

NORTH WEST SHOALS TO SHORE RESEARCH PROGRAM

March 2019



Informing the sustainable development of Australia's North West marine estate

Welcome to the quarterly newsletter from the North West Shoals to Shore Research Program. Produced by the Australian Institute of Marine Science, this bulletin will provide updates on activities within the three-year program.

In this edition:

Stay up-to-date with the latest activities and upcoming field trips

Methods we've used to gather data on fish and pearl oysters

Learn more about why we're studying the bottom of the ocean

How we plan to collect data on one of the largest animals in the world



Above: Presenters at the NWSS Symposium 19 February 2019

Mid-Program Update

Fieldwork and Metadata

The North West Shoals to Shore Research Program (NWSSRP) has reached the halfway point in this three-year program of research. A large amount of fieldwork has been completed, with more scheduled throughout 2019.

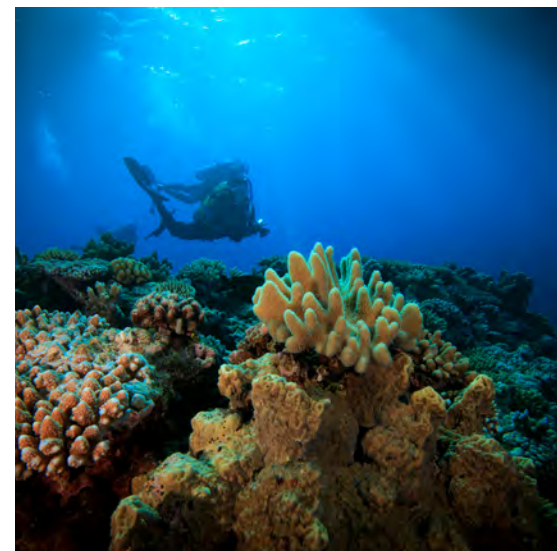
The metadata from the seismic survey, completed in September 2018, has been compiled and uploaded from each field trip and is accessible from the Australian National Data Service.

NWSSRP Symposium

The first of two symposiums was held at the Indian Ocean Marine Research Centre in Perth on 19 February. Ten Researchers presented on the work that has been done to date including, details and difficulties that had to be overcome in the science planning, feedback from the field trips so far and the processes ahead.

More than 100 representatives from industry, government and academia attended the symposium.

The symposium presentations are available at www.aims.gov.au/nw-shoals-to-shore.



Above: Conducting fieldwork at the Rowley Shoals. (Photo: Nick Thake)

Analysis Underway

Data analysis is underway across the program and the last field data collection is planned to occur in October this year.

Most information is scheduled to be released in the first quarter of 2020, with the exception of the pearl experiment.

Some 7000 pearl oysters are being left to grow out over two years. These pearls will reach market size and be tested by 2021.



