Using the Ship of Opportunity Acoustic Data Collection Program to monitor any real ecosystem changes

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Are South Pacific monitoring programmes missing a key data set for ecosystem modelling?

- *Quantitative data on the mesopelagic communities in the region.*
- *Recent ecosystem models need information on the diversity, distribution, size-structure and abundance of this group to be predictive.*
- *Do you think the biomass of this community in the region is 2 billion tonnes…….. or 20 billion tonnes?*
- *Do you have any survey data to establish this, or plans to establish a time series?*

- *There is another way, following the Australian IMOS SOOP program*

The high seas mesopelagic community is poorly understood

- *Once again, models have been found well astray of biological reality.*
- *The South Pacific Tasman Basin models (Atlantis, Seapodym) indicated only 0.5 to 3 gm^{-2} wet weight biomass .*
- *Multiple Transect survey data from commercial fishing vessels 2004-2011 crossing the Tasman Sea (4-6 transects per annum) showed 16-29 gm^{-2} in the midwater scattering layers.*
- *Global estimates from models of 1 Giga tonnes in the oceans more likely to be 10 Giga tonnes.*

Why do we need to do this work?- Ecosystem models have the wrong numbers

Example of an ecosystem model that needs initialisation and assimilation of biomass for a range of trophic levels

ELSEVIER
Progress in Oceanography
2010, 84: 69-84
journal homepage: www.elsevier.com/locate/pocean

Bridging the gap from ocean models to population dynamics of large marine predators: A model of mid-trophic functional groups

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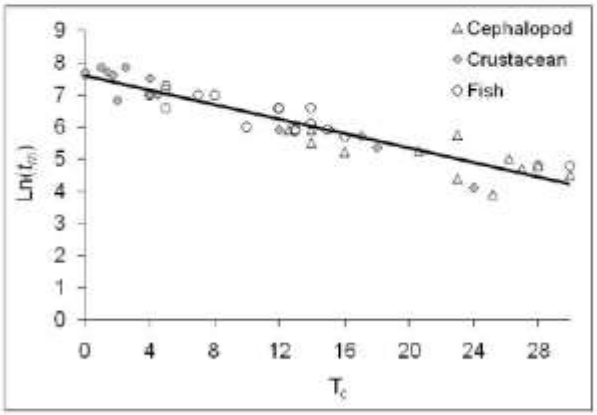
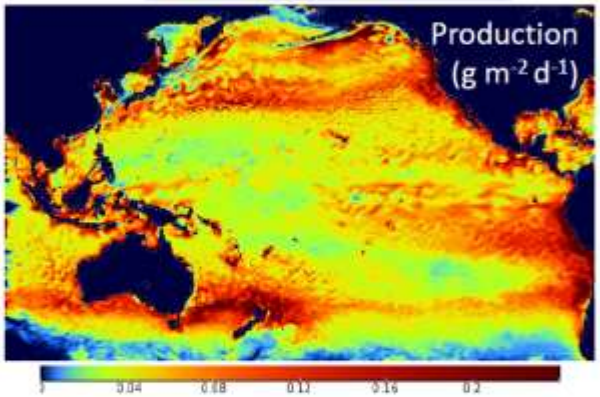


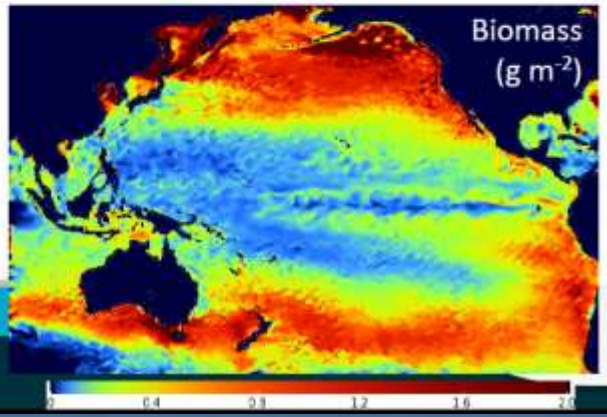
Time of development in days (Log scale) of mid-trophic (micronekton) organisms until age at maturity (t_m) in relation to their ambiant habitat temperature Tc

Ex: Component 1
Epipelagic (daytime)



