BATHYMETRIC REQUIREMENT FOR FISHERIES RESEARCH

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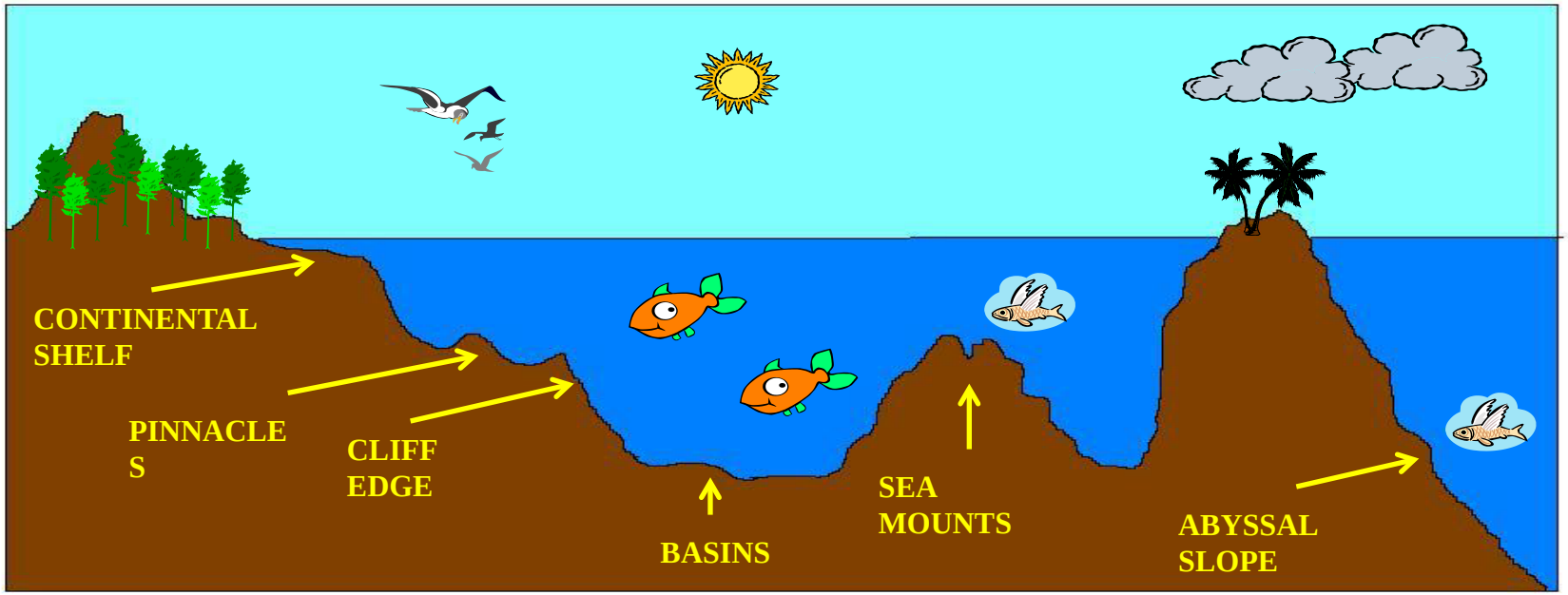
Scientific management of fisheries must depend on a fundamental understandings of fish biology and ecology

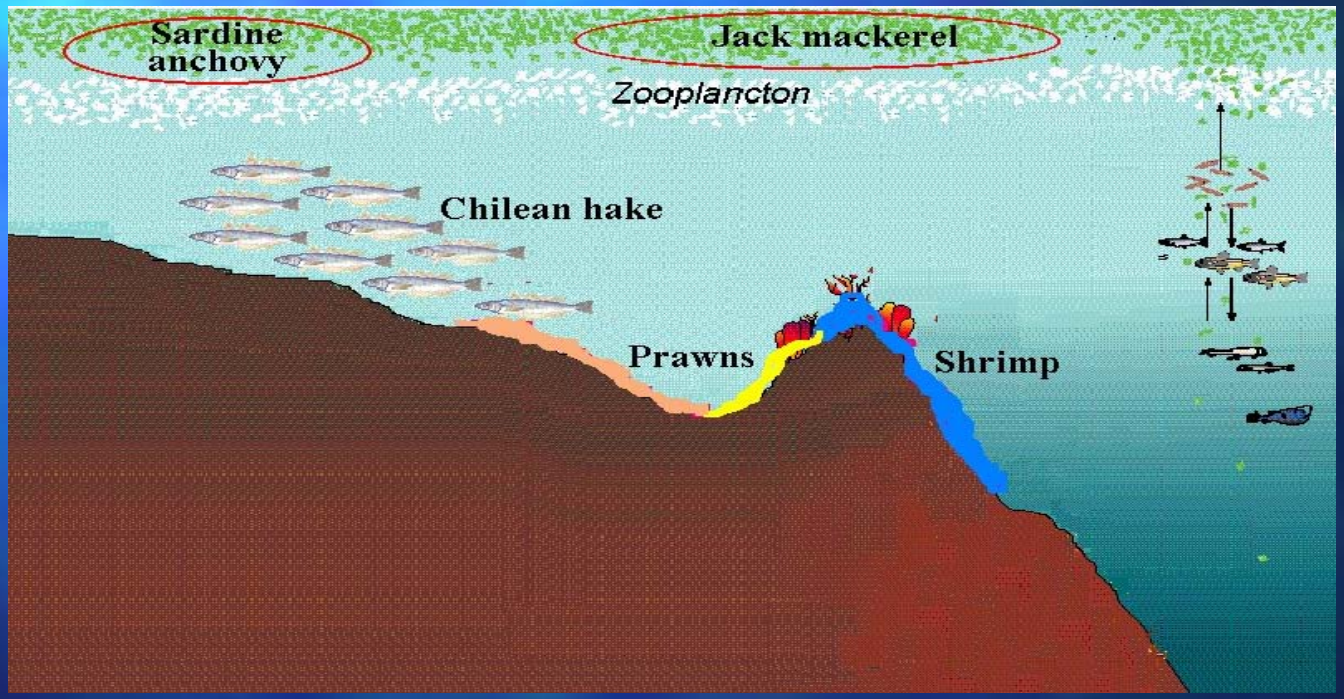
What sort of animal fish are, where and how they live.



Bathymetric profile sketch

Why are they there?

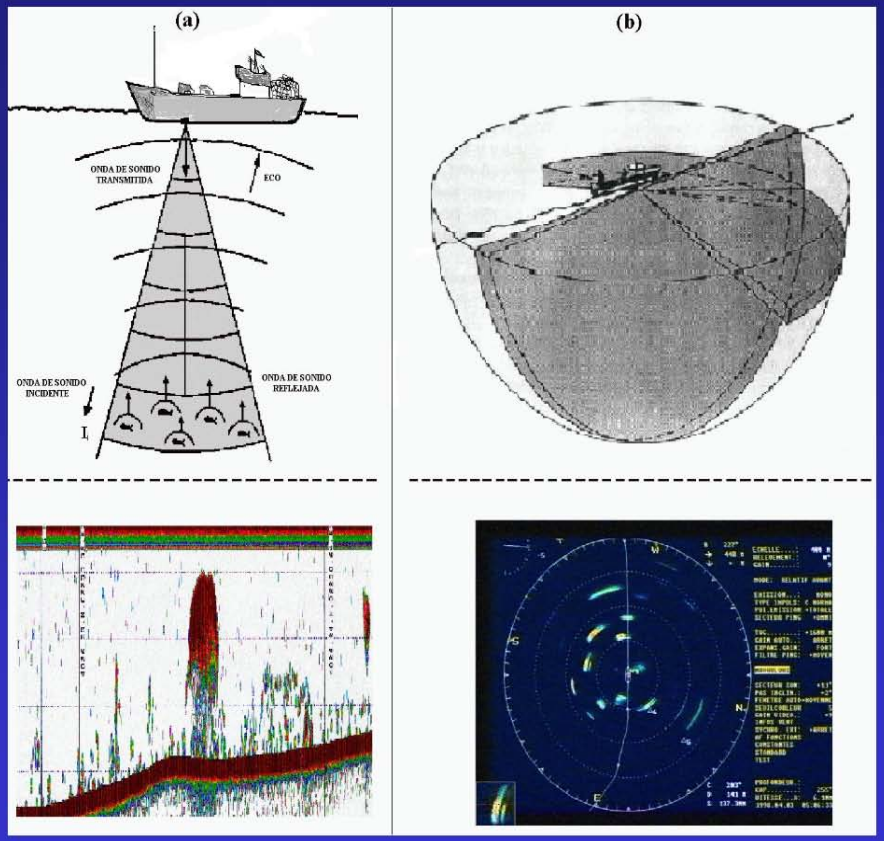
They aggregate: FOOD
SPAWNING
AVOID TO BE EATEN



Knowledge of the fish habitat is essential for the future management of the resources.

SEABED DETECTION EQUIPMENT AND TECHNOLOGY

- ECHOSOUNDER
- SONAR
- TRAWL NET SONDE AND GEAR SENSORS
- AUTOMATIC SEABED MAPPING



Echosounder **Sonar**

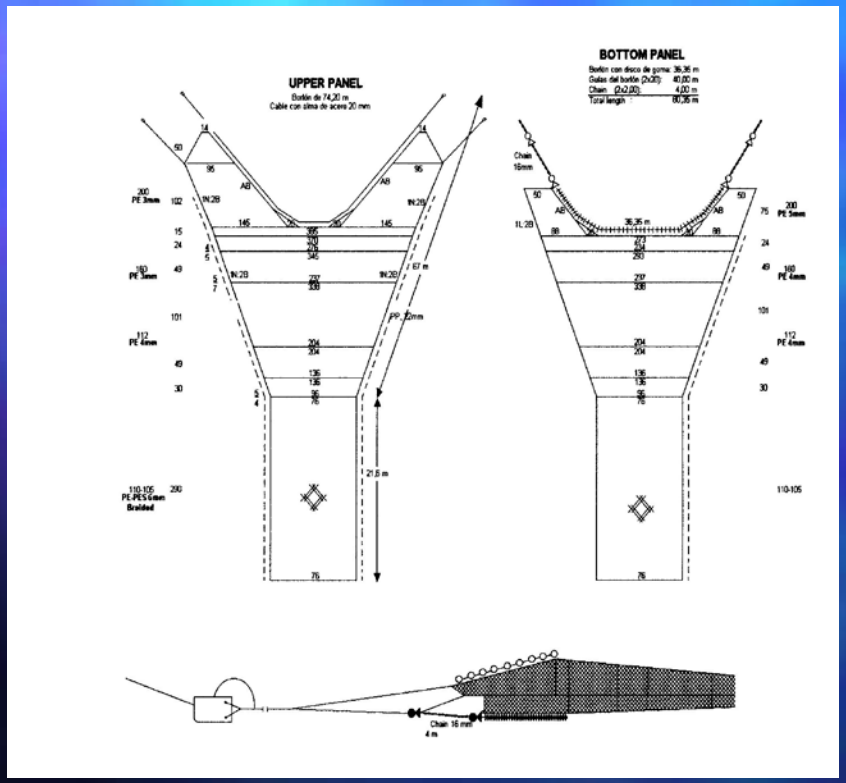
School size.

School depth.

Speed.

