
RESEARCH WORK PLAN 2009-10

Jervis Bay Marine Park



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INTRODUCTION

The Jervis Bay Marine Park (JBMP), located on the south coast of NSW, covers an area of approximately 22,000 hectares and spans over 100 km of coastline and adjacent ocean extending from Kinghorn Point in the north to Sussex Inlet in the south, including most of Jervis Bay. The marine environment of the Marine Park is biologically diverse, and while dominated by temperate species, also at times contains many subtropical species that arrive with warmer subtropical waters during summer. Within the Marine Park these species are found in a variety of ecosystems and habitats, including estuaries, intertidal rocky shores, island fringing and subtidal reefs, seagrass beds, sandy beaches and subtidal soft substrates. 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. In particular it is a popular site from recreational fishing and diving and is also a key training area for the Australian Defence Force (ADF). It is 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 development of zoning arrangements within the Jervis Bay 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 2009-10 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.

Ecological changes in shallow rocky biological diversity in Jervis Bay Marine Park

Background

Subtidal rocky reefs are habitats that contain a substantial section of the biological diversity of Jervis Bay Marine Park, including numerous species of algae, invertebrates and fishes. The substantial component of biological diversity associated with rocky reefs has led to them being selected as one of the habitats to examine the effects of the marine park zone arrangements and effectiveness.

This project will continue on from a previous research project co-ordinated by Assoc. Prof. Graham Edgar and Dr Neville Barrett (University of Tasmania) and Dr Tim Lynch (Jervis Bay Marine Park). This earlier project involved sampling numerous subtidal rocky reefs within Jervis Bay across several sanctuary and habitat protection zones over three years prior to the implementation of the zoning plan for the Jervis Bay Marine Park and every year since then (i.e. five years, 2003-2007).

The current research project will involve assessing any long-term ecological changes among the zones and areas sampled in the previous research project, and also involve assessing these changes in the newly sampled rocky reefs (inside and outside of the marine park). It is envisaged that sampling will occur yearly for the first few years of the research program to assess any potential changes in the newly sampled rocky reefs. Over the longer term, sampling will only be necessary every five years with two years of sampling to occur within each of these periods. This frequency of sampling should provide an appropriate background with which long-term ecological changes can be identified in a cost-effective and efficient manner.

Objectives

- To test the general hypothesis that entire assemblages (diversity, composition and abundance) as well as individual species abundances will differ among zones and that these differences will increase over time.
- To test the hypothesis that the size and abundance of targeted fish and invertebrates will increase in sanctuary, relative to non-sanctuary zones and outside the park over time.

Methods

To test the stated hypothesis the macroscopic biota will be sampled in replicate rocky reefs in sanctuary zones (no take areas) and habitat protection zones (areas where high impact activities are not allowed) within the marine park, and locations outside of the marine park. Sampling will also be done in anchoring and non-anchoring areas of sanctuary zones. Sampling rocky reefs within each of these areas in and outside the marine park will enable the ecological changes that occur through time to be quantified and logically interpreted.

Sampling will involve counting the densities of macroscopic algae, invertebrates and fishes (and the sizes of some invertebrates and fishes) along four transects at each rocky reef. The rocky reefs selected to be sampled will representatively cover the marine park and appropriate sections of the coast outside of the marine park. Overall, this program will provide a fully-replicated experimental design to assess the ecological changes occurring in these zones through time.

Project Contacts

Dr Nathan Knott

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
- Identify appropriate indicator species or 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

Ecological changes in deep reef fish assemblages in Jervis Bay Marine Park

Background

Subtidal rocky reefs are habitats that contain a substantial section of the biological diversity of Jervis Bay Marine Park including numerous species of algae, invertebrates and fishes. Recent swath mapping has identified extensive areas of intermediate reef (i.e. between 20 – 60 m) in several sections of Jervis Bay Marine Park. 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 of Jervis Bay Marine Park. These reefs are difficult to sample using SCUBA because of the significant issues with diving at such depths. Instead, a remote approach can be used to sample the fish assemblages associated with these reefs and to a lesser extent the surround assemblages of large sessile invertebrates using a video camera and bait to attract the fishes to the view of the camera. The use of multiple baited remote underwater video is an effective technique to assess potential changes in primarily the fish assemblages associated with the marine park and the zone types.

It is envisaged that sampling will occur yearly for the first few years of the research program to assess any current differences among the fish assemblages associated with the zones and the marine park itself. Over the longer term, sampling will only be necessary every five years with two years of sampling to occur within each of these periods. This frequency of sampling should provide an appropriate background with which long-term ecological changes can be identified in a cost-effective and efficient manner.

Objectives

- To test the hypothesis that there are differences in fish assemblages (diversity, abundance and size frequency) between sanctuary, general use and habitat protection zones and areas outside the park on deep subtidal rocky-reef and that these differences will increase over time

Methods

To test this hypothesis, 30 minutes of video will be collected from four replicate areas at two sites within several of the sanctuary or habitat protection zones, and at several locations outside of the marine park. Sampling rocky reefs within replicated areas of each zone type in the marine park and outside the will enable the changes that occur in the fish assemblages through time to be quantified and logically interpreted in relation to the zoning and the operation of the marine park.

