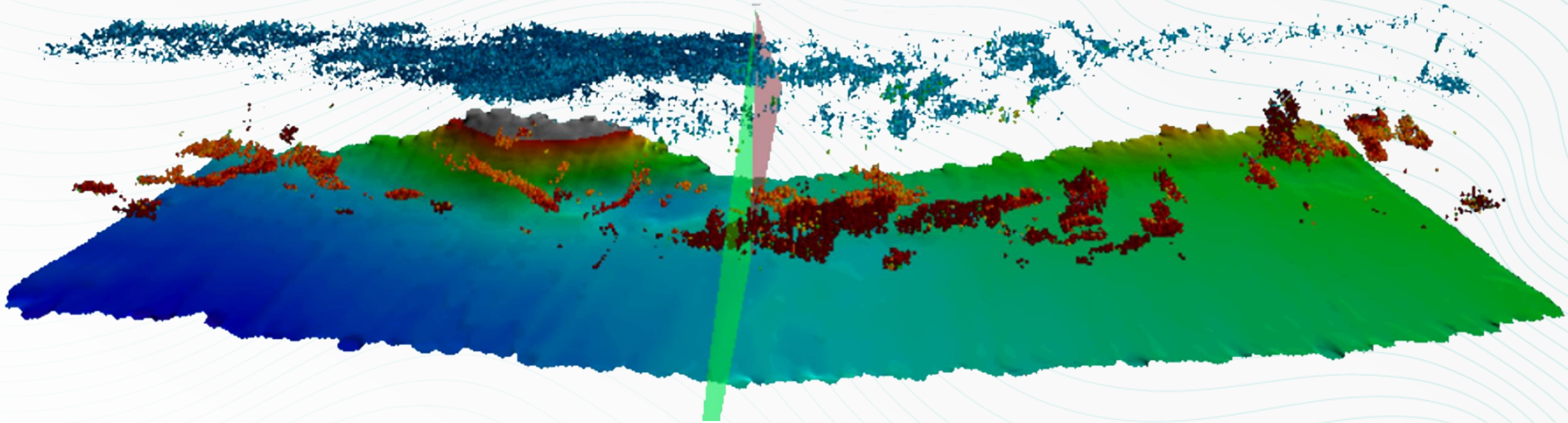
WASSP Multibeam Sonar

Stefan Richardson; stefan@enl.co.nz



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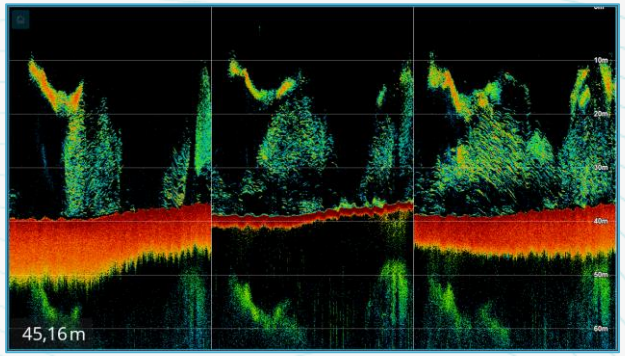
Company Overview

- Electronic Navigation Ltd. (ENL) parent company of WASSP Ltd.
- Founded in 1945; 75+ years in business
- Furuno distributor New Zealand for over 50 years
- Furuno is the now a majority owner of ENL & WASSP

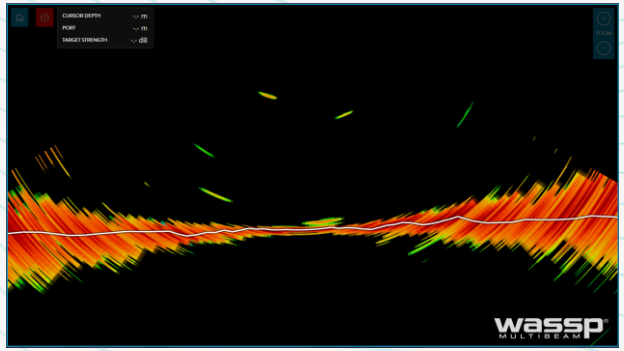
- ENL has done R&D design and manufacture for over 20 years
- Current Generation of WASSP Multibeam; Gen3 Introduced 2016

WASSP Multibeam Sonar

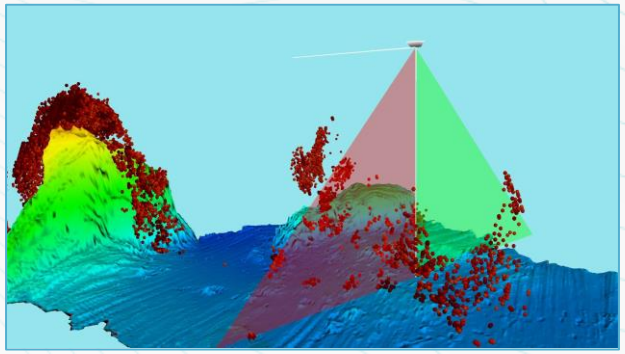
- Multiple functions for Acoustic and Bathymetric Displays
- 120 degrees Swath Coverage
  - 224 Beams
  - 4º Resolution, Port/Starboard
  - 2cm Range Resolution
- Wide Dynamic Range; >150dB
- Broad Operational Frequency Range
- Calibrated Target Strength
  - Water Column
  - Seafloor
- Real Time Visualisation and recording for Data Post Processing (Open Protocol for 3rd Party)

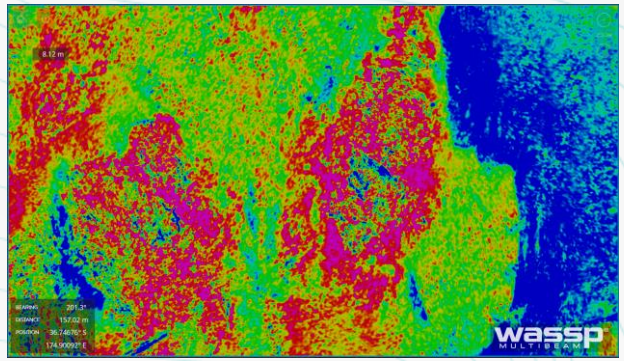


High Resolution Multi Sounder

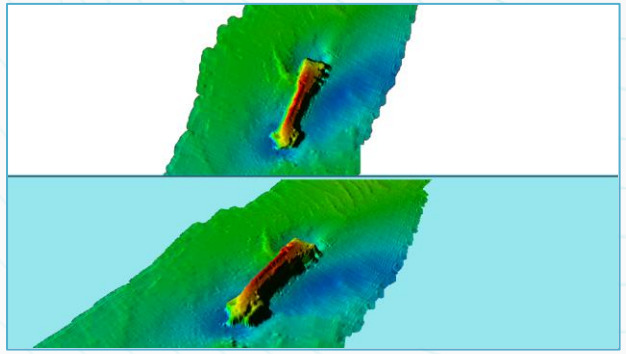


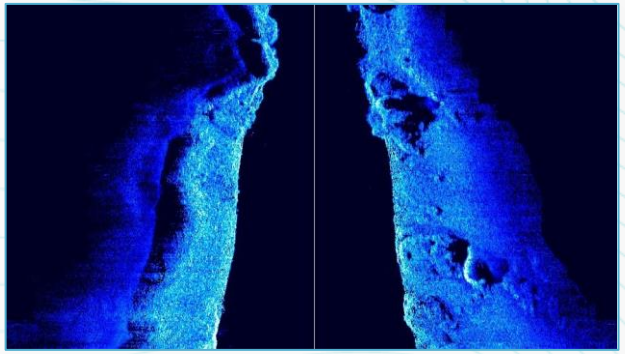
120 degree Sonar view


Water Column Targets



Seafloor Backscatter Strength


Precise Georeferenced 2D and 3D Mapping


SideScan

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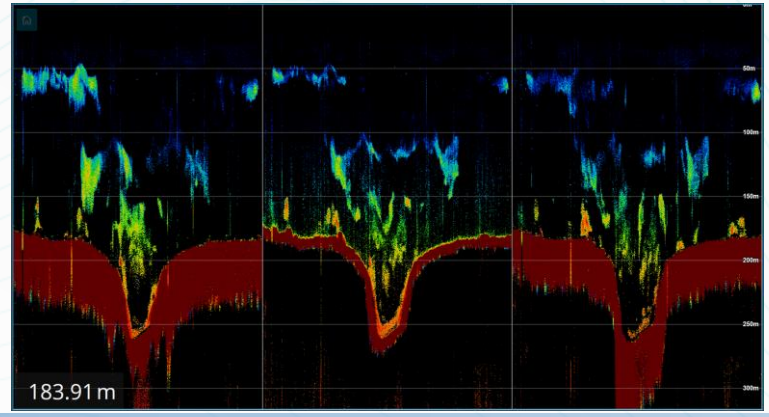
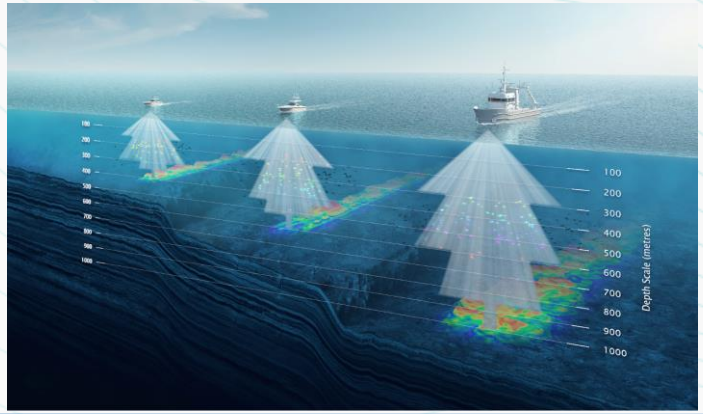
WASSP Fisheries Models

