
RESEARCH WORK PLAN 2009-10

Lord Howe Island Marine Park



RESEARCH WORK PLAN 2009-2010

Lord Howe Island Marine Park

INTRODUCTION

Lord Howe Island is a narrow volcanic strip surrounded by several small islets that is located approximately 600 km off the New South Wales (NSW) north coast and 700 km north-east of Sydney. The Lord Howe Island Marine Park (LHIMP) consists primarily of a shallow marine plateau atop an eroded seamount that varies in depth from intertidal to about 50 m at the plateau's edge, from where depths plunge abruptly to over 2000 m. The marine environment is internationally significant and features the world's southern-most coral reef. In 1982, Lord Howe Island and the surrounding waters were declared a World Heritage Area, the first in NSW.

The LHIMP extends 3 nautical miles out to sea from the mean high water mark and covers an area of approximately 480 km². The state marine park stretches north around the Admiralty Islands and south-east around Balls Pyramid and South East Rock. The NSW Government gazetted the Lord Howe Island State Marine Park in February 1999, and the LHIMP Zoning came into effect in December 2004.

The Lord Howe Island Marine Park (Commonwealth Waters) covers the waters between 3 and 12 nautical miles around Lord Howe Island and Balls Pyramid and is estimated to be around 3005 km². The Commonwealth Marine Park was proclaimed in June 2000 to compliment the Island's World Heritage status and the management plan was gazetted in September 2002 and expires in September 2009.

The marine environment of the Lord Howe Island Marine Park is very distinctive, compared to the NSW coast and continental shelf and contains a unique mix of tropical, subtropical and temperate species. It supports a large number of species not found elsewhere in NSW and is characterised by a variety of unique habitats. These include the only barrier coral reef and lagoon system in NSW, basalt cliff rocky shores, subtidal coral and algal reefs, sandy beaches, subtidal soft substrates, foraminifer meadows, seamount slopes and the open ocean. The ecological processes throughout the marine park are interconnected with both resident and migratory marine species relying on specific habitats for breeding, feeding and protection. The marine park also caters for a wide range of user groups and is of social, cultural and economic importance to the area.

The zoning plan for the Lord Howe Island Marine Park protects representative areas of these habitats in sanctuary and habitat protection zones in order to ensure their conservation. Many of the habitats of the Marine Park are poorly studied, with much to be learned about their biodiversity and ecological function.

Research is a key component in the development of zoning arrangements within the LHIMP. Monitoring and research provide information to make informed management decisions for the conservation and sustainable use of the park mandated by 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. All of this information is essential in order to maximise the effectiveness of zoning and other management actions while minimising socio-economic and cultural impacts.

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 2009-10 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 or supported by the Marine Parks Authority and does not include research conducted within the Marine Park that is funded solely from other sources, although these are listed at the end of the document. The Marine Parks Authority actively works with other government agencies and universities to identify priority projects and seek external funding for research. This plan applies to the Lord Howe Island Marine Park, both Commonwealth and NSW Waters. Additional projects may be added to the plan during the year as further resources become available.

Mapping of seabed habitats around Lord Howe Island

Background

The primary goal of the Marine Parks in NSW is to establish a comprehensive, adequate and representative (CAR) system to protect marine biodiversity and maintain ecological processes. As detailed spatial information on the distribution of marine biota is limited, seabed habitats are increasingly being used as effective surrogates for biological diversity, provided they are appropriately validated and all representative habitats are included. Remote sensing techniques for mapping of seabed habitats are now recognised as a cost-effective method of diversity assessment for marine park planning, and an important component of the overall research required to identify the distribution and structure of marine ecosystems and habitats.

To meet the primary objectives under the *Marine Parks Act* all major seabed habitats within a marine park should be represented within higher protected areas (Sanctuary Zones). While some species and assemblage data is available for fishes, macroalgae and macroinvertebrates, overall there is little data available on the spatial distribution of subtidal habitats and their associated biota. The exception is within the lagoon area and selected shallow reefs where recent work has been examining the biodiversity associated with this habitat type. Knowledge is particularly limited for deep subtidal habitats (i.e. >10 m depth) within the LHIMP, with only small areas of reef mapped from existing aerial photographs, and even less information available on the structure and distribution of subtidal soft-sediment habitats. There is a clear need to assess the distribution and extent of subtidal habitats within the Lord Howe Island Marine Park.