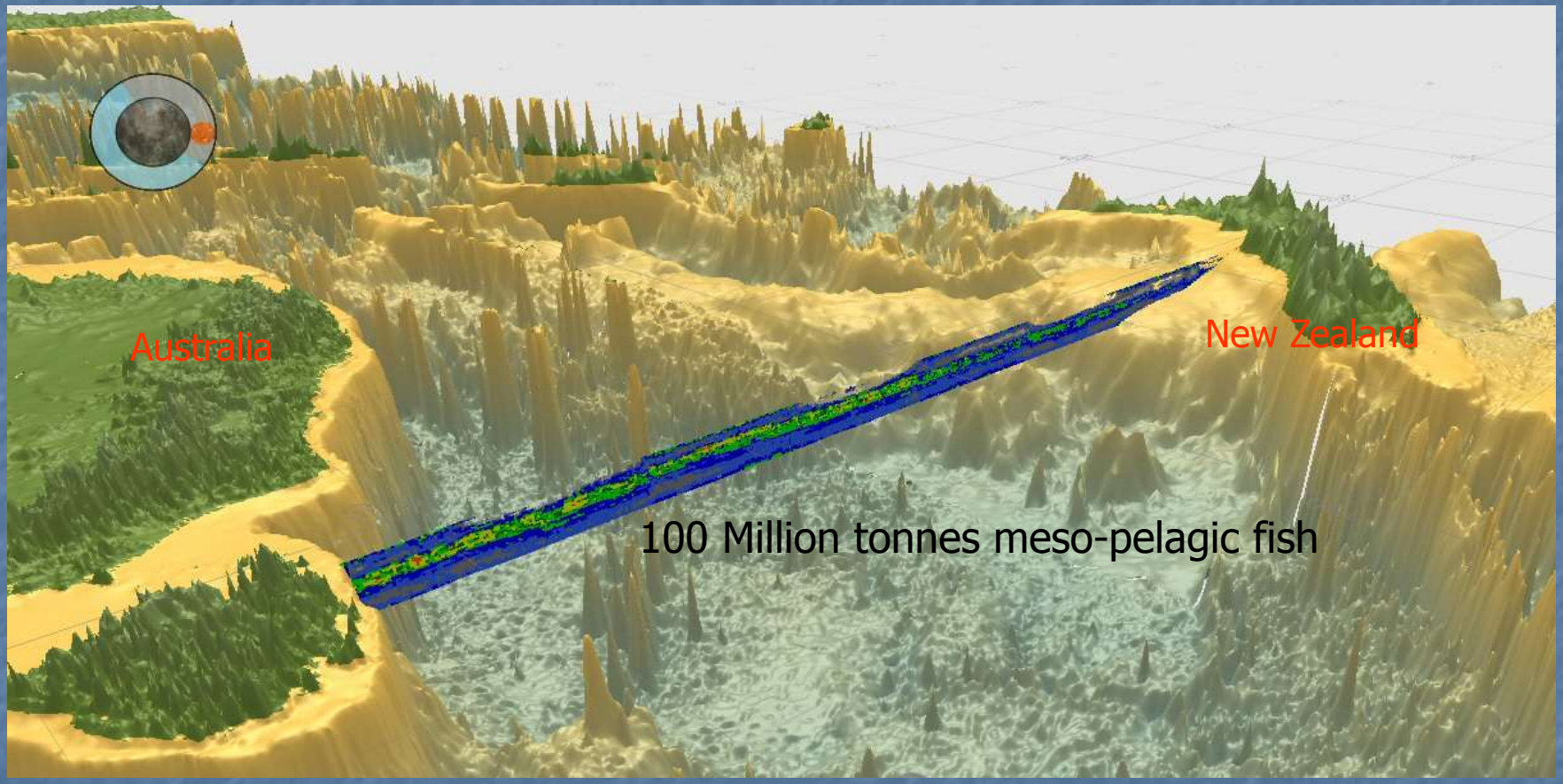
¼ deg x 6 day (2005)

Physical fields from MERCATOR (http://www.mercator-ocean.fr/)
Satellite derived Primary production