Medium Frequency | Low Frequency

	F3	F3X	F3XL
Frequency Range	120-200 kHz Wideband	120-200 kHz Wideband	60 – 100 kHz Wideband
Frequency Default Centre	160 kHz	160 kHz	80 kHz
Maximum CHIRP frequency range	+/-30kHz	+/-30kHz	+/-20kHz
Pulse Type	FM/CW	FM/CW	FM/CW
Swath	120°	120°	120°
Minimum Detection Range	1 m	1 m	2 m
Max Depth Range: Main Beam (Nadir)	400 m	600 m	1,000m





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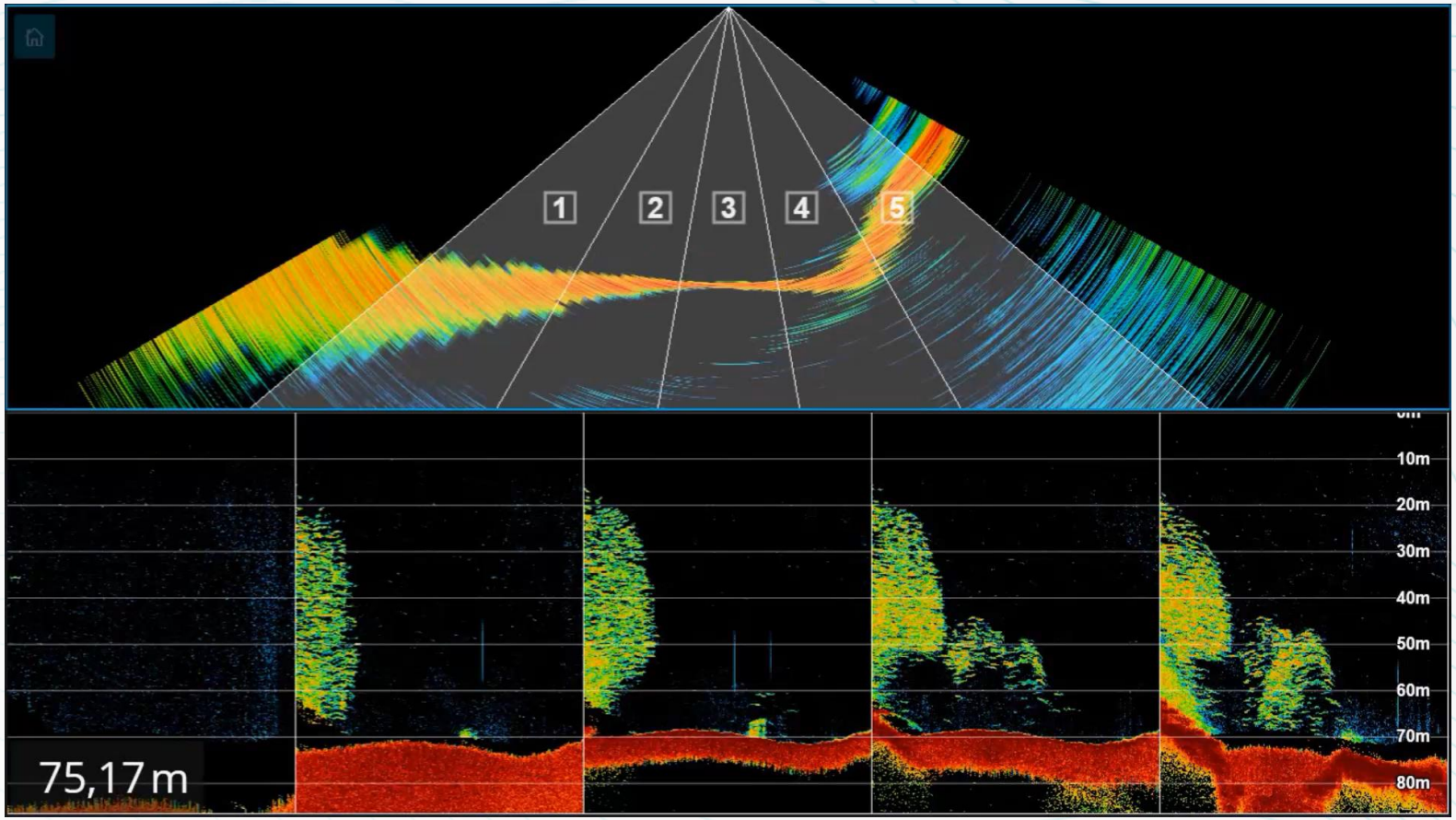
Sonar/Sounder 5 Beam View

- Up to 5 sounder beams available
- Beams adjustable by beam width and beam angle
- Beam positions and width shown on the sonar display
- Calibrated target strength, position and depth shown at the cursor



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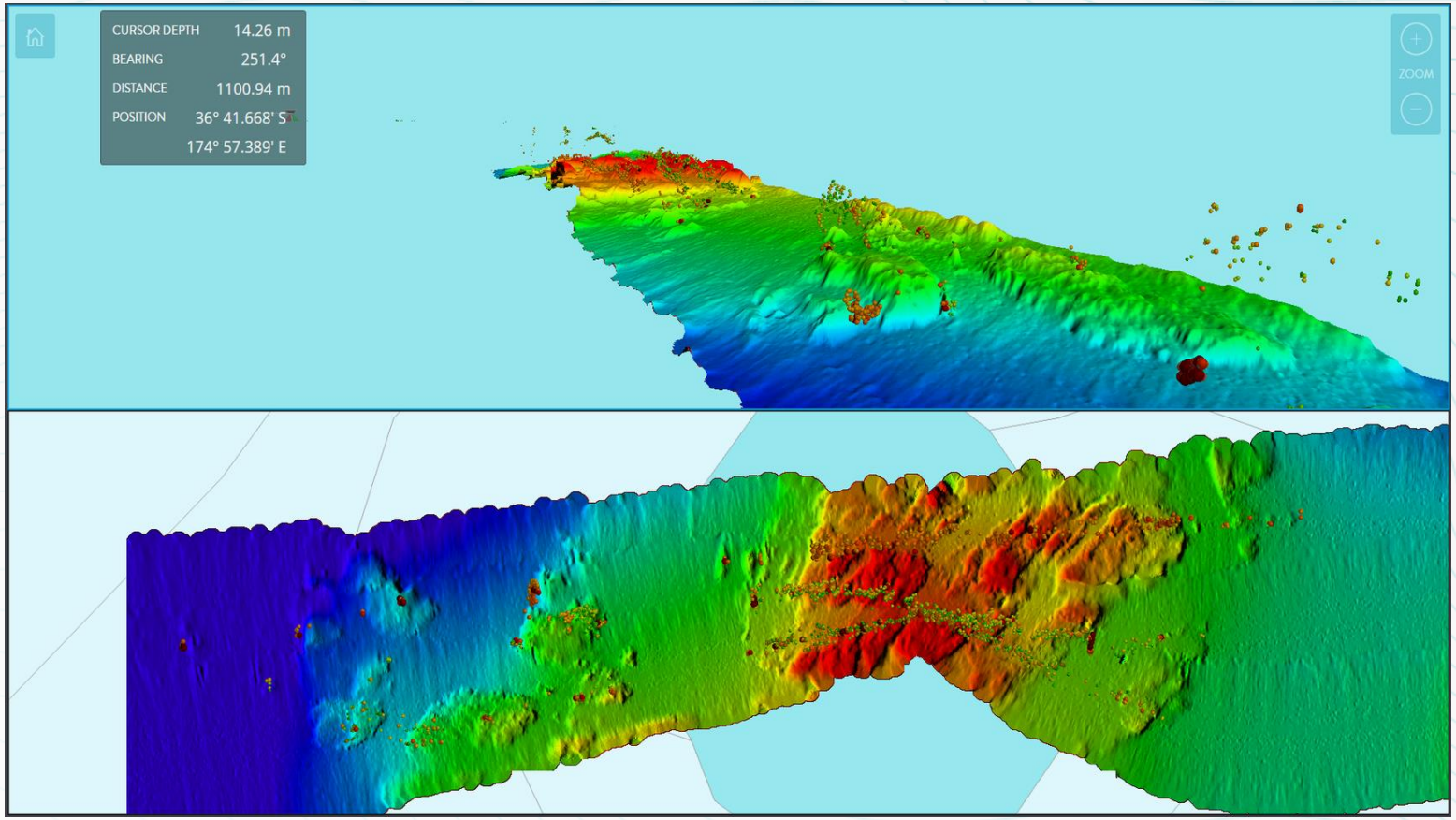
Real-time 2D and 3D Seafloor Mapping

