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# RESEARCH PROJECT SUMMARIES

## Cape Byron Marine Park

This document provides a collation on non-technical summaries for research projects conducted within Cape Byron Marine Park with support from the NSW Marine Parks Authority. Further additional funding was provided for some projects by a number of State and Commonwealth agencies and universities.



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## Mapping and classifying shallow water (<70m deep) habitats of Cape Byron Marine Park using sidescan sonar and underwater video

The Cape Byron Marine Park (CBMP) was declared on 1st November 2002 under the *Marine Parks Act* (1997) and is one of four such marine parks in NSW. The CBMP covers approximately 220 sq km of marine and estuarine environments between Lennox Head and the Brunswick River Mouth, with its seaward boundary being defined by the 3nm limit of NSW state waters. Previous maps of the seabed of the CBMP have been produced using mainly aerial photographs with detailed information being available only in shallow water up to depths of between 5 to 10m.

In late 2003, the Cooperative Research Centre for Coastal Zone, Estuary and Waterway Management (Coastal CRC) was contracted by the NSW Marine Parks Authority (MPA) to provide a rapid assessment and map of all of the subtidal marine habitats of the CBMP including those in deep water. The habitat map was to be used in preparing zoning plans within the park. The mapping was to be based on information collected by sidescan sonar and underwater video cameras to produce a classified map of the subtidal habitats and to combine this with existing mapping previously carried out by aerial photography.

The sidescan survey was carried out in November 2003 using the NSW Fisheries vessel *Ngaarru*. Over 90% cover of the area within the CBMP boundaries was achieved using the sidescan sonar system. The sidescan sonar survey was extended to cover areas of interest to the north and south of the marine park boundaries. In early 2004 the sidescan imagery was validated using an underwater video system which was towed close to the seafloor from the charter vessel *Cavanbah*. A total of twelve hours of video data was obtained. The sidescan and video information were processed and interpreted based on a habitat classification system suitable for use in zoning the marine park that had been agreed on by NSW MPA and the Coastal CRC. Maps of the areas surveyed were produced showing a range of different types of reef and unconsolidated sediment, together with existing classifications of terrestrial, estuarine and intertidal features.

The habitat maps produced showed clear and significant differences between the previously mapped extents and positions of the Julian Rocks, Mackerel Boulder and Cape Pinnacle reef systems of the area. The level of detail obtained from these surveys and depicted in the habitat maps represents significant improvement on previous knowledge which will contribute substantially to the development of zoning plans for the marine park. It is recommended that the accuracy of both mapping and classification could be enhanced with the acquisition of more detailed bathymetry.

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The recent purchase by the NSW DEC of a GeoSwath system will allow the acquisition of more detailed and accurate bathymetry and side-scan imagery simultaneously. Future surveys should be directed towards areas of particular interest, such as the deep offshore reef east of Cape Byron supplemented by detailed studies of the habitats classified and mapped. Fine scale surveys of the substrate, flora and fauna carried out by grab, corer, ROV and diver are also required to test and refine the classification system used. The techniques used by the Coastal CRC in these surveys have resulted in the rapid production of a habitat map for the CBMP, greatly improving the knowledge of the extent and diversity of the habitats of the area. In addition to a report and map showing the various marine habitats within the park, the Coastal CRC provided the NSW MPA with underwater video footage used to confirm the various habitats shown in the map. All the information was presented in a Geographic Information System (GIS) with video footage provided as video clips linked to their positions. These products will be invaluable in preparing a zoning plan for the Marine Park, and for monitoring marine habitats into the future.

The classification system developed during the project and used in the report was seen as a significant improvement on previous classification schemes by virtue of the technologies used. It is intended however that it be viewed as an interim measure for use in the zoning plans and should not be adopted as a model without further refinement. Future developments of classification schemes should focus on covering the full suite of potential communities on the NSW coast in order to work towards a standardised and comparable system for the classification of marine habitats along the NSW coast.

#### Reference

Bickers, A. (2004). Cape Byron Marine Park Habitat Mapping. Report by the Cooperative Research Centre for Coastal Zone Estuary and Waterway Management to the NSW Marine Parks Authority.

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## Reef fish assemblages in kelp (*Ecklonia radiata*) habitats off Brunswick Heads and Byron Bay, NSW.

