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NORTH WEST SHOALS TO SHORE RESEARCH PROGRAM

Effects of Seismic Surveys on Fish and Pearl Oysters

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Acknowledgements

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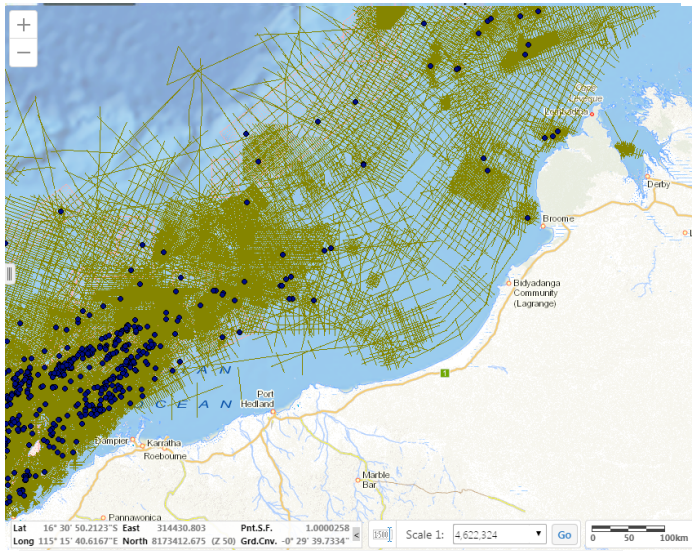
Collaborator Agencies include:

- Paspaley Pearling Company: Dave Mills, Dave Parker
- DPIRD: Cecile Dang
- Curtin University: Rob McCauley
- U of Tasmania: Jayson Semmens