Objectives

- Determine the distribution and extent of seabed habitats in selected areas within the Lord Howe Island Marine Park
- Collate detailed bathymetry and towed video data to allow ground-truthing of acoustics
- Produce a range of spatial layers of seabed habitats defined within a hierarchical habitat classification system

Methods

Much of the mapping will be conducted using aerial photographs to define areas of reef and sand, and towed video that provides information on reef profile, seabed habitat type and dominant macroflora and fauna. It is likely that this information will be combined with swath acoustic data recently collected by the University of Wollongong and GeoScience Australia around the island. A considerable coverage of this data includes waters inside the Lord Howe Island Marine Park.

Contacts

Peter Davies - NSW Department of Environment, Climate Change and Water

Alan Jordan – NSW Department of Environment, Climate Change and Water

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

Biodiversity and ecological processes

- Map and assess the spatial extent and structure of seabed habitats and key taxa

Ecologically sustainable use

- Identify unique & sensitive marine habitats and communities
- Examine the optimum design of marine parks

Reducing the incidental bycatch of Galapagos sharks at Lord Howe Island

Background

The Galapagos shark is a globally-distributed whaler shark, associated with oceanic islands and atolls. The only verified Australian distribution is around the Lord Howe Island region, where it is found on all reef habitats. Recent data identified considerably greater densities at one of the Lord Howe Island oceanic reefs (Middleton Reef) than comparative shark species on more tropical coral reefs. Anecdotal evidence indicates that the high densities of Galapagos sharks around Lord Howe Island significantly interferes with local fishing activities. The reported high predation of hooked fish species has many social and commercial effects, such as the economic consequence of losses incurred by local charter boat industries, resulting in negative tourist perceptions and potential tourism reduction; and management ramifications such as the reported complaints by tourists about the treatment of incidentally hooked Galapagos sharks.

The attack rates of some shark species on baited lines may be reduced through use of magnets placed above the hooks. Unlike fishes, sharks have sensory organs (ampullae of Lorenzini) which detect extremely weak magnetic fields. Strong magnetic fields can be particularly off-putting to some shark species without causing them any lasting harm. If Galapagos sharks are sensitive to such magnets, the introduction of magnet/hook combinations may reduce the loss of targeted fish species on Lord Howe Island, providing welcome relief for local fishers. The use of such magnets is yet to be tested on this species, and Lord Howe Island provides the ideal location to undertake formal scientific examination of this issue while concurrently assisting the economy of the Island.

Objectives

The aim is to provide a long-term solution to the fish loss incurred by Lord Howe Island fishers via:

- Investigation of the response of Galapagos sharks (*C. galapagensis*) to varying bait and lure configurations, and
- Testing whether magnetic fields used in conjunction with baited lines will reduce the incidental shark strike rate.

Methods

With the support of local fishers, we propose to initially assess the level of Galapagos shark strikes on various bait and lure combinations, including those most commonly used at Lord Howe Island. Hooks will be removed from the lines to prevent actually catching the animals. Instead, assessment of shark strikes will occur through the use of inline underwater cameras (“fish-cams”) which will record the behaviour, timing and frequency of shark attacks on fishing gear. Local fishing vessels will be hired, and local knowledge on the best places to conduct this research will be obtained.

Once the gear selectivity of Galapagos sharks is determined, the effectiveness of rare earth magnets as a shark fishing deterrent will be investigated. These magnets are the most powerful permanent magnet for their size, and can throw a magnetic field for short distances through saltwater. By using the most efficient size and shape of magnets (pre-determined under laboratory conditions at the Cronulla Fisheries Research Centre of Excellence), the feasibility of these magnets as a shark deterrent can be examined under real-life fishing conditions. Cooperation of local fishers will also permit us to obtain feedback on the feasibility and

acceptance of such magnets within the Lord Howe Island fishing community. If a suitable working design is found, we would request the assistance of local fishers to provide us with longer-term feedback on the catch rates of Galapagos sharks and targeted fish species using such gear.

