# Killer whale habitat use and prey fields from remote hydrophones and echosounders

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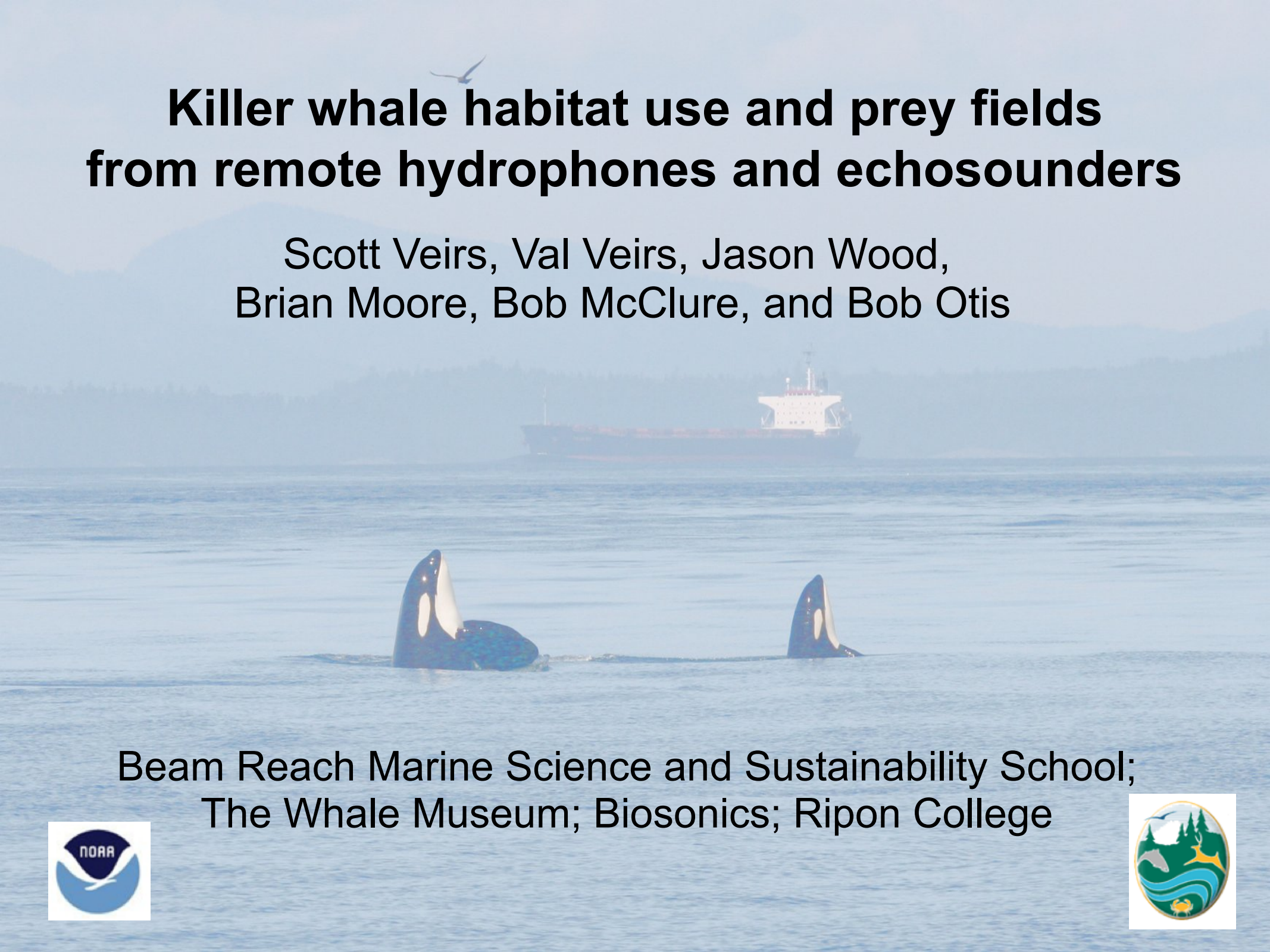


Beam Reach Marine Science and Sustainability School;
The Whale Museum; Biosonics; Ripon College

# Motivation: no fish, no blackfish

Should we manage salmon for orcas?

<u>Echosounder goals</u>

- assess salmon (prey) field
- salmon-orca interactions
- real-time continuous fish data

<u>Hydrophone goals</u>

- detect presence/absence
- monitor underwater noise levels
- compare detection efficiency (humans vs computers)
- raise awareness about underwater noise

# Methods: hydrophone network

## How does it work?

- 5 nodes
- sensitive to ~1-10 kHz
- local processing
- global streaming

($1/month/node/listener)