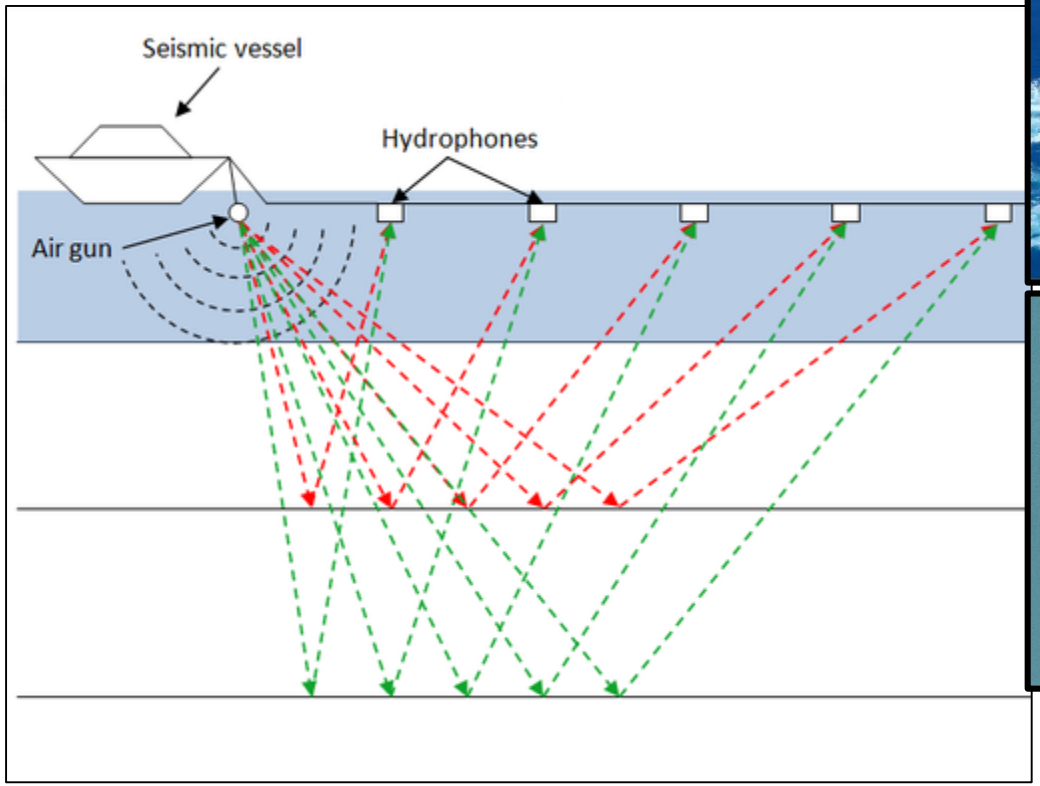
Background

Assessing the potential effects of petroleum exploration activities require field experiments that occur in real-world situations over scales of time and space relevant to the activities of industry and the life cycles of the organisms concerned



Location of petroleum activities that have occurred in the NWSSRP study area

Seismic Surveys - Issues

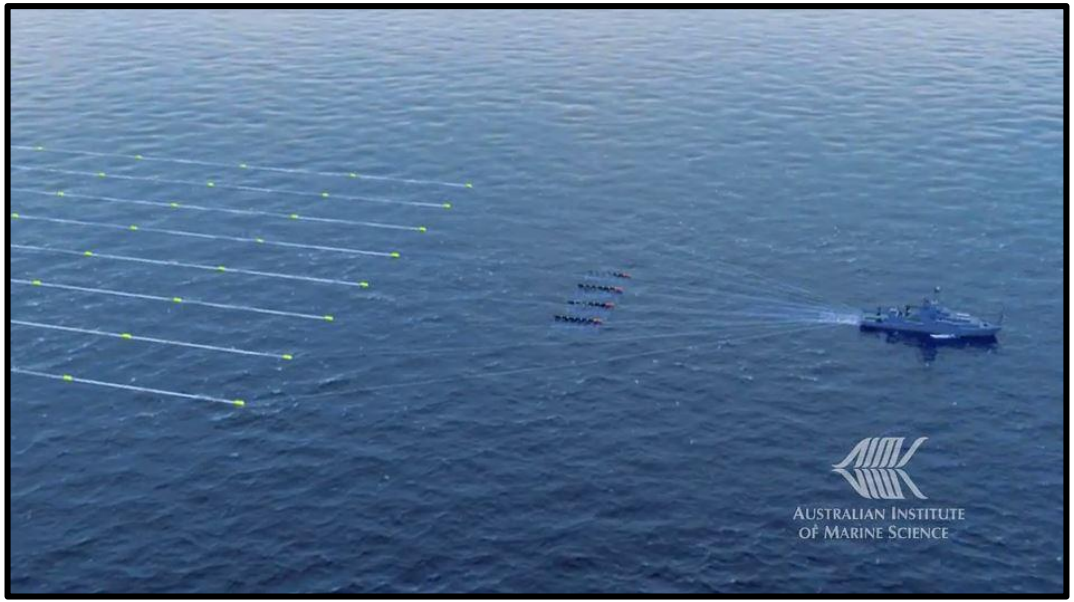


Theme 1: Marine Noise Monitoring and Impacts

- Impacts of seismic surveys on fishes and pearl oysters
- $6M project
- May 2017 to June 2020

Objectives

Determine the impact of a “real-world” seismic survey on fish assemblages and pearl oysters