- Georeferenced bathymetry displayed in real-time for assessment and decision making
- Bathymetry data stored in a database for display any time as a mapping library
- Navigation Chart Overlay available
- Real-time contour and depth overlays available
- Format supported by multiple 3rd Party applications



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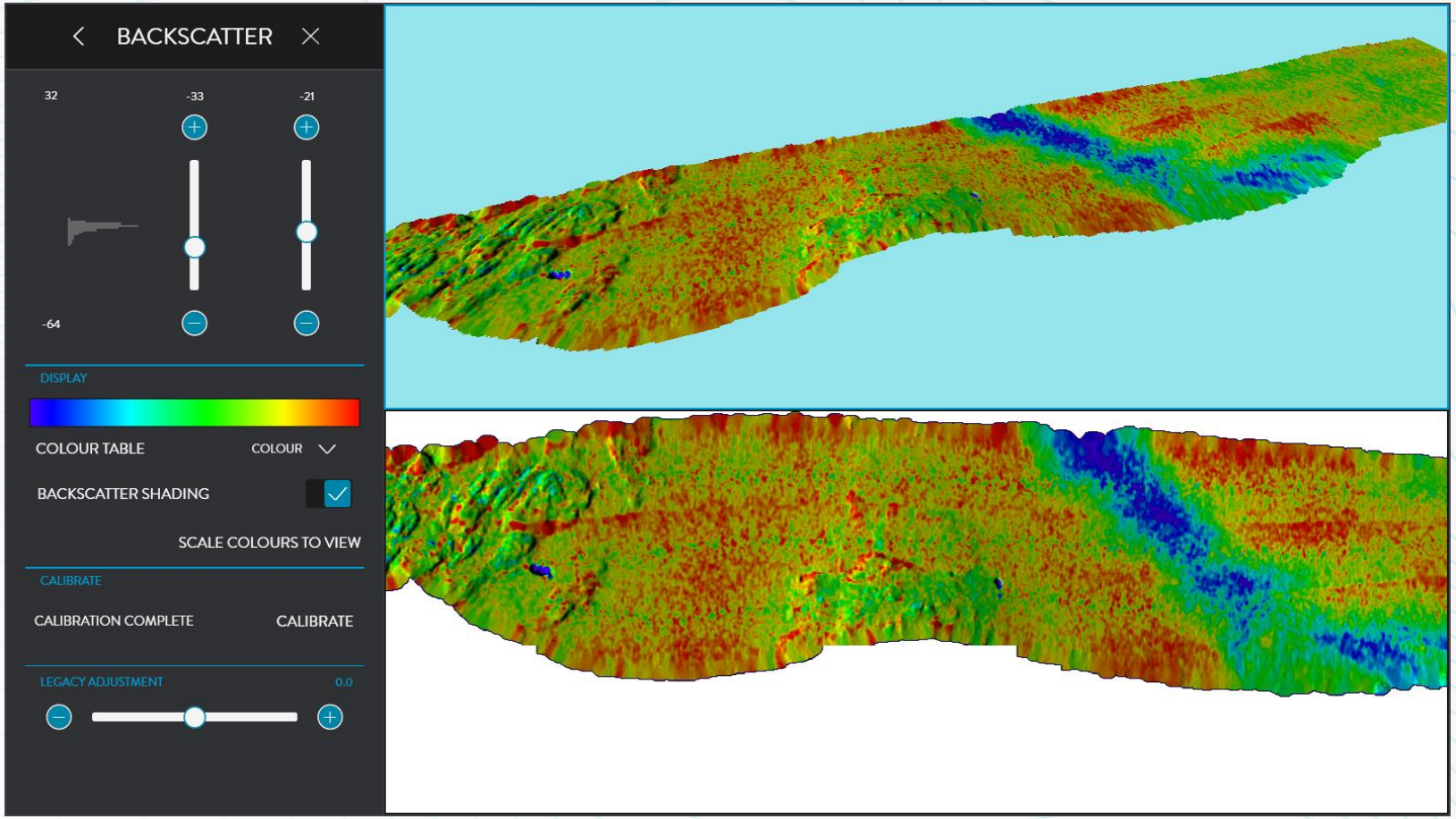
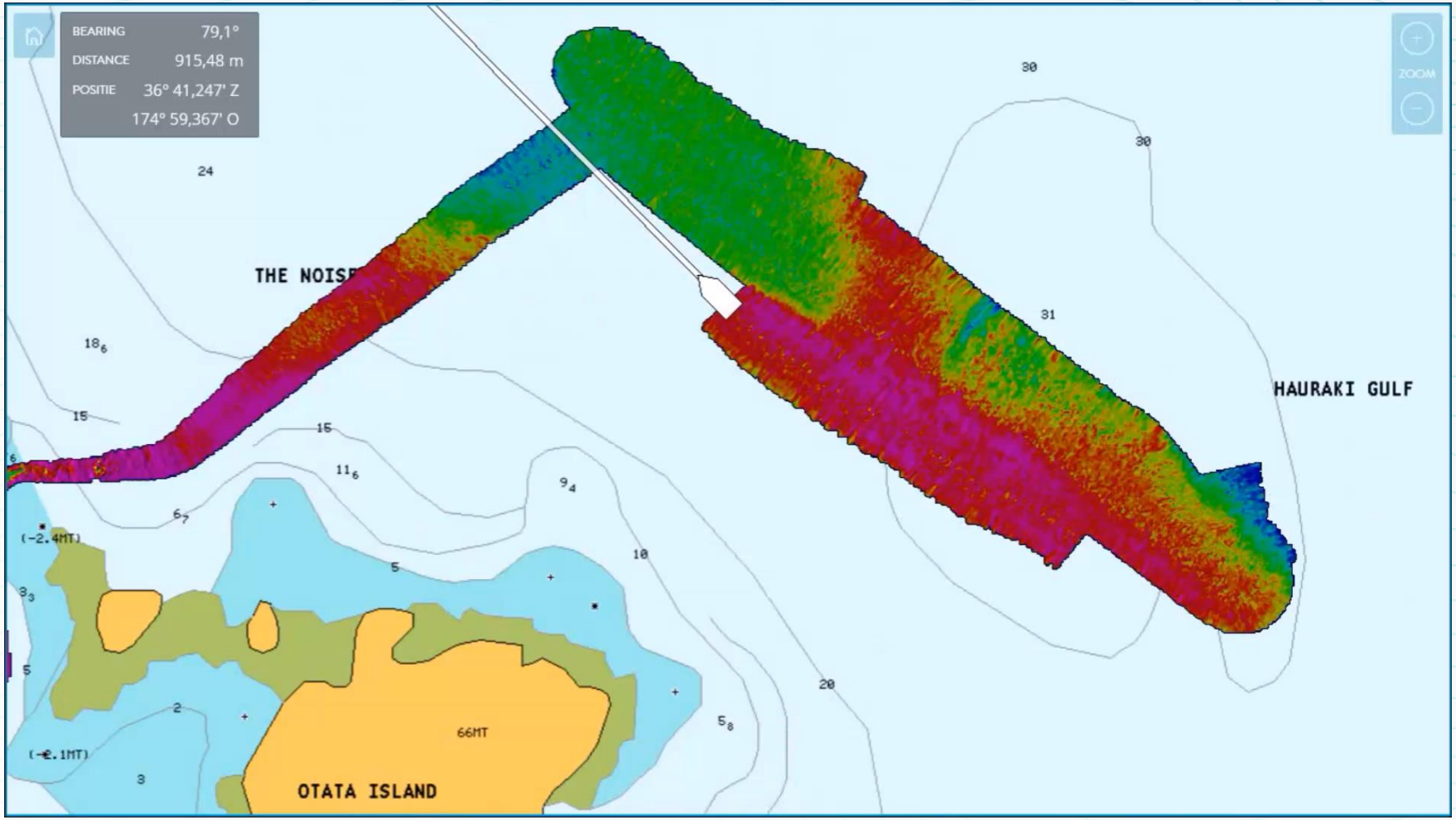
Backscatter for Seafloor Hardness

- Calibrated, georeferenced for consistency and repeatability
- Displays seafloor backscatter to distinguish seafloor types
- Viewable by various colour and shading options
- Identify habitat types