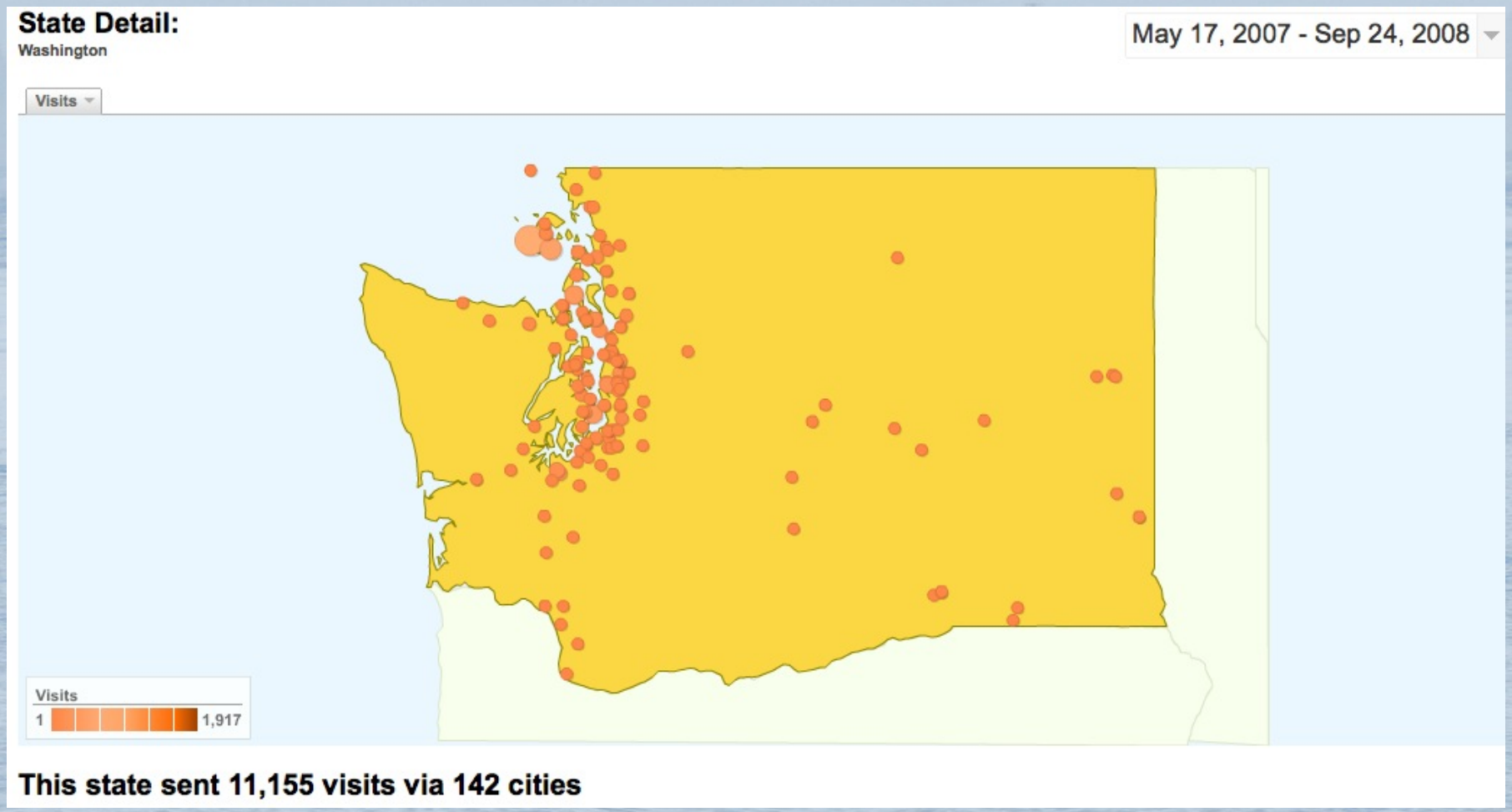

Demo: orcasound.net

## Supplements sighting network

- Bob Otis observes KWs from light house
- Orca Network and other groups

# Human listening network

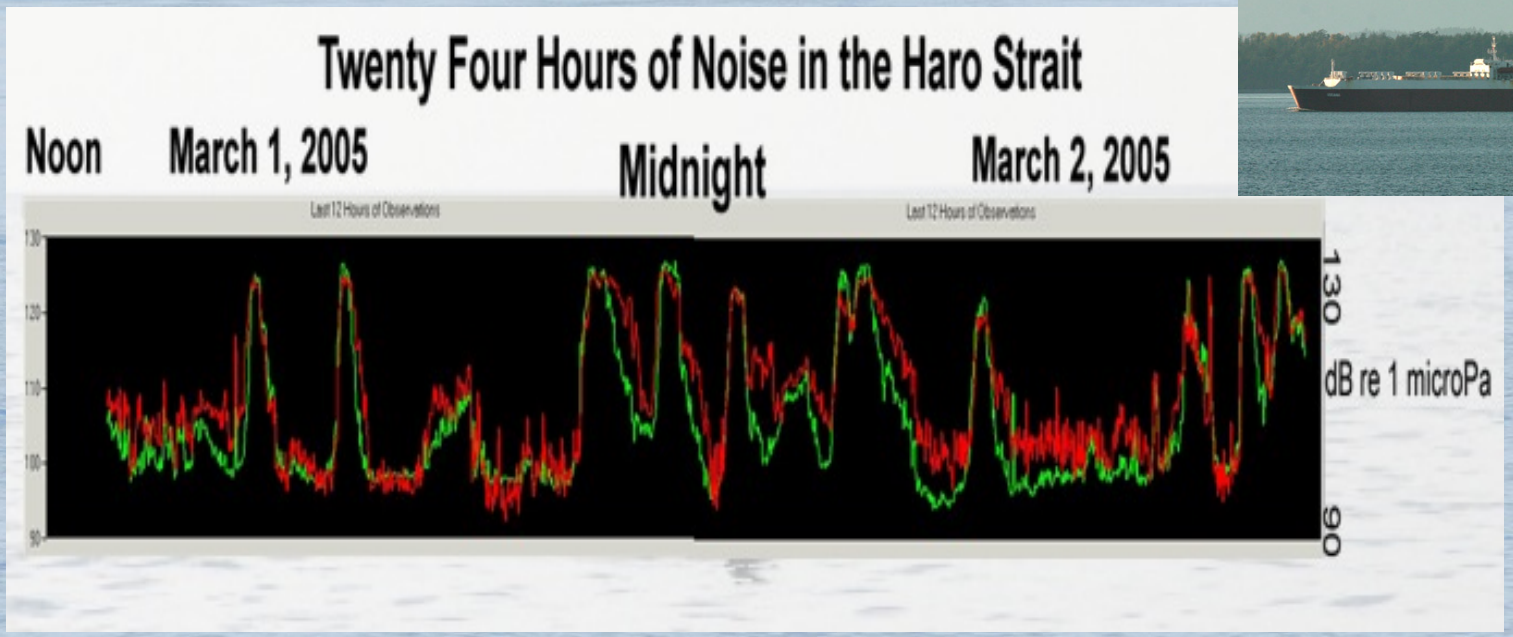
- time zone diversity: 25% of web visits non-U.S.
- 12% of listeners non-U.S. (6% U.K., 4% Canada)
- ~10 devotees, 100 others
- notification via email; logging via Google spreadsheet