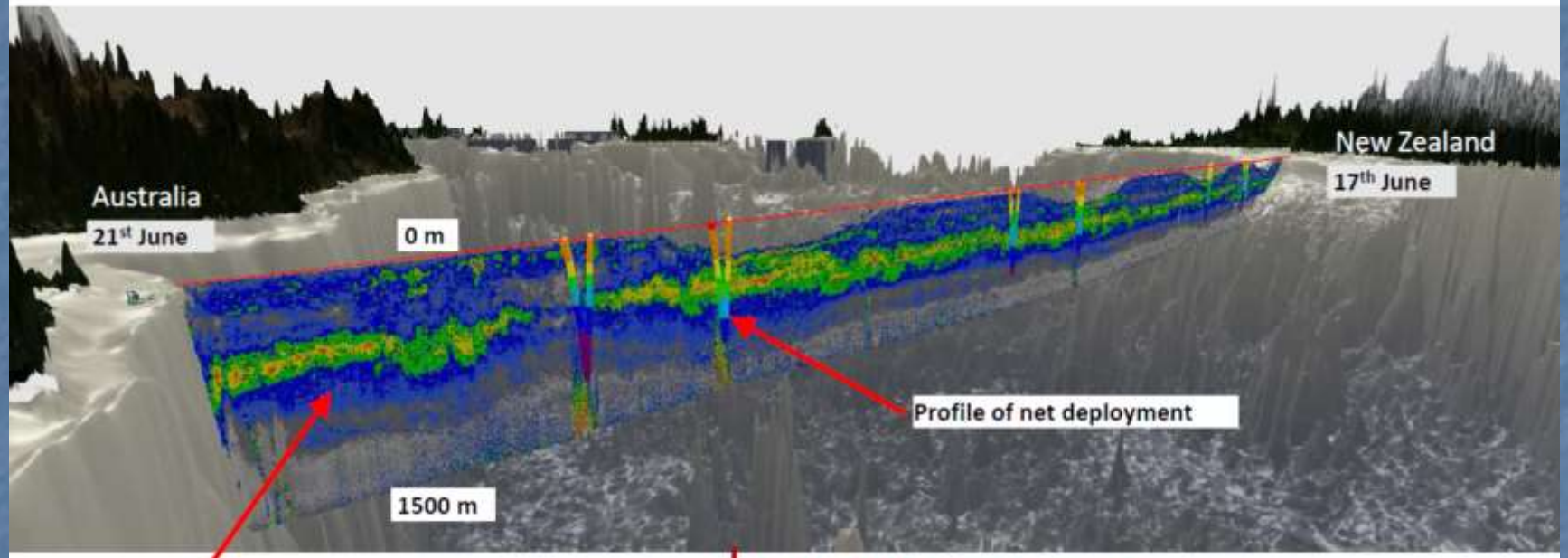
Basin scale monitoring

Australian IMOS Program Tasman Sea
-Using data collected by Sealord Group 2004-2011



Ocean basin monitoring using fishing vessels

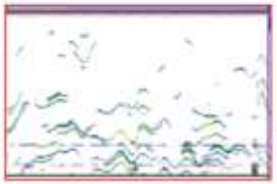
Density, biodiversity and biogeography of micronekton at the scale of an ocean basin with nets, acoustics and optics