Backscatter for Seafloor Hardness



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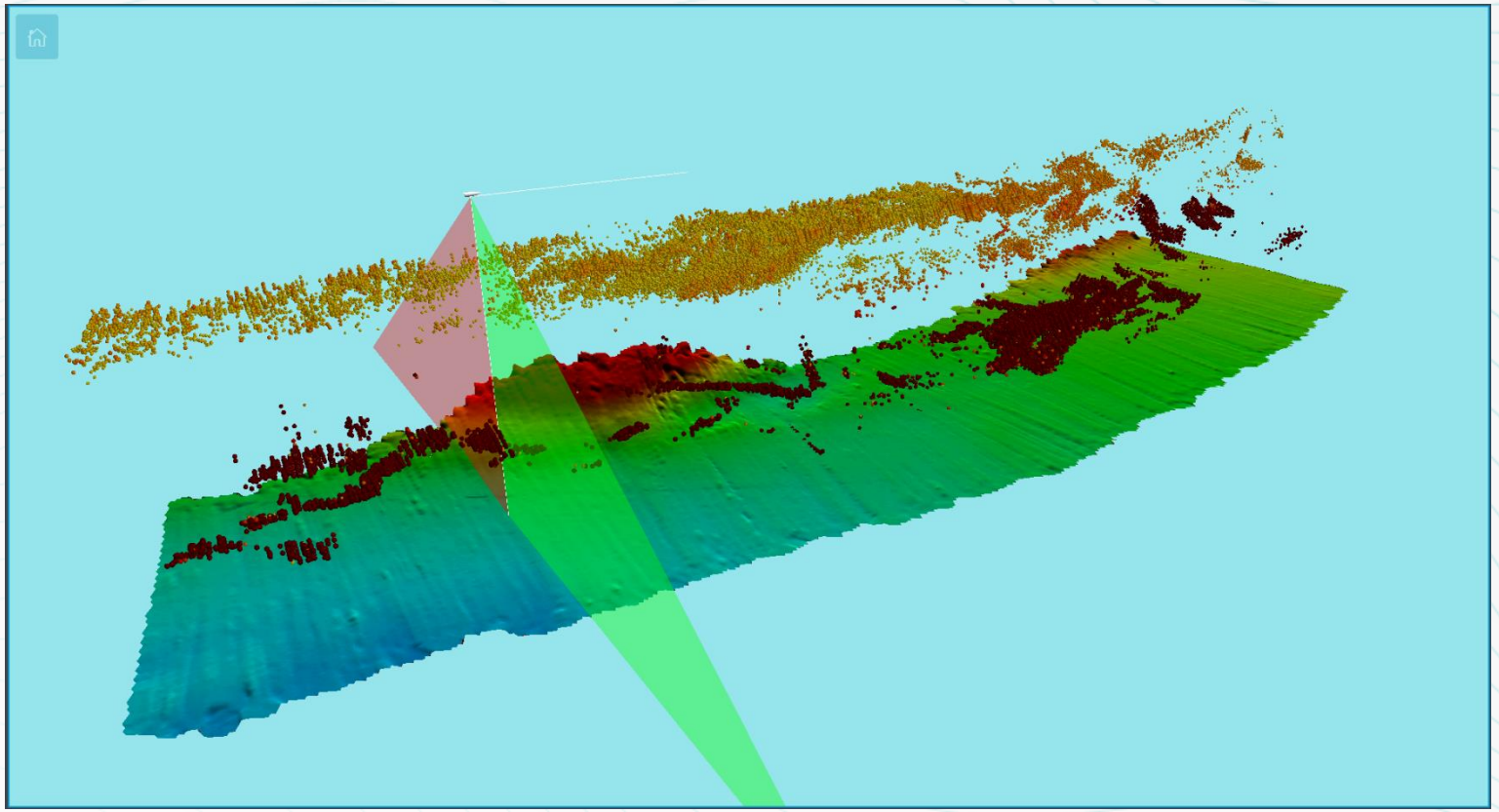
Water Column Targets

- Fish target tracking and display
- Displays water column targets in 2D and 3D
- Targets can be filtered by strength and position in the water column
- Colour coded and sized by Target Strength



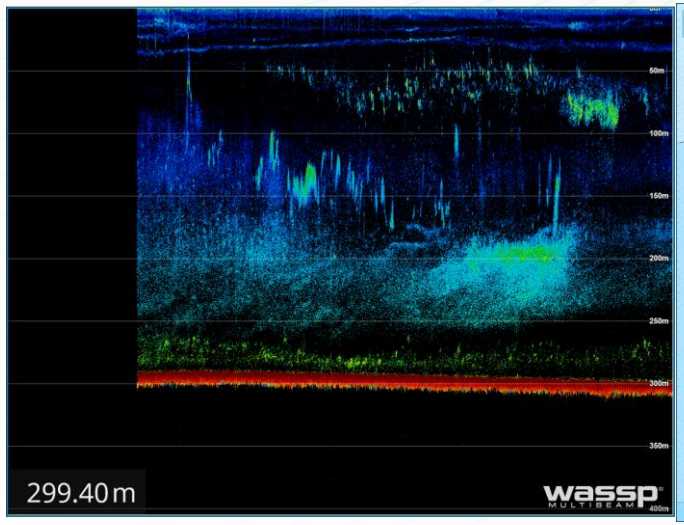
Applications - Fisheries

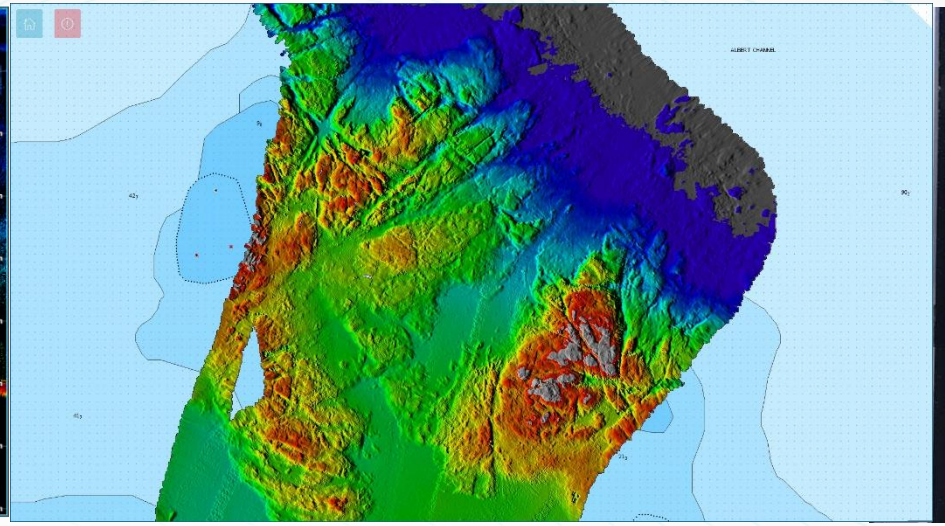
Trawling

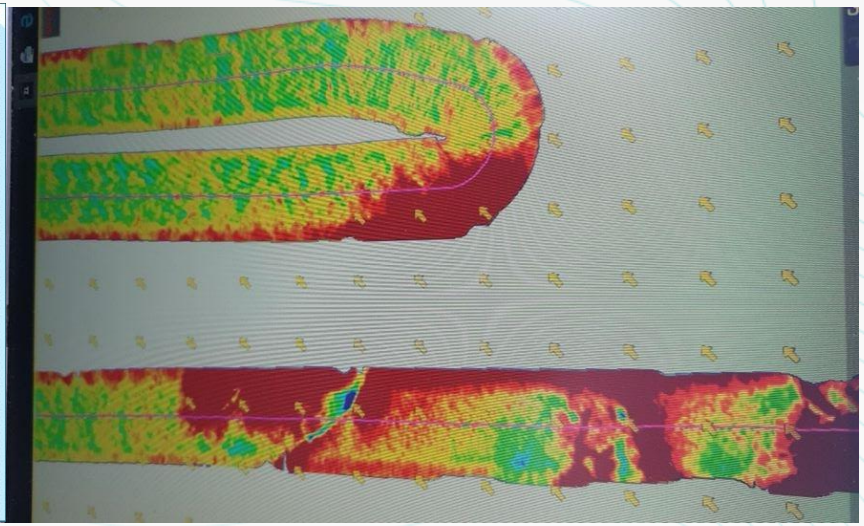
Lining

Pot/Trap

Seining/Netting







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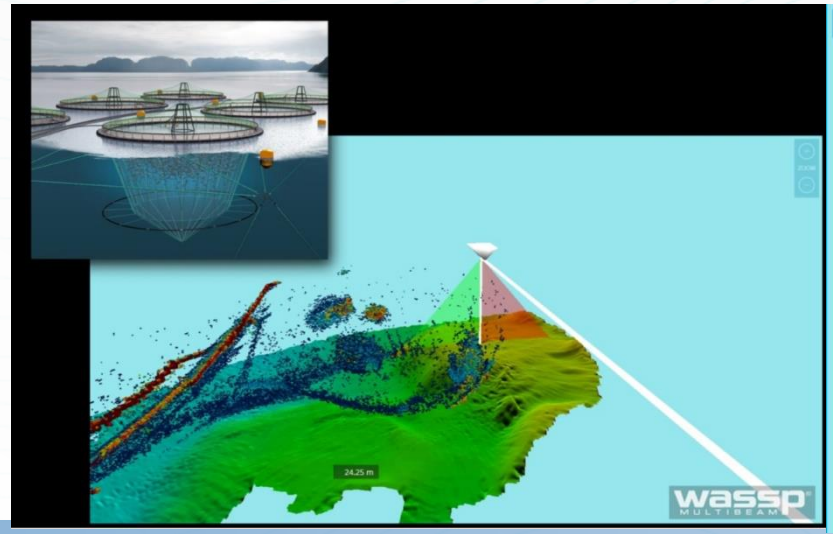
Applications - Hydroacoustic