# Automated detection and recording

Custom software (Val Veirs):

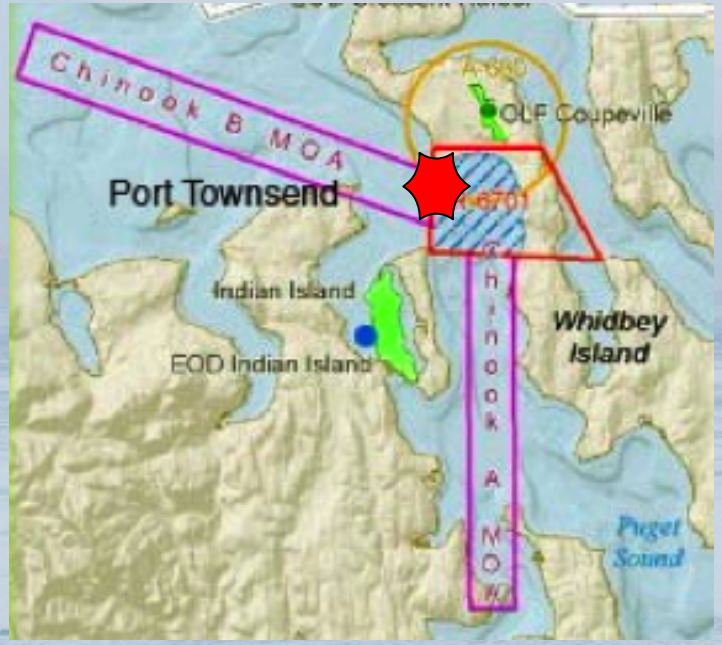
- calibrates receive levels
- summarizes statistics of 2-second mean data
- 20-minute broadband means & spectrum levels
- triggers on unusual sounds (powerful, tonal, etc)
- records ~10-second sound samples
- experiments with 5-day buffer



# Results: habitat use

Haro Strait

- Night-time and first detections
- Detection range up to ~10 km (possibly 25 km)
- Navy sonar (2003, 2009)




Port Townsend

- Kids hear whales!
- Calls from Keystone (~6 km)
- Midnight vocalization

Seattle Aquarium

- No KWs detected
- Dominance of ferry and industrial noise (explosions!)