Contacts

Ian Kerr – NSW Marine Parks Authority

Dr William Robbins & Dr Vic Peddemors – NSW Department of Industry and Investment

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

Ecologically sustainable use

- Assess effects of fishing

Benthic fish assemblages on deep water habitats around Lord Howe Island

Background

The Commonwealth waters around Lord Howe Island represents a significant challenge to management agencies as there are key knowledge gaps in the knowledge of marine biodiversity. Recent swath mapping of the region has allowed an improved understanding of the distribution, structure and extent of deeper seabed habitats on the continental shelf. Previously these habitats have been poorly studied in this region, with information restricted to physical features such as depth and profile. The exception to this is a study by the Australian Institute of Marine Science who conducted limited towed video and Baited Remote Underwater Video (BRUV) surveys of deep water habitats around the island to assess the association between benthic habitats and fish faunas in these areas. Due to operational limitations, the coverage of sites was limited but found that benthic habitats were composed of a diverse assemblage of plant and animal epibenthos associated with hard and soft substrata, and these habitats appear to be widespread and represented equally inside and outside sanctuary zones. Video surveys in habitats below the limits of sunlight penetration produced the most sightings of fish – most notably large kingfish (*Seriola lalandi*), redfish (*Centroberyx* sp.) and large unidentified groupers (Epinephelinae). These deep reef areas used by recreational and commercial fishers, with many targeted species being associated with reef habitat.

While seabed habitats and fish composition are frequently used as a surrogate for spatial patterns in marine biodiversity, the information on fish diversity associated with habitats in depths >20 m around LHI is insufficient to confirm the validity of the classifications used in the development of zoning plans. While the separation at the 20 m contour line relates to an average depth where benthic assemblages change from algal/coral dominated to that containing mostly sessile invertebrates (mostly sponges, ascidians, bryozoans and cnidarians), there is little information on depth variation in fish assemblages.

The use of depth to divide rocky reefs into different habitat types for marine park zoning purposes assumes that assemblages of fish differ at increasing depths across the continental shelf. This has been commonly found in many sites throughout the world but requires testing within the LHI region to ensure zoning arrangements provide adequate protection to the full range of fish species. Deep reefs are difficult to monitor using traditional techniques such as Underwater Visual Census (UVC), but BRUV allows for an assessment of fish composition and abundance of these deeper reef habitats. This project will complement the assessment of fish composition in shallow water habitats being conducted in the Lord Howe Island Marine Park using UVC. It will also provide valuable information on seabed habitats and fish composition to assist the ground-truthing of the recently collected swath acoustic data. BRUV's is a technique commonly used throughout Australia to examine fish assemblages and population structure in deeper reefs that are below safe diving depths. Standardised baits are used to attract fish to a viewing area, being recorded horizontally by a video camera.

There is also a clear need to monitor the effectiveness of marine park zoning within the Lord Howe Island Marine Park, and the establishment of baseline information on the composition and abundance of fish on deep reefs is one component of this evaluation. Given the varying levels of fishing pressure between Sanctuary and Habitat Protection Zones within the marine park, there is a need to include these zone types in order to establish baseline information on species such as kingfish (*Seriola lalandi*).

Objectives

- To determine the composition and relative abundance of fish and shark species within deepwater habitats (>20 m) in the waters surrounding LHI, particularly in commonwealth waters
- To collect information within Sanctuary and Habitat Protection Zones
- To obtain size composition information for kingfish (*Seriola lalandi*) and other key target species

Methods

The survey design includes 4 locations, (2 Sanctuary and 2 Habitat Protection Zones), 3 sites within each location and 4 replicates at each site, resulting in a total of 48 total deployments. Four BRUV stations will be deployed simultaneously for approximately 30 mins. Habitats sampled will be >20 m depth and exact site positions determined by examination of the swath bathymetry collected within the region.

All observed fish species are recorded to provide total species richness. An index of relative abundance is determined using the maximum number (MaxN) of individual fish (of a particular species) in the frame at any one time during the 30 min set. Time of MaxN (TmaxN) is also recorded. The time of first sighting (TFS) and the time at first feeding (TFF) are also recorded. Multivariate analysis will be conducted to examine the factors of region, habitat type, depth and location. Target fish that feed on the bait bag and are perpendicular to the camera are measured for either total-length or fork-length, depending on the species.

