

Multi-parameter observations of whales, zooplankton and hydrography on the west coast of Vancouver Island using ocean gliders

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Dave Duffus² and Stephanie Waterman³

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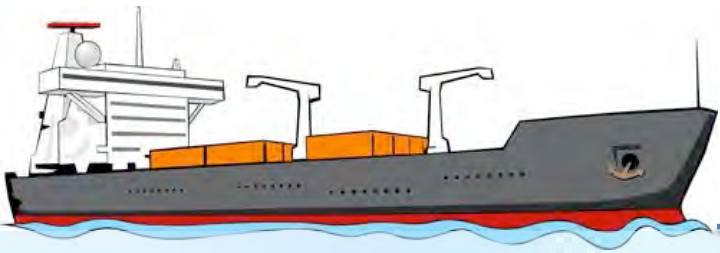
Fisheries and Oceans Pêches et Océans
Canada Canada

2



3





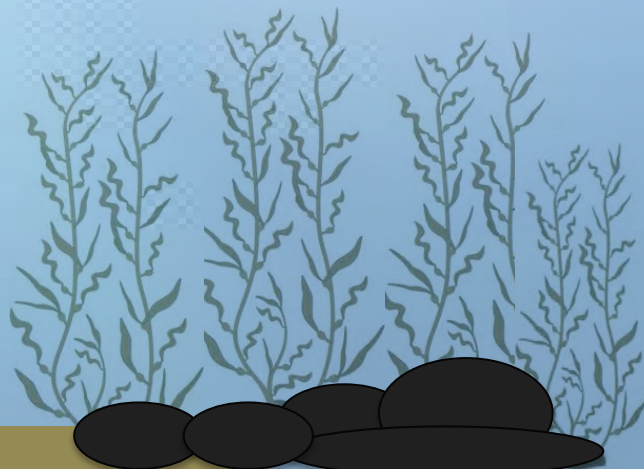
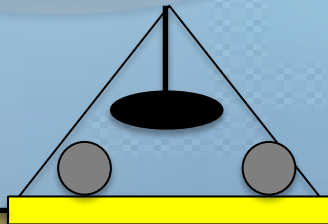
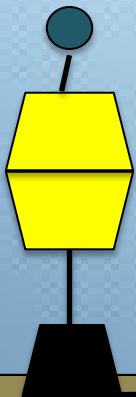
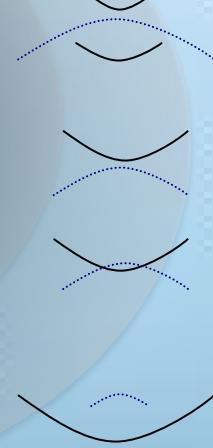
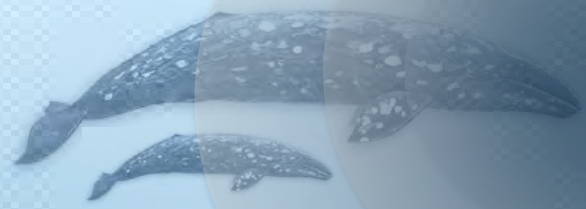
The technological vision:

- New combinations of measurements & measurement platforms to observe whales and whale habitat in the coastal ocean



