

Cape Byron Marine Park



RESEARCH WORK PLAN 2008-09

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 contain 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.

Monitoring and research provide information to make informed management decisions for the conservation and sustainable use of the park in accordance with the provisions of 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.

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 by the Marine Parks Authority and does not include research conducted within the Marine Park that is funded 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.

Monitoring the frequency of coral disease and survivorship at heavily-dived and rarely-dived sites adjacent to Julian Rocks, northern New South Wales

Background

Impacts from recreational SCUBA diving on subtropical reef ecosystems are largely unknown, but the likely impact of divers on corals at Julian Rocks in Cape Byron Marine Park is an issue of concern for management. There are incidences of coral diseases and unexplained mortalities around Julian Rocks which appears to be concentrated around the two most heavily-dived areas (the northern Nursery and Hugo's Trench) and in the vicinity of most moorings.

Currently, species of particular interest for disease studies are the meandroid brain coral *Goniastrea australensis*, the common branching coral *Acropora solitaryensis* and two species of *Turbinaria*. Most of the diseased corals at Julian Rocks are *Goniastrea australensis*, although a major bleaching event in 2002 principally affected the branching coral *Pocillopora damicornis*, although other species showed minor bleaching in 2006. To properly manage and protect marine habitats the underlying processes that affect those habitats must be understood, with particular emphasis on potential threatening processes.

While important, monitoring changes in benthic assemblages by examining percent cover of different benthic categories only provides part of the picture. Important factors that cause change include stress response, competition, predation, growth and reproduction within individual categories (corals, sponges, algae and other groups). In heterogeneous benthic assemblages, monitoring stress response or change in some conspicuous benthic categories using random transect or quadrant methods is problematic. Patchy distribution and limited cover of corals and sponges would require excessively large numbers of replicate transects or quadrats to detect very small (but potentially biologically significant) changes. Therefore, individual stress response, survivorship, disease or predation is to be examined by monitoring individuals or colonies.

Objectives

- Survey selected coral and/or sponge colonies assemblages to examine colonies/individuals for physical damage, predation, bleaching, disease (or recovery from previous events)
- Examine recruitment rates, frequency of disease, damage and dieback and survivorship rates in heavily dived and rarely-dived sites.

Contacts

Mr Simon Hartley/Dr Daniel Bucher/
Assoc. Prof. Peter Harrison

Southern Cross University

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

Ecologically Sustainable Use

- Assessment of usage, impacts and threats of anthropogenic activity on habitats

Mapping biodiversity in and around the Cape Byron Marine Park. To what extent are the protected zones of CBMP representative of the range of local benthic communities?

Background

The Cape Byron Marine Park (CBMP) was established in November 2002 and the zoning plan came into effect in May 2006. The protection zones of the park ('sanctuary' and 'habitat-protection') are by definition intended to include examples of each community type, thereby providing sufficient representative habitat for the full range of biodiversity in the region. To facilitate this, prior to the zoning for the park a side-scan sonar survey of the park's seabed was conducted. During this project habitat types were broadly defined either on the basis of arbitrary physical parameters (e.g. depth and sediment hardness/texture) or on the presence or absence of visually dominant taxa (e.g. the kelp *Ecklonia*). There was no further classification of soft-sediment habitats based on the presence of dominant benthic communities.

On hard substratum in CBMP, significant differences in invertebrate and fish assemblages have been described between geographically close reefs of similar depth with similar coverage of *Ecklonia*, and between sediment infaunal assemblages in deep coarse sands. Significant differences were also found in fish assemblages on reefs of different topography at similar depths around Julian Rocks. Before the present zoning plan can be effectively reviewed more detail is needed on the distribution of benthic communities within and surrounding the Marine Park. Some sections of CBMP that were previously open to fishing such as trap and line, spanner crabbing and prawn trawling have been closed under the zoning plan. Although the sensitivity of this study is not designed to detect fishing effects (or rather the effects of protection *from* fishing), such differences may be evident if suitable sample units are chosen.

Previously, the CBMP commissioned an honours project to examine the Marine Park's soft-benthic fauna, and this has provided some insight into the composition of these communities. However, given the amount of unconsolidated seabed in the park and the diversity of taxa discovered by this program far more work is required before any patterns in distribution can be properly described. Overall, knowledge of the composition and distribution of soft-sediment fauna of CBMP is poor, and this is the predominant habitat of the Park.

Objectives

- To examine the soft-sediment invertebrate communities within CBMP to depths of 80 m using a combination of established and novel sampling methods to sample a range of benthic species
- Describe and map the extent of the different faunal community types
- Evaluate the sensitivity of these communities to anthropogenic disturbance

Contacts

Mr Simon Hartley/Dr Daniel Bucher/
Assoc. Prof. Peter Harrison

Southern Cross University

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

Ecologically Sustainable Use

Assessment of usage, impacts and threats of anthropogenic activity on habitats

Assessment of demersal sharks and rays in Cape Byron Marine Park using baited remote underwater video

Background

Seabed habitats within the Cape Byron Marine Park (CBMP) are dominated by soft-sediment habitats, primarily fine sand inshore and coarse sand offshore. While the habitat type dominates CBMP, the demersal (or bottom dwelling) fauna that it contains has not been examined in detail, particularly the larger demersal species such as sharks and rays. There is a clear need to monitor the effectiveness of marine park zoning within the CBMP, and the establishment of baseline information on the composition and abundance of demersal fauna on soft-sediment habitats is one component of this evaluation.

