

# **Batemans Marine Park**



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# RESEARCH WORK PLAN 2008-09

## Batemans Marine Park

### INTRODUCTION

The Batemans Marine Park (BMP) is located on the south coast of NSW from the most northerly point of Murramarang Beach near Bawley Point to the southern side of Wallaga Lake entrance at Murrunna Point. The marine park extends from the three nautical mile offshore limit of NSW waters to mean high water mark within all rivers, estuaries, bays, lagoons and inlets, and saline and brackish coastal lakes (excluding Nargal Lake).

One outstanding feature of the BMP is the large expanses of rocky reefs on the continental shelf that support a diverse array of fish, invertebrates and seaweeds. There are also numerous islands (including the Tollgates and Montague) that provide breeding areas for many seabird species and habitat for populations of the endangered grey nurse shark, many species of benthic and pelagic fish, seals and penguins. The park also contains highly significant coastal lakes and lagoons, including Durras, Brunderee, Tarourga and Brou Lake, many of which have previously been recommended for protection and contain a wide range of aquatic macrophyte habitats. The Clyde River and Batemans Bay areas also have significant estuarine habitats including mangrove and saltmarsh.

The coastal land surrounding the marine park is the traditional country of the Yuin people and contains many sites of historic and cultural significance. The Yuin people have a long association with the south coast which continues today, with a tradition of cultural resource use. The Marine Park area is of social, economic and cultural importance to the region and caters for a wide range of user groups. It is a particularly popular area for holidaying, recreational and charter fishing, diving and boating. There is also a wide range of commercial fishing activities conducted throughout the Marine Park, and aquaculture (principally oyster farming) within several of the rivers and lakes.

Monitoring and research provide information to make informed management decisions at the BMP 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.

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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 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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## Assessment of nearshore rocky reef assemblages within Batemans Marine Park

### **Background**

Shallow rocky reefs are an important habitat within the Batemans Marine Park covering a considerable proportion of nearshore areas adjacent to both the mainland and offshore islands. Such reefs are often characterised by dense macroalgal forests which support an astounding diversity of associated plants and animals. Urchin barrens also account for much of the rocky reefs in the park and, in contrast, are characterised by encrusting coralline algae and macro-grazers such as limpets, gastropods and urchins. Rocky reefs are well represented within all zones in the BMP, including Sanctuary Zones. To properly determine whether changes in fish, invertebrate and algal assemblages are a result of the implementation of management strategies, rather than natural variation in space and time, we will conduct annual surveys of the abundance and diversity of these organisms.

Each year the abundance of fish, large mobile invertebrates and macroalgae will be estimated within sanctuary, habitat protection and general use zones in BMP, and compared to areas outside the park. This sampling will allow the detection of biologically significant changes in the abundance and size distribution of a wide range of species through time and among zone types. In addition to changes in heavily exploited species, this research will also be able to detect broader habitat changes such as changes in the extent of urchin barrens and cover of macroalgal forests and long term variability in the reef assemblages associated with these areas.

### **Objectives**

- Document long term spatial and temporal variation in the species composition and size frequency of fish and abundances of macro-invertebrates and macroalgae at selected shallow water rocky reefs within Batemans Marine Park where different management strategies have been implemented

### **Project Contacts**

Dr Melinda Coleman

NSW Marine Parks Authority

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
- Examine multi-species linkages and mechanisms determining rocky reef assemblage structure and dynamics

#### **Ecologically Sustainable Use**

- Examine the optimum design of marine parks
- Abundance of key species of fish and invertebrates
- Effects of fishing on reef community structure and function

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# Mapping and classification of continental shelf seabed habitats in the Batemans 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. As detailed spatial information on the distribution of marine biota is limited, seabed habitats defined within a hierarchical classification structure 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 have developed considerably in the past decade and 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 Batemans 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 Batemans Shelf Bioregion, with only small areas of rocky reef mapped from existing aerial photographs and hydrographic charts, none of which have been ground-truthed. There is even less information available on the structure and distribution of subtidal soft-sediment habitats. Initial mapping in the region indicates extensive reef habitat along sections of the coast north of Batemans Bay and around Montague Island, Brush Island and Tollgate Islands. There is a clear need to assess the distribution and extent of subtidal habitats within the Batemans Marine Park to continue to improve our knowledge of habitats extent, structure and distribution, and to ensure habitats are adequately represented within highly protected areas. Much of this will be conducted through the use of 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 Batemans Marine Park
- Collect detailed bathymetry, backscatter and towed video information in selected areas
- Produce a range of spatial layers of seabed habitats defined within a hierarchical habitat classification system