Integrated Marine Observing System 38 kHz vessel of opportunity acoustic data

Validation experiments

- Midwater nets with attached acoustic-optical system



AOS DSLR

Mesopelagics

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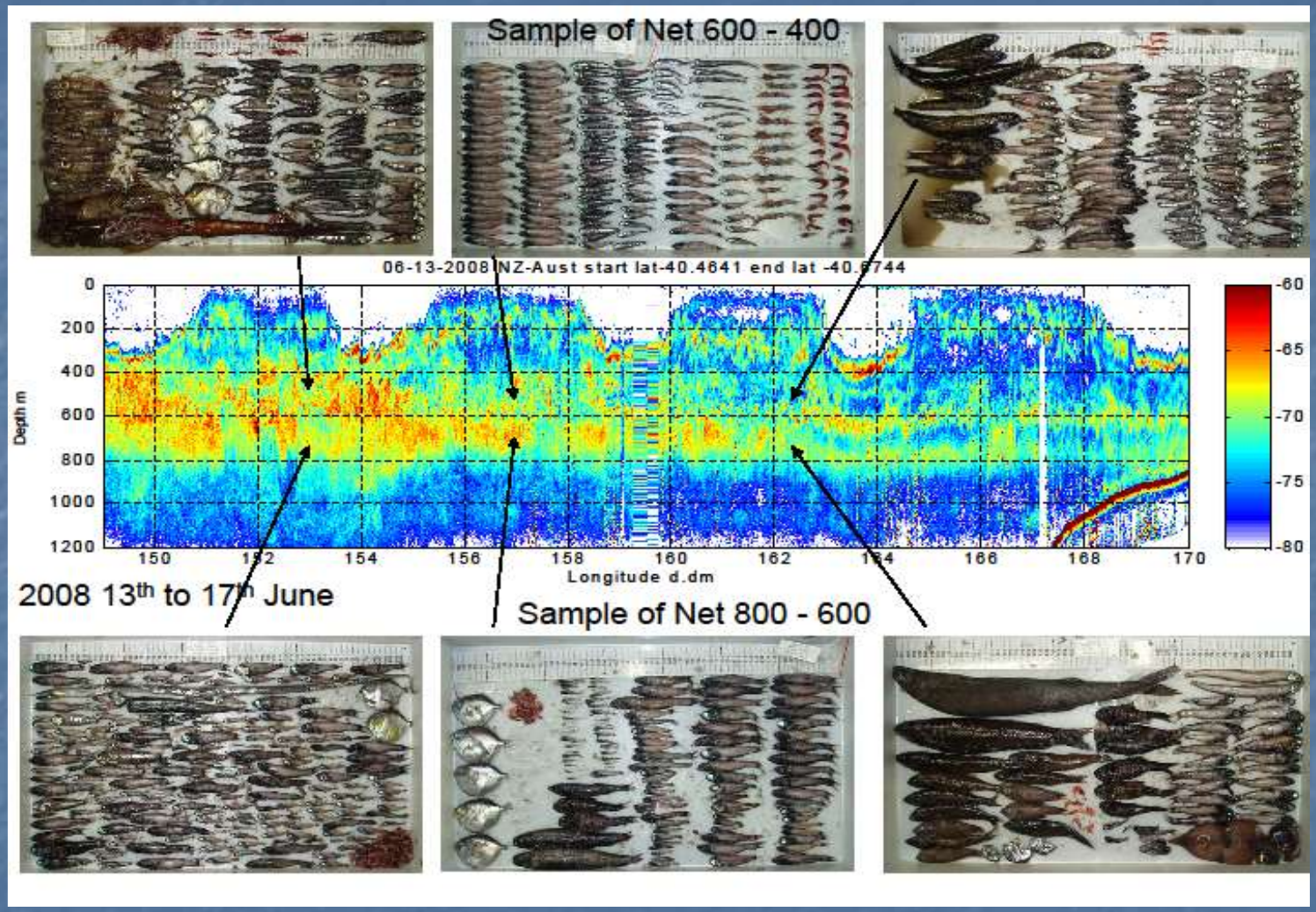
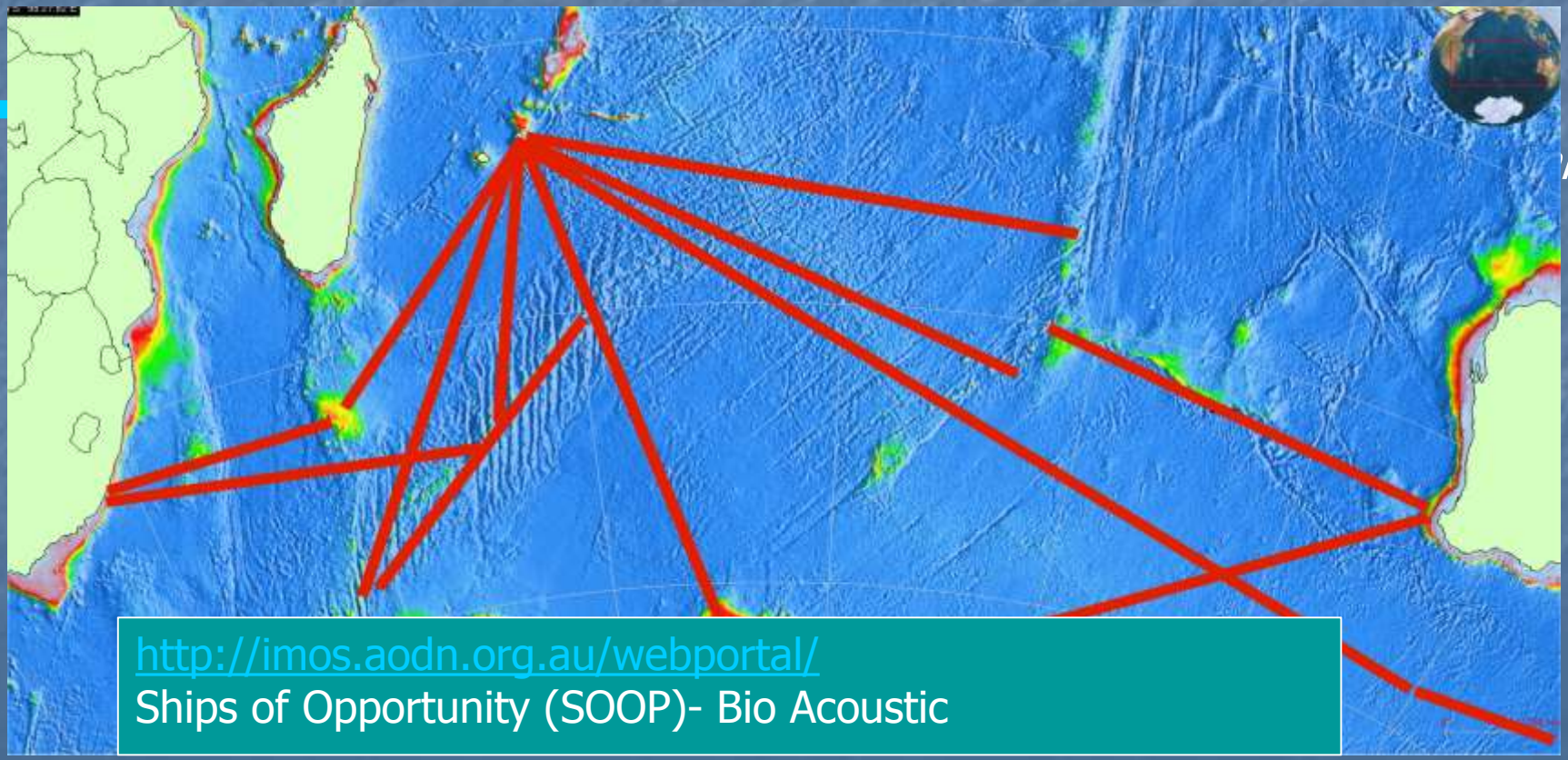