Effects of Seismic Surveys on Fish and Pearl Oysters

Marine noise and monitoring

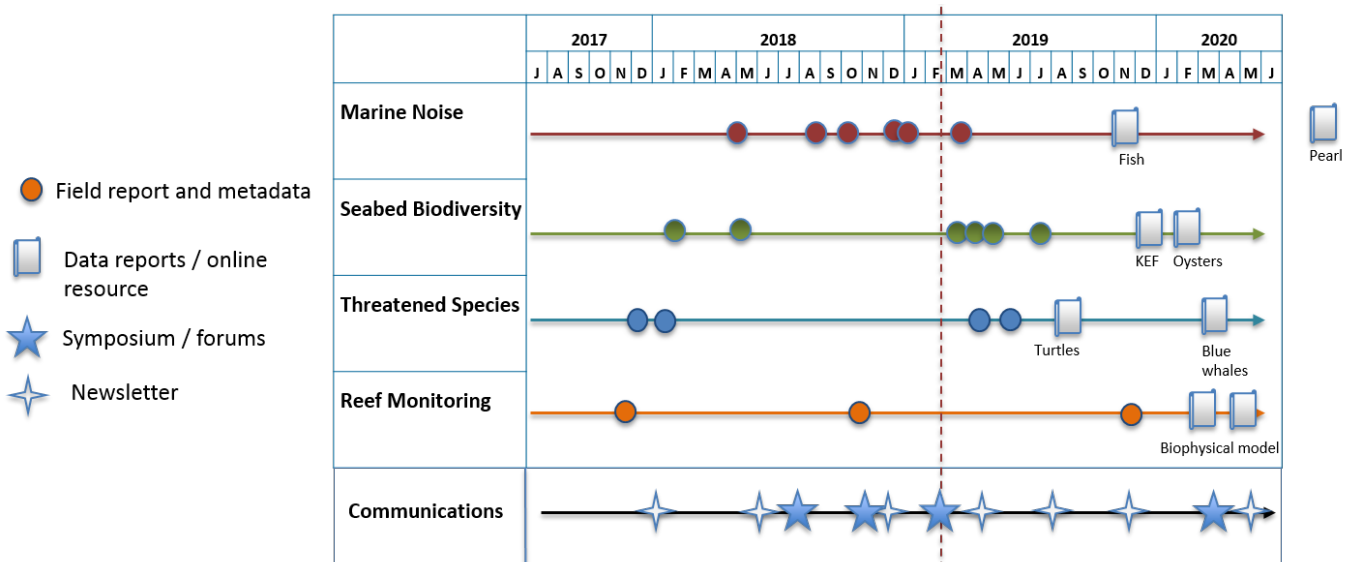
Our studies will provide:

- Detailed information on the impacts of seismic surveys on fish and pearl oysters.
- An improved understanding as to whether and to what degree seismic surveys impact adult fishes and oysters.
- Robust, scientifically derived information contributing to the regulation and impact assessment by management agencies.
- Greater certainty for stakeholders including the commercial fishing industry, pearl aquaculture, tourism and oil and gas.

Data Collection: Fish and Oyster Sampling

	Method	Information Gathered
MAPPING SITES	Multi-Beam Mapping	Bathymetry and substrate type
	Towed Video	Benthic cover
	Sediment Sampling	Grain size
ACOUSTIC MAPPING	Passive Acoustic Monitoring (PAM)	Characteristics of seismic signals propagating to sampling locations Characteristics of local soundscapes
	Acoustic Tagging	Movement patterns of red emperor
FISH SITE	BRUVS	Presence, length distribution, relative abundance and behaviour of fish assemblage including red emperor
	Echosounder (Fish)	Presence, distribution of fish targets in the water column
	Sediment Sampling	Infauna composition and mortality
	eDNA	Species presence
PEARL OYSTER SITE	Laboratory Sampling	Mortality and condition: physiology, immunology, histopathology, gene expression
	Commercial Audit	Mortality and condition (growth, mantle retraction, byssal attachment)
	Audit After Two Years	Number, size, shape, weight, quality of pearl oysters

NWSSRP Deliverables and Milestones



Why Care About the Bottom of the Ocean? Seabed Habitats and Biodiversity

Knowledge of what, and how many animals live on the seabed is important information to underpin management decisions. For example, increasing our knowledge of the benthic biodiversity and seabed habitats will provide knowledge to help understand benthic ecosystems and the consequences of anthropogenic activities or catastrophic events such as cyclones, unplanned hydrocarbon release, or a ship grounding.

The Seabed Habitats and Biodiversity research program will increase our understanding of seabed biodiversity on the North West Shelf offshore from Eighty Mile Beach. This increased knowledge will enable us to transition from a system of precautionary decision making to informed decisions about how we manage marine resources.

This program is split into two projects, the first focusses on understanding the Ancient Coastline at the 125 metres depth contour Key Ecological Feature (KEF). The second is focusing on pearl oyster habitats.

Pearl Oyster Habitat Offshore from Eighty Mile Beach

This project will characterise the types of habitats that pearl oysters live in. To do this, we will measure physical (from multi-beam) and biological (from towed video) aspects of pearl oyster habitats and use that information to predict where oysters may live more broadly across the North West Shelf.

We will also be trying to determine if there is connectivity between offshore pearl oyster populations and inshore pearl oyster populations.

It is thought that the fishery (which is in shallow water) is seeded from populations in deep water. To determine if this is the case, we will use state-of-the-art genetic markers (Single nucleotide polymorphisms – or SNPs) to look at the relationships between the populations and infer larval dispersal between them.