WHaLE

Whales, Habitat and Listening Experiment



Whales are important to Canadians

Top predators, cycle nutrients



Cultural, Historical Icons



Marine Ecotourism Flag-bearers

Whale - Vessel Encounters: A Threat to All



Collisions injure & kill whales



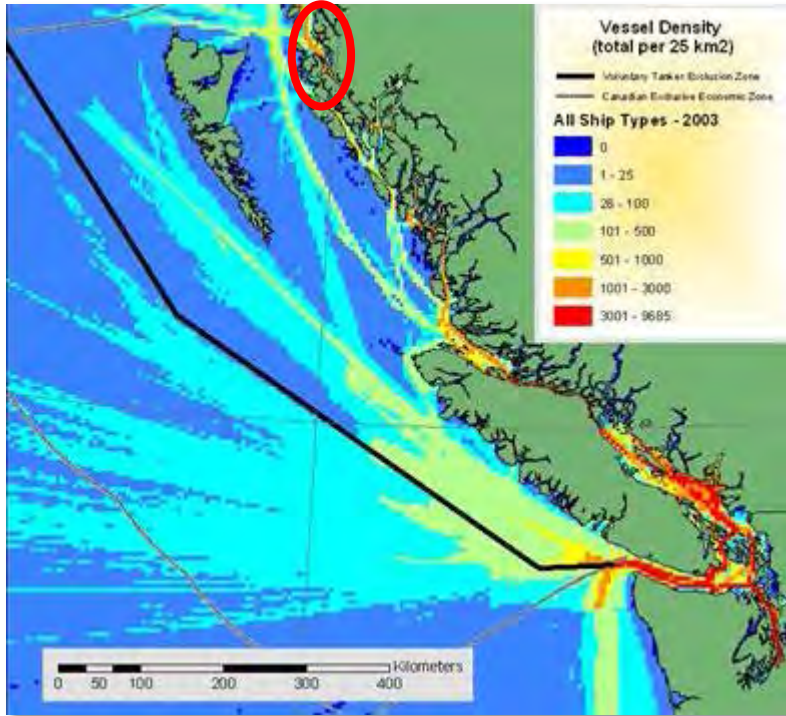
**Physical hazard to small boats
Public image hazard to vessel industries**



Public worry, conflict

Goal: Reduce encounters & strikes by providing fleet with whale & habitat locations & information

Increased Shipping, increased risk



Increases along
typical patterns

Potential % increase
is large in B.C.
North Coast



Gray whales

- represent the largest biomass of whales in Canadian waters as they migrate
 - a population of about 20,000 moves from Mexico to the Arctic



Large baleen whales

- were frequently seen on B.C. coast, until they were decimated by commercial whaling
- little is known regarding their populations, distributions and habitats

fin



North Pacific right

sei



Fixed whale listening



Experiment 1: use of acoustics on the migration by gray whales.

- deployed Feb 2015, 2016 for 2 months at ~50m
- opportunistic vessel observations were made when weather allowed



- Experiment 2: in gray whale feeding bay; comparing acoustics use for traveling and foraging; looking for reaction to the presence of vessels
- deployed summer (May-Sept) in 2015 and 2016 at ~20m
 - focused vessel-based observations:
 - whale presence (number/location)
 - social context (adult whales/ cow-calfs)
 - whale behaviour
 - boat presence and movements around the whales

Mobile whale listening and habitat observations

Slocum Glider deployment
March 17 – April 16, 2016



Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat
Data LDEO-Columbia, NSF, NOAA

Mobile whale listening and habitat observations



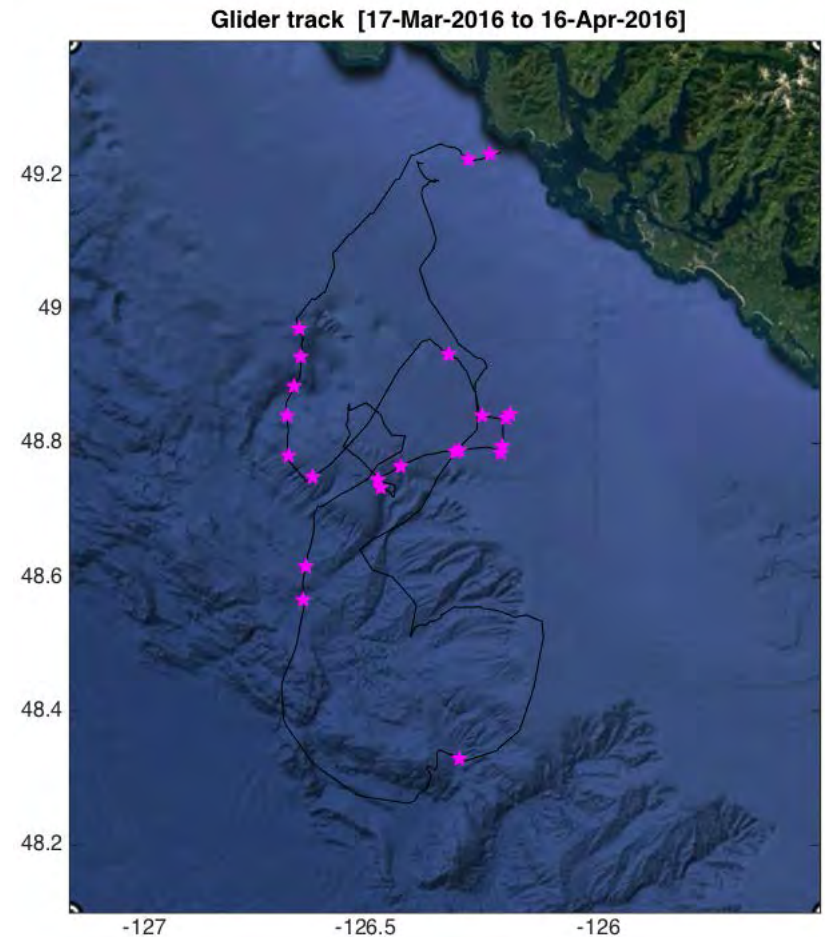
**Digital Acoustic Monitoring
Device (DMON)**