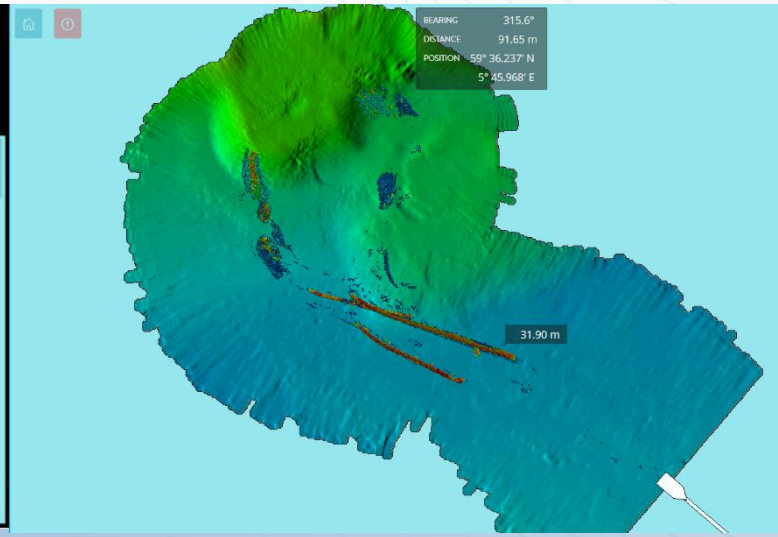
Fish Farming

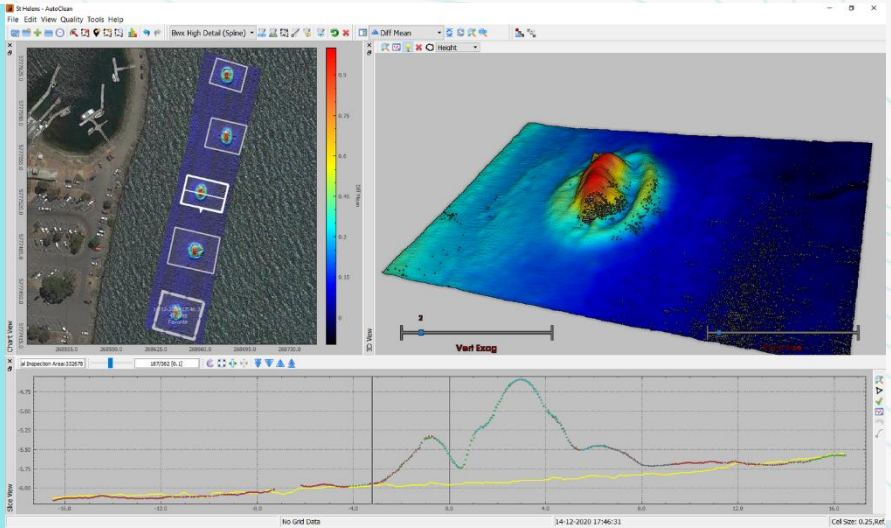
Marine Research

Ecological Research

Fisheries Research







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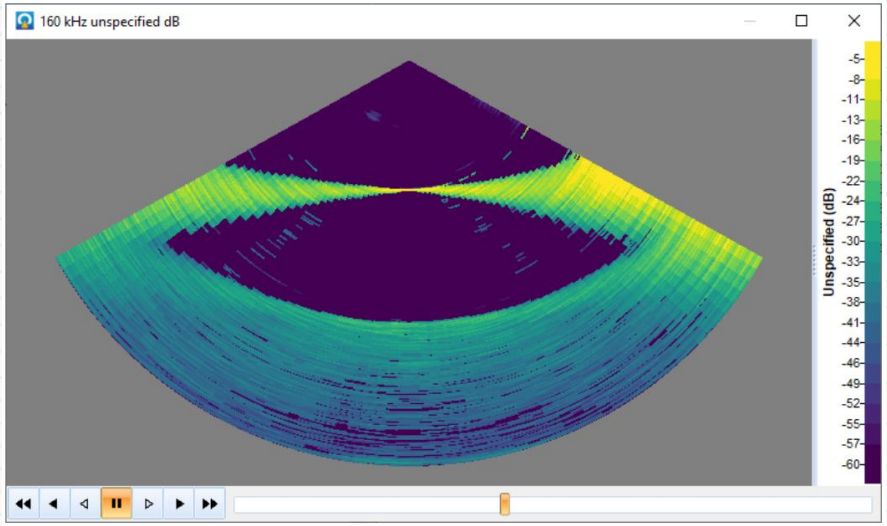
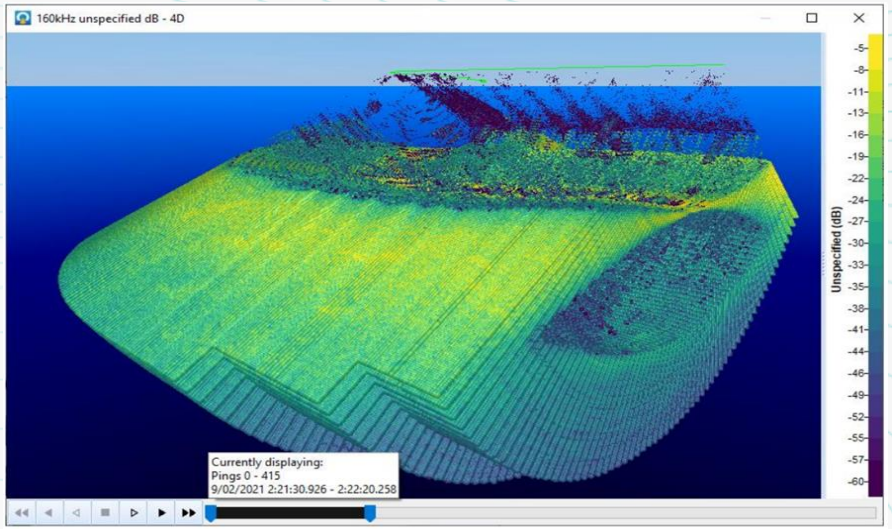
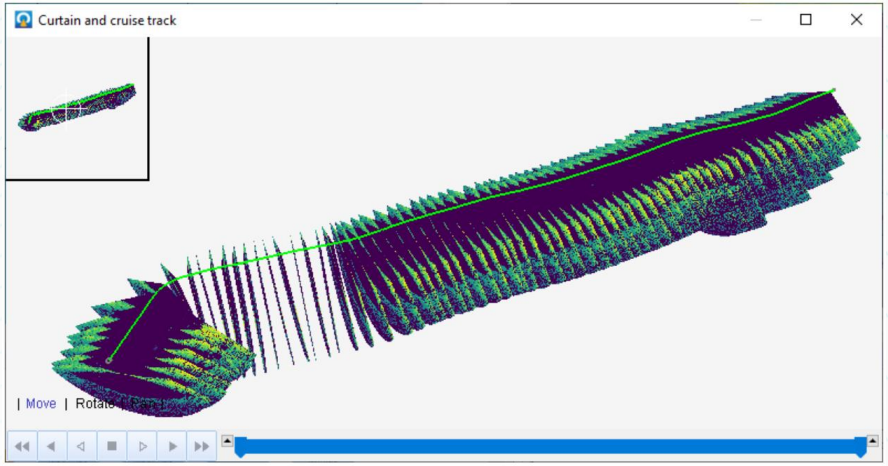
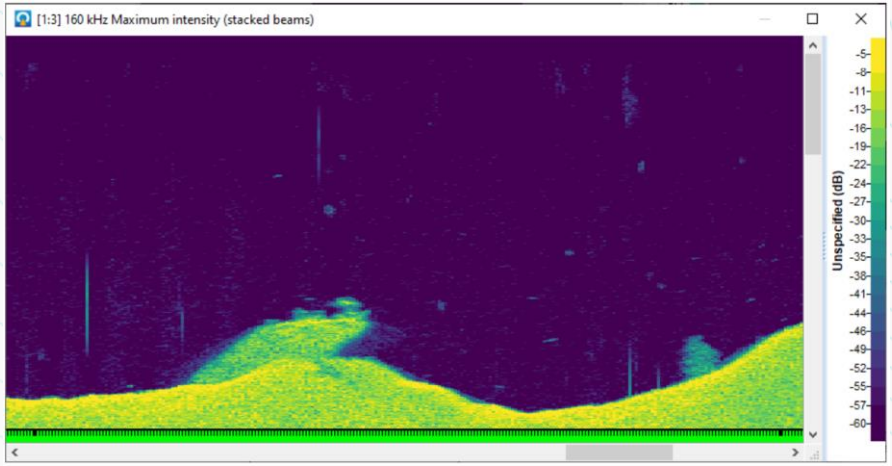
Applications - EchoView Export