A method increasingly used to examine species composition and relative abundance in habitats generally too deep to assess on SCUBA is through baited remote underwater video (BRUV). This method has been used extensively on reefs, but appears to work best on soft-sediment habitats to examine demersal sharks and rays as they often smother and dominate the bait removal. Given the need to obtain further information on the composition of demersal fauna within CBMP, and to assess the effectiveness of the zoning arrangements in providing a representative selection of biological diversity, a BRUV's program is being conducted over soft-sediment habitat.

While a range of sharks and rays are expected to be surveyed, the sampling locations were selected primarily to examine the distribution of the white-spotted guitarfish (*Rhynchobatus australiae*). This is a demersal ray-like shark known to inhabit the waters of the inner shelf of north eastern Australia, and in 2003 was placed on the IUCN Red List as Vulnerable due to known large and rapid reductions in its total population of greater than 30%, with indications of continued declines. Very little is known of the population status or ecology of the species but they are can be found close to shore in CBMP intermittently in winter and seem to aggregate in groups on sand and adjacent reefs. The location of aggregation sites for species such as *R. australiae* is poorly know as they do not appear to be on shallow water reefs that are regularly dived.

Of all the large cartilaginous fishes in CBMP *R. australiae* stands out as the most vulnerable to a wide variety of fishing gear. Mature *R. australiae* inhabit sandy areas and are vulnerable to being taken in demersal prawn trawl nets and gillnets as bycatch. It is susceptible to being speared, hooked by recreational and commercial fishers and is known to take baits from droplines and demersal longlines of commercial shark fishers. In this regard it is very likely that the species is at greater risk than other sharks and rays to fishing pressures. Given the varying levels of fishing pressure between sanctuary zones and adjacent areas there is a need to establish baseline information on species such as *R. australiae*.

Objectives

- To determine the composition and relative abundance of demersal Chondrichthyans including Rhynchobatids, Rhinobatids, Urolophids and Dasyatids in CBMP sanctuary zones and areas open to harvesting
- To investigate the distribution of *R. australiae* and their aggregation sites in near-shore waters of CBMP and adjacent areas to assess the level of protection provided by sanctuary zones to the species.

Contacts

Mr Andrew Page

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
- Investigate the effectiveness of marine parks in increasing propagation, identifying areas of sources or sinks, extent of spillovers
- Abundance of key species of fish

Assessing the impact of four-wheel driving and horseback riding on *Donax deltoides* (“pipis”) in the Cape Byron Marine Park

Background

Four-wheel driving and horseback riding are common activities on sandy beaches. Both activities may, however, have detrimental impacts on sandy beach fauna. Compaction of sand by 4WD vehicles can crush fauna (Schlacher and Thompson in press, Schlacher et al. 2006, 2007) while horses’ hooves may both crush and dislodge animals. The magnitude of any impacts caused by vehicles may, however, vary depending on the weight of the vehicle and the volume of traffic. Similarly, the impact of horses may depend on the numbers of horses accessing the beach and whether the horses walk, trot or gallop. Determining the magnitude of the impact under different impact conditions, therefore, is important for managing these activities within marine parks.

The beach clam, *Donax deltoides* (“pipis”) is abundant on sandy beaches in NSW (James and Fairweather 1996). Pipis are susceptible to damage by vehicles and horses because they burrow to shallow depths only (typically less than 10 cm) and occupy the lower part of the shore and swash zone (James and Fairweather 1996), which is the area most frequented by vehicles and horses. Pipis feed mainly on surf diatoms and play a pivotal role in sustaining higher-order predators, such as birds, rays, cephalopods and crabs (Murray Jones and Johnson 2003). Pipis, therefore, are a crucial energetic and functional link in sandy beach ecosystems. Substantial quantities of pipis are also harvested by commercial and recreational fishers. During the 1990s the commercial harvest of pipis in NSW exceeded 300t and the recreational harvest was estimated to account for up to 20% of all pipis collected (Murray-Jones and Steffe 2000). Consequently conservation of pipis is important because of their critical role in sustaining sandy beach food webs as well as their importance as commercially and recreationally harvested species.

Four-wheel driving and horseback riding on beaches is a controversial issue. Within the Cape Byron Marine Park, 4WD vehicles and horses are largely restricted to Seven Mile Beach. Up to 200 vehicles and 50 horses are thought to access the beach weekly, but no quantitative data on the volume of traffic exist. Since management decisions need to be evidence-based, it is important that the numbers of vehicles and horses accessing the beach is quantified and their impacts assessed using rigorous experiments. The experiments proposed will enable managers to make informed decisions regarding management of vehicles and horses. The results will have direct application to the management of the Cape Byron Marine Park but has wider application for management of traffic on beaches in general.

Objectives

- To quantify the maximum volume of vehicle and horse traffic on the beaches of the Cape Byron Marine Park, and
- To assess, using a series of replicated manipulative experiments, the effects of four-wheel driving and horseback riding on pipis.

Contacts

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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

Ecologically Sustainable Use

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