So far, sampling has been conducted from 40 metres out to 100 metres depth offshore of Eighty Mile Beach.

During the first field trip some 3000 kilometres of seabed was mapped with the multi-beam, and validated with 100 kilometres of towed video survey and about 22 benthic sled samples to collect oysters off the bottom.

More than 500 pearl oysters have been collected from the shallow fishing grounds for genetic analysis and subsequent surveys will concentrate on collecting in the deeper areas.



Key Ecological Feature

The Ancient Coastline KEF (above) extends more than 1500 kilometres from North West Cape, past Broome and along the Kimberley. It is the coastline that existed 17000 years ago, but through sea level change it's now 125 metres below the surface.

KEFs are believed to be important for biodiversity and ecological processes. In the case of the Ancient Coastline KEF, it's thought to provide hard substrate for filter feeding and benthic communities in what is a relatively sandy and barren region. It is also thought to be associated with upwelling that will form important links between the benthic and pelagic productivity.

Is this feature important?

We will be studying the Ancient Coastline KEF over three voyages, with the next two voyages in April and June 2019. We are focusing on five areas, to capture variation along the length of the feature.

At its narrowest, it's about 300 metres and at its widest, it's about 50 kilometres. So, where it is narrowest, we might expect to find more of a sharp drop-off and interesting hard-substrate features. Where it is wider, we would expect a gradual sloping and sandy seafloor.

During our first voyage in 2018 we found a lot of sandy habitats, but there definitely are some areas where we are seeing interesting biodiversity, such as sponges and filter feeding communities, which are characteristic of hard ground.

According to the original description of the Ancient Coastline KEF, there is a natural biological break at about 17 degrees, with communities north considered to be more tropical. This project specifically targets areas north and south of 17 degrees to see if we can quantify differences in the biodiversity around this point.

In 18 months' time, we'll be able to show a much greater knowledge of the benthic biodiversity, as well as the distribution and abundance of benthic species across the Ancient Coastline KEF, and put the feature in a regional context.



Pygmy blue whale (Shutterstock)

Assessing the Potential Threats to Pygmy Blue Whales

Threatened and iconic species

Unlike the name suggests, pygmy blue whales are anything but small and can grow up to 24 metres in length. They are called pygmy because they are just a little bit shorter than the Antarctic blue whale.

Pygmy blue whales are classed as endangered and have a distribution that overlaps with industry activities, but in fact we have a limited understanding of their movement, distribution and their biologically important areas, especially on the North West Shelf. Because of this, their management can be largely precautionary.

The objectives of this project are to quantify the movement, the distribution and the threats to pygmy blue whales on the North West Shelf, and to find the biologically important areas.

What we know about migration routes

Pygmy blue whales migrate from their summer feeding grounds to their northern winter breeding grounds in Indonesia. They start their migration from the Perth canyon in around March-

April, arriving in Indonesia around June, where they stay until about September.

Their southward migration down the WA coast occurs between September and December.

The migration largely occurs along the shelf edge, but they can be found in shallower water, especially where the coast narrows, like at the North West Cape at around 200 metres, but also in shallower areas, such as in Geographe Bay, south of Perth, or around Rottnest Island.

They are one of the biggest animals in the world, but they're quite difficult to study. They are still at low density in numbers because they haven't recovered from commercial whaling, and they spend a lot of their time under the water, especially on the North West Shelf.

The approach to collect data

- Deploy satellite tags
- Passive acoustic surveys (onboard IMOS slocum gliders and fixed)

- Trial eDNA analysis
- Use of existing data

Some water samples have been collected from the Perth Canyon, where the whales are in high density. Those samples were collected when blue whales were actually sighted. So if blue whale DNA can be detected there, then it may become a method rolled out more broadly on the North West Shelf.

Pygmy blue whales will be tagged at North West Cape in June and at Ashmore Reef in late September so that we will be able to document both the northern and southern migration.

We will use all the data to develop distribution models and maps, and to assess the overlap with industry, such as vessel movements and industrial infrastructure and activities.

This will lead to an improved understanding with which to assess the impacts and to provide a broader basis for mitigation.

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Santos

Helping to better understand WA's marine environment.