Mobile whale listening and habitat observations



Sei whale detections

Sei whales are incredibly rare, and little is known about their feeding or habitat use in B.C. waters



Mobile whale listening and habitat observations



Digital Acoustic Monitoring Device (DMON)



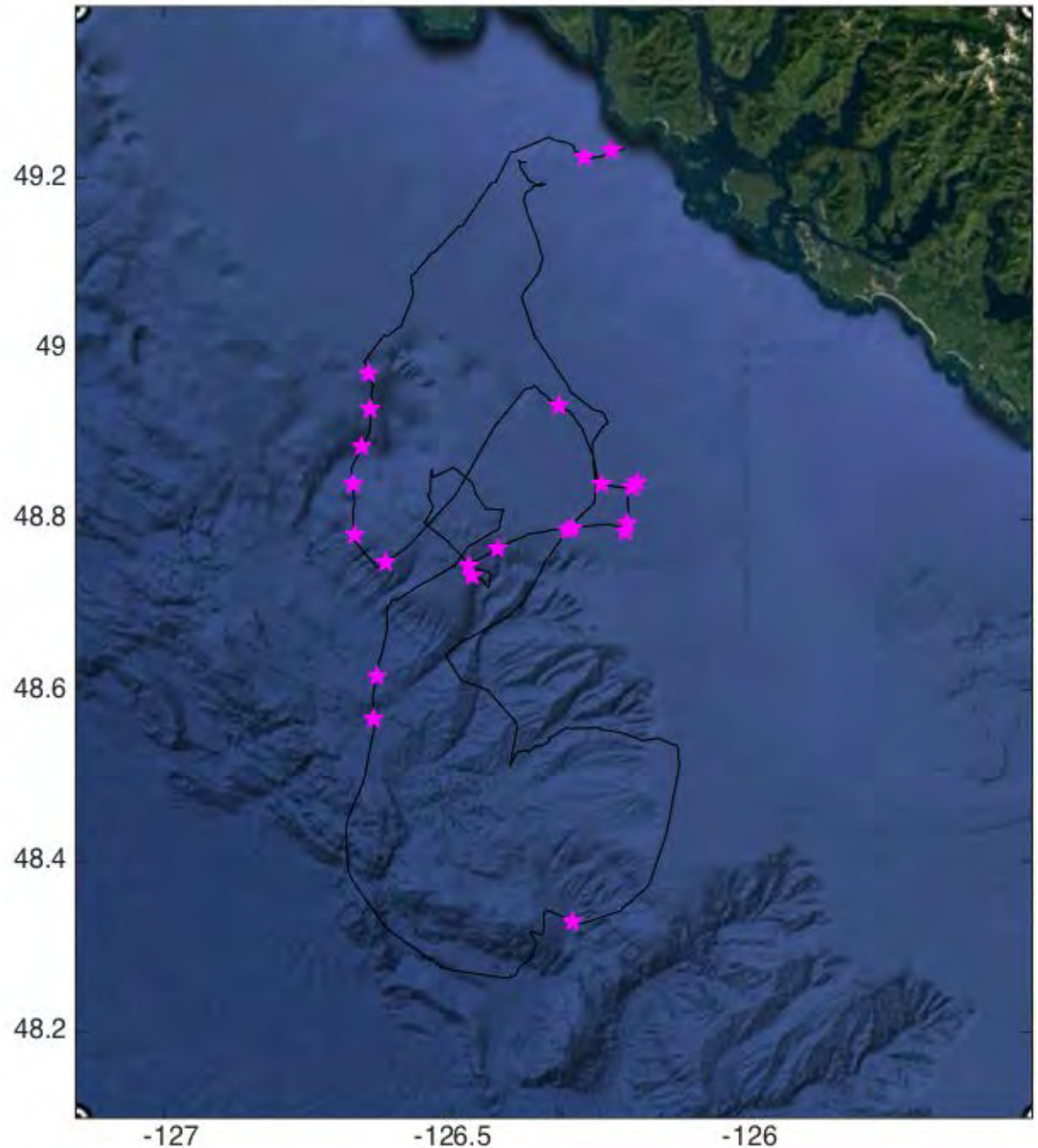
Imagenex 300 kHz echosounder

Acoustic scattering from fish and zooplankton down to 2 mm in size

Glider track [17-Mar-2016 to 16-Apr-2016]