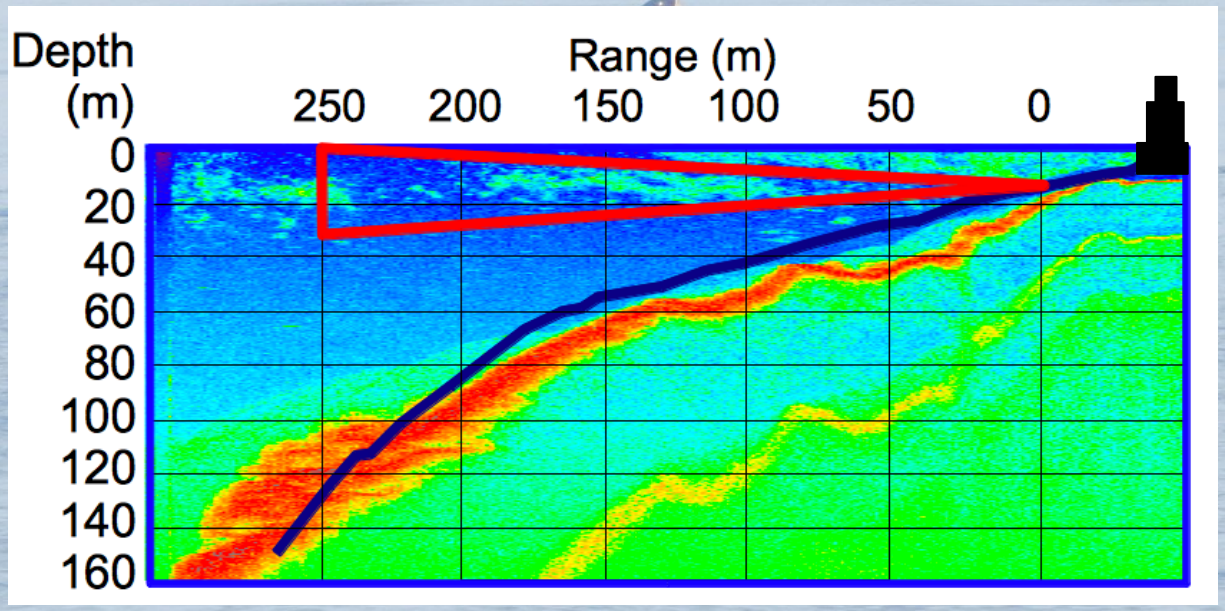
Neah Bay

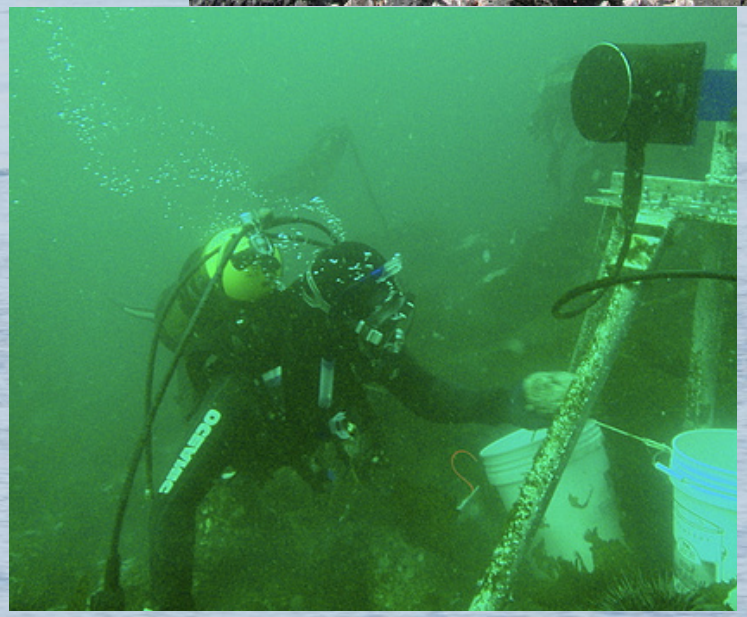
- One possible human detection
- Harbor seals and pile driving

# Methods: 200 kHz echosounder

## Biosonics DTX system

- 250m range,100m cable, 15m depth
- 1.9 pulses/s, fixed horizontal survey
- 6.6° circular split-beam
- Data acquisition 24/7, Aug-Dec '08
- MyPC remote login



# Methods: 200 kHz echosounder

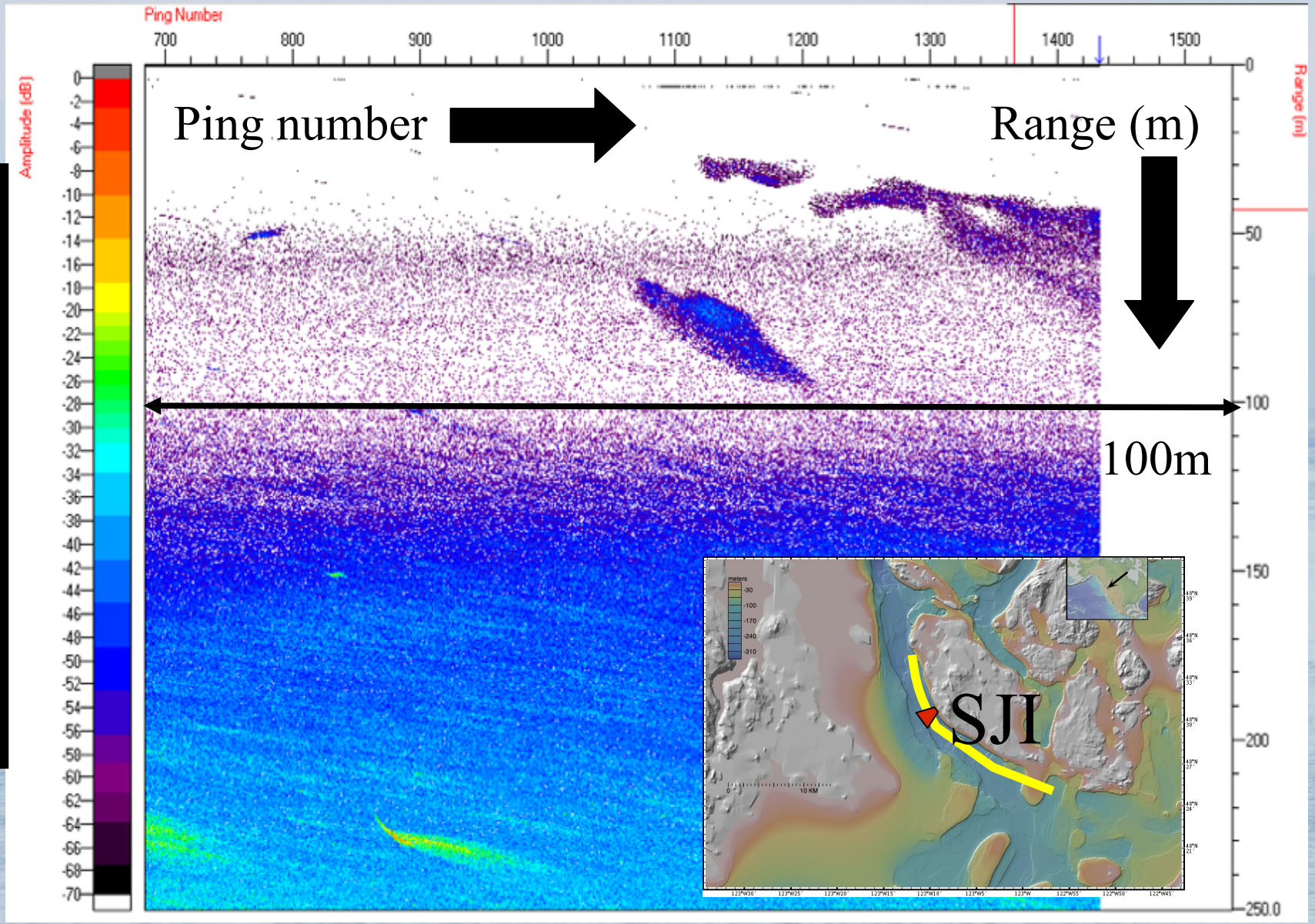
Target strengths:

Killer whales

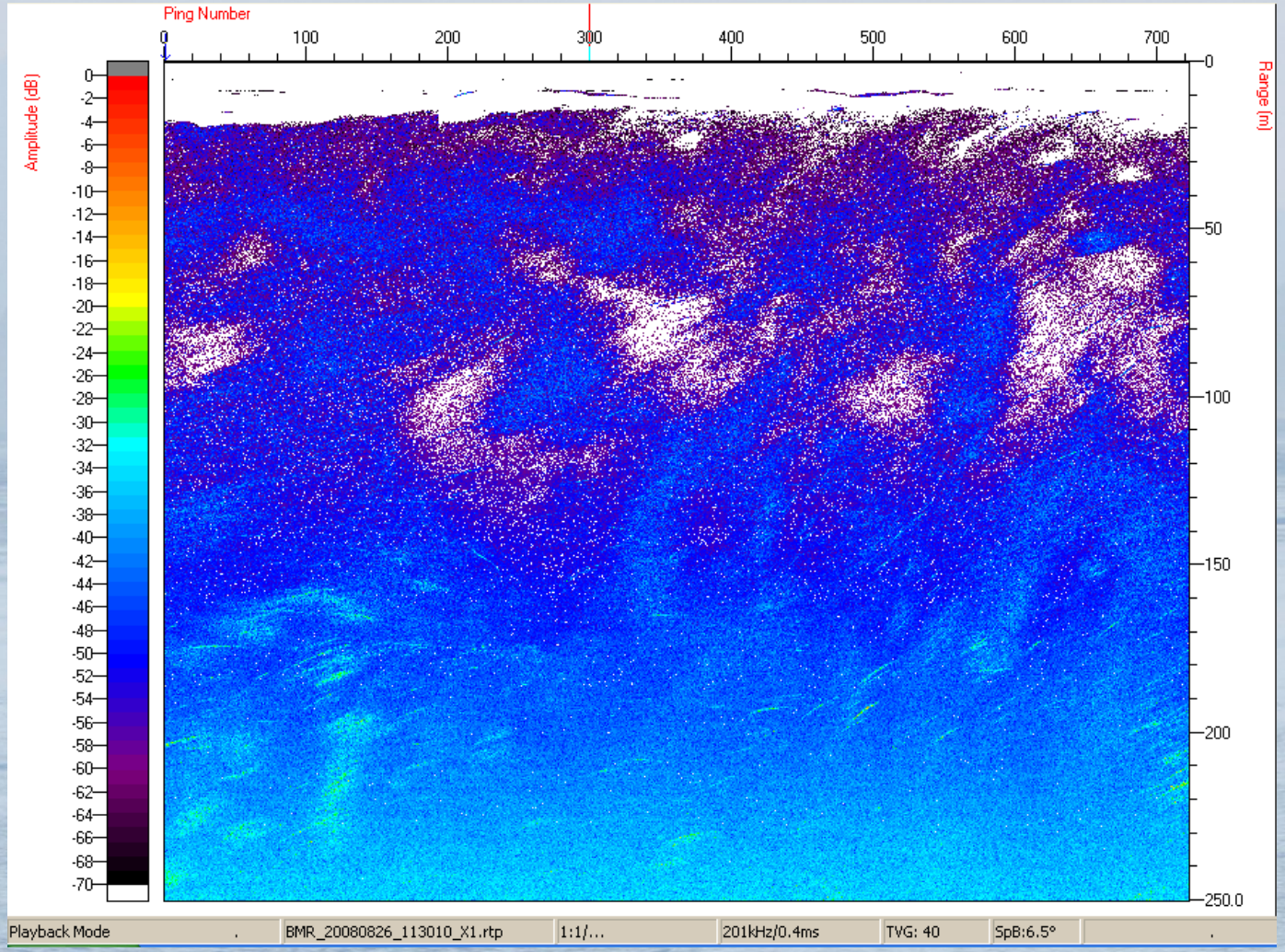
Salmon

Surf smelt?