- WASSP recorded data can be imported into EchoView for data analysis
- Ping based echograms
- 4D sonar view to view georeferenced samples
- 3D scene window
- Stacked beams for maximum intensity









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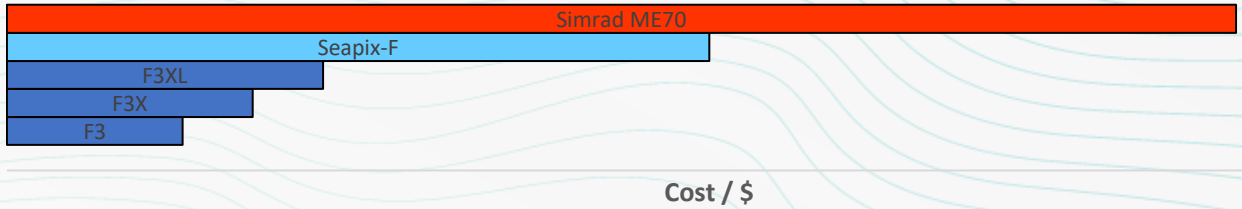
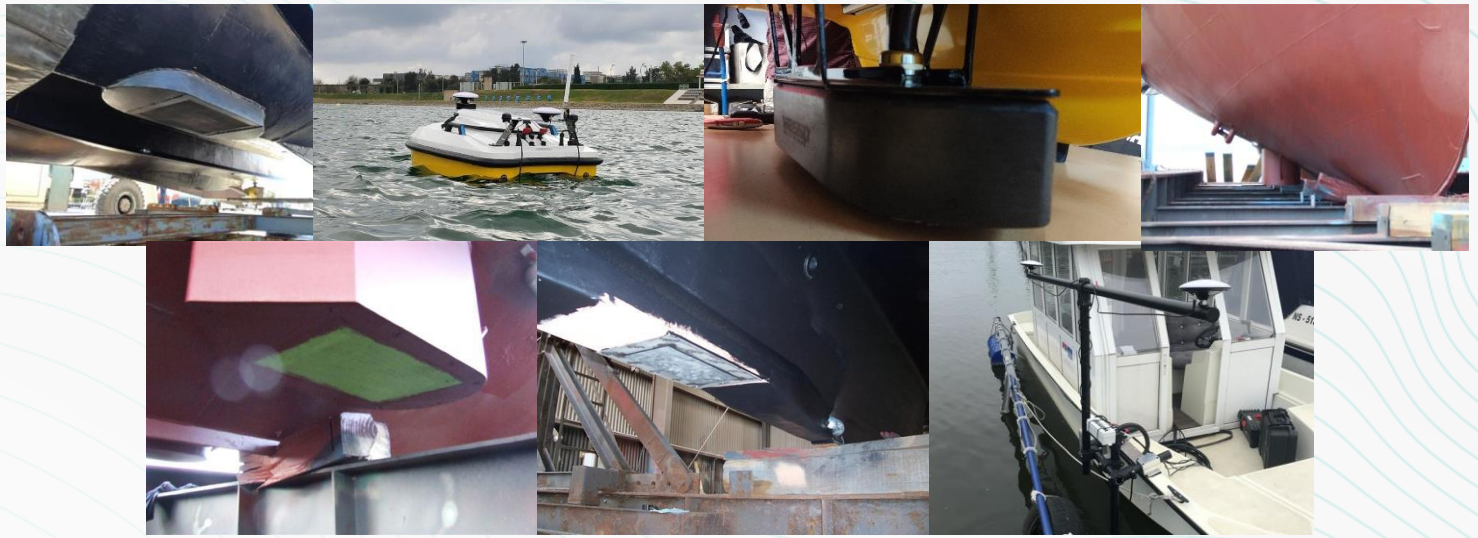
The WASSP Advantages

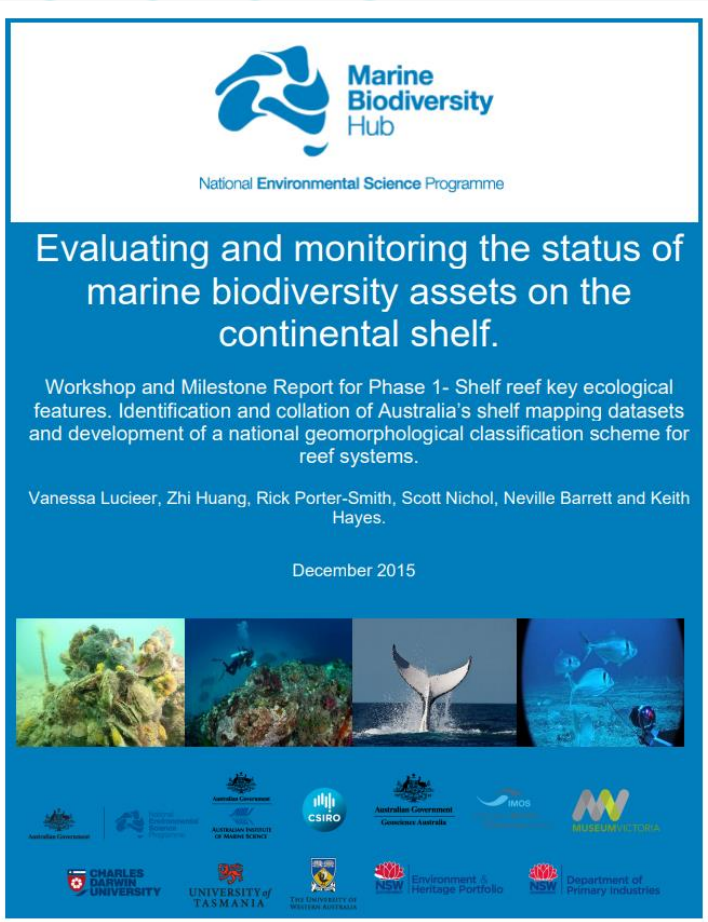
- Cost Effectiveness
- Scientific Performance
- Flexible Installation Options
  - Hull Mount Transducer
  - Fairing Transducer
  - Pole Mount Transducer
- Ease of Use
  - WASSP CDX for optimum performance and usability
  - TimeZero or GD700 for industry standard
  - Multiple 3rd party interfaces for specialty requirements
- Proven Technology on 1000's of vessels across multiple applications
  - #1 MBES in commercial fishing





Appendix – Research Papers

Evaluation and monitoring the status of marine biodiversity assets on continental shelf



The Department of Primary Industry and Fisheries has recently closed five areas between Port Keats, Darwin and around the Tiwi Islands to address concerns for the unstainable harvest of selected reef fish. These reef fish protection areas range in size from 91 to 482 km^2 totalling 1854 km^2. Selected areas within and outside these areas are being mapped using a WASSP multibeam sonar. These maps will help identify sites for monitoring fish abundance using acoustic surveys, and deploying BRUVS to characterise fish reef fish communities.