Contacts

Ian Kerr – NSW Marine Parks Authority

Alan Jordan – NSW Department of Environment, Climate Change and Water

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
- Assess the spatial and temporal patterns of assemblages

Ecologically sustainable use

- Abundance of key species of fish and invertebrate
- Examine the optimum design of marine parks

Exotic Marine Pest Monitoring

Background

The Lord Howe Island Marine Park has been a rich maritime history regularly visited by ocean going vessels since its discovery in 1788, and is still a popular stop over for international yachts, cruise ships and naval vessels. The Lord Howe Island Port currently receives regular shipping from Yamba in NSW and approximately 90-130 recreational yachts of wide-ranging domestic and international origins. A marine pest survey using standardised survey protocols was undertaken in February 2006. The survey identified 19 cryptogenic species (i.e. unclear if the species is native or introduced), and when amalgamated with literature reviews, 54 cryptogenic species were identified, of which 50 were confirmed as being found in the islands marine habitats. The report found the waters of Lord Howe Island Marine Park to be virtually “pest species-free”, with Lord Howe Island being possibly the only Australian port in this condition.

Marine pest invasion is widely recognised as one of the most significant threats to marine ecosystem integrity. Due to the nature of regular shipping visiting the island and the relatively enclosed nature of the lagoon, there is a high potential to severely compromise the values for which the island was listed as a World Heritage and marine park. Invasive pests carried by visiting vessels are a direct and immediate threat to the integrity of the Lord Howe Island Group World Heritage values. The monitoring program will aim to raise community awareness and provide for early detection and response for any future invasion.

Objectives

- To develop monitoring and response protocols for the early detection and treatment of invasions
- To survey, assess and report on the identity, distribution and population density of invasive marine species in high risk areas and representative habitats
- To increase the local community awareness of the potential impacts and identification of exotic marine pests.

Methods

The introduced marine pest survey design and methodology will be consistent with the relevant protocols outlined in the 'National Monitoring Manual' produced by the Australian Government Department of Agriculture, Fisheries and Forestry (DAFF).

Qualitative diver assessments, photo stills and quadrat scrapings (of jetty pylons/moorings if required); including beach wrack and intertidal searches will be undertaken on an annual basis. Since the public can play a key role in detecting introduced pests (due to their familiarity with local species and habitats), local diver operators and Lord Howe Island Board staff will be trained in the detection of marine pest species and can assist with inspection of moorings and other high risk areas. Visual waterline and underwater assessments of visiting yachts will be undertaken in liaison/conjunction with Lord Howe Island Maritime Port Operations and will involve visual hull observations and possibly involve the use of underwater pole camera (funding dependent).

Contacts

Ian Kerr - NSW Marine Park Authority

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

Specific impacts

- Identify and monitor the distribution and impacts of marine pests
- Impacts of marine structures

Biodiversity and ecological processes

- Examine habitat condition
- Identify processes that threaten biodiversity

Attitudinal Survey - Lord Howe Island Marine Park

Background

The Lord Howe Island Marine Park is due to commence a review of its zoning plan in late 2009, and the establishment of attitudinal information is critical information required to assist this process. The values that people have in relation to the marine park vary between individuals and are difficult to quantify. To fully consider values it is important to consider attitude and perceptions in combination with actual patterns of use.

A Visitor Survey for Lord Howe Island was undertaken for Lord Howe Island Marine Park in 2006 and provides overall information relating to the socio-economic information of visitors to Lord Howe Island (LHI). This study surveyed domestic and international visitors to Lord Howe Island between January 2007 and late April 2007, with 376 surveys being completed. The survey was primarily intended to collect socio-economic information which could be used in planning and management of the NSW Lord Howe Island Marine Park. The survey also collected information on expenditure made by visitors to Lord Howe Island, which demonstrates the economic benefits to the local community of the marine park and the Lord Howe Island natural environment.

The survey showed that respondents highly valued their visit to the marine park and other natural areas on the island, with swimming, snorkelling and walking on the beach the most popular marine related activities. The reports made recommendations for future surveys but did not directly address attitudes and community values of the marine park. Attitudinal surveys are an important input into the marine park zoning plan review process. The main target audiences for the proposed LHIMP Attitudinal Survey are: local residents, islanders (those living on and off the island), local business owners, commercial operators, managers and staff, marine park users and island visitors.