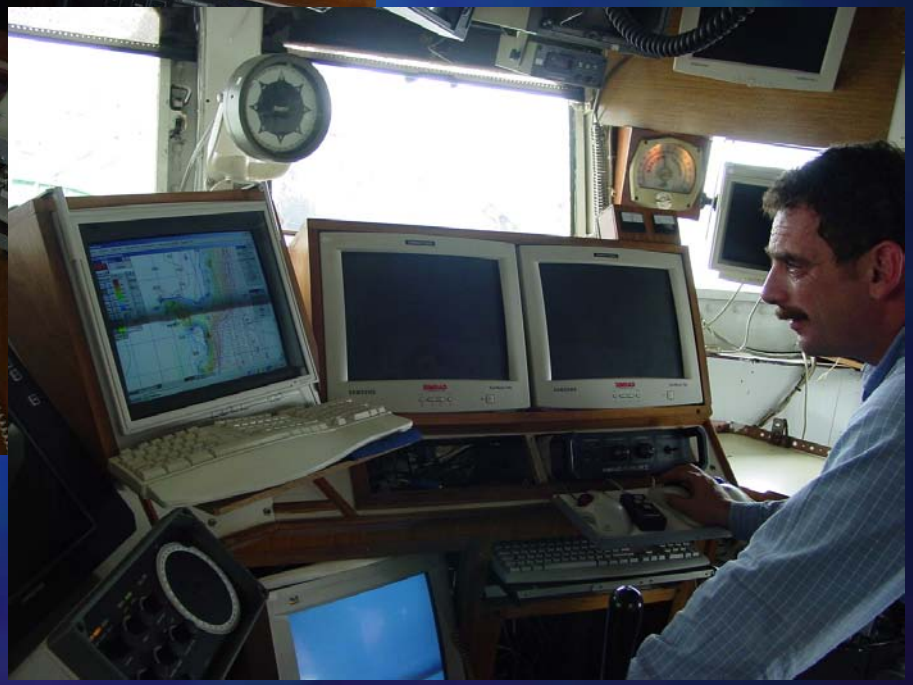
Swimming direction

Trawler net

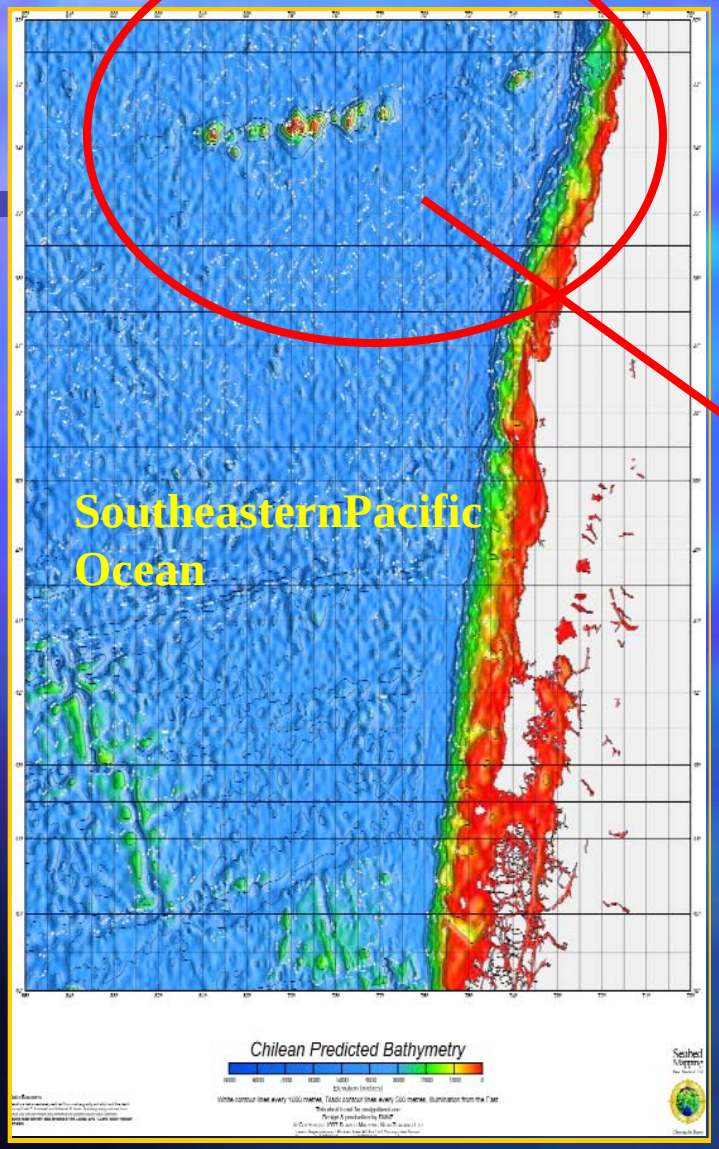


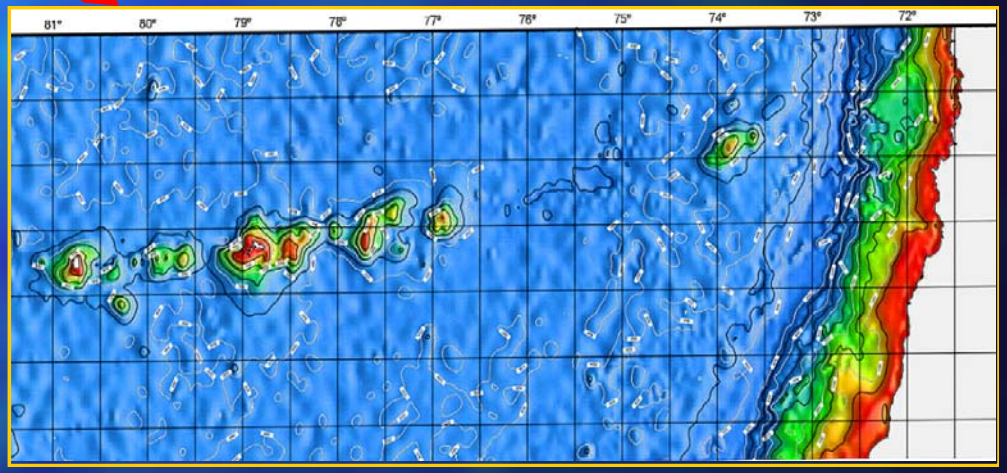
Trawler


3701
SIMRAD
SAMSUNG
SIMRAD



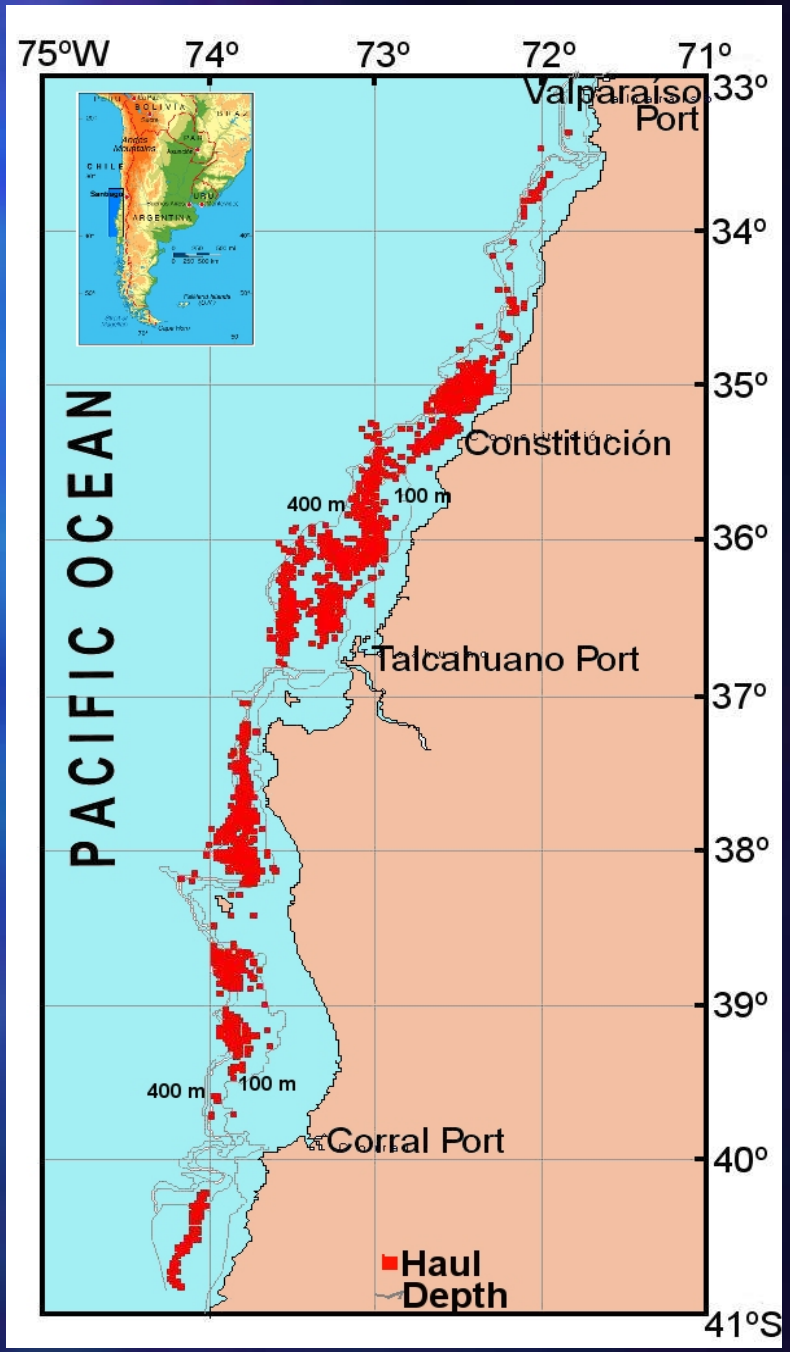
Juan Fernandez´s Island

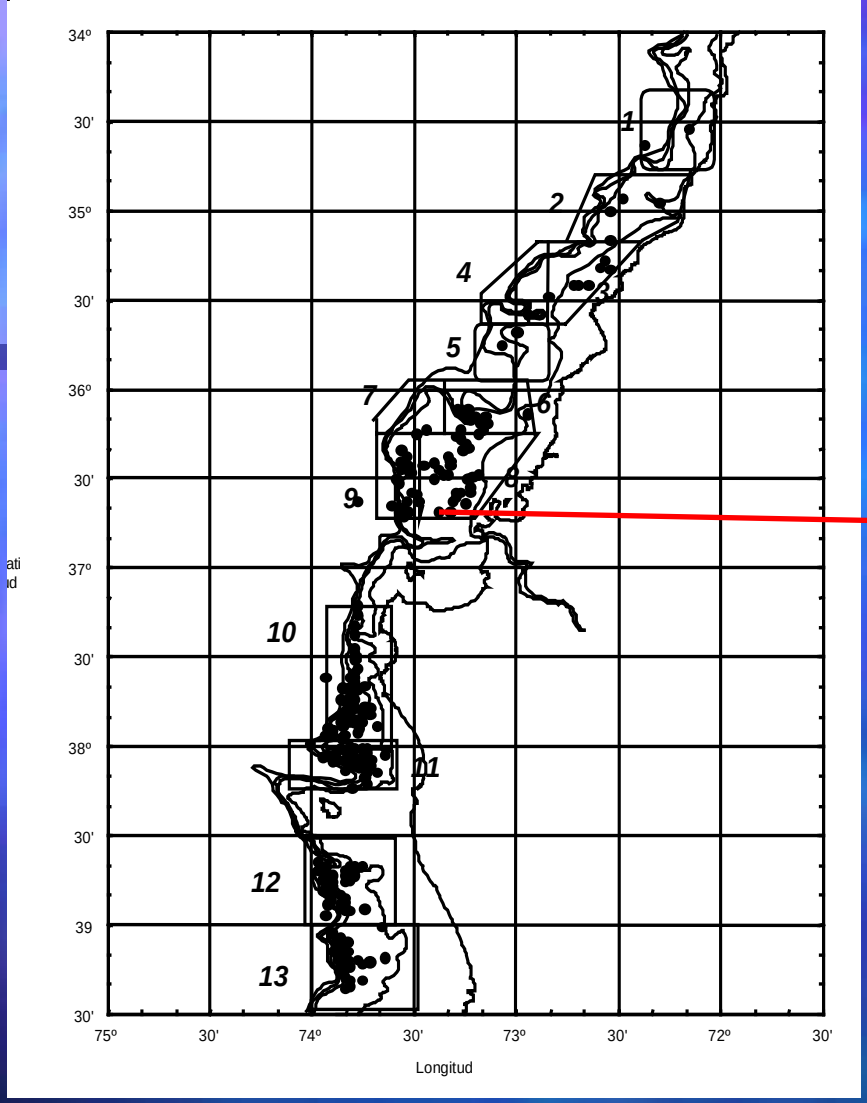


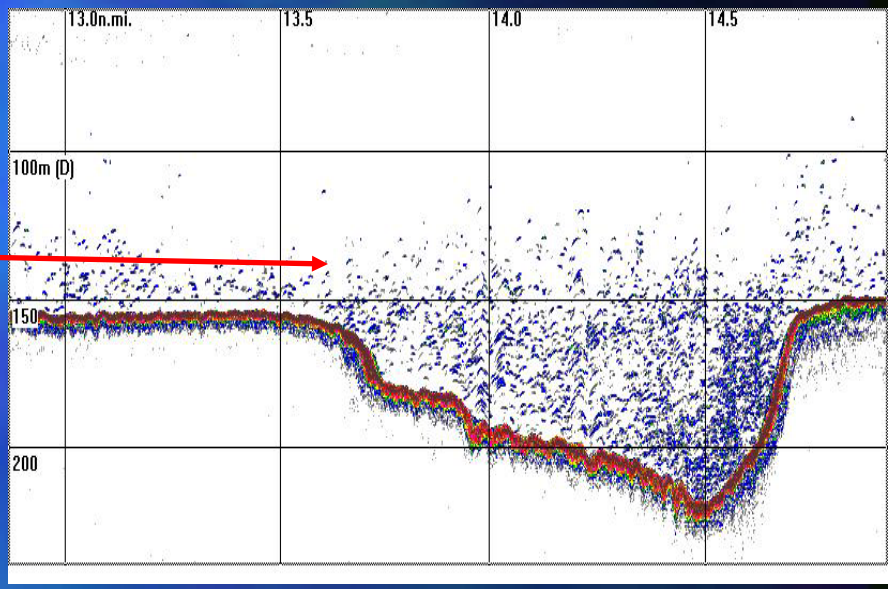


Chilean hake

Merluccius gayi







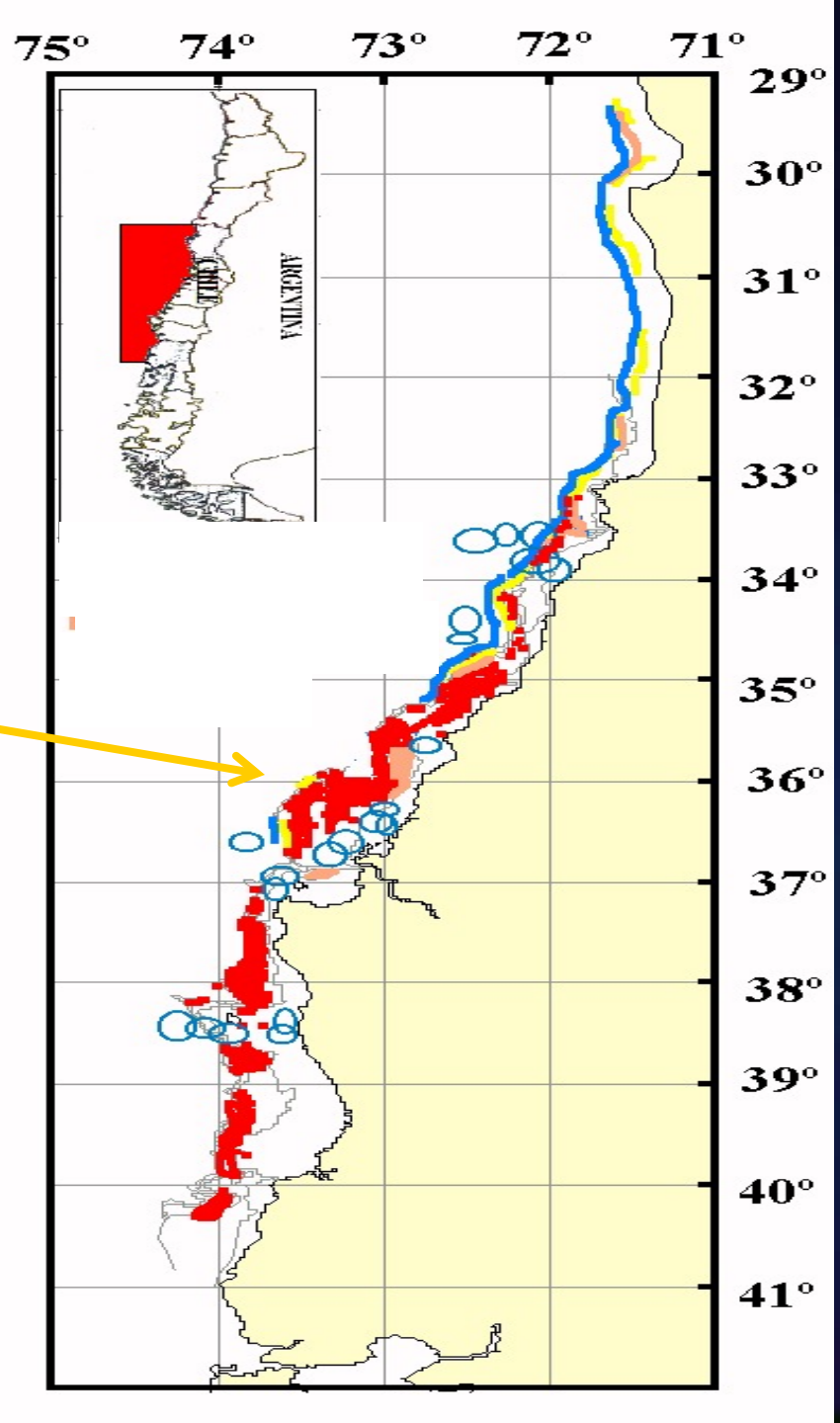
Map of distribution of commercial hauls of Chilean hake during 1997 and location of 13 fishing grounds associated to the main focuses of abundance. Echogram showing hake near to the seabed on the continental shelf.