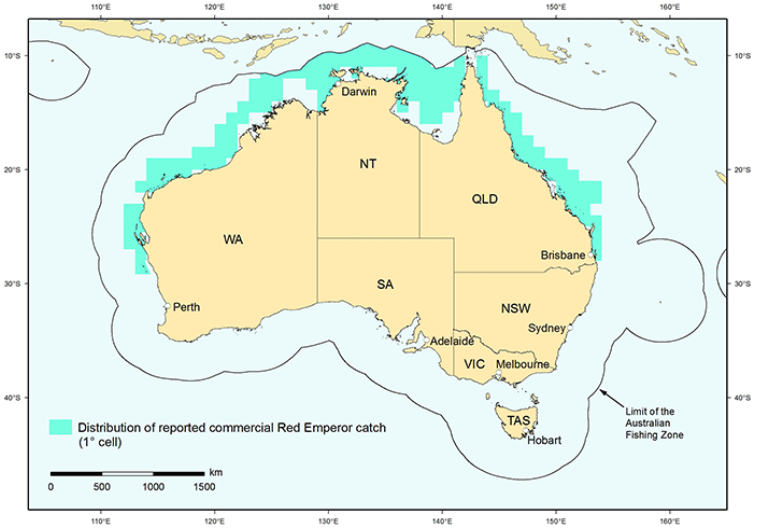


Fish - Questions

- Do the fish move away or die in the area of a seismic survey?
  - If fish move – how far? For how long?
  - All fish – or just some?
- What is the ‘safe’ distance for seismic operations?
- What are the implications of any displacement/mortality for the commercial fishery?

What to study? Focal species

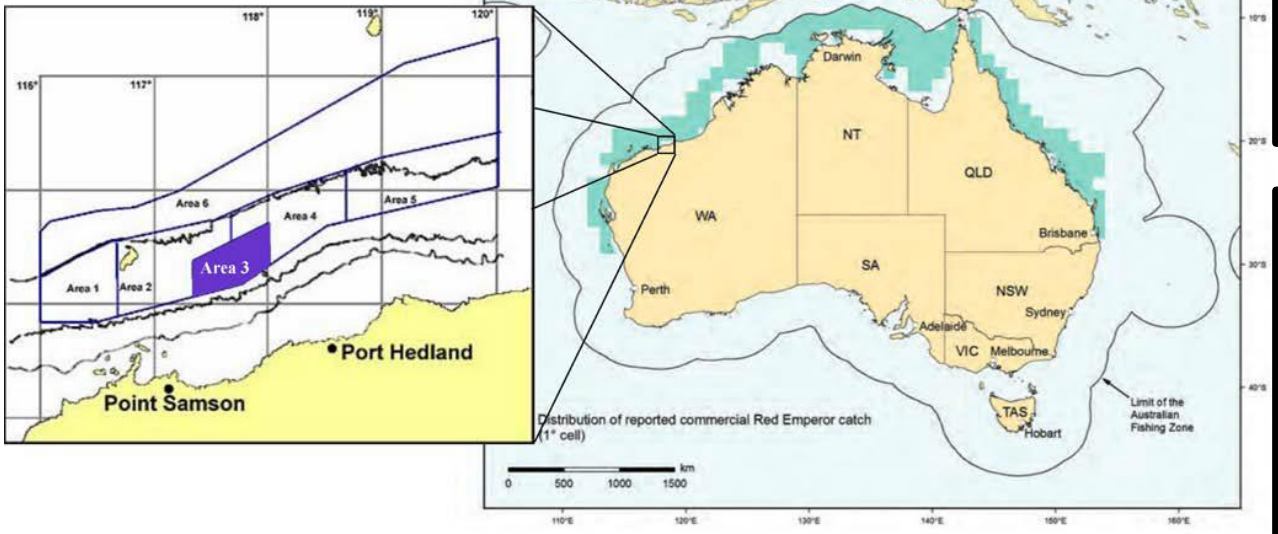
- Red emperor - commercially and recreationally important across tropical Australia
- Abundant
- Resilient to capture from depth and tagging
- Site-attached with a limited home range
- Likely to vocalise and is active at night