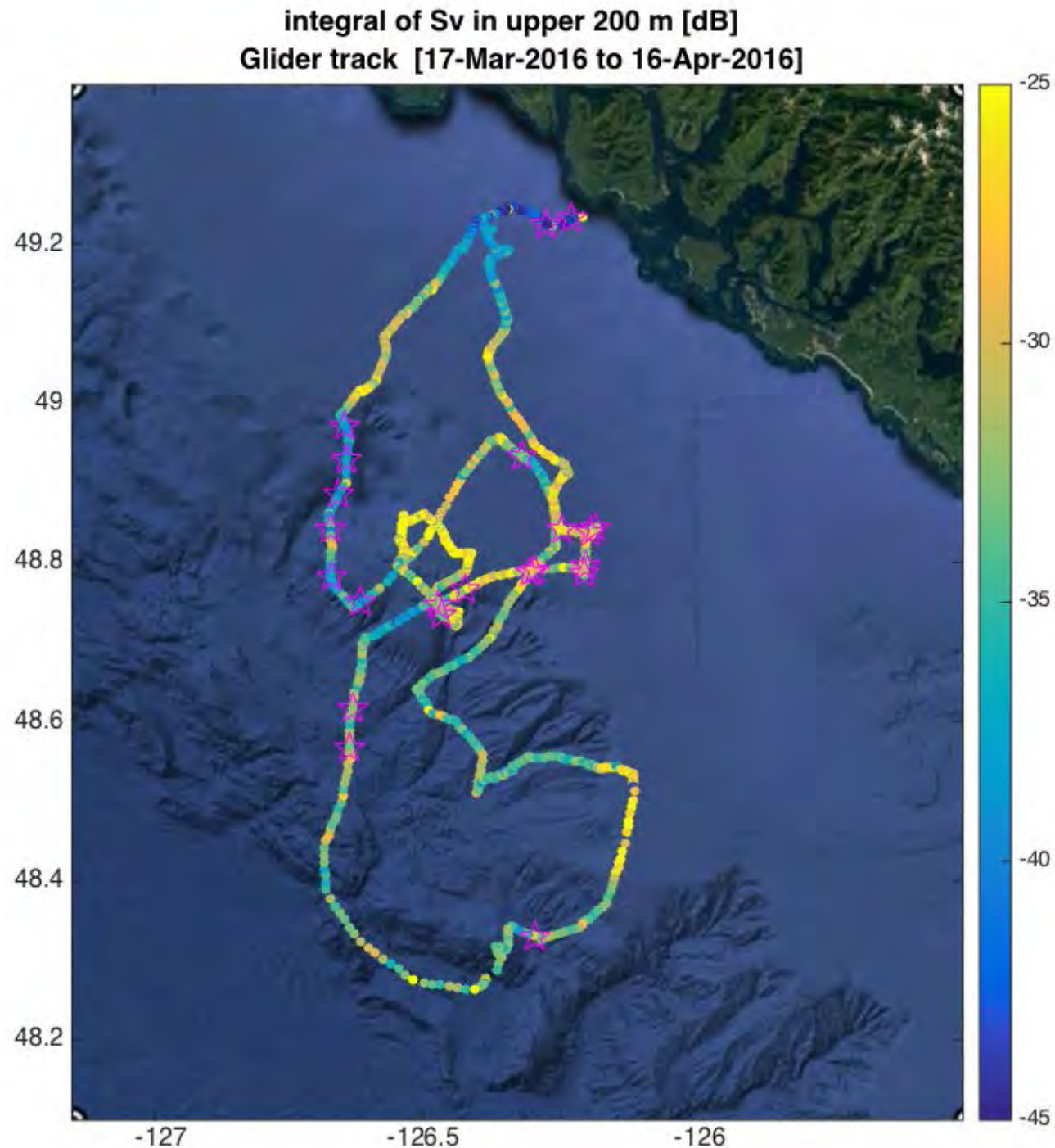
**Sei whale
detections
seem to be
associated
with the
canyons**