Chilean Hake

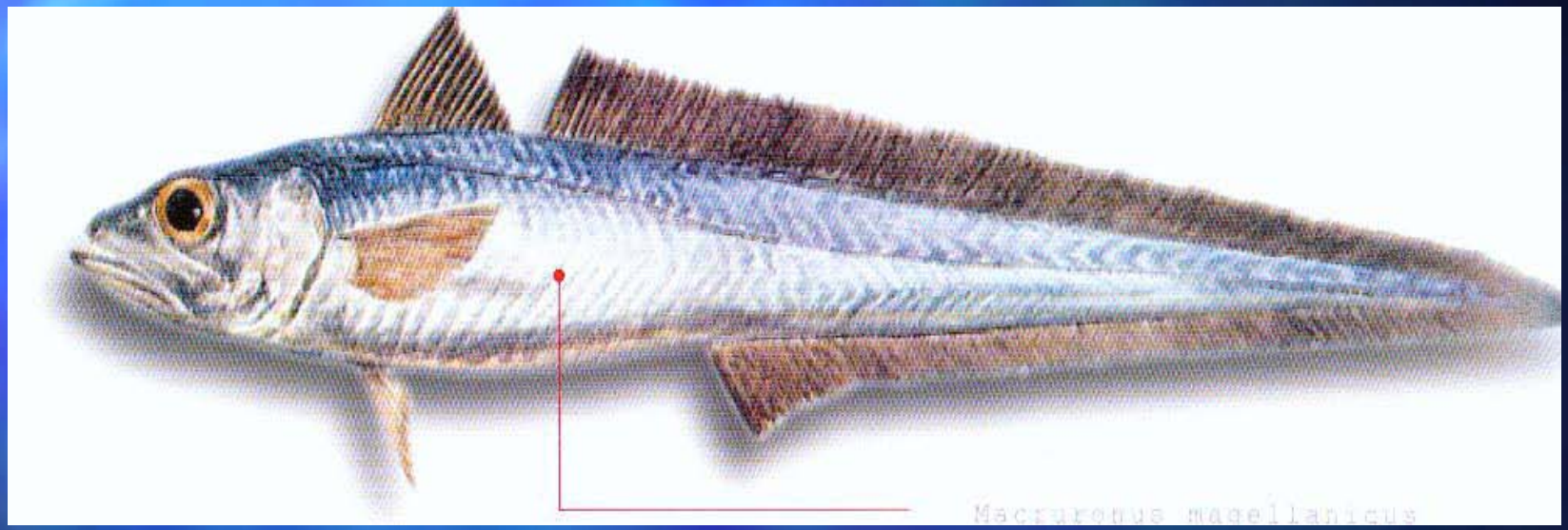
Shrimp

Orange Prawn

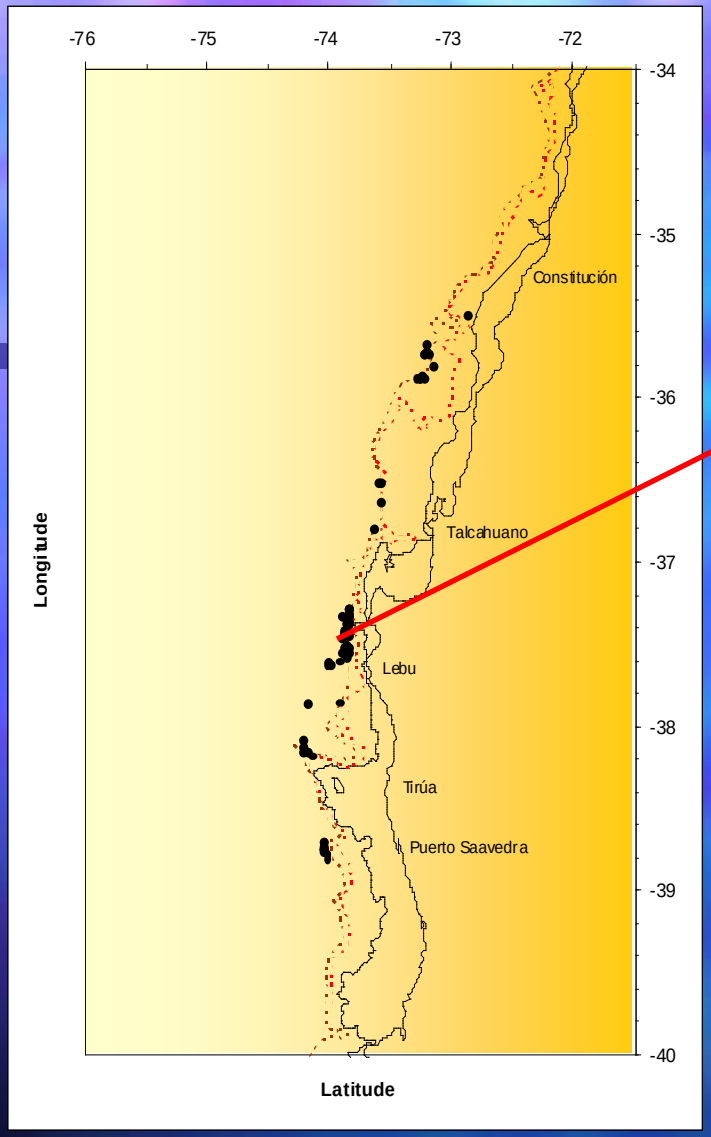
Yellow Prawn

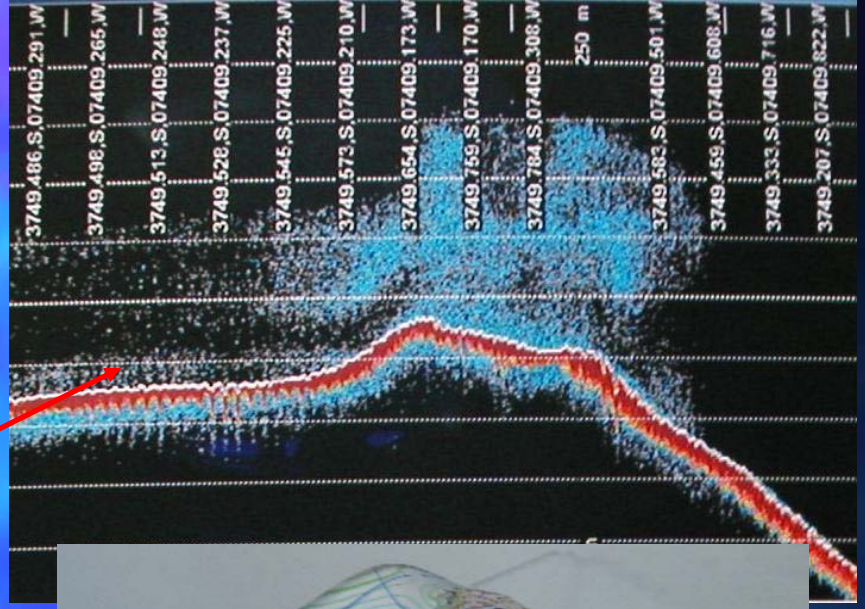


Haketail - Hoki



Macroronus magellanicus

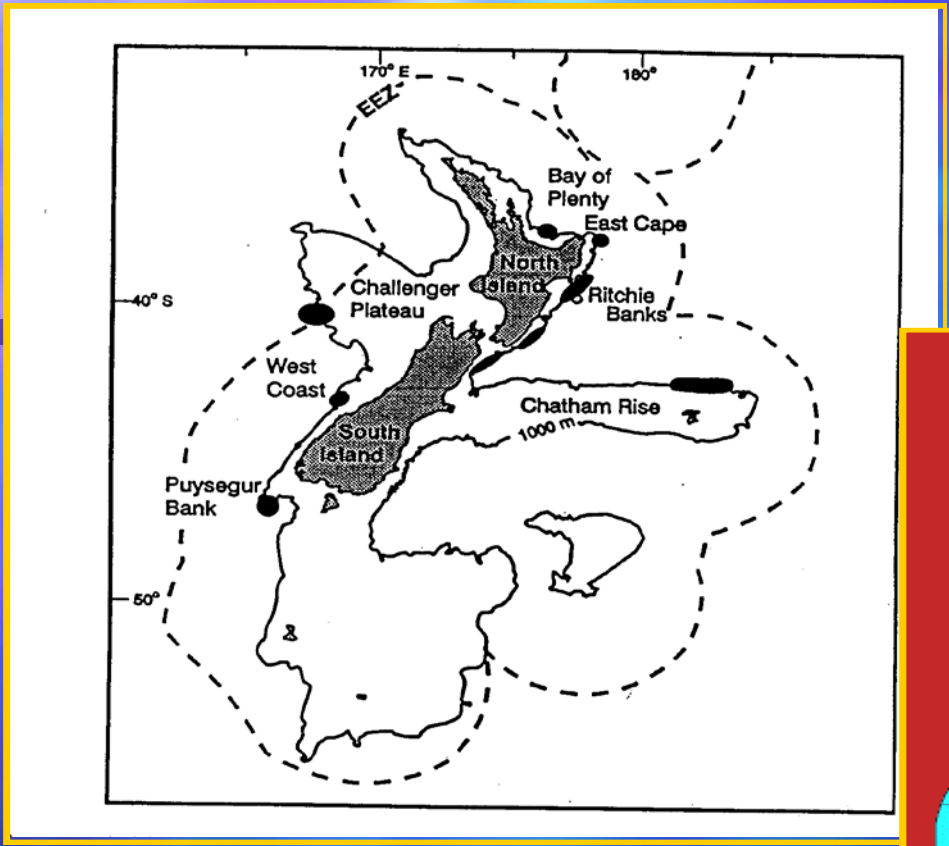


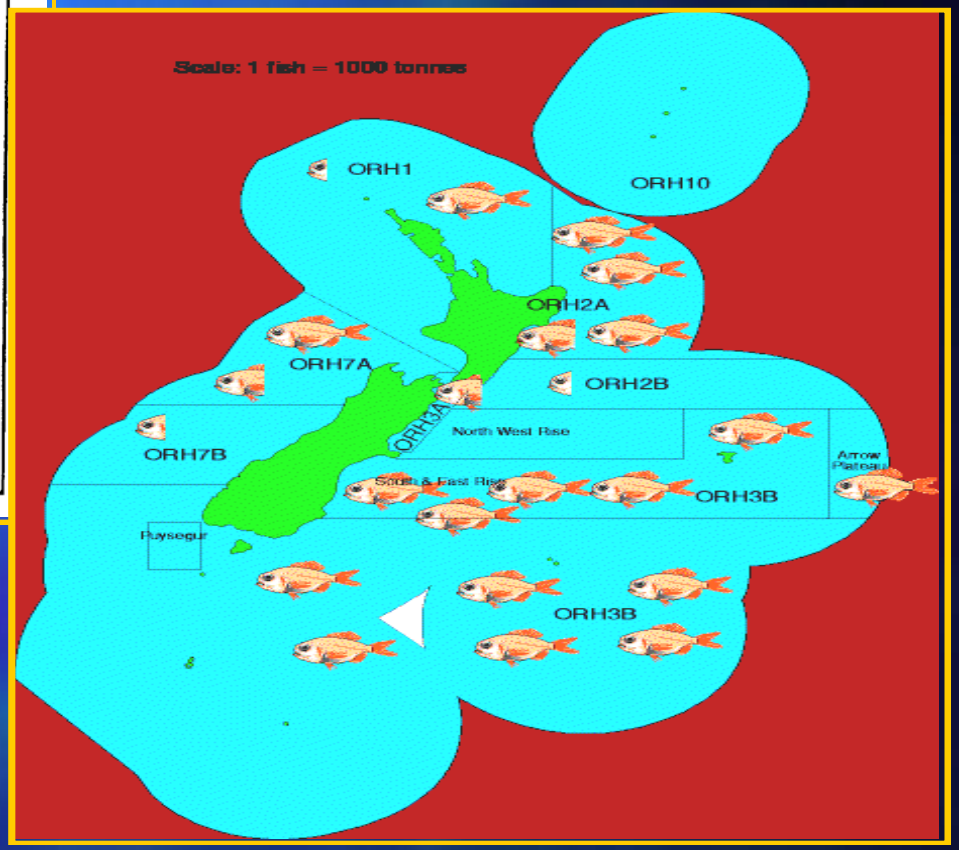


Location of trawls of haketail *M. magellanicus* realized by the demersal fleet of Central Chile (2002). Echogram showing haketail near to the border of the continental shelf (Hassler Bank) and 3D view of the bank plotted by own data of skippers (red crosses).

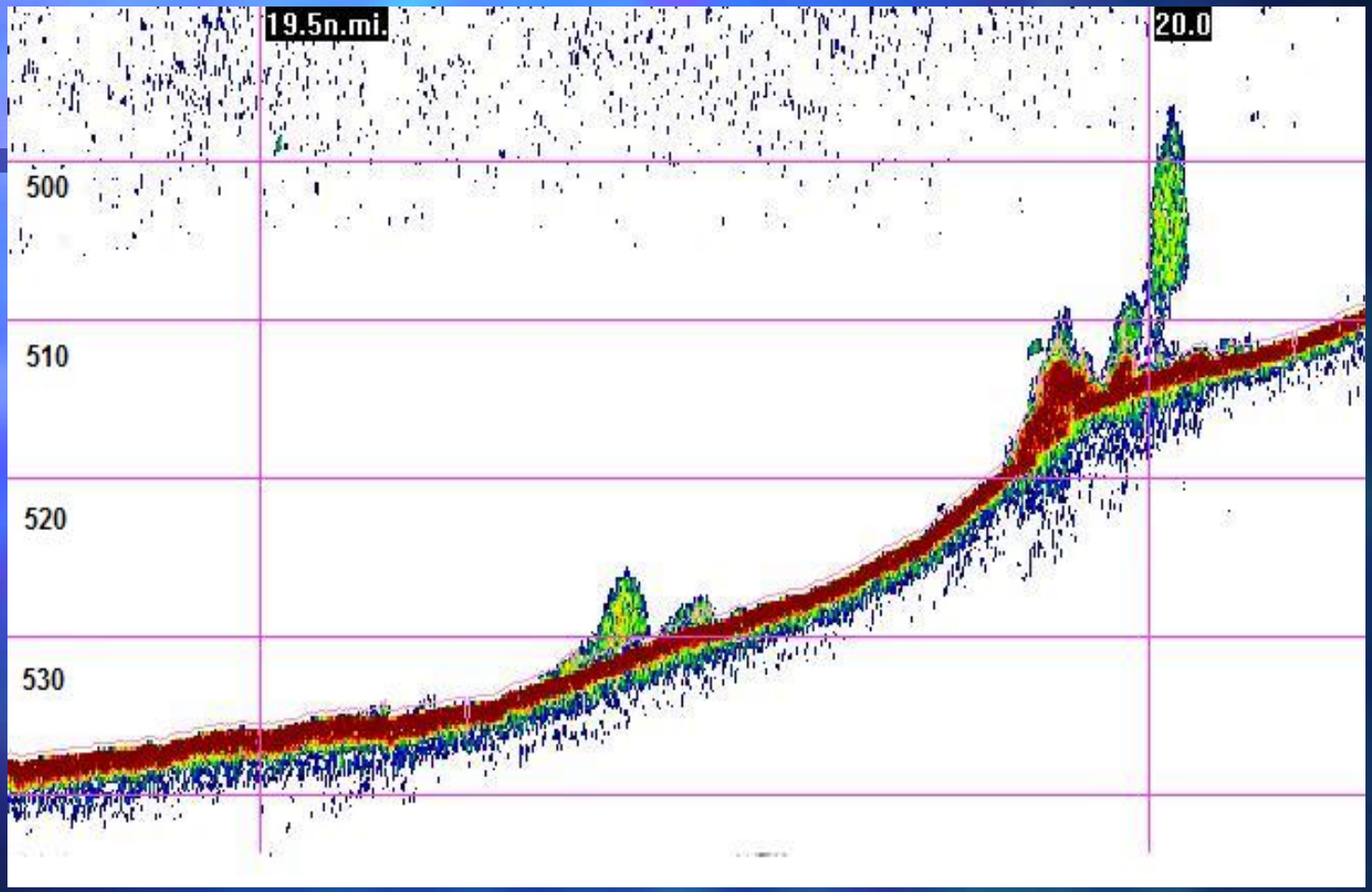
Orange roughy

Hoplostethus atlanticus





Schematic location of Orange roughy (*Hoplostethus atlanticus*) off New Zealand (Chatham Rise)



