

Cape Byron Marine Park



RESEARCH WORK PLAN 2006-07

Cape Byron Marine Park

INTRODUCTION

The Cape Byron Marine Park extends for approximately 37 km from Lennox Head in the south to Brunswick Heads in the north and extends from the mean high water mark and upper tidal limits of coastal estuaries to three nautical miles offshore. The marine and estuarine environments in the Marine Park are biologically diverse and contains a range of 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, seagrass beds, sandy beaches and subtidal soft substrates. A range of resident and migratory marine species rely on specific habitats for breeding, feeding and protection.

The marine park 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. Tourism is a major industry within the region, with many activities occurring within the Marine Park, particularly swimming, surfing and diving.

Research is a key component in the management of the Cape Byron 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.

This 2006-07 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 to provide for the conservation and sustainable use of Cape Byron 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 the Marine Park that is funded from other sources.

The 2006-07 research and monitoring program for the Cape Byron Marine Park (CBMP) incorporates a number of projects and includes collaborations with Southern Cross University student undergraduate and postgraduate research projects.

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**

A comparison of species composition of shallow reef fish communities in Cape Byron Marine Park Sanctuary, Habitat Protection and General Use Zones as determined with differing survey methods

Background

As major components of marine ecosystems, reef fish are clearly of fundamental interest in any monitoring program within a marine protected area. Much of the community initiative to create protected areas stems from an appreciation of reef fish abundance and diversity, so it is important to ensure that controls are adequate to protect and enhance these taxa. This program is intended to assess the diversity and abundance of fish in a variety of habitats in Cape Byron Marine Park (CBMP).

While protocols exist for performing diver transects and recording of observed species in situ, there are limits to the feasibility of performing this work, particularly where the depth of diving precludes extended bottom time, as is the case in much of CBMP. As well, a high level of observer training is required for diver counts, and counts are inevitably subject to individual biases, which make managing and standardising such a program difficult in the long-term.

A possible alternative to diver surveys in CBMP is a program of video transects and video sites to trial the feasibility of using lesser-trained divers to perform fish surveys. Ultimately, this may enable the assistance of students and community groups to have a real input to monitoring in the marine park, and maintain a high survey standard. Preliminary results appear to indicate that this could be a cost effective means of comparing reef-wide community structure. However, monitoring of the effects of fishing and/or fishing closures on specific taxa may be more effectively performed by alternative methods, depending on the habitat and the fish species being surveyed. This project will assess the relative effectiveness of three different methods of fish survey in describing diversity and abundance over several benthic types.

The project will compare the most rigorous and difficult method (diver transects) to methods requiring a basic knowledge of fish taxonomy. The results will be used to design future monitoring programs for the marine park by selecting appropriate indicator taxa and survey methods suited to these. For example, if the relative abundance of a few conspicuous taxa are adequately assessed by all methods it would follow that the method that allows the greatest consistency should be favoured in future surveys. Many species of fish found on reefs are closely associated with the habitat, with varying habitat structure and depth known to influence the fish assemblage composition. Shallow reefs (<20 m deep) within CBMP vary in the size and proximity to other reefs and extent of kelp (*Ecklonia radiata*) cover. There is evidence that abundance and species richness is greater on the reef with less kelp, although it is not possible to isolate the presence of kelp as the major factor influencing distribution. It is more likely that a combination of habitat variability, reef size, exposure and local-scale spatial distribution of reefs contributes to variations in abundance and species richness of reef fishes.

Previous surveys have examined reef fish at Wilson's Reef located in shallow depths adjacent to the main beach in Byron Bay. This project is examining fish abundance, richness and assemblage composition on the reefs around Julian Rocks. Data collection will be a combination of diver-held video transects and stationary video point counts, using a sampling design already employed on reefs in the region.

Objectives

- To compare survey protocols and quantify species biases to determine the most effective and appropriate methods and sample sizes for on-going monitoring of inshore reef fish populations and assemblages
- Conduct video surveys at Old Man and Middle reefs to allow for comparisons with existing data (supplemented by new surveys) from Bait, Wilson's and Wide Wilson's Reefs
- Conduct video and baited remote underwater video (BRUV) surveys at Julian Rocks, Spot X and Mackerel Bowl to compare these seasonally closed sites with the permanently protected reefs closer to Julian Rocks.

Contacts

Dr Danny Bucher

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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
- Identify appropriate indicator species or taxa

Ecologically Sustainable Use

- Abundance of key species of fish
- Examine the optimum design of marine parks: size, patterns of zoning

The diversity and abundance of soft-bottom epifauna and infauna in Cape Byron Marine Park Sanctuary, Habitat Protection and General Use Zones

Background

A significant proportion of the seabed of Cape Byron Marine Park (CBMP) consists of soft sediment, and although broadly grouped into surrogates based on depth and sediment type, these habitats remains poorly described in terms of their assemblage composition and diversity. Managing what may be diverse and fragile benthic communities is clearly not feasible without knowing their locations, and therefore there is a need to better understand the distribution of soft sediment assemblages to improve our ability to manage the park and evaluate the effectiveness of the closure to demersal trawling.