Plankton

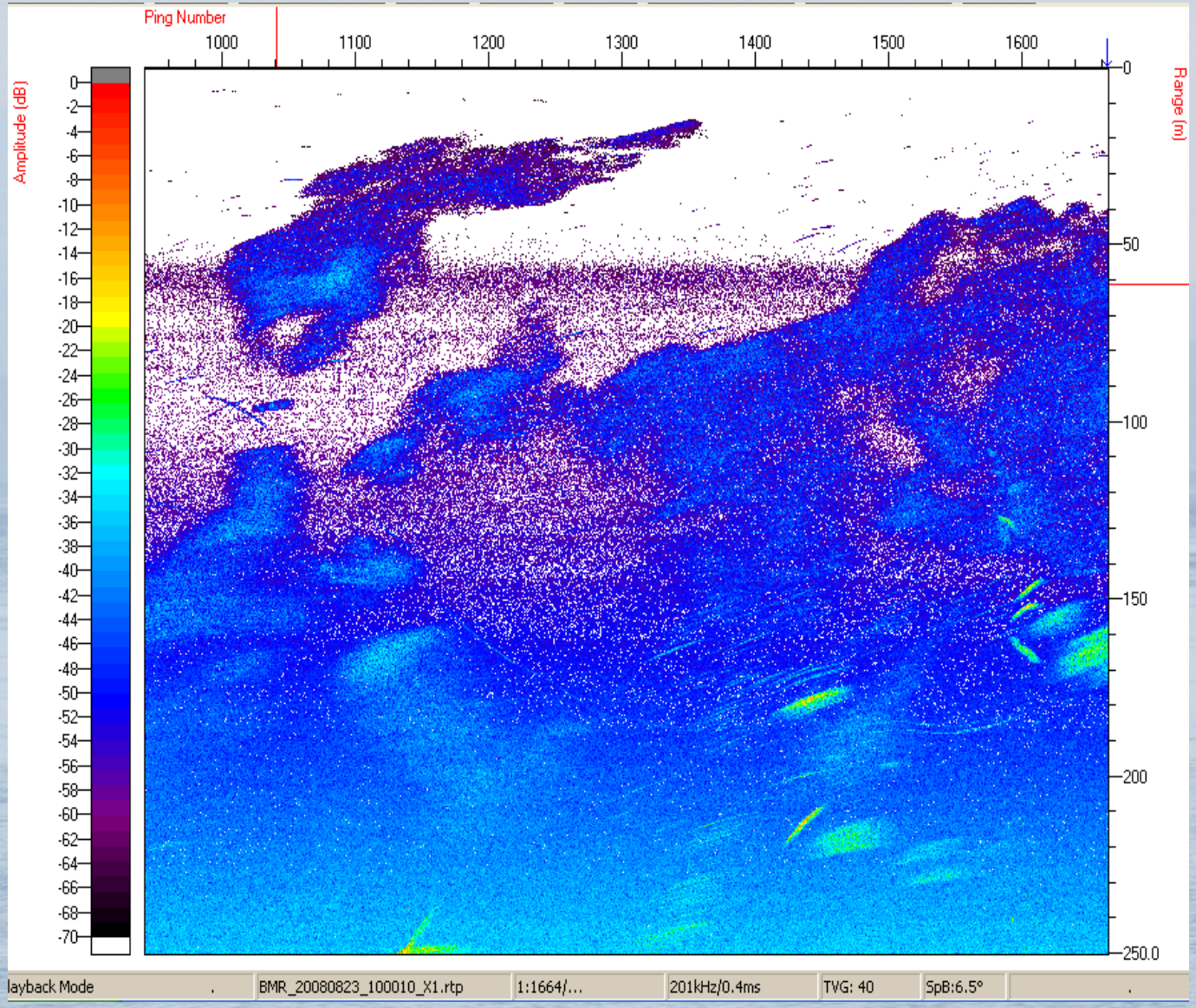


# Results: potential prey field



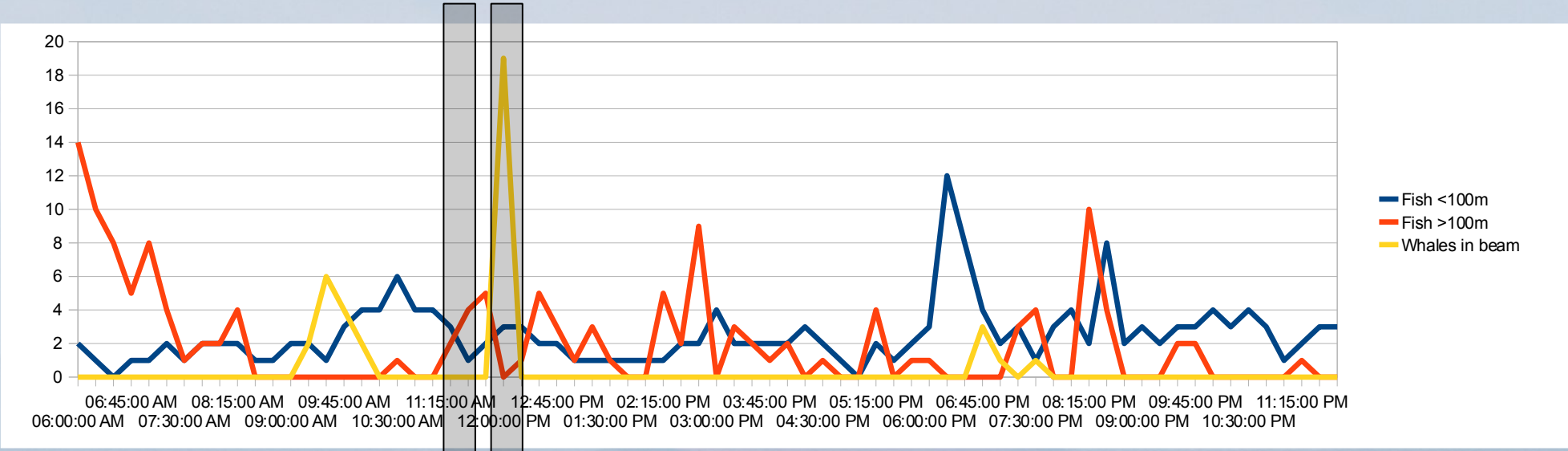

Fish at <20m & 100-250m

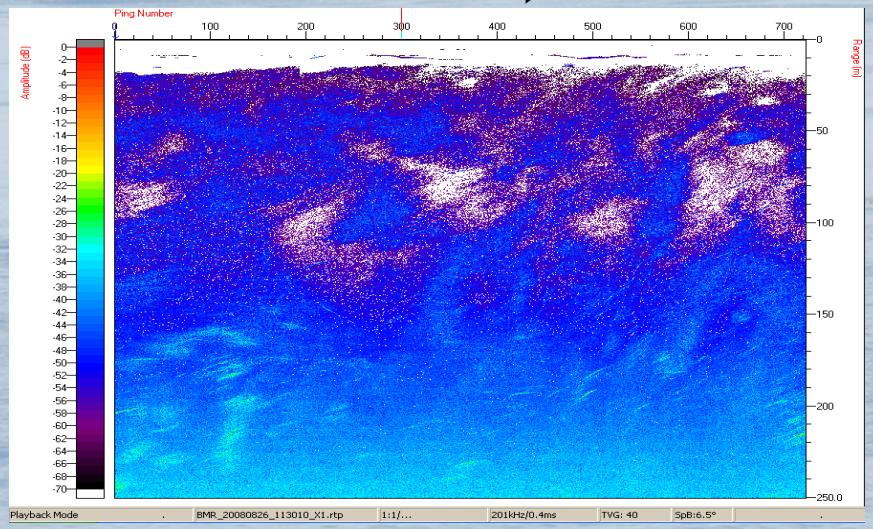
# Results: potential prey field



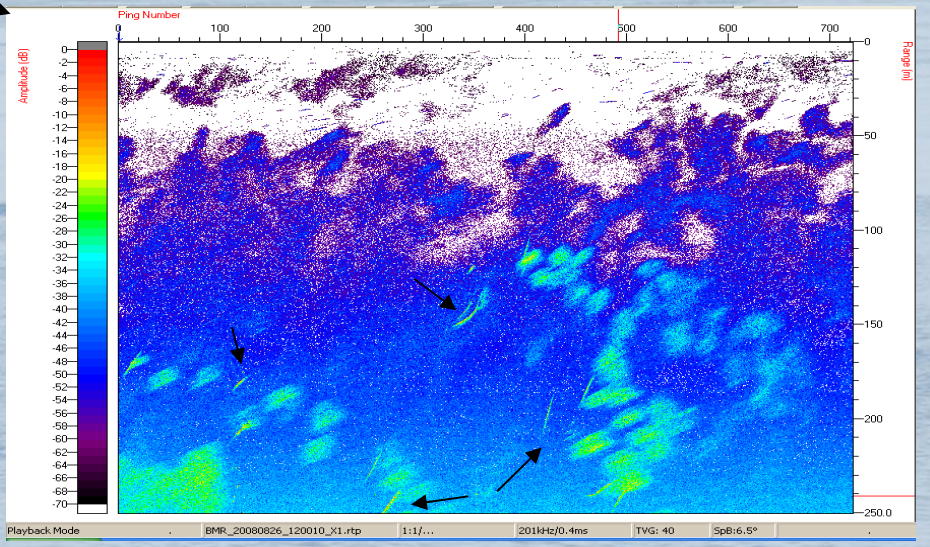

Orcas among fish?