Echogram showing schools of Orange roughy near to pinnacles off Chile (Juan Fernandez Island).

Alfonsino

Beryx splendens

Cardinal fish (Besugo)

Epigonus crassicaudus

FISH STOCK ASSESSMENT IMPORTANCE

1883 Cause of fluctuations "natural fluctuations vs influence of fisheries.

1908 Fishery Biologist introduced topics as: Fish Age, Fish behaviour, Fish composition, Fish tagging, eggs and larvae.

1954 Beverton initiate the structure model to estimate mortality rate given catch and effort data.

1960 Direct method to stock assessment: Hydroacoustics, Catch per unit area.

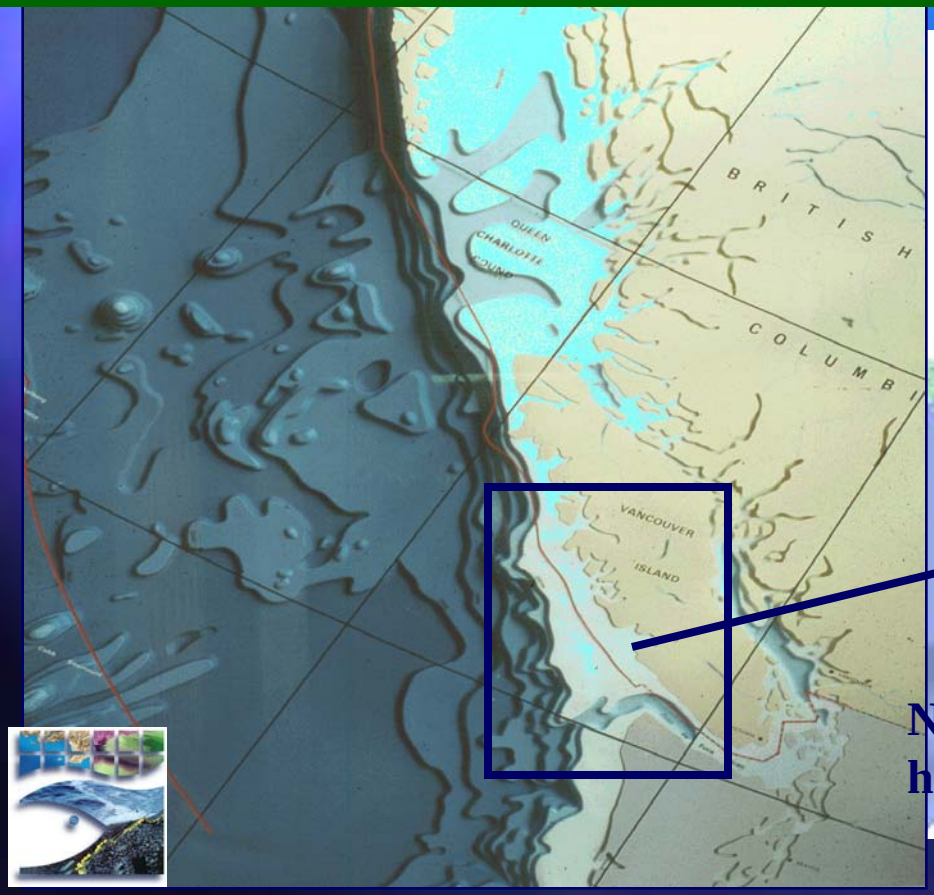
1970 Biomass quantification using the echointegration.