These are the mesopelagics that move diurnally up towards the surface

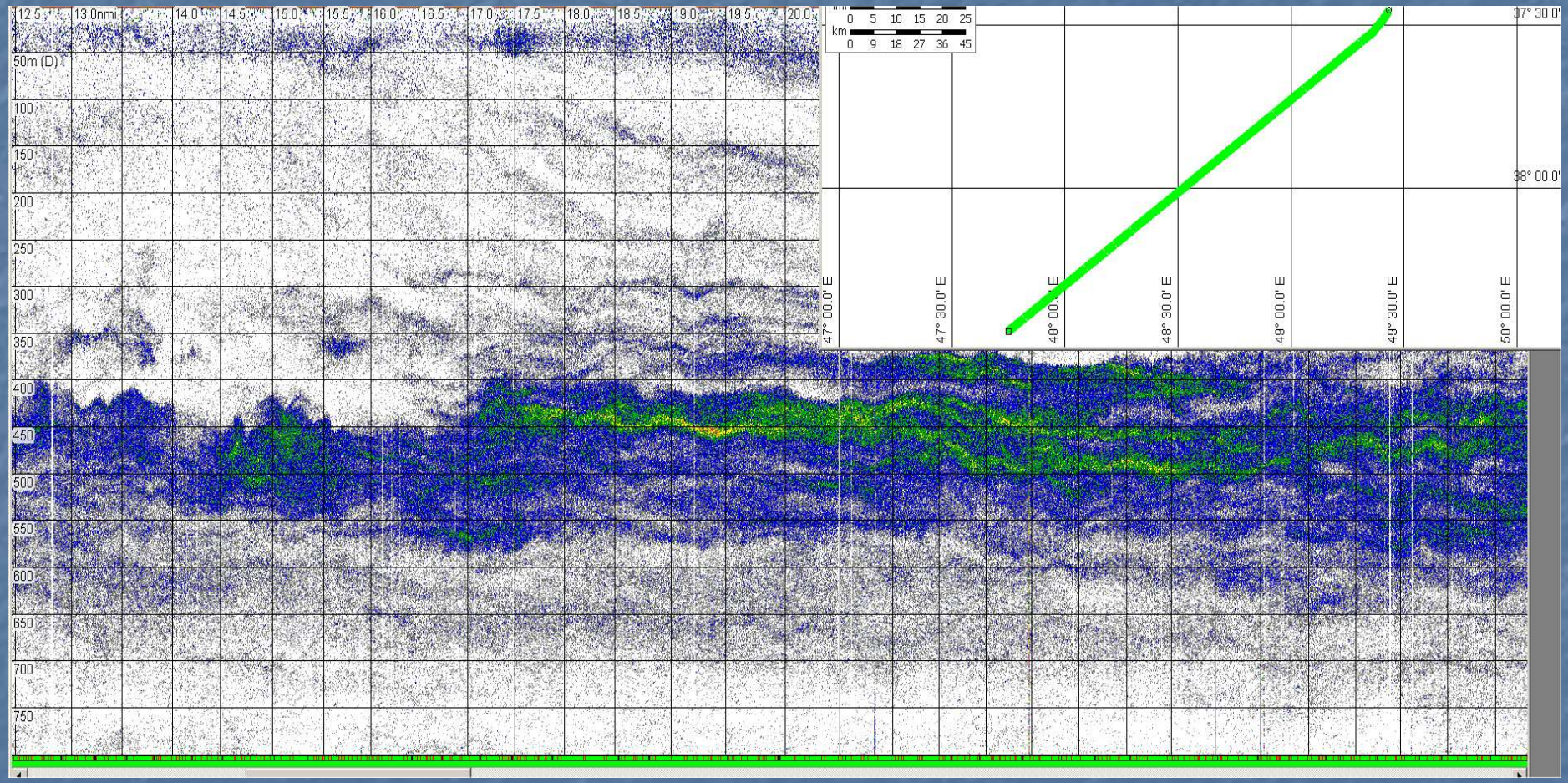
Commercial vessels are now providing the data to develop mesopelagic estimates for the entire Indian Ocean south of Mauritius

- *Commercial fishing vessels with calibrated acoustic equipment provide a time series of data that research vessels cannot deliver.*
- *Including regular transects across the Agulhas and Somali Current system for the Large Marine Ecosystem Project*

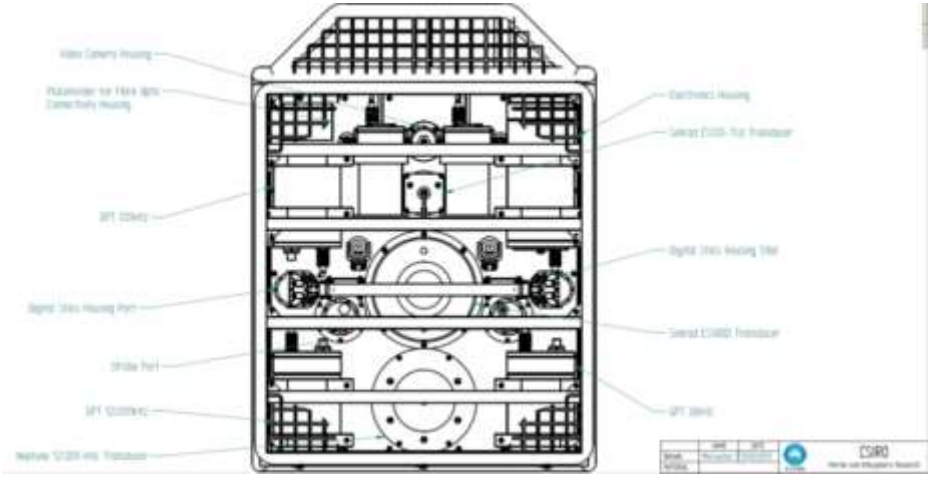


http://imos.aodn.org.au/webportal/
Ships of Opportunity (SOOP)- Bio Acoustic

These are the mesopelagics that feed the tuna and pelagic stocks such as Jurel



The multi-frequency Acoustic Optical System- the next step in providing quantitative high seas data



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However, the gelatinous component of the ecosystem is not detected by acoustics