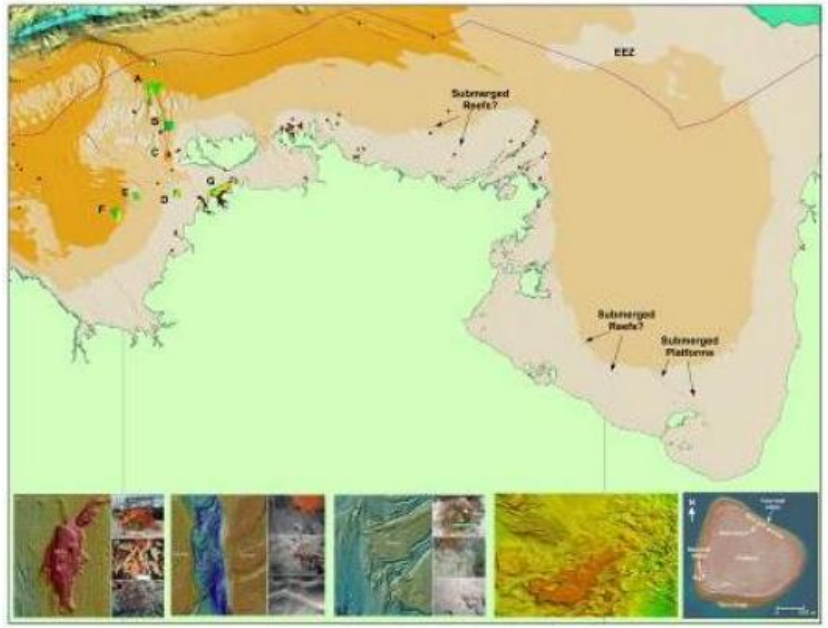
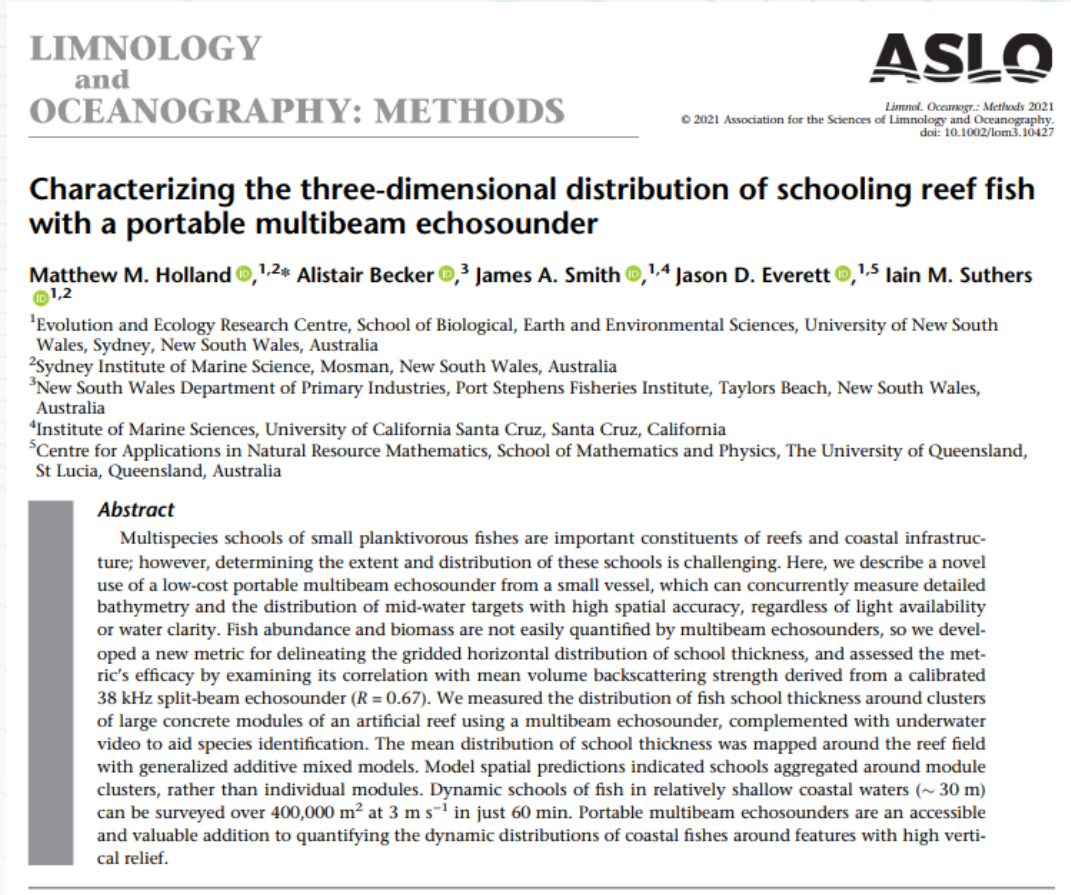


Figure 21: Mapping coverage on the NT shelf, showing areas mapped in high resolution using multibeam sonar (A to G) and sites where reef is known to exist from charts but remain poorly documented.

https://core.ac.uk/download/pdf/43006437.pdf

Characterizing the three-dimensional distribution of schooling reef fish with a portable multibeam echosounder



LIMNOLOGY and OCEANOGRAPHY: METHODS

ASLO

Limnol. Oceanogr.: Methods 2021
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doi: 10.1002/lom3.10427

Characterizing the three-dimensional distribution of schooling reef fish with a portable multibeam echosounder

Matthew M. Holland [1,2*] Alistair Becker [3] James A. Smith [1,4] Jason D. Everett [1,5] Iain M. Suthers [1,2]

[1]Evolution and Ecology Research Centre, School of Biological, Earth and Environmental Sciences, University of New South Wales, Sydney, New South Wales, Australia
[2]Sydney Institute of Marine Science, Mosman, New South Wales, Australia
[3]New South Wales Department of Primary Industries, Port Stephens Fisheries Institute, Taylors Beach, New South Wales, Australia
[4]Institute of Marine Sciences, University of California Santa Cruz, Santa Cruz, California
[5]Centre for Applications in Natural Resource Mathematics, School of Mathematics and Physics, The University of Queensland, St Lucia, Queensland, Australia

Abstract

Multispecies schools of small planktivorous fishes are important constituents of reefs and coastal infrastructure; however, determining the extent and distribution of these schools is challenging. Here, we describe a novel use of a low-cost portable multibeam echosounder from a small vessel, which can concurrently measure detailed bathymetry and the distribution of mid-water targets with high spatial accuracy, regardless of light availability or water clarity. Fish abundance and biomass are not easily quantified by multibeam echosounders, so we developed a new metric for delineating the gridded horizontal distribution of school thickness, and assessed the metric's efficacy by examining its correlation with mean volume backscattering strength derived from a calibrated 38 kHz split-beam echosounder ($R = 0.67$). We measured the distribution of fish school thickness around clusters of large concrete modules of an artificial reef using a multibeam echosounder, complemented with underwater video to aid species identification. The mean distribution of school thickness was mapped around the reef field with generalized additive mixed models. Model spatial predictions indicated schools aggregated around module clusters, rather than individual modules. Dynamic schools of fish in relatively shallow coastal waters (~ 30 m) can be surveyed over 400,000 m^2 at 3 m s^{-1} in just 60 min. Portable multibeam echosounders are an accessible and valuable addition to quantifying the dynamic distributions of coastal fishes around features with high vertical relief.

https://aslopubs.onlinelibrary.wiley.com/doi/abs/10.1002/lom3.10427

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FURUNO

Dynamic distribution of coastal zooplanktivorous fishes

UNSW SYDNEY

Dynamic distributions of coastal zooplanktivorous fishes

Matthew Michael Holland

A thesis submitted in fulfilment of the requirements for a degree of

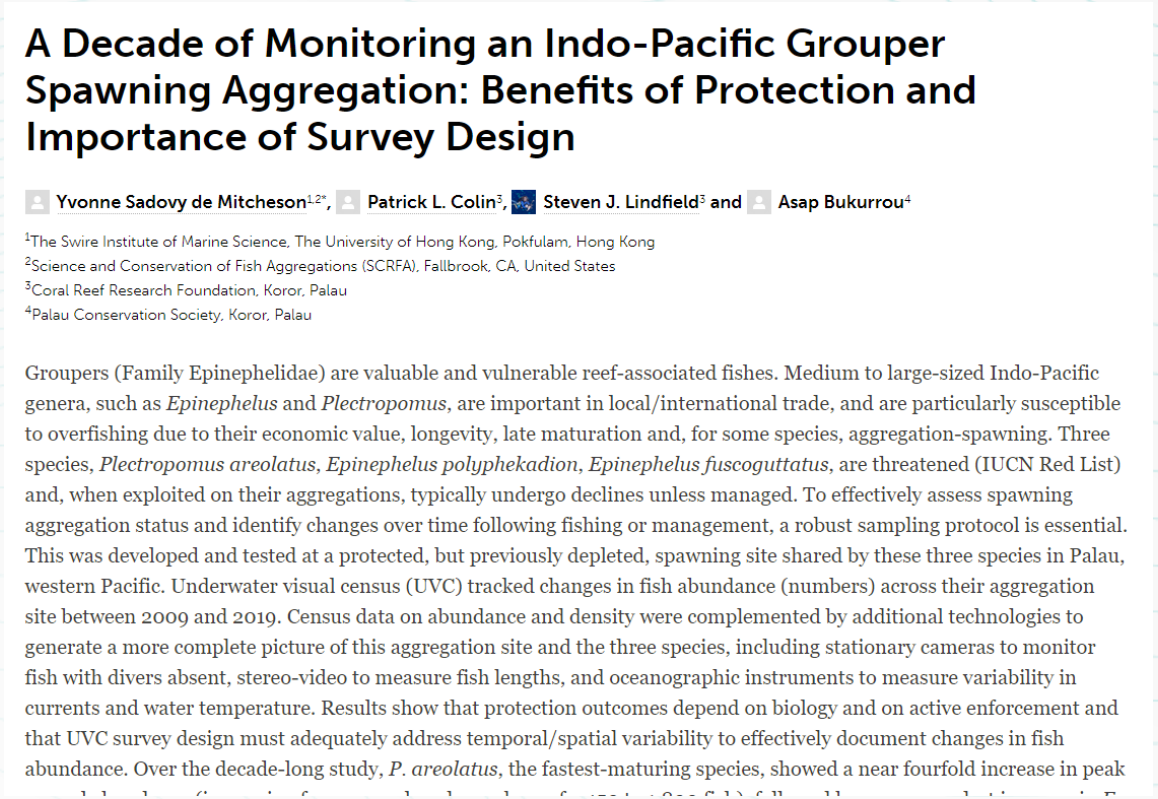
Doctor of Philosophy

School of Biological, Earth and Environmental Sciences

Faculty of Science

http://unsworks.unsw.edu.au/fapi/datastream/unsworks:75302/SOURCE02?view=true

A Decade of Monitoring an Indo-Pacific Grouper Spawning Aggregation: Benefits of Protection and Importance of Survey Design