Reef fishes are often closely associated with habitat, and fish assemblages are known to vary according to varying habitat structure. The distribution of many reef fishes is governed by a number of biophysical factors including habitat which is therefore one of the most important criteria in fisheries management and selecting of areas for conservation. The reef fish assemblages on two sub-tidal rocky reefs in northern NSW were investigated to document community structure and spatial variations and determine factors responsible for distribution patterns. Both reefs contain significant kelp (*Ecklonia radiata*) communities but vary in the level of kelp cover and in benthic community composition.

Despite a significant difference in abundance and species richness between the two reefs, they were dominated by similar species and families with similar overall patterns in community structure. Although results indicate that abundance and species richness is greater on the reef with less kelp it is not possible to isolate the presence of kelp as the major factor influencing distribution due to the similarity in community composition between the reefs. It is more likely that a combination of habitat variability, reef size, physical conditions and the location of an individual reef in relation to other reef habitats contribute towards abundance and species richness of reef fishes.

### Reference

Perera, N. (2004). Reef fish assemblages in Kelp (*Ecklonia radiata*) habitats off Brunswick Heads and Byron Bay, NSW. Unpublished report from Southern Cross University to the NSW Marine Parks Authority

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## Recreational Use Survey of the Brunswick River

The Brunswick River estuary, including all tidally affected areas of Simpsons and Marshall Creeks, is located within the northern extremity of the Cape Byron Marine Park. The Marine Parks Authority (MPA) is required to prepare a zoning plan for Cape Byron Marine Park, including the Brunswick River estuary. The purpose of the zoning plan is to ensure that the marine biodiversity of the area is conserved while minimising changes to the public's use and enjoyment of the area.

The full extent of recreational use of different areas of the Marine Park is being assessed through a number of different surveys including the broad-scale distribution of a questionnaire, a phone survey, and observational surveys. The aim of this study was to determine the nature and extent of all recreational activities in the Brunswick River. The information collected will be used together with natural resource data to assist in the preparation of a zoning plan for Cape Byron Marine Park.

In regards to recreational fishing ease of access to the public appeared to play a major part in determining the intensity and location of fishing activity. Fishing intensity was greatest in the central and western regions of the river where access is easiest for shore based fishermen and families staying in the caravan parks. The central and western regions of the river also provided the most consistent deep water, during all tidal fluctuations, for navigation by boat based fishermen. (Quote in here about where the 50% most of the river is inaccessible to boating activity ie south and north arm due to shallow waters). Surprisingly Region 10c had quite low levels of fishing intensity despite ease of access to the public and there being waters deep enough for consistent boat navigation. This region of the river appeared to be more heavily used for other activities such as swimming, beach going, snorkelling, canoeing and kayaking, walking and running.

### Reference

Wellington, C.N. (2003). Recreational Use Survey of the Brunswick River. Report from Earth Sense Consulting to the NSW Marine Parks Authority

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## Rapid Assessment of Rocky Shore Biodiversity in the Byron Bay Region.

This report summarises the results of a rapid assessment of the biodiversity of intertidal habitats at 4 sites with the Byron Bay region - Flat Rock, Lennox Head Reef, Broken Head and Cape Byron (the Pass eastward to the Cape). The objectives were to provide a description of intertidal habitats and communities and to: i) determine patterns of community structure and differences between habitats and sites; ii) identify the presence of rare or unusual species; iii) provide recommendations with respect to conservation zoning based on differences in community structure and species richness; and iv) to comment on conservation and management issues at the survey sites.

The study consisted of replicated 30 minute surveys of different habitat types at each site during which all species were recorded and given an abundance rating ranging from 0 (absent) to 5 (abundant). Comparisons of overall community structure and of general species richness were made within and between sites using multivariate and univariate statistical methods.

A total of 143 species were recorded for the intertidal region at Flat Rock (109 animals and 34 algal species). Of note was the relatively high cover of algae in the pools around the margin of the platform. Tropical cnidaria were represented by a single colony of zoanthid, which was the only colony of tropical cnidarian encountered during the full survey program within the region. A specimen of the tropical sea-urchin *Diadema savignyi*, the only one recorded from any locality during the surveys, was also found in the same region of the headland. The boulder habitat on the south-western margin of the platform supported a diverse community that was dominated by molluscs, 2 species of which were not encountered at other sites within the region. Although surveys of the deep-pool habitat (which is present on the north-eastern margin of the platform) were incomplete, this habitat supported algal species that were either absent or rare at other locations.