Objectives

- Determine the level of support and understanding for the overall conservation of Lord Howe Island Marine Park
- Evaluate the importance of various reasons for protecting Lord Howe Island Marine Park
- Determine relevant issues relating to the upcoming marine park zoning plan review

Methods

The main target groups for the survey were identified as the visitors to Lord Howe Island, local residents and local businesses, including tour operators, lodges and restaurants. A total of 500 surveys were completed, over a 3 week time period from 13th December 2008 to 4th January 2009. Surveys were distributed at the Lord Howe Island airport during the hour between flight check-in and boarding. A total of 24 flights (pre-boarding) were attended both on weekends and on weekdays. Surveys were randomly distributed to departing passengers and local residents and surveys were also available at an easily identifiable location inside the airport. Surveys were also available at the Lord Howe Island Museum and Lord Howe Island Board Administration Office, and distributed to local residents through the local businesses, governing agencies (i.e. Lord Howe Island Board, Education Department), through direct distribution, and numbers per business were allocated according to staff as advised by managers/owners.

Public awareness was generated through information articles in the Lord Howe Island Signal newspaper and the Lord Howe Island Board Community Newsletter and via signage at survey location points (airport, Visitors Centre/Museum and Lord Howe Island Board Office).

Contacts

Ian Kerr - NSW Marine Parks Authority

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

Ecologically sustainable use

- Assessment of usage, impacts and threats of anthropogenic activity

Socio-economic influences

- Social & economic value of MPA's

Fishing catch data and population response to fishing pressure

Background

Recreational charter line fishing licensees are required through a condition of marine parks permits to return records of the number and size of each individual of each species of fish caught each day from the Lord Howe Island Marine Park at the end of every three months. Permit holders are also required to report how much time was spent fishing at each location, and catch and size composition of kept and released fish. The park is divided into a total of 6 locations, and approximately 40 different species of fish are regularly taken. All fishing is undertaken using recreational line fishing methods, although no records are kept to discriminate between the different techniques employed within the method (e.g. jigging, trolling, bait fishing, fly fishing).

Objective

- To determine levels of fishing mortality and the direct and indirect effects on population structure in order to determine sustainable levels of use of certain fish species.

Methods

Catch record data forms are distributed to local commercial fisherman and as part of their Marine Park commercial activities permit. Each operator is required to complete 3 monthly data returns of their fishing catch and effort. For each trip, the length of trip, area fished and a record of species and estimates of species lengths is recorded. Both species retained and species discarded are required to be recorded. This information is collated into a Microsoft Access database with annual summaries of catch, species and effort being available for analysis.. This analysis is undertaken in conjunction with NSW DPI fisheries staff.

Fish species life history data can be compiled, including inferred natural mortality rates for certain species of fish, catch efforts, target species and locations and fleet efforts within the Lord Howe Island Marine Park.

Contacts

Ian Kerr - NSW Marine Parks Authority

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

Ecologically sustainable use

- Examine the distribution and composition of the recreational fishing catch and effort

Socio-economic influences

- Social & economic value of MPA's

Assessment of baseline biodiversity survey data for Lord Howe Island Marine Park

Background

A survey of marine pests was conducted within Lord Howe Island Marine Park in 2006 using standard port survey protocols. As these methodologies do not collect quantitative data on native species that allows direct comparisons of biodiversity among sites and between Lord Howe Island and other locations, additional biodiversity surveying methods were conducted independent of the marine pest survey. While there are pre-existing monitoring sites for coral and algal species at Lord Howe Island, the value of the biodiversity survey techniques are that they provide quantitative data on the biodiversity of fish and mobile macro-invertebrates as well as sessile species, using techniques identical to those applied in other Australian marine parks. Therefore, repetition of these surveys over time will enable a quantitative assessment of changes in biodiversity of a wide range of community types, and an assessment of these changes in the context of changes documented in marine parks elsewhere in Australia. Three distinctive community types were recognised during the 2006 surveys: (1) coral dominated communities; (2) macroalgal dominated communities; and (3) offshore communities, while some sites possessed a mixture of these community types