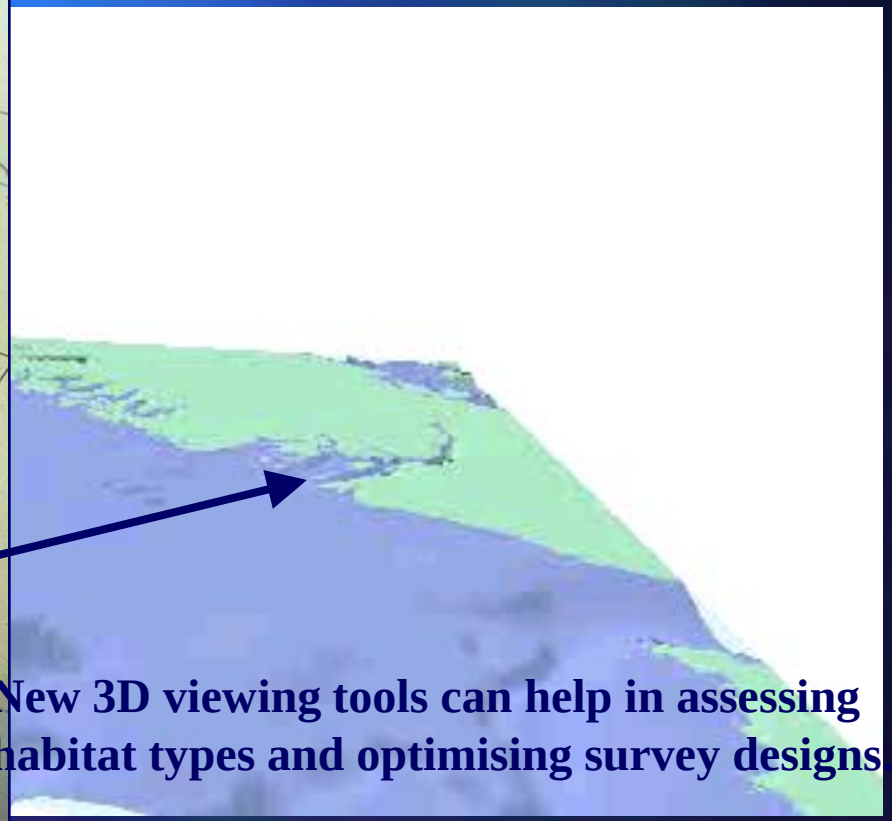
1980 New methodology for fisheries independent assessment.

2000 High degree of sophistication: dual beam, split beam.

Acoustic Studies of Demersal Fishes and Their Habitats

High relief habitats pose considerable challenge for acoustic detection of fish, particularly in regions where the acoustic scattering properties of the substrate are largely unknown and poorly understood. The much better near boundary detection depends on a greater knowledge of the 3D boundary shape as well as acoustic parameters such as target size and beam pattern.

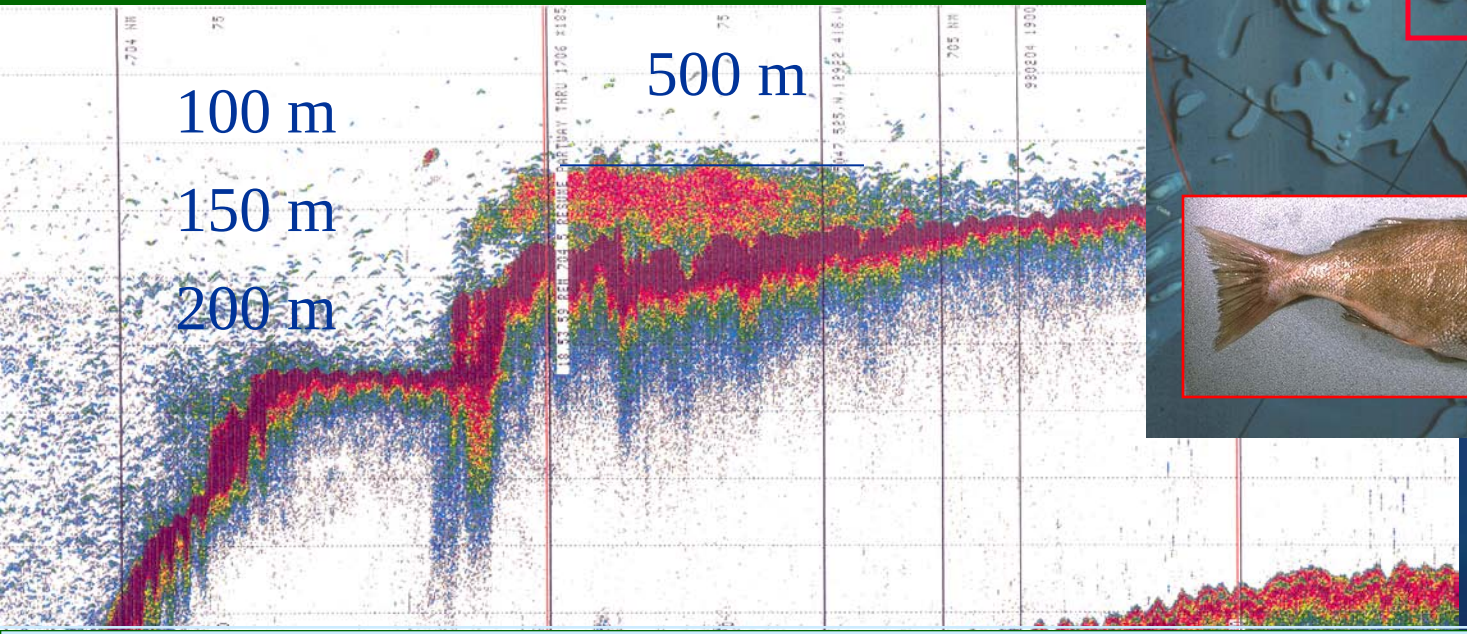




New 3D viewing tools can help in assessing habitat types and optimising survey designs

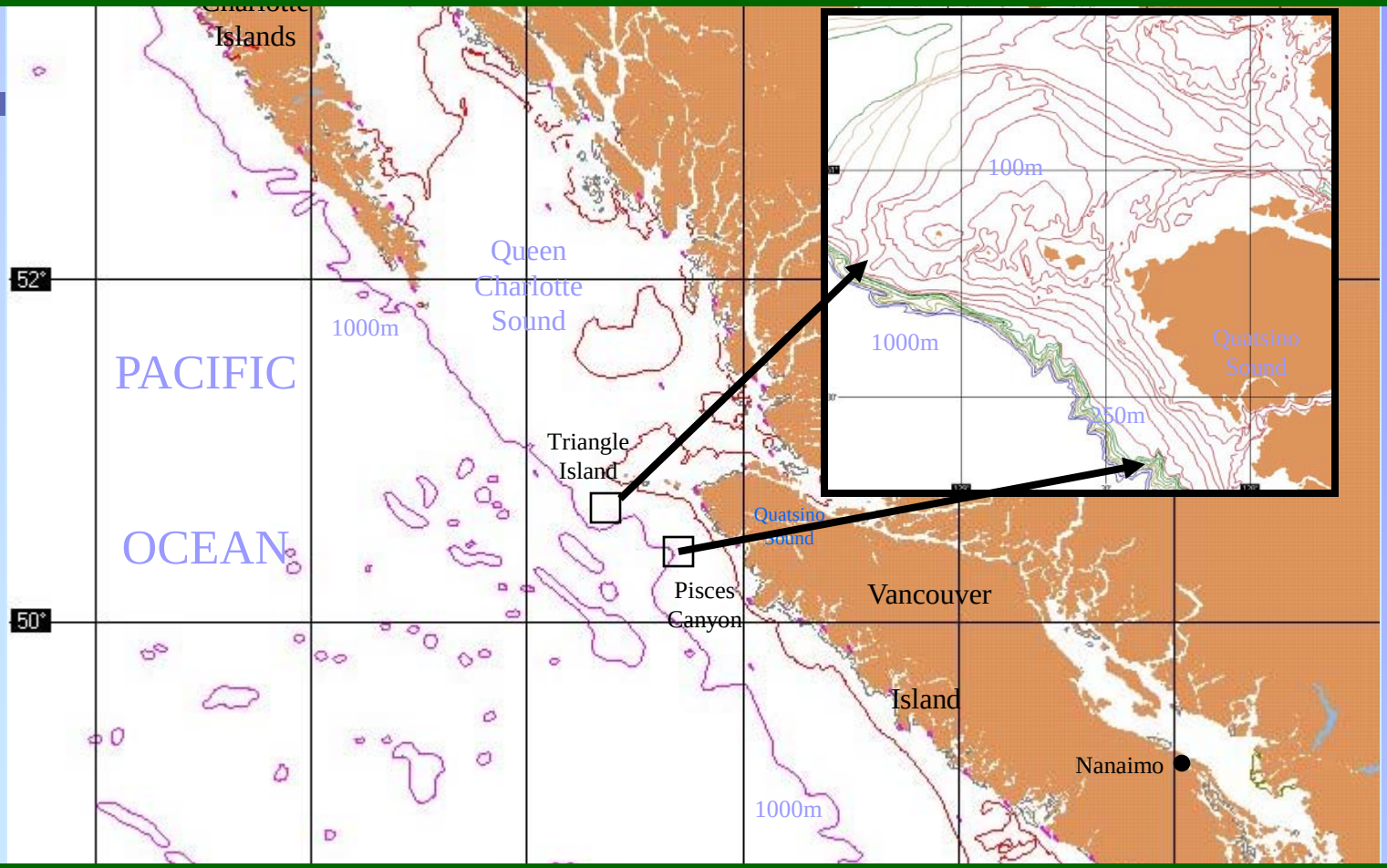
Widow rockfish (*Sebastes entomelas*)

Assessment of organisms living in association with high relief habitats can be severely limited by the nature of the habitat type and by species-specific behaviour patterns.



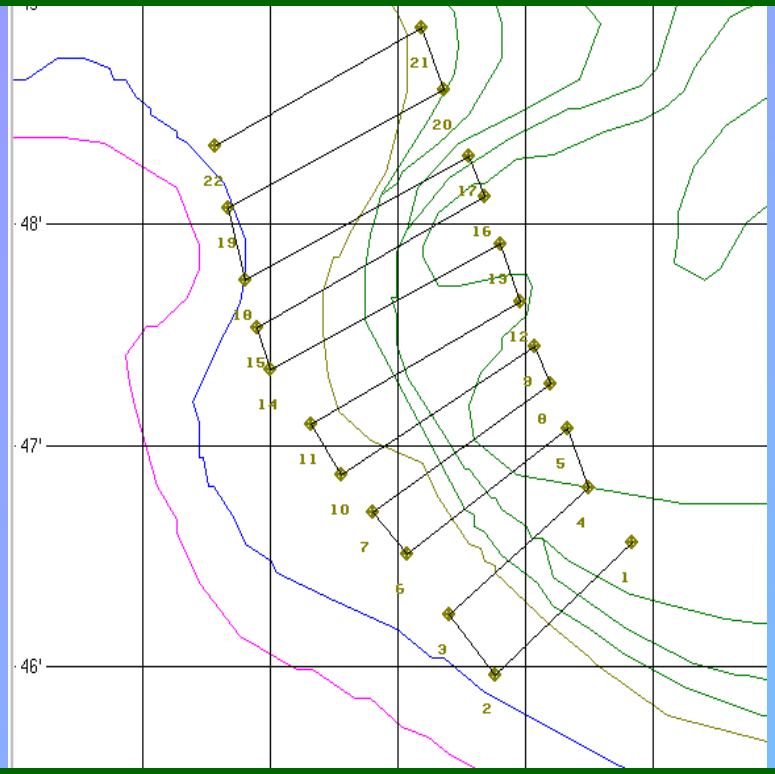
Knowledge of bathymetry is key to improving our interpretation of acoustic observations of demersal fishes found near bottom.