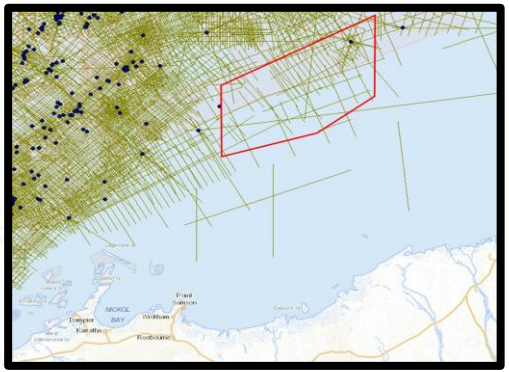


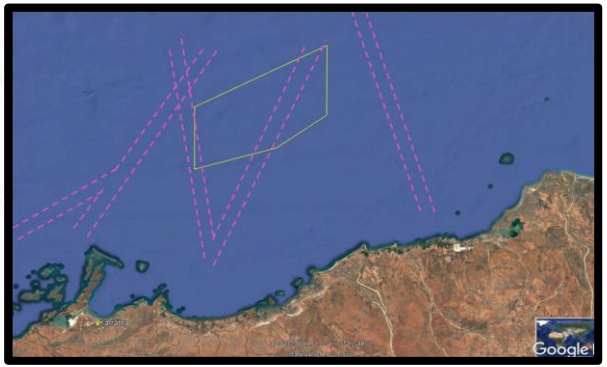
Where to study it?

Area 3:

- Closed to commercial fishing
- Target species abundant

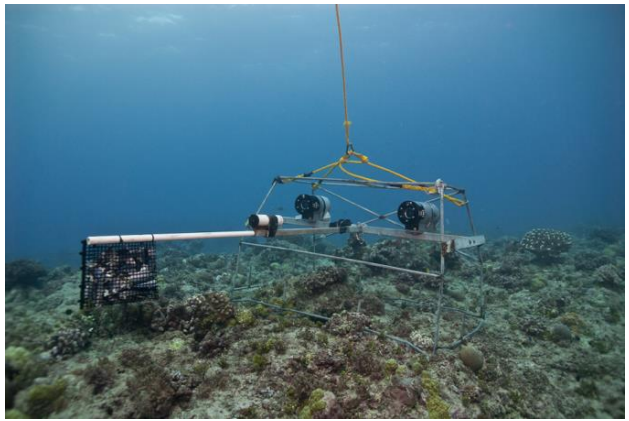




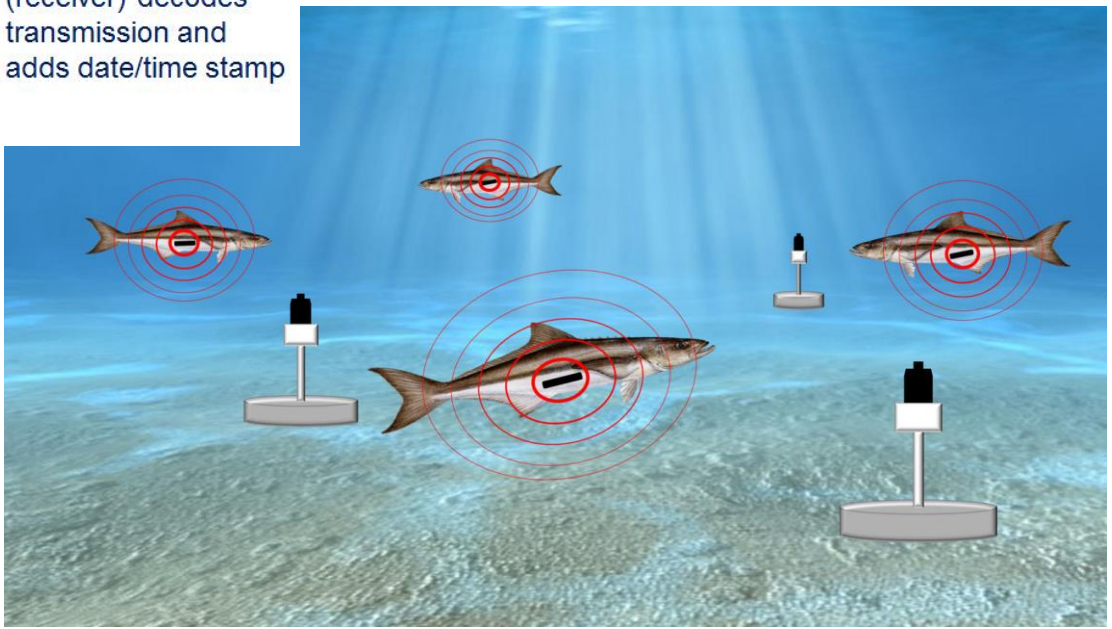


How to study it?