The protection of marine biodiversity is a key objective of the Marine Parks Authority and Lord Howe Island Marine Park is seen as an area of high biodiversity containing a unique mix of tropical, subtropical and temperate species, including the most southerly coral reef in the world. There is limited information on a wide range of marine taxa at Lord Howe Island, particularly at a large number of sites and habitat types. The collection of such data will allow a detailed assessment of diversity, and there is a need to fully analyse and report on these surveys. In addition, analysis of data on the distribution and density of fish, invertebrates and algae over various habitat types in the Lord Howe Island Marine Park is required to establish baselines for time series monitoring of population densities as they respond to zoning protection.

Objectives

The primary objectives of the surveys are to:

- Repeat intertidal and shallow subtidal biodiversity monitoring surveys to allow comparison with baseline ecological data collected in 2006
- Determine whether any change in biotic communities has occurred between 2006 and 2008 in relation to the level of habitat protection
- Where possible, incorporate additional monitoring sites into the monitoring program to identify any habitat types not adequately covered by baseline surveys, and to increase the overall statistical power to detect effects of habitat protection.

Methods

Subtidal and intertidal reef biota in the Lord Howe Island Marine Park were surveyed to assess changes in biota since initial baseline surveys were conducted in 2006. Sites surveyed as part of the baseline monitoring in 2006 were resurveyed, along with an additional 5 sub-tidal sites.. Intertidal surveys were undertaken at four sites where duplicate 0.5 m x 0.5 m quadrats were haphazardly placed within 1 m of a 10 m transect line at five fixed intervals. Additional paired quadrats set approximately 1 m apart were also haphazardly dropped onto the shore approximately 10 m to both the left and right of the central transect. Percentage cover of plants

and sessile invertebrates was estimated by counting the number of times each species occurred directly under the 50 positions on the quadrat at which perpendicularly placed wires crossed each other.

Subtidal surveys were undertaken along two depth contours at a total of 36 sites distributed around Lord Howe Island and the Admiralty Islands, and at an additional two sites near Balls Pyramid. The general fish censusing protocol at each site was consistent with that used for visual census surveys within other marine parks, and numerous other sites throughout Australia. Cryptic fishes and large macro-invertebrates (large molluscs, echinoderms and crustaceans) were censused along the same transect lines set at two depths per site for baseline fish surveys. Habitat characteristics along the subtidal transect lines set for fish and invertebrate censuses were surveyed by taking digital photoquadrats.

Project Contacts

Assoc. Prof. Graham Edgar - Aquenal Pty Ltd

Dr Joe Valentine - Aquenal Pty Ltd

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
- Assess the spatial and temporal patterns of assemblages

Ecologically Sustainable Use

- Abundance of key species of fish and invertebrates

The life-history and ecology of Bluefish (*Girella cyanea*) at Lord Howe Island

Background

Knowledge of the ecology of a population is crucial for the informed management and conservation, although effective management of fish is especially difficult and near-impossible since many species are considered data deficient. Few studies have focused on species in the family Girellidae in situ, or examined aspects of their ecology such as reproduction, life history or age. *Girella cyanea* is one of sixteen species belonging to the genus, and is considered to be data deficient.

Historically an important fish species for residents of Lord Howe Island, the continued popularity of angling on the island indicates a need for targeted research on the basic ecology and biology of the species. Despite its importance to the residents of Lord Howe Island, no comprehensive study has been attempted for the species, its life history parameters are very poorly understood, and there are no formal data on the reproductive ecology and/or ontogeny for the species. Furthermore, there are few data on the ecology of the genus.

Data being used to surmise the biology (e.g. feeding, life history, ecology) of the genus in Australia and New Zealand have often been based on one or a few studies carried out on related taxa on the other side of the world (e.g. *G. nigricans*). Moreover, there are currently no formal monitoring efforts in place, with only fishing catch rates and incidental observations during other research used to assess the status of the species. This research project aims to investigate the population biology, structure and ecology of the Lord Howe Island population of *G. cyanea*.

Objectives

- To provide quantitative baseline data on the nearshore distribution, abundance and population composition of *G. cyanea* at Lord Howe Island
- To determine basic life-history parameters of age, growth, size-at maturity and temporal patterns of spawning
- To describe the level of connectivity between habitats for different life stages of *G. cyanea* as a basis for effective management at key life stages.