Lennox Head Reef was the largest of the sites examined and was found to support a number of discrete community types that were associated with different tidal heights and locations relative to the Moat, the lagoon occupying the majority of the reef area. Boulder fields dominate the intertidal region. A total of 187 species were recorded (158 animals and 29 plants) from the intertidal region at Lennox Head Reef with 7 additional species also present in the Moat. The highest species richness was recorded at the low tide level along the eastern margin of the reef. Pools present across the southern and south-western areas of the reef supported diverse communities which included dense aggregations of cowries and sea-cucumbers and also specimens of colourful nudibranchs. The sea-floor habitats within the Moat were dominated by algae and seagrass and animals were relatively scarce. Most rocky surfaces in the Moat were covered by a layer of sand which may limit suitable habitat for the establishment of diverse animal assemblages. Storm-water discharging over the beach from drains to the west of the Moat was

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observed to result in rapid changes in turbidity at adjacent intertidal sites and also to increase sedimentation which resulted in burial of reef habitat and smothering of attached biota.

Rocky intertidal areas at Broken Head and Cape Byron were found to support low species richness (61 and 48 species, respectively) which probably results from the effects of moderate wave exposure and sedimentation from adjacent beaches. Community structure was similar at these sites and was characterised by common shell species, algal assemblages in pools at lower tidal levels, and sand tolerant animals such as anemones. Despite the relatively low diversity, subsequent analysis indicated that community structure at these sites was distinct and was not represented at other sites examined during the study.

Shallow pools across the study sites supported approximately 55% of the species richness of similar locations in the Solitary Islands Marine Park (SIMP). Species richness in the boulder field habitat was also lower at the study sites than at sites within the SIMP. This is likely to be due to the differences in geology, the lack of low energy platforms in the Cape Byron region, and the effects of sedimentation which were evident at all study sites.

The results of community level analysis indicate that 7 different community types are present in the intertidal areas of the study sites. Three of these are present at Flat Rock, 1 at Broken Head/Cape Byron, and 3 at Lennox Head Reef. Lennox Head Reef also supports the Moat habitat which is unique within the region. In order to ensure that representative areas of each habitat type are included in protective zones within the Cape Byron Marine Park, we suggest that: i) consideration should be given to extending the southern boundary to include Flat Rock; ii) Lennox Head Reef is given maximum protection; and iii) Broken Head is also given maximum protection. Observations made during this study also indicate that stormwater needs to be more effectively managed at Lennox Head Reef if the conservation value of the site is to be adequately protected.

#### Reference

Smith, S.D.A. and James, K.A. (2003). Rapid Assessment of Rocky Shore Biodiversity in the Byron Bay Region. Report from the National Marine Science Centre to the NSW Marine Parks Authority

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## A preliminary survey of mollusc communities found within the non-vegetated sediments of the Cape Byron Marine Park.

The Cape Byron Marine Park is the latest addition to a series of marine parks encompassing much of the NSW coastline designed to protect, monitor and encourage the sustainable use of marine resources. Successful management of the Cape Byron Marine Park requires that performance based monitoring guidelines are established.

Benthic (bottom dwelling) organisms are known to be highly sensitive to anthropogenic disturbance, however reactions to such disturbances are often hard to identify over natural background fluctuations. Prior to implementing a benthic monitoring program it is crucial that all background fluctuations in diversity and abundance are mapped. The dominant invertebrates found within marine benthic communities are polychaete worms, crustaceans and molluscs. Unlike polychaete worms and crustaceans the study of mollusc communities do not require complex taxonomic identification skills and are better suited for the purpose of a pilot study. This aim of this study is to conduct a pilot survey examining the macrofaunal (>1mm) mollusc communities found within the unconsolidated sediments of the Cape Byron Marine Park.

Sediment samples were obtained from two of the three sediment types identified with a benthic Van-Veen grab. All samples were sorted, photographed, identified and subsequently crushed (unless animal was visible) to quantify the number of inhabited mollusc shells. A complete digital reference collection was created, however few specimens were preserved (due to crushing process). The results revealed a total of 189 individuals of the classes; Gastropoda (74%); Bivalvia (24.5%) and Scaphopoda (1.5%). Although it was revealed that each sediment type was represented by a unique functional group it is unclear if these differences were a result of site or equipment variations. It was revealed that two replicates would be adequate for monitoring purposes for fine, sandy sediments (that cover much of the marine park). This study represents the beginning of a more extensive survey that will further map the benthos of the Cape Byron Marine Park.

### Reference

Adams, D. (2006). A preliminary survey of mollusc communities found within the non-vegetated sediments of the Cape Byron Marine Park. Unpublished report from Southern Cross University to the NSW Marine Parks Authority.