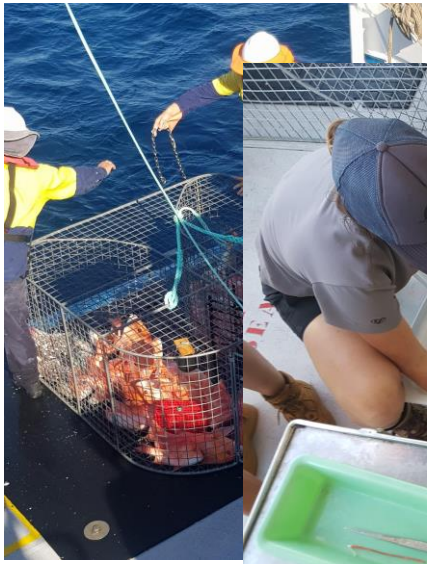
- Movement patterns - tagging
- Abundance and distribution – baited remote underwater video systems



Tagging – How it works



Tagging – The Process



387 red emperor tagged and released into the study area

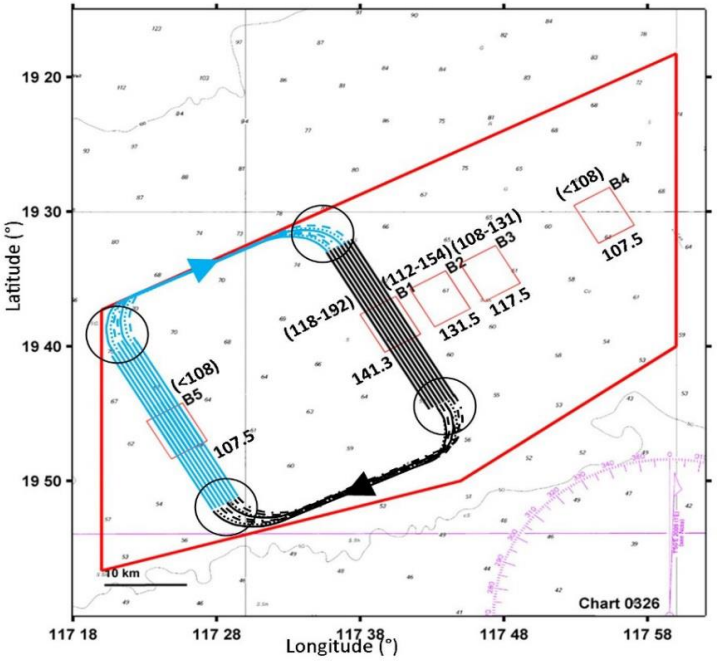
Baited Remote Underwater Videos

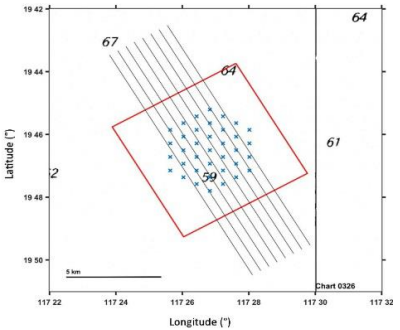
Study Design - Fishes

- Target species red emperor *Lutjanus sebae* (tagging)
- Demersal fishes (BRUVS)
- Entire fish community – sonar surveys

A before-during-after control-impact design

- Prior to experiment 3x
- During
- After 2x to 6 months
- 1 year for tagging





Constraints: Weather and Whales

- Best weather windows –
  - Avoid cyclone season ~ December to March
  - Rough seas ~ May to October