Methods

In situ behavioural observations (bite rate, grazing substrate, distribution by size class) and censusing (no. of individuals) were conducted on snorkel at sites around Lord Howe Island, twice per year at sheltered sites (west side North Bay, Far Rocks, South Passage area) and exposed sites (east side Ned's Beach, Middle Beach, Blinky's/Boat Harbour).

The spatial separation of these sites along with the temporal separation of the field expeditions will provide considerable baseline data for ongoing management. A limited number of fish (~20 site) were collected from adult (offshore), sub-adult (coral reef), juvenile (rocky reef) and recruit (rockpool) habitat to examine diets (gut contents), size-at-age (sagittal sections), and reproductive status (GSI). Target and habitat-specific methods were used for capture (hand-administered anaesthetic, handnets, BINCKE net). Data will be supplemented by archived specimens, existing literature and fish frames obtained from locals.

Contacts

Melanie Lewis - University of Technology Sydney

Prof. David Booth - University of Technology Sydney

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

Biodiversity and Ecological Processes

- Examine species connectivity at multiple scales

Ecologically Sustainable Use

- Determine age, growth, reproductive biology of selected fish species
- Abundance of key species of fish

Assessment of McCulloch's anemonefish (*Amphiprion mccullochi*) Lord Howe Island through community based monitoring

Background

McCulloch's anemonefish (*Amphiprion mccullochi*) is endemic to Australian waters and is only found at Elizabeth Reef, Middleton Reef and Lord Howe Island. Initial surveys revealed that McCulloch's anemonefish is extremely rare at these Reefs sites, and therefore the last remaining stronghold in the world for this species is at Lord Howe Island. In addition, the anemones that these fish rely on for survival have been dieing in recent years due to anemone bleaching, which is caused by increased water temperatures. This has the potential to significantly reduce anemone populations and therefore decimate anemonefish populations.

Given this scenario, monitoring the distribution and abundance of McCulloch's anemonefish at LHI is a priority and is essential to determine population declines and identifying species at risk of extinction. Data on the abundance and distribution of vulnerable species is fundamental to the development of effective management and conservation strategies. It is also essential to determine the genetic connectivity between the different populations of McCulloch's anemonefish to determine at what spatial scale the species should be managed.

Objectives

- to provide baseline estimates of McCulloch's anemonefish (and host anemones) distribution and abundance at Lord Howe Island
- to establish a community based monitoring program of McCulloch's anemonefish (and host anemones); and
- to determine genetic connectivity between populations at Middleton Reef and Lord Howe Island

Methods

To determine patterns of distribution and abundance the number of adult and juvenile McCulloch's anemonefish and host anemones will be counted at two depths (5 and 20 m) at 16 sites around LHI. At each depth we will use 3 replicate 50 by 5 m strip transects (a total of 6 replicates per site). Three replicate 3 m line intercept transects will also be used per 50 by 5m transect to quantify habitat composition. Two of the sites will be on contrasting sides of Balls Pyramid, and two sites will be on contrasting sides of Admiralty Islands. The remaining 12 sites will be evenly distributed around the perimeter of the main island. The lagoon at Lord Howe Island represents a relatively large amount of shallow (< 5 m) sheltered habitat and considerable numbers of anemonefish have been reported to occur in this area. Therefore, separate surveys will be conducted in lagoonal habitats such as reef passes, back reefs and patch reefs to effectively determine the size of the lagoonal population of anemonefish and anemones. The size and number of transects will be optimised according to the distribution and abundance of anemonefish in the lagoon. We will also establish a monitoring program by training members of the local community in underwater survey techniques of anemonefishes (and anemones).

To determine genetic connectivity between Middleton Reef and Lord Howe Island populations of McCullochs anemonefish will require a small finclip (about 1 mm by 4 mm) from 30 individuals at Lord Howe Island. To do this we will anaesthetise the fish using a clove oil solution and the fish will be finclipped using small scissors underwater and then the fish will be returned to their home anemone.

Contacts

Jean-Paul Hobbs - James Cook University

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

Ecologically Sustainable Use

- Abundance of key species of fish