Researchers from Fisheries and Oceans, Canada and commercial fishers conducted a joint venture project in 1998-1999 to assess Widow rockfish populations off the westcoast of Vancouver Island, British Columbia.

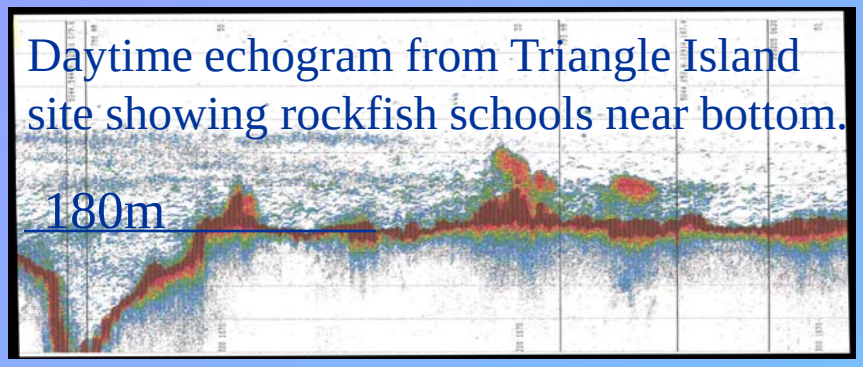


Results from two study sites show detailed knowledge of bottom features should be considered a prerequisite to studies on fish distribution and estimating abundance of demersal species in regions of high relief.

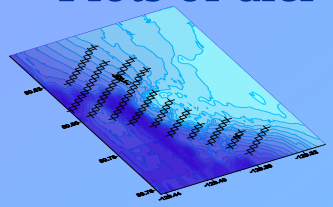
The transect grid was repeatedly surveyed to collect observations of diel changes in abundance and distribution of fish schools.

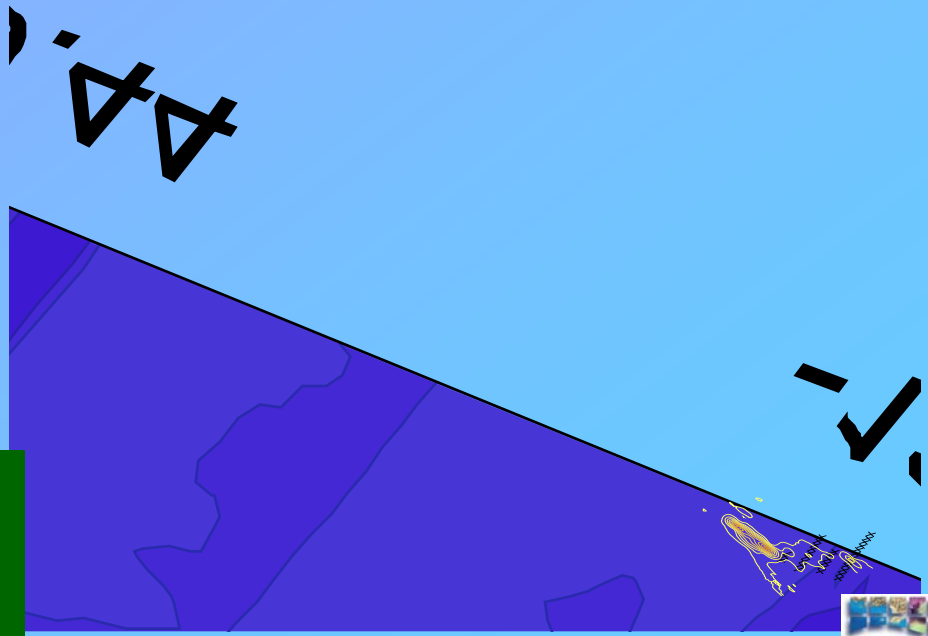


Daytime echogram from Triangle Island site showing rockfish schools near bottom.



Plots of diel changes in fish distribution.





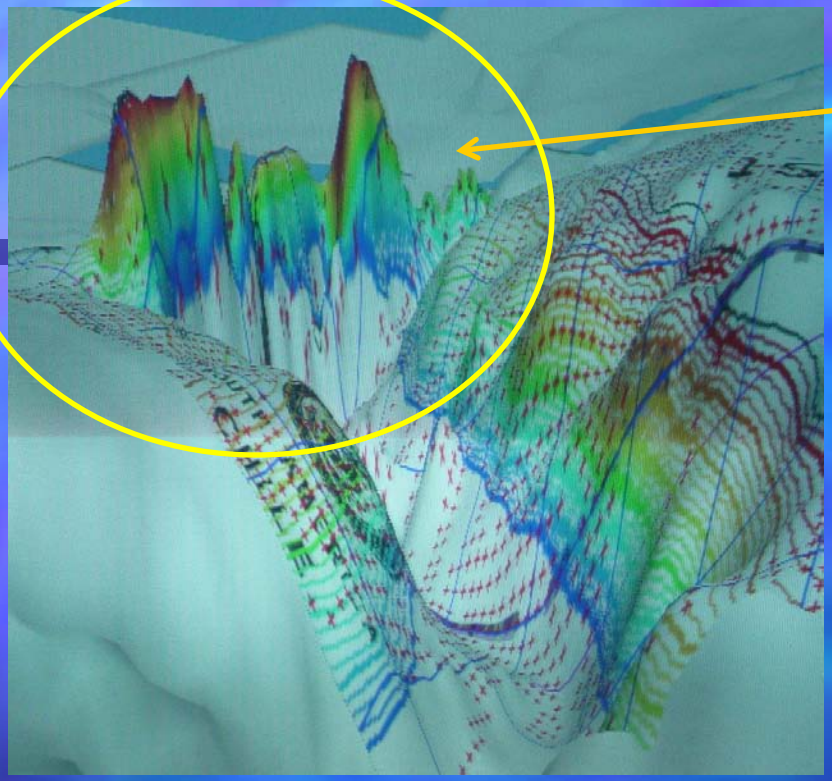
Acoustic data were also used to map the area since no detailed bathymetry data was available.

The survey grid from the Triangle Island study site was continuously sounded over two diurnal cycles.

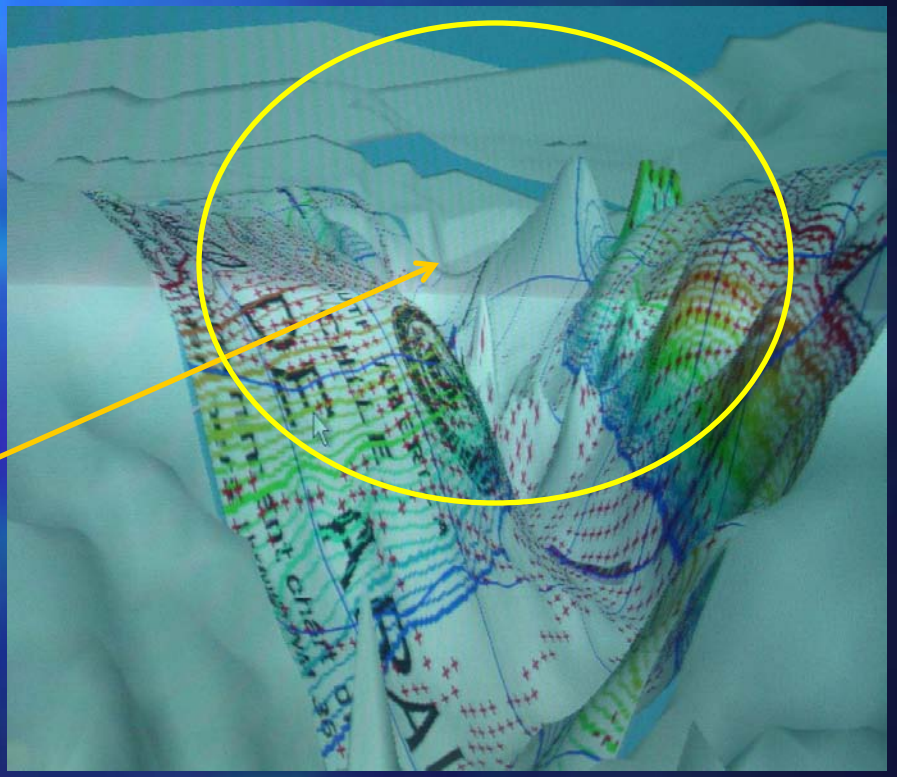
Acoustic ping data was plotted in 3D and draped over an interpolated map created from all bottom detections.

Aggregations are seen in association with the shelf edge, bottom features, and other fish schools.

WHAT YOU SEE ….IS NOT WHAT YOU GET!!

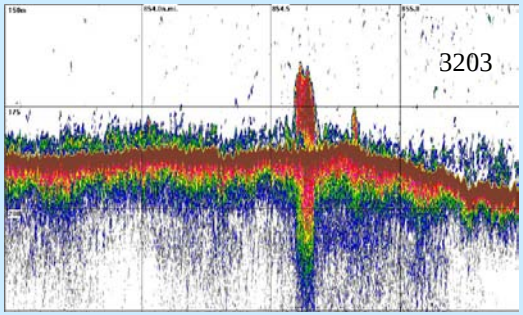


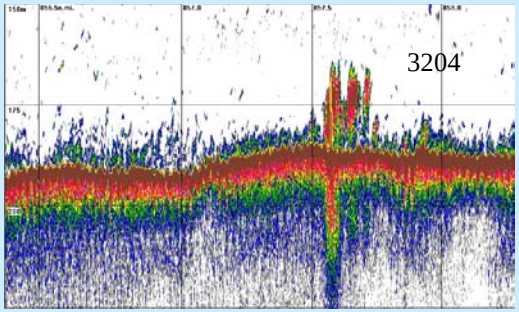
Noise?. Rolling?. What?.

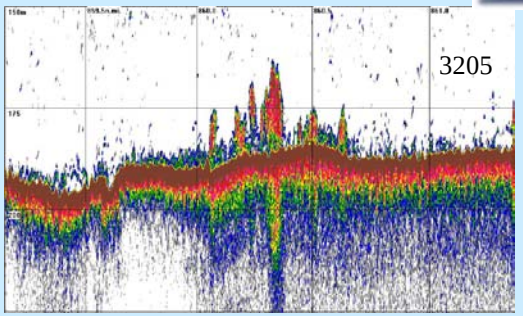


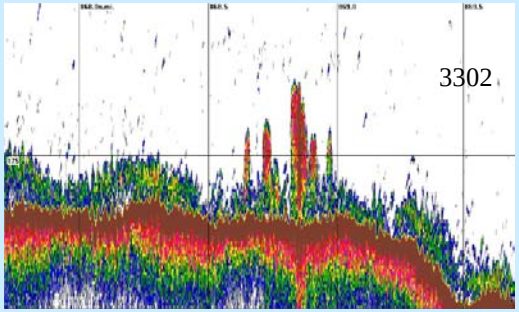
After applied MAXSEA

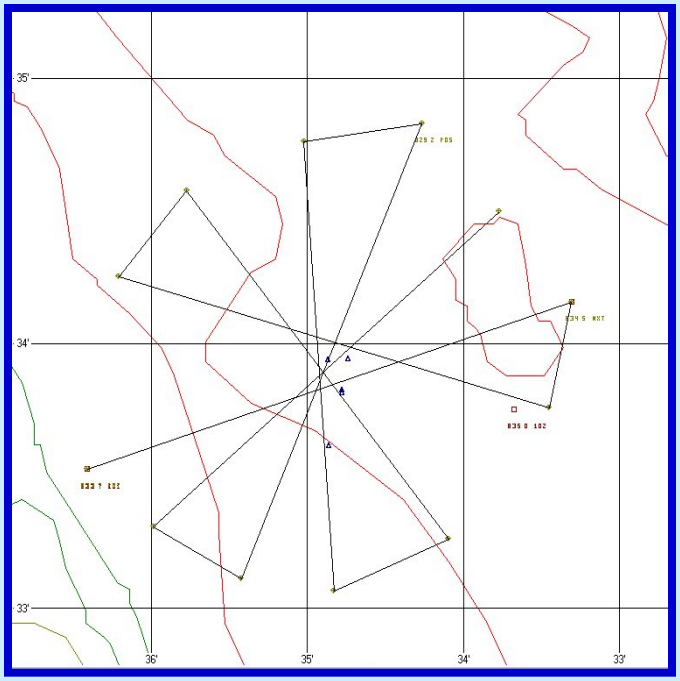
Acoustic observations from Pisces Pinnacles study site showed targets that appeared as dense rockfish schools, often separated from bottom.