# Results: salmon and killer whales




Fish at <20m & 100-250m




Killer whales but no fish

# Conclusions:

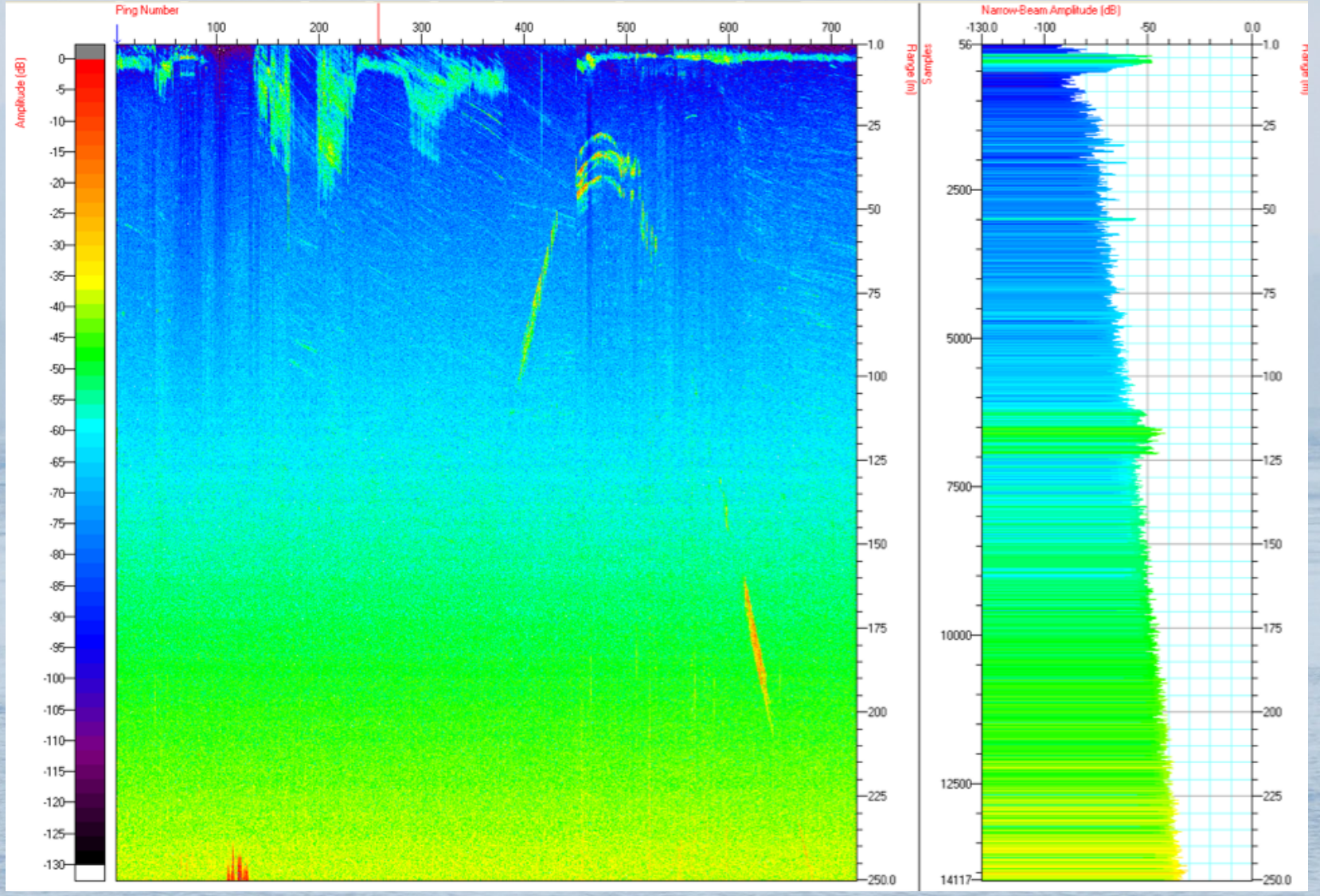
1. The Salish Sea hydrophone network is helping us understand habitat use by SRKWs
2. The Biosonics 200kHz echosounder can capture fish distributions and dynamics

