

# **Cape Byron Marine Park**



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# RESEARCH WORK PLAN 2007-08

## 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 2007-08 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**

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## 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 & 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

Dr Kylie Pitt

Griffith University

Dr Thomas Schlacher

University of the Sunshine Coast

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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: size, patterns of zoning
- Assessment of usage, impacts and threats of anthropogenic activity on habitats

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## 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 benthic 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

- Record the position of all selected coral and/or sponge colonies and survey the 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 Danny Bucher/  
Assoc. Prof. Peter Harrison

Southern Cross University

Matt Dasey

NSW Marine Parks Authority

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## 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 northern east 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.

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**Contacts**

Matt Dasey

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

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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

**Contacts**

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