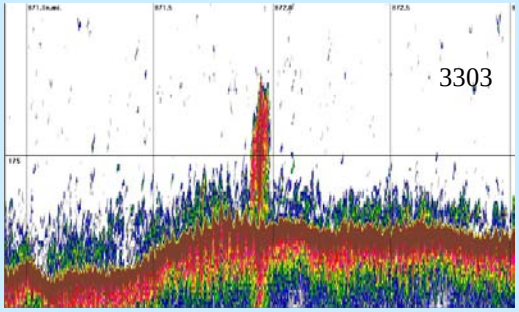


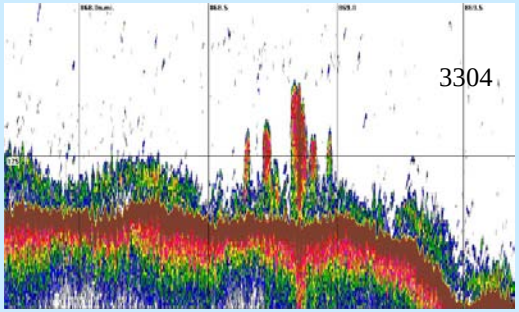


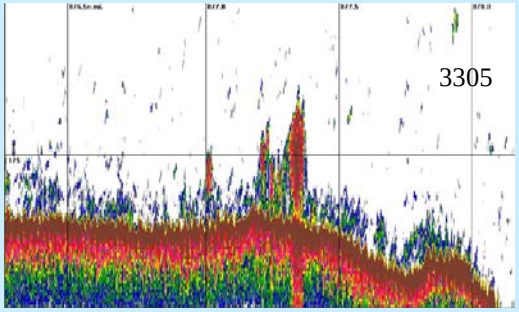








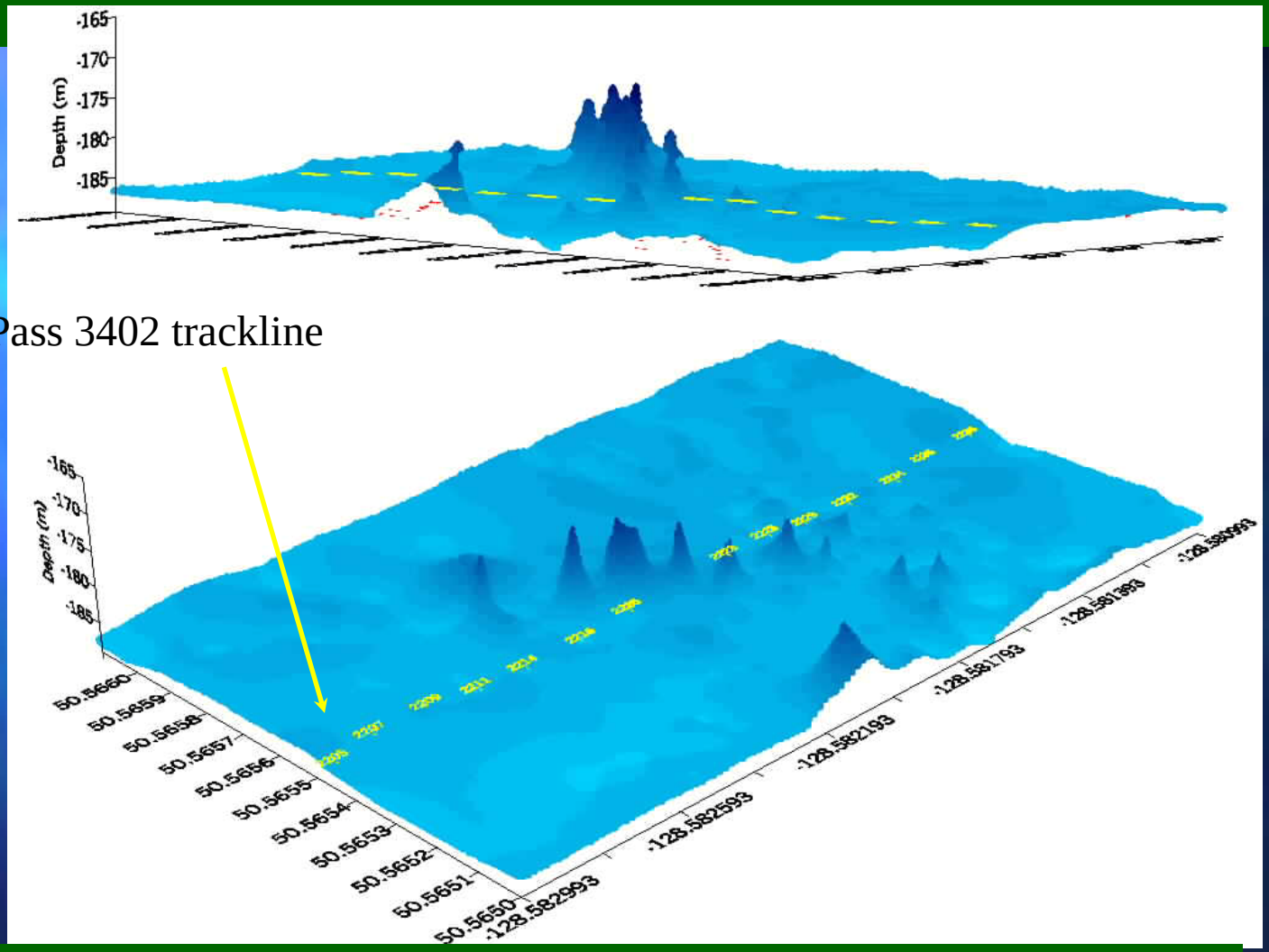




However, fishers reported lost or damaged gear when trawling.

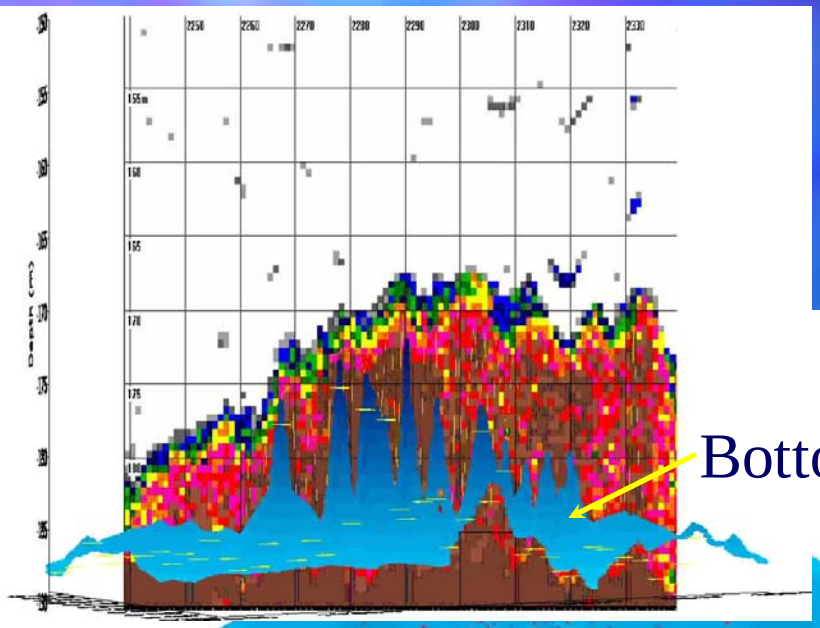
32 passes were conducted along different bearings to view the site.

All bottom detect samples were used to create an interpolated 3D surface.



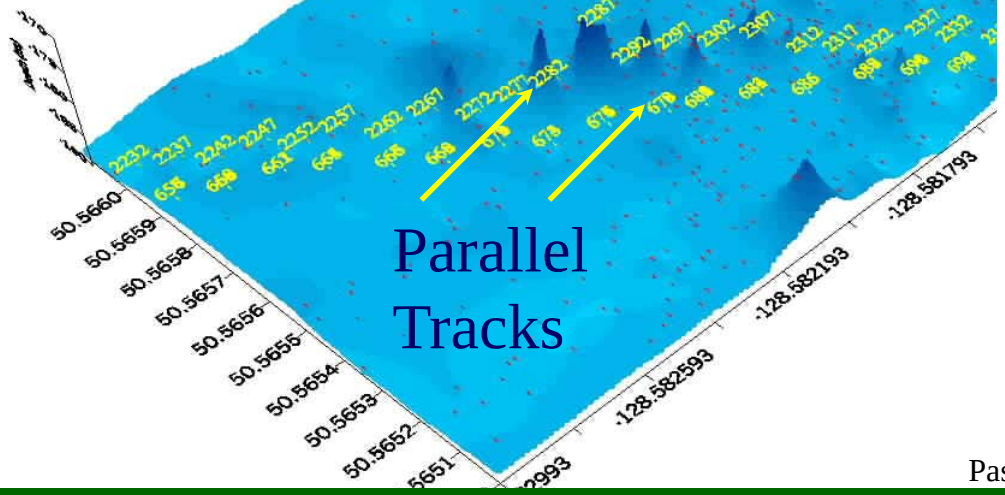
Several rock pinnacles that extended over 150m in length and rose up to 15m above bottom were seen.

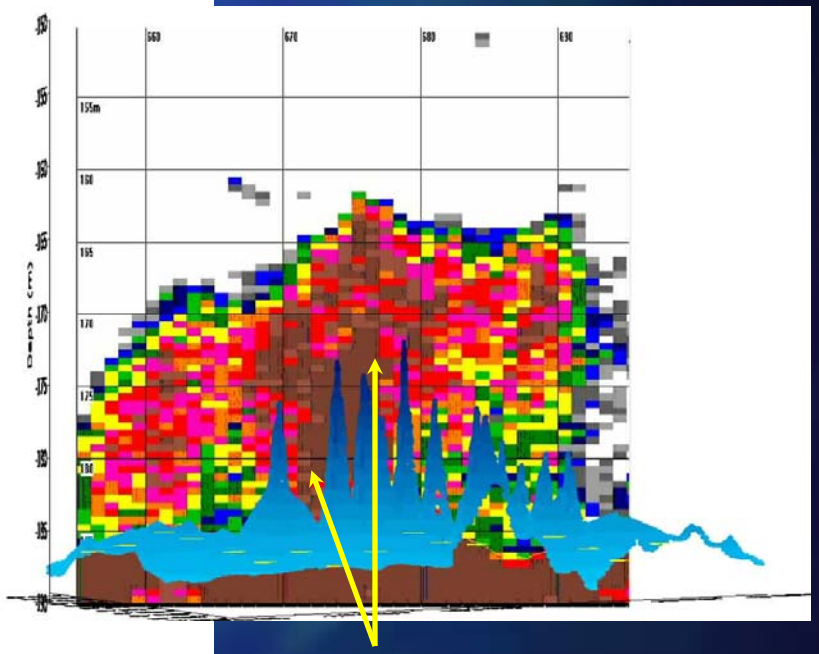
A ‘new’ bottom profile was created from the interpolated surface, draped as a mask over each trackline and aligned with the echogram ping data.