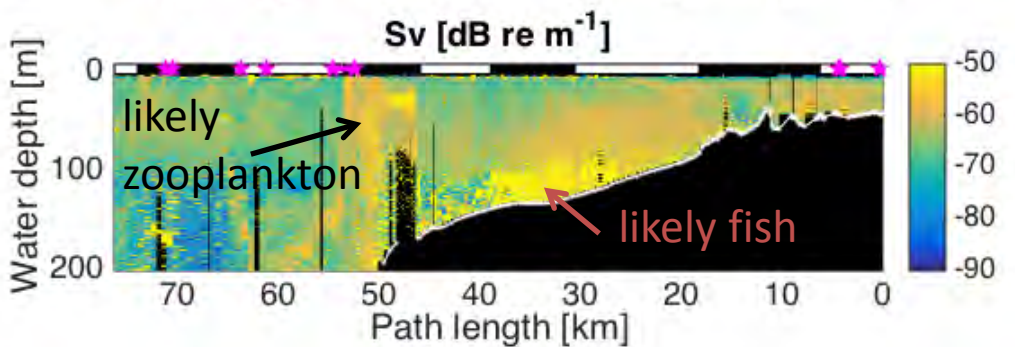
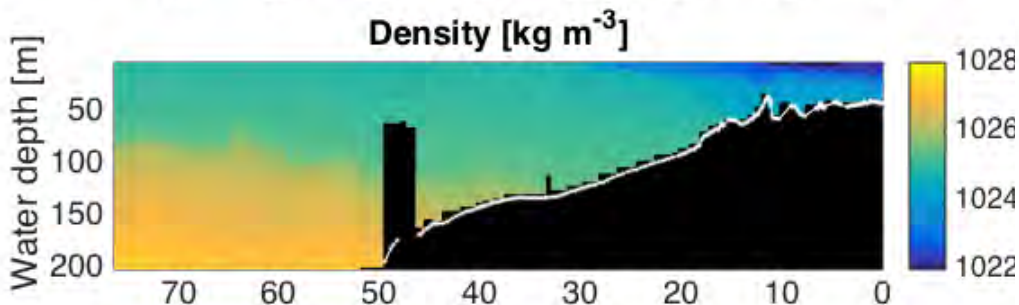
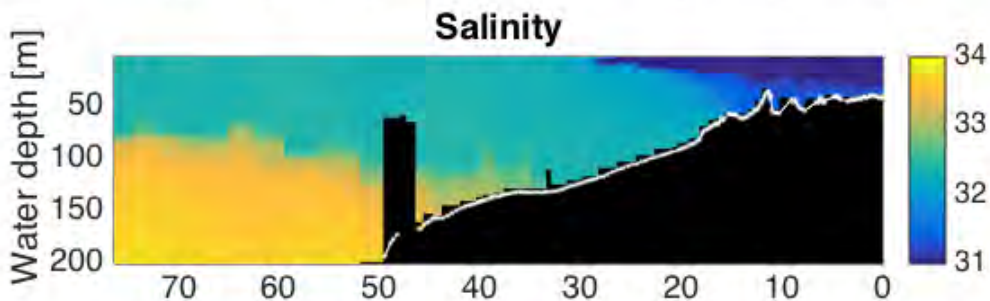
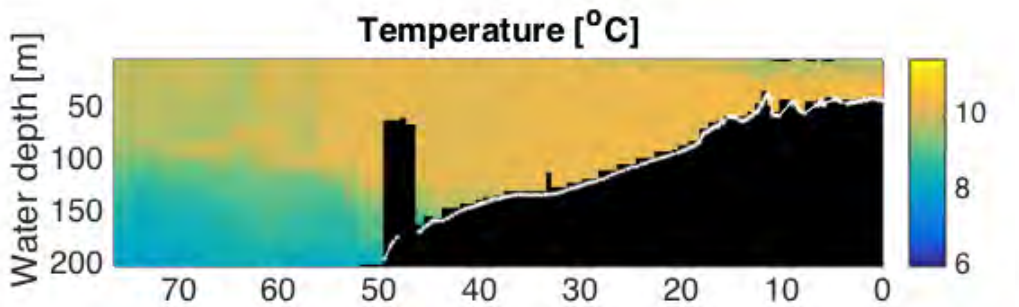
Is this
because
there is more
food there?



