Parks Victoria Research Partners Panel
Project Summary Report

Baseline habitat mapping and improved monitoring of reef habitats in Victoria's marine national parks and sanctuaries

Parks Victoria and Deakin Univiersity

Background

Parks Victoria has established the Signs of Healthy Parks (SHP) program for its network of marine national parks and sanctuaries with the aim of both improving baseline knowledge of Victoria's marine protected areas (MPAs) and addressing applied management questions. The program aims to ensure systematic, robust and integrated ecological monitoring across the breadth of Victoria's marine national parks and sanctuaries. Parks Victoria has implemented subtidal and intertidal reef monitoring programs in a large number of its MPAs from as far back as 1998; however, they only cover a small proportion of the key habitats in the parks. Using advances in ocean technology, and through collaborative research partnership with Deakin University the SHP program can now monitor the health of the entire extent of parks, allowing the full gamut of protected features to be monitored. Building on Parks Victoria's Conservation Action Planning process and historical monitoring programs, the SHP aims to monitor the health of protected areas using a range of environmental indicators that provide information about natural values and ecological processes occurring within the parks and potential threats to those. This study trials a suite of new monitoring approaches to address knowledge gaps across several major marine national parks and sanctuaries with the overall aim of enhancing our ability to measure indicators and understand the health of MPAs.

Aims

The specific aims of this project were to:

1) develop a full bathymetry map for Bunurong MNP and full habitat maps for both Bunurong and Wilsons Promontory marine national parks, to provide comprehensive information on the types and distribution of habitat found within the parks;
2) establish monitoring sites in Wilsons Promontory MNP as part of the national IMOS autonomous underwater vehicle (AUV) program (the first in Victoria), to examine habitats not previously explored or surveyed and build a more comprehensive understanding of habitat distributions;
3) use baited remote underwater video stations (BRUVS) to continue to build an inventory of fish species in Wilsons Promontory MNP, better understand the role of habitat in explaining the distribution of fish populations to help target future research and monitoring, and identify populations (and areas of the park) that may be vulnerable to illegal fishing to inform future compliance efforts;
4) investigate species–habitat relationships present within Wilsons Prom MNP using species distribution models based on BRUV observations and habitat/environmental measures.
5) use fisheries-independent survey methods to assess rock lobster populations inside Wilsons Promontory MNP (and at suitable reference sites outside the park) in combination with various modelling approaches to better understand the role of habitat and no-take protection in explaining rock lobster distribution
6) test, refine and implement new methods for intertidal reef surveys using low-cost unmanned aerial vehicles (UAVs) at Merri Marine Sanctuary (MS), Port Phillip Heads MNP, Ricketts MNP and Mushroom Reef MS

Relevant parks and ecosystems

Wilsons Promontory Marine National Park

Bunarong Marine National Park

Port Phillip Heads Marine National Park

Merri Marine Sanctuary

Ricketts Point Marine Sanctuary

Mushroom Reef Marine Sanctuary

More information

Contact Parks Victoria on 13 1963

Publications and presentations

Results

Autonomous underwater vehicle (AUV) surveys in Wilson Promontory MNP and towed video surveys in both Wilsons Promontory MNP and Bunurong MNP were used to classify the benthic habitat and, using predictive models, build accurate and detailed habitat maps of the parks. Bunurong MNP has a reasonably uniform and gentle depth gradient throughout the park with extensive contiguous reef areas across a wider depth range. In contrast, much of Wilsons Promontory MNP is dominated by sediment with patchier reefs clustered in shallower areas that are predominantly extensions of granitic outcrops. These differences between the 2 parks in their depth range and reef structure resulted in differences in the benthic species and assemblages observed. Although both parks are dominated by brown macroalgae in areas shallower than 20 m, most depth classes in Wilsons Promontory MNP deeper than 20 m are dominated by sediments with sparse sessile invertebrates interspersed with small areas of complex rocky reef supporting high diversity sponge gardens. Bunurong MNP is dominated by red algae below 20 m and has over 50% coverage of biota until around 40 m depth. Bunurong MNP also has a large region dominated by rhodolith beds between 25 and 40 m depth.

Observations of fish assemblages within and adjacent to Wilsons Promontory MNP using baited remote underwater video stations (BRUVS) found that greatest species richness was present at depths between 20 and 50 m. This depth range also coincides with a large portion of reef within the Wilsons Promontory MNP. The most abundant species observed in Wilsons Prom MNP were perch (*Caesioperca* spp., 45.9%), Rosy Wrasse (*Pseudolabrus rubicundus*, 6.3%), Degen's Leatherjacket (*Thamnaconus degeni*, 5.4%), Blue-Throat Wrasse (*Notolabrus tetricus*, 5.4%) and Longfin Pike (*Dinolestes lewini*, 4.1%) (Table 3.5,Figure 3.8). Shark species such as Gummy Shark (*Mustelus antarcticus*, 30.4% of total biomass) Draughtboard Shark (*Cephaloscyllium laticeps* 25.9%) and Port Jackson Shark (*Heterodontus portusjacksoni*, 8.8%) were the highest contributors to biomass.