Andy Holman with a Chinook (Puget Sound Anglers, SJI Chapter)

- Groundtruthing with local fishers
- Mean TS of orcas ~-11dB

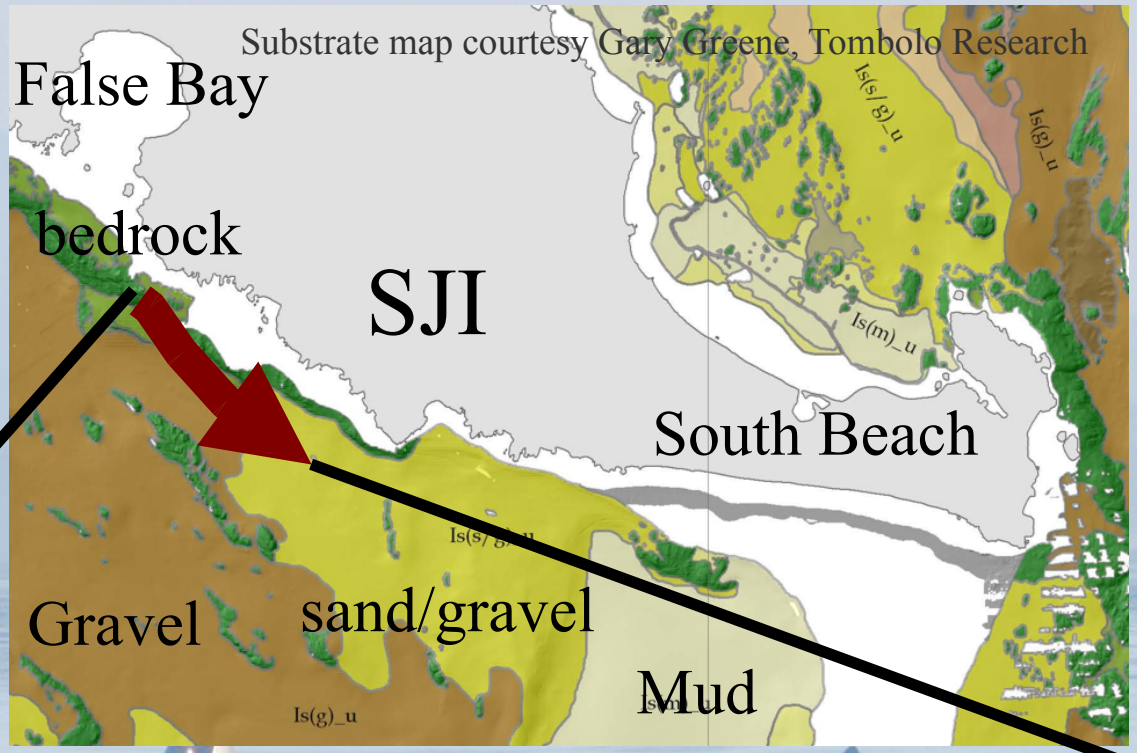
Thank you for listening!

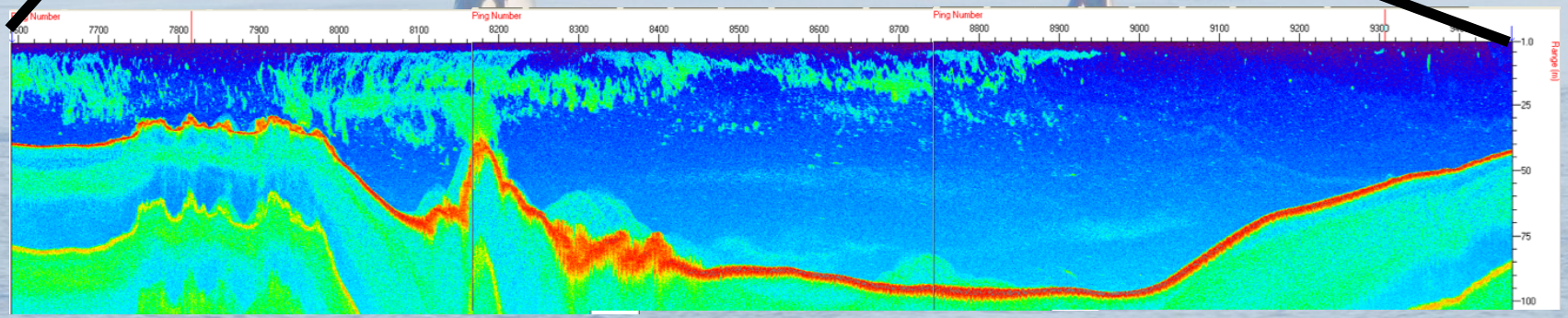
# Results: killer whale target strength




3 orcas pass in a manually-steered beam

# Along-shore potential prey transects




Enhanced echo strength over rough topography