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## **Contacts**

Dr Peter Davies - NSW Department of Environment and Climate Change

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**

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

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## Benthic fish assemblages on deep water reefs within the Batemans Marine Park

### **Background**

Recent swath habitat mapping within Batemans Marine Park (BMP) has identified extensive rocky reef on the continental shelf which, in some places, extends from inshore waters to the eastern edge of the marine park. In this region, these habitats have been poorly studied, with information restricted to physical features such as depth and profile. While seabed habitats are frequently used as a surrogate for spatial patterns in marine biodiversity, there is little information on the fish diversity and composition associated with rocky reefs in depths >20 m within the BMP. At present reef habitats are defined on the basis of depth (0-20 m, 20-60 m and 60-200 m). While the separation at the 20 m contour line relates to an average depth where benthic assemblages change from macroalgal dominated to that containing mostly sessile invertebrates (mostly sponges, ascidians, bryozoans and cnidarians), there is little information on depth variation in fish assemblages.

These deep reef areas are commonly used by recreational and commercial fishers, with many targeted species being closely associated with reef habitat. The inclusion of several areas within BMP where deep reef is included within Sanctuary Zones provides an opportunity to assess changes in species and size composition of fish, sharks and rays resulting from these fishing closures. Baited Remote Underwater Video systems (BRUV's) are a technique commonly used throughout Australia to examine fish assemblages and population structure in deeper reefs that are below safe diving depths. Standardised baits are used to attract fish to a viewing area, being recorded horizontally by a video camera.

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 in many sites throughout the world but requires testing within the Batemans region to ensure zoning arrangements provide adequate protection to the full range of fish species. This project will complement the similar assessment being conducted in BMP on shallow rocky reefs using UVC within the project 'Evaluating the benefits of protection to shallow rocky reef ecosystems within the Batemans Marine Park'.

### **Objectives**

- To characterise long term spatial and temporal variation in the composition, abundance and size frequency of fish (particularly snapper), shark and ray species on deep reefs (>20 m) under each of the management strategies in BMP and in areas outside the park.

### **Contacts**

Dr Melinda Coleman                      NSW Marine Parks Authority

Dr Andy Davis                              University of Wollongong

This project aims to address the following specific research issues identified in the Strategic Research Plan
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<b>Biodiversity and Ecological Processes</b>
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- 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
- Effects of fishing on reef community structure and function

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## Monitoring shallow subtidal reef assemblages in Batemans Marine Park using stakeholder groups

### Background

Demonstration of the effectiveness of the Batemans Marine Park' zoning plan will be key to ensuring community acceptance of the Park, as well as a positive step towards long-term conservation of biodiversity. Such a demonstration can only be achieved through effective and efficient environmental monitoring programmes. While professional scientists will need to take on a significant proportion of this work, financial resources will strongly limit the scope of monitoring that is possible. Furthermore, the repetitive nature of long-term monitoring limits the involvement of post-graduate students. To address these issues, marine resource managers have endeavoured to utilise the efforts of local volunteer organisations with varying degrees of success. While not only being cost-effective, this approach has the added benefit of directly involving the local community in the marine park, facilitating a sense of ownership and appreciation.

This project will monitor shallow (<5 m depth) subtidal communities in the Batemans Marine Park by utilising volunteers from a local marine conservation organisation. An appropriate and scientifically sound sampling protocol has been developed and volunteers have been trained. The data collected will be used to test hypotheses to determine whether different management strategies act to change abundances and size frequencies of both targeted and non-targeted species of fish, invertebrates and macroalgae in the BMP. In addition, this study will also determine whether there are any indirect changes to shallow subtidal community structure via trophic cascades. That is, whether increases in abundances of top predators (predatory fish and macro-invertebrates) influences the cover of macro algal communities due to decreased abundances of grazers (e.g. urchins).