Species distribution models predicted hotspots of fish species richness and abundance across an area of over 150 km2, which covered Wilsons Promontory MNP. Overall fish species richness and total abundance was highest around shallow rocky reef. Species distribution models showed a strong ability to explain relationships between habitat and abundances of several key fish species such as the Blue-Throat Wrasse, Rosy Wrasse, Draughtboard Shark and Degens Leatherjacket. Blue-Throat Wrasse and Rosy Wrasse were found in highest abundance in rocky reef areas, while Draughtboard Shark were found on both sediment and rocky reefs up to 60 m depth and Degens Leatherjacket were found across a variety of habitat types.

Fisheries-independent surveys of *Jasus edwardsii* (Southern Rock Lobster) populations within and adjacent to the Wilsons Promontory MNP do not show clear trends with respect to protection. The results showed no significant differences inside and outside the MPA. This lack of difference could be due to a number of factors. The individuals captured in and around Wilsons Promontory were predominantly large and found in low numbers, potentially suggesting low recruitment

UAV's were found to be an effective means to monitor the distribution and abundance of canopy forming macro-algae across intertidal reefs. No differences were detected between estimates of macroalgae from UAV or on-ground methods, though UAVs were not able to complete biological assessment of biota found under canopies to the extent that on-ground surveys can.

Implications

The habitat maps resulting from this study will help prioritise management by providing more comprehensive information on the types and distribution of habitats across MPA's.

This study established a baseline for building a time series to monitor fish assemblages over the entire depth range of Wilsons Promontory MNP using BRUVs. BRUVs also enabled sampling at greater depths than

the underwater visual census methods used in historic monitoring programs, which provides a stronger characterisation of fish assemblages in MPAs.

BRUVs provided sufficient information to generate species distribution models for fish assemblages and species. The distribution modelling approaches used this study enhance our ability to predict patterns in abundance and biodiversity beyond sampled locations. Distribution modelling can be ‘
used for a range of applications such as identifying critical habitat or locations within MPAs for species of management interest, identifying sites of high biodiversity to focus protection efforts or researching effects of environmental change.

Although there were no significant differences in the abundance of Southern Rock Lobster with regard to protection status, finding many large individuals in the survey suggests that Wilsons Prom Marine MNP may be an important area for the export of larvae that contribute to populations outside the study area.

The results of this study show that although UAVs may not be able to replace on-ground monitoring techniques on intertidal reefs, they provide a complementary data source that gives a more comprehensive coverage of intertidal reefs.

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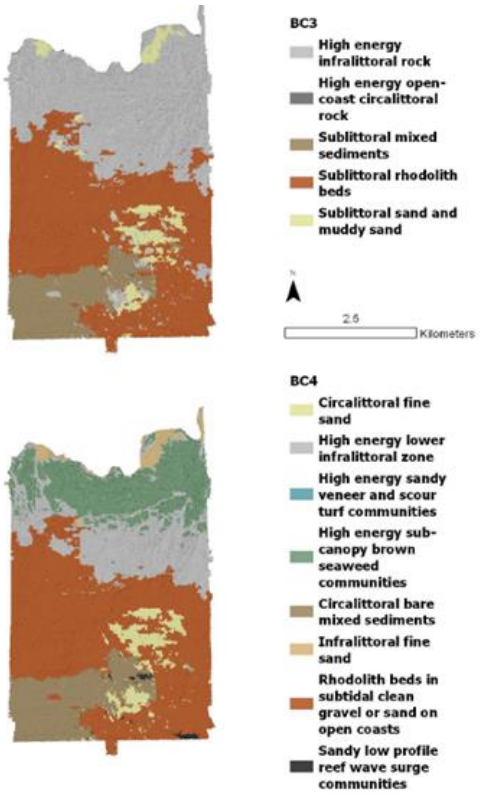
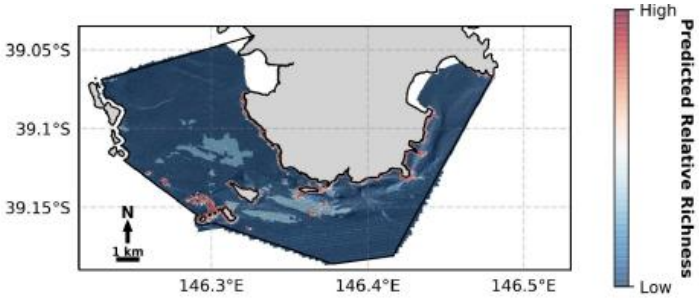


Predictive habitat maps of Bunurong MNP across both hierarchies BC3 – Habitat complex and BC4 – Biotope complex. Created using "ModelMap" in R



Species richness predicted from BRUVS sampling and species distribution models across Wilsons Prom National Park