Trawling for prawns and finfish has been conducted intensively throughout the park for many decades, and in some areas this ceased in May 2006. There are likely to have been considerable impacts on the diversity of benthic assemblages within Cape Byron Marine Park consistent with that demonstrated in trawl grounds elsewhere in the world. Examining the extent of demersal trawling impacts and the time required to restore these areas would be a useful tool in managing trawl impacts.

From May 2006 CBMP contains areas that are closed to trawling with nearly identical areas adjacent that are still accessible to trawlers. This provides an opportunity to demonstrate the likely effects of trawling on the macrobenthic community and to test the effectiveness of closures to protect biodiversity of soft sediment habitats. This will require baseline data on the present assemblages and further sampling at intervals after closure will examine the degree of change in the protected sites relative to those that continue to be trawled.

Objectives

- Compare invertebrate samples from earlier surveys to determine if there is any short-term change since introduction of the zoning plan.
- Conduct pipe dredge and cage dredge sampling at a range of shallow water sites, to extend the reference collection of sediment macro-invertebrates from the CBMP to include areas for which a comparison of paired trawled and untrawled sites is not possible.*
- Create a reference collection of benthic invertebrates and/or images for future studies.

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

Assessment of deep water reef fish communities in Cape Byron Marine Park and adjacent areas

Background

While submerged structures do attract fish, the value of reef habitats for nearshore benthic and pelagic communities and the role that targeted fish may play in structuring and maintaining diversity in them is generally overlooked by recreational anglers. For example, large reef fish may perform ecological roles which may maintain the physical structure and diverse assemblage composition of these areas.

If it can be shown that protected areas not only have a greater abundance of targeted fish species but also demonstrate greater overall fish diversity this would assist in communicating the goals protecting marine areas to this stakeholder group. Having a monitoring program focussed on iconic fish species could provide a valuable tool in promoting a greater community acceptance of the more subtle functions of the marine park. That is, by creating productive areas that possess a high biodiversity and ecosystem integrity, there will be benefits both to the environment and anglers in other areas.

Also, by using a method that is known to target iconic species such as bream and snapper in Cape Byron Marine Park (CBMP) acknowledges that these species are valued by recreational anglers, and that they are an important component of the Cape Byron reef areas. This not only validates the anglers' interest in these species but also provides a common point of interest for park managers and the community, which may be useful in engaging the interest of anglers in reporting marine park research.

Deep reefs, while often targeted by fishers, are difficult to monitor using traditional techniques. The study will allow a comparison of reef fish abundance and diversity between sanctuary zone, habitat protection zone and general use zone providing some information on the effectiveness of the zoning arrangements in CBMP over the period of the current zoning plan.

Objectives

- Determine the relative abundance (and change through time) of selected deep water fish species in sanctuary, habitat protection, and general use zones within Cape Byron Marine Park.
- Produce educational materials that describes the ecological role that these fish species play in structuring marine communities.

Contacts

Matt Dasey

NSW Marine Parks Authority

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- Conduct biodiversity assessments of selected taxa

Ecologically Sustainable Use

- Examine the optimum design of marine parks: size, patterns of zoning
- Abundance of key species of fish

A test of the ability of the Cape Byron Marine Park to conserve stocks of the pipi,
Donax deltoides

Background

The bivalve, *Donax deltoides*, (commonly known as pipis) are abundant on sandy beaches in Australia. They have been harvested commercially since the 1950's and during the 1990's the commercial harvest in NSW exceeded 300 tonnes. Pipis are also harvested recreationally for food and bait and the recreational harvest can account for up to 20% of all pipis collected. Despite their abundance and commercial and recreational importance, few studies have examined the ecology of the species. However, since pipis can make up a significant proportion of the macrofaunal biomass on beaches it is likely that they have a significant role in the ecology of sandy beach systems. In particular, similar species of surf clams are known to be important sources of food for wading shore birds such as oyster catches and for crabs.

A major goal of the Marine Park Authority is to assess changes in abundances and sizes of organisms in such a way as to be able to attribute the observed differences to the zoning arrangements within the marine park. In May 2006, commercial harvesting of pipis in the Cape Byron Marine Park (CBMP) was restricted to just two areas: Grays Lane and Seven Mile Beach Habitat Protection Zone thus providing the opportunity to assess the effectiveness of Sanctuary Zones to conserve pipi populations. This project aims to address this issue by sampling the abundance and size composition of pipi within open and closed areas within CBMP.

Objectives

- To use a rigorous experimental design to determine whether potential increases in abundances and sizes of pipis within the Cape Byron Marine Park Sanctuary Zone can be attributed to the cessation of commercial harvesting

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Biodiversity and Ecological Processes

- Conduct biodiversity assessments of selected taxa

Ecologically Sustainable Use

- Examine the optimum design of marine parks: size, patterns of zoning
- Assessment of usage, impacts and threats of anthropogenic activity on habitats