- Whales
  - Abundant May/June through to August

Objectives

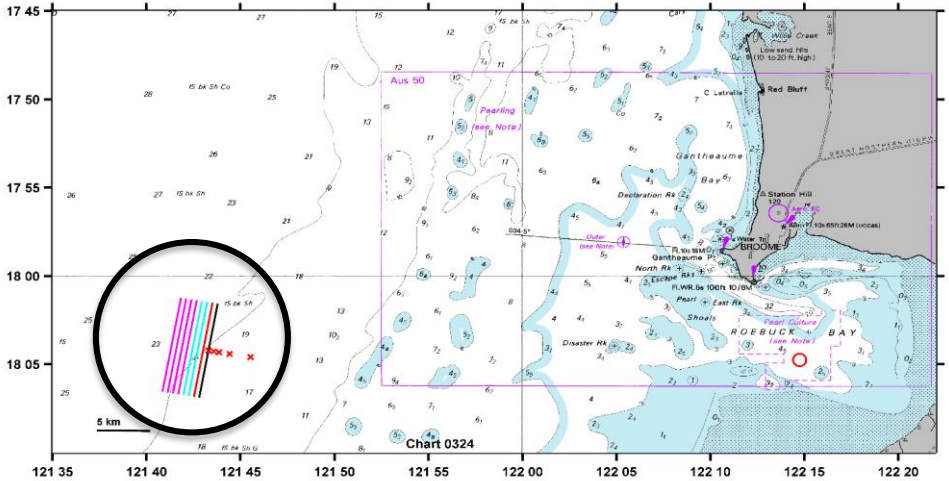
The nature and extent, if any, of the impact of seismic surveys on physiology, growth and production of market quality pearls by pearl oysters, *P. maxima*

- Broome is the only wild-caught culture industry in world – sustainably managed and certified by the Marine Stewardship Council

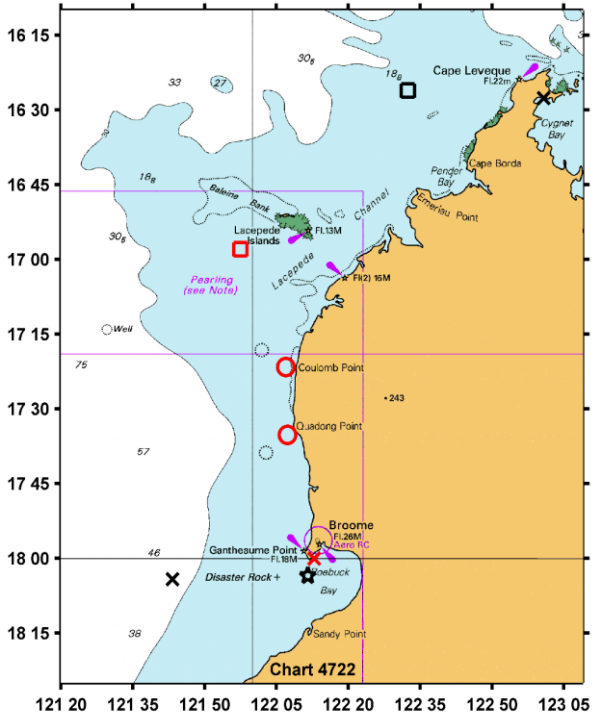
Pearls – Key Constraints

Limited in the number of locations

Proximity to facilities, weather: Off Gantheaume Point



Potential pearl holding locations



Pearls – Key Constraints

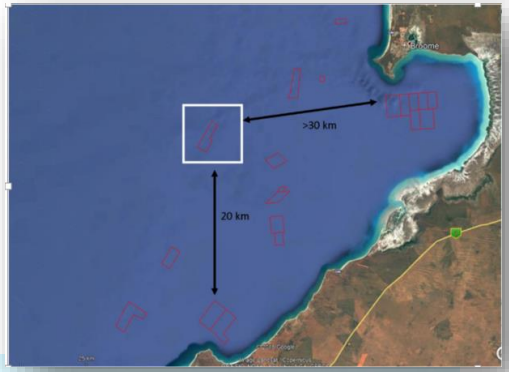
- No harm to commercial stakeholders or the surrounding ecosystem
- Weather
- Whales