Project Contacts

Dr Nathan Knott

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
- Identify appropriate indicator species or 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

Recreational fisher and other users groups monitoring

Background

Recreational anglers are the major extractive user group within Jervis Bay Marine Park (JBMP) targeting multiple species with a wide variety of techniques. The response of the fishery to the JBMP zone plan is of particular interest as is the relationship between fishing pressure and fisheries independent studies of reef species. This combination of studies is rare in marine parks. Each year the JBMP undertakes extensive sampling of the recreational fishery. Boat and ramp-based sampling of the fishery occurs in February, April and December and commenced in 1999. The study also builds on baseline work that investigated the daylight fishery of Jervis Bay in 1989-1990. The survey also collects distribution data on other users of the marine park. This includes data on sea kayakers, jet skiers, snorkellers and scuba divers.

Comparative results indicate that fishing effort, prior to the introduction of the zoning plan in 2002, doubled or tripled between study periods. There is also evidence of some depletion of stocks. Modern sampling provides a more precise measure of the spatial distribution of fishing effort as anglers are now plotted using GPS. This data has since been used to model potential impacts on fishing effort by sanctuary zonings. Several other questions are currently under investigation. For instance, whether fishing effort or distribution has changed since the introduction of the zoning plan and an independent assessment of compliance effectiveness. Two long-term aims of the project are to determine if fishing indices such as catch diversity, CPUE and the rate and distribution of effort change following zoning.

Objectives

- To monitor the distribution of recreational fishing catch and effort in Jervis Bay Marine Park

Methods

Roving and stationary fishing surveys were used to sample the recreational fishing activity and catches within Jervis Bay Marine Park from the period of establishment to the present time. Roving surveys involved a progressive angler count along a defined pathway circumnavigating the bay. In each survey, the number and types of vessels on the bay were counted as were the numbers of fishers in each boat and the type of finishing on each boat and from shoreline (and water for spearfishers). Stationary surveys were also carried out at either Woollamia or Murrays Beach boat ramps and involved identifying the species caught in each vessel and the numbers and size of the each of fishes caught. The roving and stationary surveys were carried out in February of each year and during April and December in most years between 2002 and 2009.

Project Contacts

Dr Nathan Knott

NSW Marine Parks Authority

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

Ecologically Sustainable Use

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

Socio-economic impacts

- Social & economic value of MPA's

Changes in biological diversity on intertidal rocky shores in Jervis Bay Marine Park

Background

Intertidal rocky shores are habitats that contain a substantial section of the biological diversity of Jervis Bay Marine Park. They provide hard surfaces to which numerous species of algae and invertebrates attach and grow, and provide habitat and foraging areas for a range of mobile invertebrates and fishes. Because of the biological diversity and ecological importance of intertidal rocky shores they have been selected as one of the habitats assessed for the ecological changes that may occur in and outside of the marine park and among the zone types.

To assess the aims of the marine park for intertidal rocky shores, the macroscopic algae and invertebrates will be sampled in replicate rocky shores in sanctuary zones (no take area) and habitat protection zones (a zone type that protect habitat and prevent high impact activities) within the marine park and locations outside of the marine park. Sampling will be done at several heights on the shore and several shores within each zone. Sampling intertidal rocky shores within each of these areas in and outside the marine park will enable the ecological changes that occur through time to be quantified and logically interpreted.

This project will also be designed to enable comparison, where possible, to data collected as part of the CSIRO Jervis Bay Baseline Study. This earlier project involved sampling several intertidal rocky shores within Jervis Bay across what are now sanctuary and habitat protection zones numerous times between November 1988 and August 1991. Data from the current research project and CSIRO study will enable long-term ecological changes within the marine park to be assessed.

It is envisaged that sampling will occur yearly for the first few years of the research program to assess any immediate differences among shores, zone types and inside and outside of the marine park. Over the longer term, sampling will only be necessary every five years with two years of sampling to occur within each of these periods. This frequency of sampling should provide an appropriate background with which long-term ecological changes can be identified in a cost-effective and efficient manner.

This research program will assess whether there are general changes in the biological diversity among these zones through time. This information is essential in order to scientifically manage NSW Marine Parks. Furthermore, locations outside of the marine park will also be sampled to evaluate whether there are changes related to the overall management of the marine park.

Objectives

- To test the hypothesis that there are differences in sessile and mobile invertebrates and macroalgae assemblages between sanctuary, general use and habitat protection zones and areas outside the park on intertidal rocky shores, and these differences will increase over time

Methods

To achieve the stated aims of the marine park for rocky intertidal shores, sessile and mobile invertebrates and macroalgae will be sampled on replicate shores in sanctuary zones and habitat protection zones within the marine park and locations outside of the marine park. Sampling will involve counting the densities of invertebrates and measuring the percentage cover of algae

within replicate 0.25 m² quadrats at several heights on each shore. Two sites (4 x 4 m) will be sampled within each height and several shores within each zone. The rocky shores selected to be sampled will representatively cover the marine park and appropriate sections of the coast outside of the marine park. Overall, this program will provide a fully-replicated experimental design to assess the ecological changes occurring in these zones through time.

Project Contacts

Dr Nathan Knott

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
- Identify appropriate indicator species or 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 invertebrates