to provide critical information for decisions relating to issues such as appropriate number and configuration of Sanctuary Zones within marine parks.

A number of Underwater Visual Census (UVC) surveys of shallow rocky reefs have previously been conducted within the Port Stephens region. These surveys have provided some information on the composition of fish assemblages and densities of a number of species of macroinvertebrates. The power to detect spatial variations in abundance has also been examined providing some basis for designing an effective UVC survey in PSGLMP.

There is a clear need to monitor the effectiveness of marine park zoning within the PSGLMP, and the establishment of baseline information on the abundance of fish and mobile macroinvertebrates on shallow rocky reefs is one component of this evaluation. It is a program that is expected to continue as part of a core monitoring program to evaluate the effectiveness of the marine park zonings.

### Objectives

- Determine the abundance of fish and selected macroinvertebrates on shallow rocky reefs within sanctuary and habitat protection zones with Port Stephens-Great Lakes Marine Park
- Estimate the size composition of selected species of fish and macroinvertebrates

### Contacts

Assoc. Prof. William Gladstone

University of Newcastle

Dr Alan Jordan

NSW Department of Environment and Climate Change

This project address the following 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
- Abundance of key species of fish and invertebrates

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## Towards the long-term management of the dolphin population in the ‘Dolphin-Watching Capital of Australia’

### **Background**

Research into the dolphin population in Port Stephens has included analyses of abundance, group and social structure, site fidelity, genetics, usage patterns, and boating impacts. The Port Stephens’ dolphin population is small and genetically distinct from the adjacent coastal dolphins, with four main female bands in the area and several male alliances. Three of the bands, as well as several male alliances, concentrate their activities in the eastern section of the Port where high levels of commercial dolphin-watching and recreational boating activity occurs.

Dolphin responses to interactions with boats in this area include disruption to their social structure and changes in time allocated to different behavioural activities. Similar short-term changes in behaviour to those reported in Port Stephens have been recently linked to long-term impacts on relative abundance, and possibly reproductive success of Indo-Pacific bottlenose dolphins in a population exposed to a small number of boats in Shark Bay, WA. The study showed that as the number of dolphin-watch boats increased from one to two, there was a significant decline in local dolphin abundance of about 15%. There is a clear need for information on population size and use of habitats by the dolphins when formulating management options for the dolphin-watching industry in Port Stephens.

### **Objectives**

The main goal of this project is to continue to obtain scientific data pertinent to the long-term management of the bottlenose dolphin population in Port Stephens.

The specific objectives are to:

- Assess trends in bottlenose dolphin population size using a long-term photo-identification dataset
- Identify ecologically important habitat through an integrated GIS approach

### **Contacts**

Dr Luciana Möller

Macquarie University

Assoc. Prof. Rob Harcourt

Macquarie University

This project address the following issues identified in the Strategic Research Plan:

#### **Ecologically Sustainable Use**

- Interactions with marine mammals
- Abundance of key species

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# Mapping and classification of continental shelf seabed habitats in Port Stephens Great Lakes Marine Parks

## 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. As detailed spatial information on the distribution of marine biota is limited, seabed habitats are increasingly being used as effective surrogates for biological diversity, provided they are appropriately validated and all representative habitats are included. Remote sensing techniques for mapping of seabed habitats are now recognised as a cost-effective method of diversity assessment for marine park planning, and an important component of the overall research required to identify the distribution and structure of marine ecosystems and habitats.

The Manning Shelf bioregional assessment provided information on the broadscale distribution of marine and estuarine ecosystems and intertidal and nearshore habitats. While some species and assemblage data was available for marine mammals, threatened birds and estuarine fishes, overall there was little data available on the distribution of subtidal habitats and their associated biota. The exception is within estuaries where there is detailed information on the distribution of seagrass, mangroves and saltmarsh. Such information was identified as important to provide a more comprehensive assessment of marine biodiversity in the region.

To meet the primary objectives under the *Marine Parks Act* all major benthic habitats within a marine park should be represented within higher protected areas (sanctuary and habitat protection zones). There is currently limited knowledge of deep subtidal habitats (i.e. >10 m depth) within the Manning Shelf Bioregion, with only small areas of rocky reef mapped from existing aerial photographs, and even less information available on the structure and distribution of subtidal soft-sediment habitats. There is a clear need to assess the distribution and extent of subtidal habitats within the PSGLMP. Much of this will be conducted using acoustic swath mapping that provides detailed information on bathymetry and seabed texture and hardness.

## Objectives

- Determine the distribution and extent of seabed habitats in selected areas of the continental shelf within the Port Stephens-Great Lakes Marine Park
- Collect detailed bathymetry and towed video data to allow ground-truthing of acoustics
- Produce a range of spatial layers of seabed habitats defined within a hierarchical habitat classification system

## Contacts

Dr Peter Davies  
Dr Alan Jordan

NSW Department of Environment and Climate Change  
NSW Department of Environment and Climate Change

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

### **Ecologically sustainable use**

- Identify unique & sensitive marine habitats and communities
- Examine the optimum design of marine parks

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# Assessment and monitoring of urchin barrens on shallow and deep reefs within Port Stephens-Great Lakes Marine Park

## Background

Rocky reef areas devoid of foliose algae (barrens habitat) are known to be widespread throughout areas of NSW, and the extent and persistence of patches of barrens have important implications for the ecology of many species of algae, fishes and invertebrates. The development of barren reef area due to the over-grazing of macroalgae by sea urchins can result in part from the reduction in the number of urchin predators due to fishing. Studies of a sanctuary zone in New Zealand found that once the numbers and average sizes of snapper and rock lobsters had recovered, these large predators began controlling the local sea urchin (*Evechinus chloroticus*), which had eaten extensive areas of kelp (predominantly *Ecklonia radiata*) resulting in barren areas.

There is limited information on the distribution and temporal variability in extent of barrens along the NSW coast, although evidence suggest they are maintained with only low levels of urchin grazing. In particular, there is little information on the extent of barrens in depths greater than around 15 m, although they commonly occur on deeper reefs in other temperate waters of Australia. There is a clear need to understand the extent of barrens habitat on rocky reefs within PSGLMP in order to evaluate habitat condition and provide a baseline in which to assess change over the long term. Monitoring of barrens would involve mapping the extent of barrens from SCUBA and/or video surveys at a number of reef locations within PSGLMP.

This initial assessment of urchin barren extent is funded primarily by the Hunter-Central Rivers Catchment Management Authority.

## Objectives

- To determine the distribution and extent of urchin barrens on both shallow and deep rocky reefs in the marine park
- To compare the extent and distribution of barrens at several sites within sanctuary and habitat protection zones

## Contacts

Assoc. Prof. William Gladstone      University of Newcastle

Dr Alan Jordan      NSW Department of Environment and Climate Change

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

### **Ecologically sustainable use**

- Examine the optimum design of marine parks
- Assessment of impacts and threats of anthropogenic activity on habitats