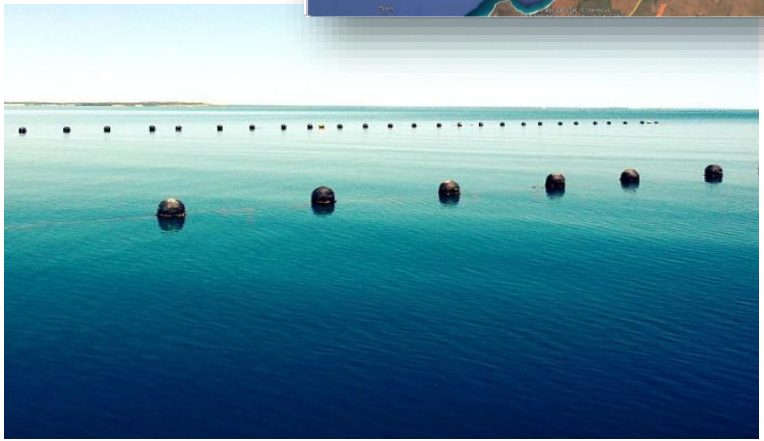
Impacts - Pearls

Combines a before-during-after control-impact design and a dose response design

Commercial vessel towing seismic array

Transfer to grow-out after the experiment





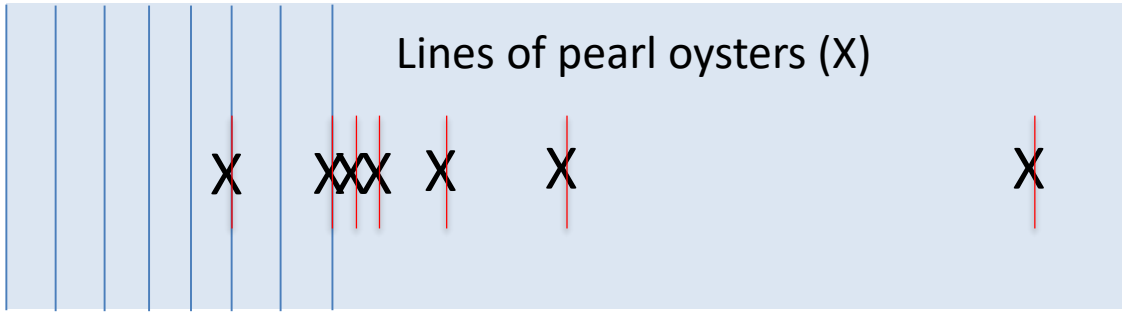
Observations:

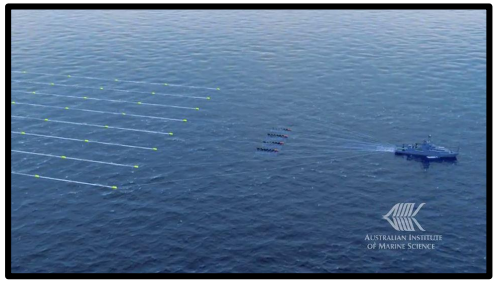
- Mortality
- Stress (physiology, immunology, genetics)
- Pearl production capability

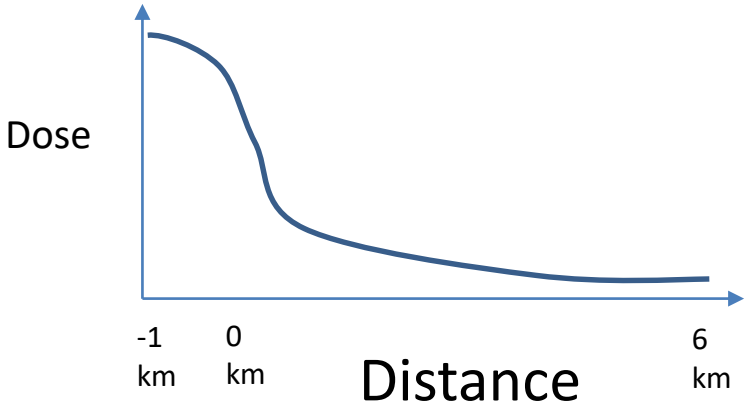
Sampling:

- Prior to experiment (control)
- During
- After 3x to 6 months
- 2 years for pearl production

Dose - Response experiment







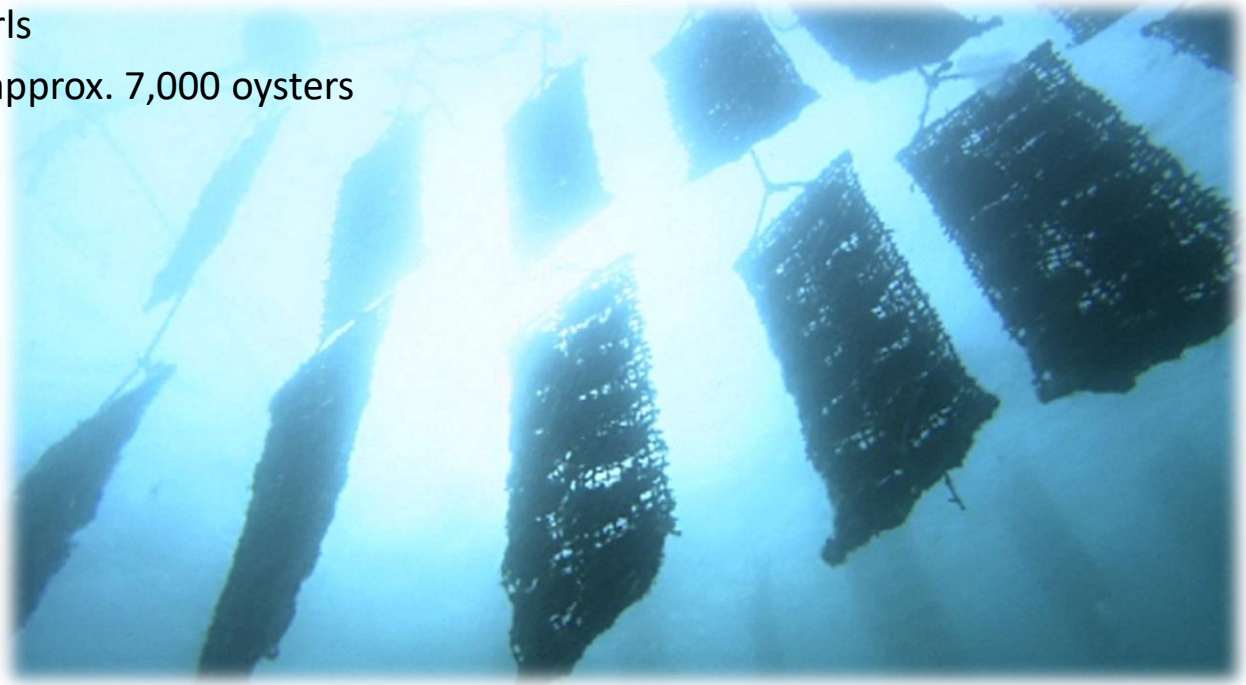
Seismic vessel passes	8 times
Line spacing (m)	500 m
Line spacing (s)	24/12 hours
Line length	9 - 15 km

Pearls – Lab work

Total of 1490 oysters studied for impacts on physiology, health

Pearl production

- Oysters seeded with pearls
- Grown out for 2 years – approx. 7,000 oysters



Our studies will provide:

- The most detailed information on the impacts of seismic surveys on fish and oysters
- Definitive answers to the question do seismic surveys impact adult fishes and oysters
- The basis for regulation and impact assessment by management agencies
- Certainty for stakeholders – commercial fishing, pearl aquaculture, oil and gas
- See website: www.aims.gov.au/nw-shoals-to-shore