### Objectives

- To monitor long term spatial and temporal changes in the diversity, abundance and size composition of fish and macro-invertebrates and cover of macroalgae among shallow subtidal areas where different management strategies have been implemented, compared to outside the park
- To assess the reliability and usefulness of data collected by community groups

### Contacts

Dr Melinda Coleman

NSW Marine Parks Authority

Mr Andrew Green

Nature Coast Marine Group Inc.

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

#### **Biodiversity and Ecological Processes**

- 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
- Effects of fishing on reef community structure and function

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## Monitoring changes in estuarine seagrass habitats in Batemans Marine Park

### Background

Estuarine habitats exhibit marked changes in community structure and function as a result of multiple anthropogenic stressors, which are superimposed on natural changes. Of particular concern are human impacts on ecologically and economically important seagrass habitats. Seagrasses are critically important to estuarine systems because they greatly enhance local primary production and biodiversity, stabilize sediment and provide a nursery habitat for many commercially-important crustaceans and fish. Despite their high conservation status, seagrass beds are declining worldwide, as well as in Australian waters.

Seagrass habitats are well represented in BMP and changes with the implementation of different management strategies are likely. Decreased fishing pressure on commercially and recreationally targeted organisms such as fish and crustaceans may significantly influence community dynamics of seagrass habitats via trophic cascades. Similarly, decreased human disturbance within sanctuary zones e.g. fewer instances of direct physical disturbance from activities such as boat and anchor scarring, are likely to change the spatial extent and patch dynamics of seagrass beds. This project will monitor spatial and temporal changes in seagrass beds within different zones of BMP. Specifically, we will monitor seagrass species composition, density, blade length and epiphyte load as well as changes in the spatial extent of seagrass beds and the occurrence and size of anchor/boat scarring.

### Objectives

- To monitor long term spatial and temporal changes in the size, density, blade length, epiphyte load and damage (e.g. from boat scarring) to seagrass habitats in estuaries within the BMP with different management strategies

### Contacts

Dr Melinda Coleman                  NSW Marine Parks Authority

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

#### **Biodiversity and Ecological Processes**

- Assess the spatial and temporal patterns of assemblages
- Examine habitat condition

#### **Ecologically Sustainable Use**

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

#### **Specific Impacts**

- Impacts of vessel moorings on seagrass beds

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## Pilot studies to unconfound the influence of seal foraging on fish abundances in areas with different management strategies on Montague Island

### Background

A common long-term outcome of the implementation of sanctuary or no-take zones worldwide is an increase in the abundance and size of targeted fish species with decreased fishing pressure. This prediction becomes problematic, however, in areas that support locally high abundances of organisms in higher trophic levels. Unless the effects of these higher order predators are accounted for, changes in abundances of fish among areas with different management strategies cannot be properly interpreted.

Montague Island in the BMP is home to large colonies of Australian and New Zealand Fur Seals which are known to forage around the island as well as adjacent mainland reefs and are likely to have significant impacts on the size composition and abundances of fish assemblages. Although the implementation of sanctuary zones on Montague Island may act to increase abundances of fish, predation by seals may obscure these changes. To rigorously determine whether changes (or lack thereof) in fish assemblages on Montague Island are associated with the implementation of Sanctuary zones or foraging by seals, experiments need to be designed to examine these factors.

This pilot study will involve existing deepwater BRUV techniques to determine the influence of seals on fish assemblages inhabiting the nearshore reefs of Montague Island. Relative changes among zones that have different management strategies will be compared to those observed on the mainland where seals are less abundant or absent. This data will complement National Parks and Wildlife long-term monitoring of seal populations around the island.

### Objectives

- To characterise spatial and temporal changes in the size, abundance and species composition of fish among zones with different management strategies on the nearshore reefs of Montague Island, compared to the magnitude of changes occurring between zones on the mainland.

### Contacts

Dr Melinda Coleman                      NSW Marine Parks Authority

Dr Brendan Kelaher                      NSW Marine Parks Authority

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

#### **Biodiversity and Ecological Processes**

- Examine multi-species linkages and mechanisms determining rocky reef assemblage structure and dynamics
- Species level interactions – predators, prey, competitors, especially between key species

#### **Ecologically Sustainable Use**

- Examine the optimum design of marine parks
- Abundance of key species of fish and invertebrates
- Effects of fishing on reef community structure and function