A Decade of Monitoring an Indo-Pacific Grouper Spawning Aggregation: Benefits of Protection and Importance of Survey Design

Yvonne Sadovy de Mitcheson[1,2*], Patrick L. Colin[3], Steven J. Lindfield[3] and Asap Bukurrou[4]

[1]The Swire Institute of Marine Science, The University of Hong Kong, Pokfulam, Hong Kong
[2]Science and Conservation of Fish Aggregations (SCRFA), Fallbrook, CA, United States
[3]Coral Reef Research Foundation, Koror, Palau
[4]Palau Conservation Society, Koror, Palau

Groupers (Family Epinephelidae) are valuable and vulnerable reef-associated fishes. Medium to large-sized Indo-Pacific genera, such as *Epinephelus* and *Plectropomus*, are important in local/international trade, and are particularly susceptible to overfishing due to their economic value, longevity, late maturation and, for some species, aggregation-spawning. Three species, *Plectropomus areolatus*, *Epinephelus polyphekadion*, *Epinephelus fuscoguttatus*, are threatened (IUCN Red List) and, when exploited on their aggregations, typically undergo declines unless managed. To effectively assess spawning aggregation status and identify changes over time following fishing or management, a robust sampling protocol is essential. This was developed and tested at a protected, but previously depleted, spawning site shared by these three species in Palau, western Pacific. Underwater visual census (UVC) tracked changes in fish abundance (numbers) across their aggregation site between 2009 and 2019. Census data on abundance and density were complemented by additional technologies to generate a more complete picture of this aggregation site and the three species, including stationary cameras to monitor fish with divers absent, stereo-video to measure fish lengths, and oceanographic instruments to measure variability in currents and water temperature. Results show that protection outcomes depend on biology and on active enforcement and that UVC survey design must adequately address temporal/spatial variability to effectively document changes in fish abundance. Over the decade-long study, *P. areolatus*, the fastest-maturing species, showed a near fourfold increase in peak

https://www.frontiersin.org/articles/10.3389/fmars.2020.571878/full

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Seagrass Habitat Suitability Map at Merambong Shoal, Johor: A Preliminary Study Using Multibeam Echosounder and Maxent Modelling

The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLII-4/W16, 2019
6th International Conference on Geomatics and Geospatial Technology (GGT 2019), 1–3 October 2019, Kuala Lumpur, Malaysia

SEAGRASS HABITAT SUITABILITY MAP AT MERAMBONG SHOAL, JOHOR: A PRELIMINARY STUDY USING MULTIBEAM ECHOSOUNDER AND MAXENT MODELLING

M. A. H. Muhamad [1] and R. Che Hasan [1,2]

[1] Razak Faculty of Technology and Informatics, Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia - muhammadabdulhakim1991@gmail.com

[2] Center for Coastal and Ocean Engineering (COEI), Universiti Teknologi Malaysia, Jalan Sultan Yahya Petra, 54100 Kuala Lumpur, Wilayah Persekutuan Kuala Lumpur, Malaysia - rozaimi.kl@utm.my

KEY WORDS: Multibeam, Seagrass habitat suitability, Bathymetric derivatives, Maximum entropy, Benthic Terrain Modeller, seagrass habitat distribution

ABSTRACT:

In recent years, there has been an increasing interest to use high-resolution multibeam dataset and Species Distribution Modelling (SDM) for seagrass habitat suitability model. This requires a specific variable derived from multibeam data and *in-situ* seagrass occurrence samples. The purpose of this study was (1) to derive variables from multibeam bathymetry data to be used in seagrass habitat suitability model, (2) to produce seagrass habitat suitability model using Maximum Entropy (MaxEnt), and (3) to quantify the contribution of each variable for predicting seagrass habitat suitability map. The study area was located at Merambong Shoal, covering an area of 0.04 km², situated along Johor Strait. First, twelve (12) variables were derived from bathymetry data collected from multibeam echosounder using Benthic Terrain Modeller (BTM) tool. Secondly, all variables and seagrass occurrence samples were integrated in MaxEnt to produce seagrass habitat suitability map. The results showed that the Area Under Curve (AUC) values based on training and test data were 0.88 and 0.65, respectively. The northwest region of survey area indicated higher habitat suitability of seagrass, while the southeast region of survey area indicated lower suitability. Bathymetry mean found to be the most contributed variables among others. The spatial distribution of seagrass from modelling technique agreed with the previous studies and they are found to be distributed at depths ranging from 2.2 to 3.4 meters whilst less suitable with increasing of water depth. This study concludes that seagrass habitat suitability map with high-resolution pixel size (0.5 meter) can be produced at Merambong Shoal using acoustic data from multibeam echosounder coupled with MaxEnt and underwater video observations.

https://noa.gwlb.de/servlets/MCRFileNodeServlet/cop_derivate_00040792/isprs-archives-XLII-4-W16-463-2019.pdf

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Chagos Archipelago Pelagic Expedition, February 5-24,2016

Scientific Report: Pacific Marlin Expedition
February 2016

Chagos Archipelago Pelagic Expedition, February 5-24, 2016

Expedition Report

T. B. Letessier[1], P. J. Hosegood[2], A. Nimmo-Smith[2], M. C. Fernandes[3], R. Proud[4], L. Lieber[3], J. Turner[3], P. Carr[1], R. Schaellert[5], N. Froman[6], Z. Belamy[1], S. Addison[1], P. Clement[1], A.S. Brierley[3]

[1] *Marine and Freshwater Group, Zoological Society of London.*
[2] *Marine Physics Research Group at Plymouth University*
[3] *Centre for Marine Futures, Oceans Institute, University of Western Australia*
[4] *Pelagic Ecology Research Group, Scottish Oceans Institute, University of St-Andrews*
[5] *MBARI Stanford University,*
[6] *Manta Trust*

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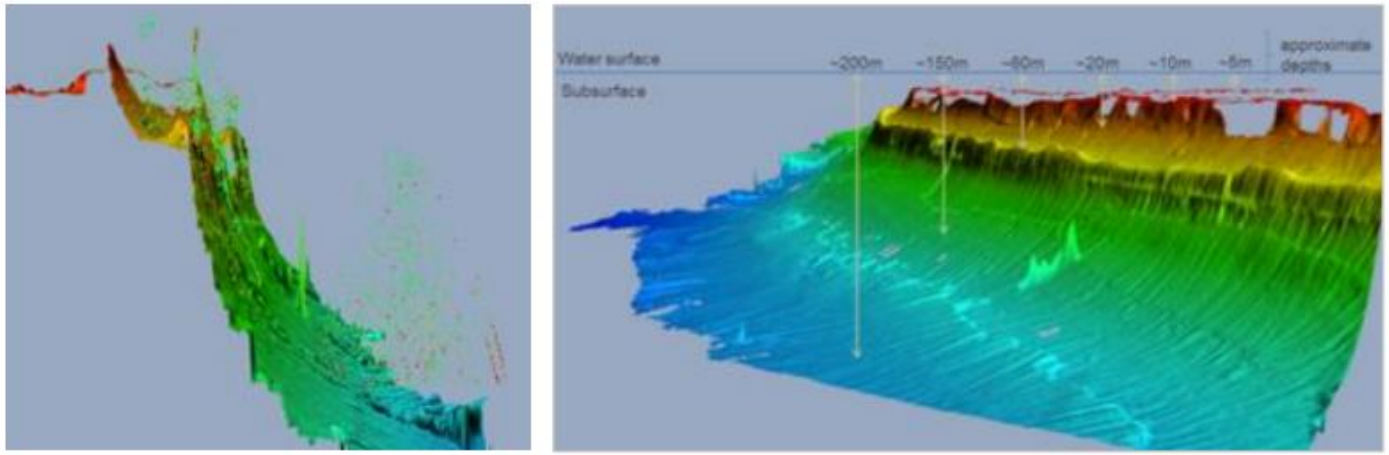

Fig. 8. Seabed 3D representation (scale=4:1) off Egmont Islands, Chagos Archipelago. Manta Alley refers to the yellow depth contour embedded between the very shallow waters (10m depth) and the 60m dip. Left: Seabed with display of mid-water targets. Right: Seabed only; approximate depths given.

https://biot.gov.io/wp-content/uploads/Bertarelli-Pelagic-Expedition-Feb-2016.pdf