Bottom mask

Pass 3503



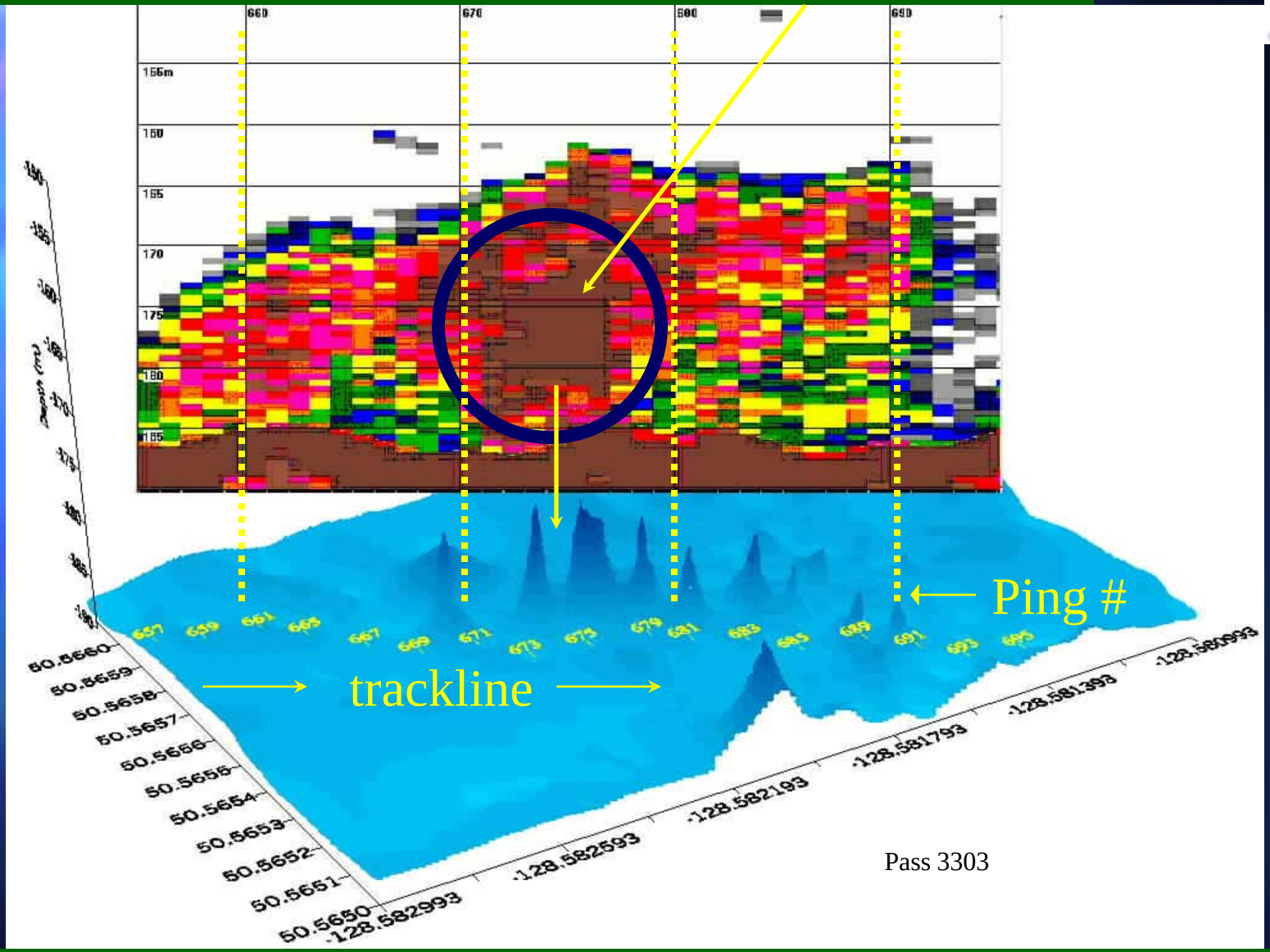


Pass 3303

We identified areas of uncertain signal source:

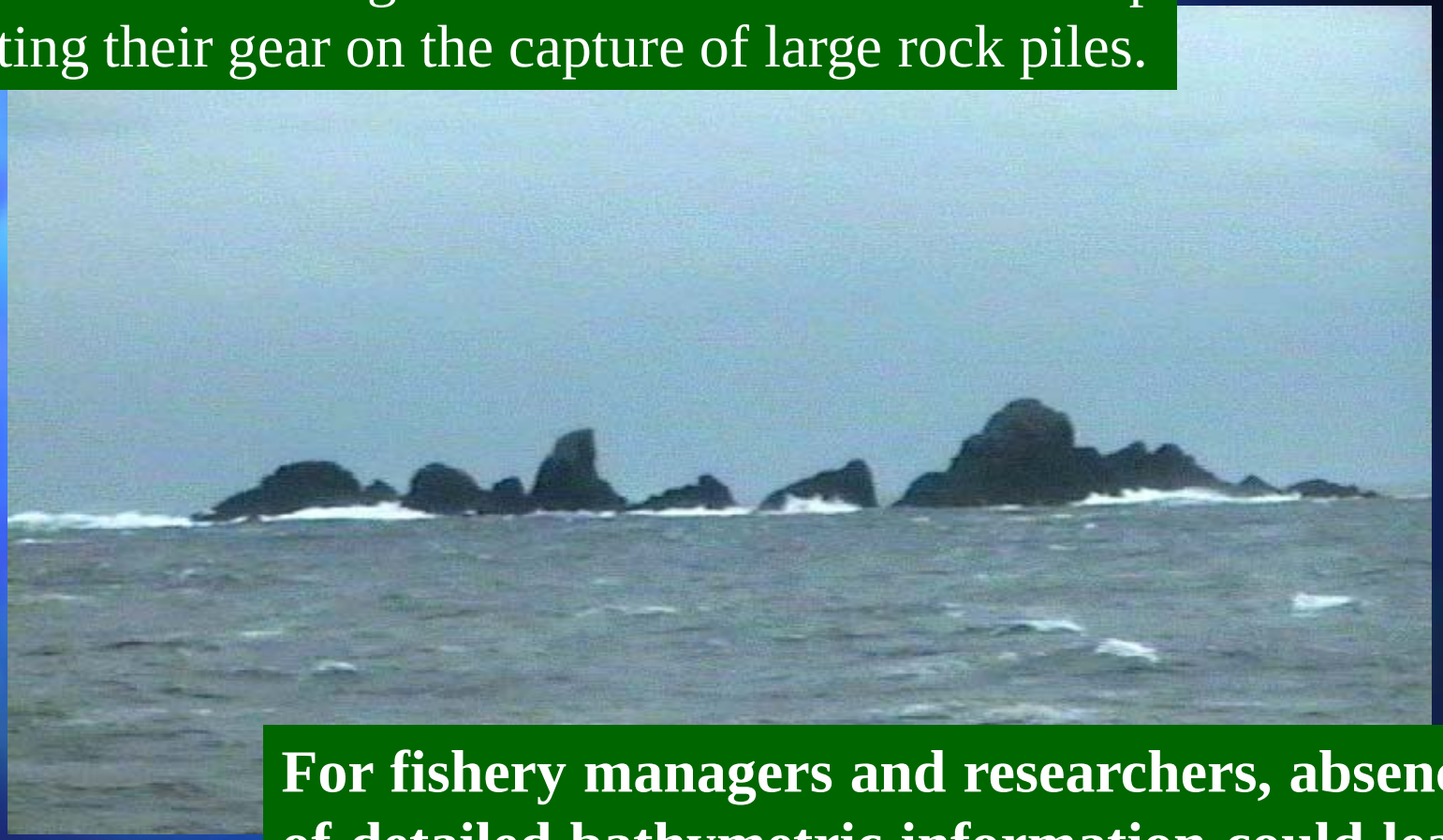
fish schools?? or...
sidelobe interference??

Dense aggregations first thought to be fish schools……



But……were more likely sidelobe echoes from nearby pinnacles.

Even the most experienced fishers could be misled by the acoustic image on their sounder and end up targeting their gear on the capture of large rock piles.



For fishery managers and researchers, absence of detailed bathymetric information could lead to gross over-estimates of stock abundance through acoustic integration of rock rather than rockfish.

What data and why?

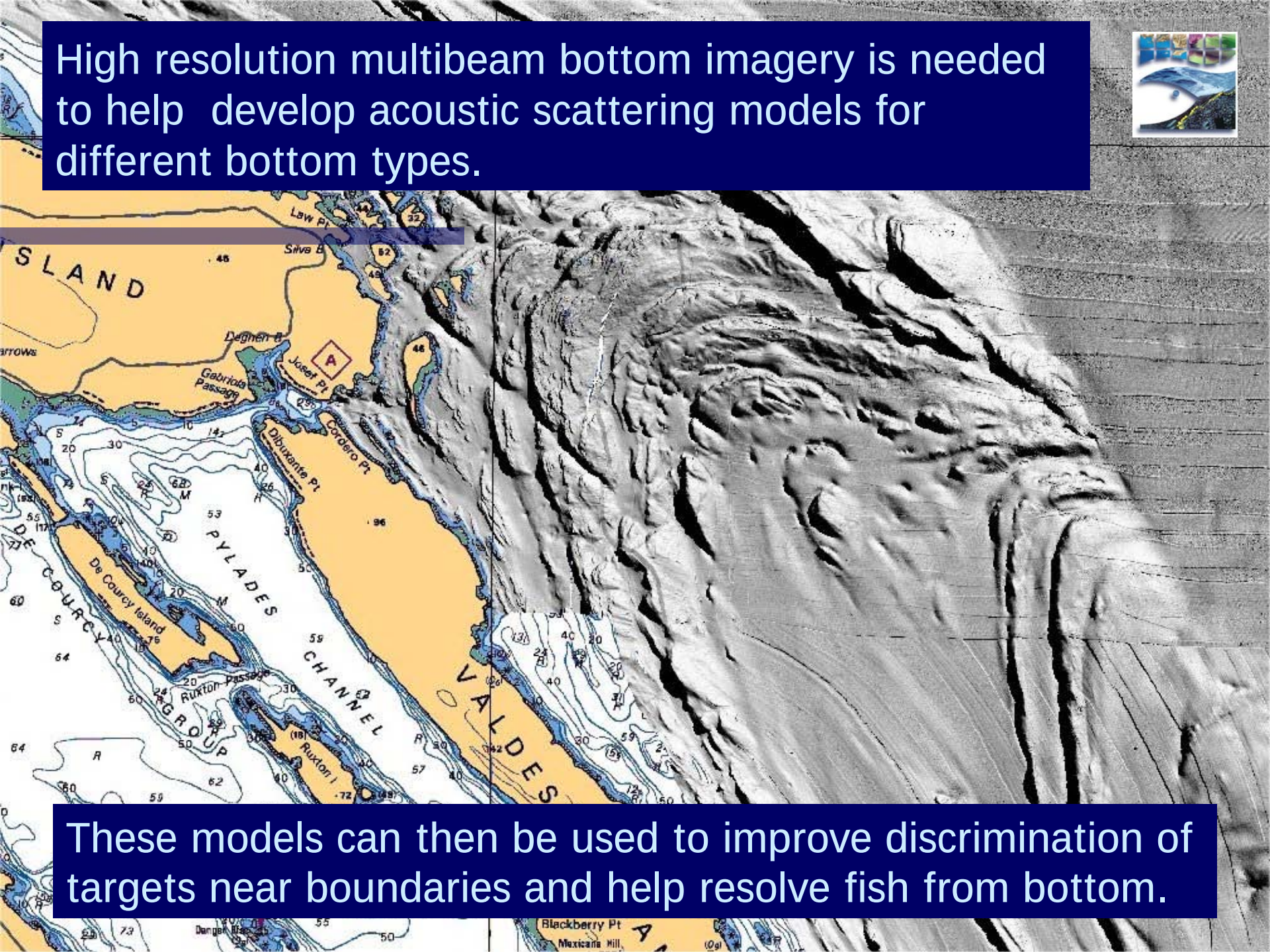
Fish schools and Environment

The use of the acoustics method for the quantification of fish biomass release a great amount of information that could be extracted from the echograms, as *v.g.*: the school´s size, shape, structure, position and the sorrounding environment.

The information from different sources enables to draw up a summarized list of frequently asked data which can be improved in the future:

Bathymetry: Good quality data, reliable and precise.
Artificial obstruction: wreck, pipelines, cables.
Nature of the seabed: Sand, shell, gravel, rocks, mud.
Regulations: Restricted areas, EEZ limits.
Deep Currents: main direction and speed.

High resolution multibeam bottom imagery is needed to help develop acoustic scattering models for different bottom types.



These models can then be used to improve discrimination of targets near boundaries and help resolve fish from bottom.

Data is need for:

- Planning tows safely.
- Avoid seabed obstructions.
- Prospecting new potential areas.
- Positioning precisely the fishing device.

Skippers need that pinnacles, ridges, cliff edges, pronounced slopes.

CONCLUSION

Fishermen want products that can show directly what they are looking for.

¡¡WHAT YOU SEE IS ……...WHAT YOU GET !!

The End