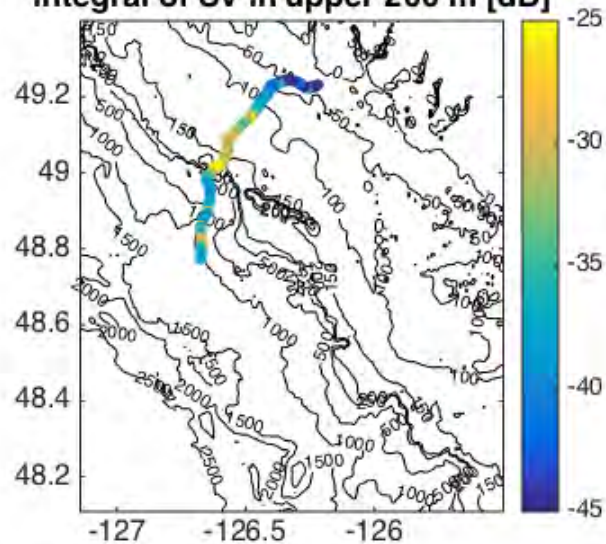
**Sei whale
detections don't
co-occur with
strongest
integrated
backscatter**

Perhaps
there is more
food, but
only of a
weaker
scattering
type (i.e.
zooplankton,
not fish)

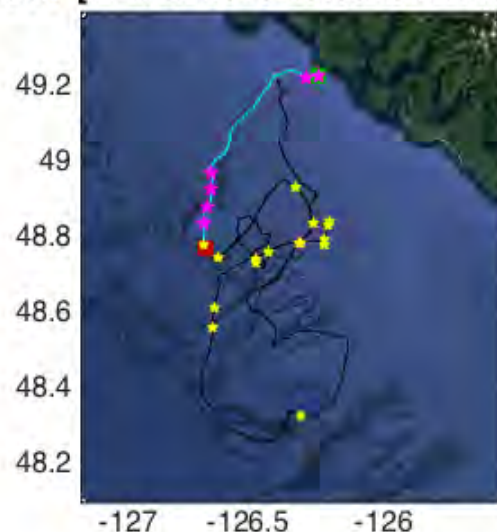


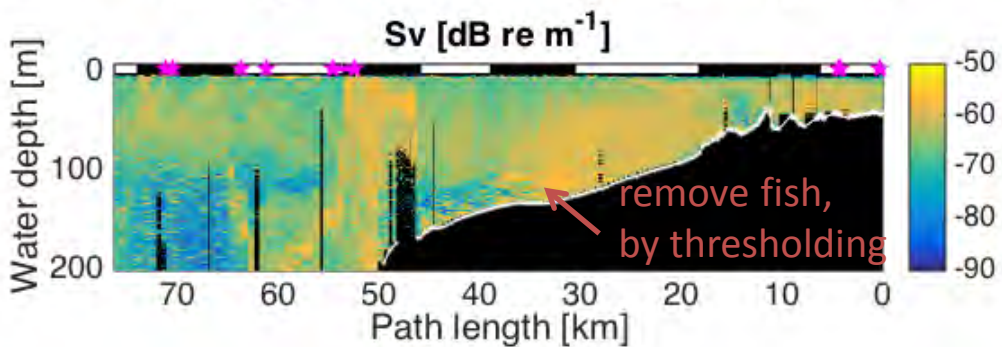
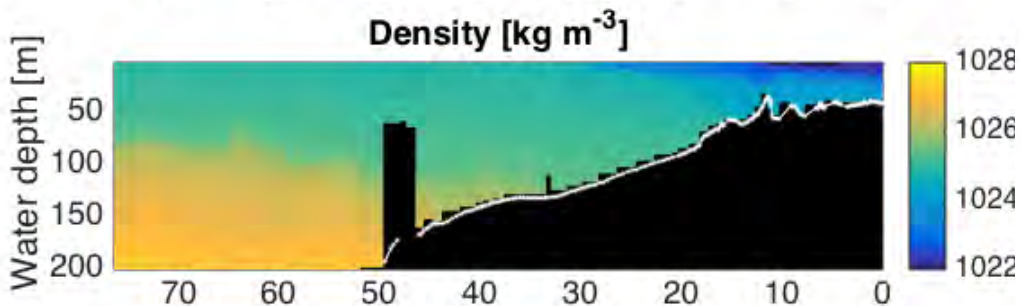
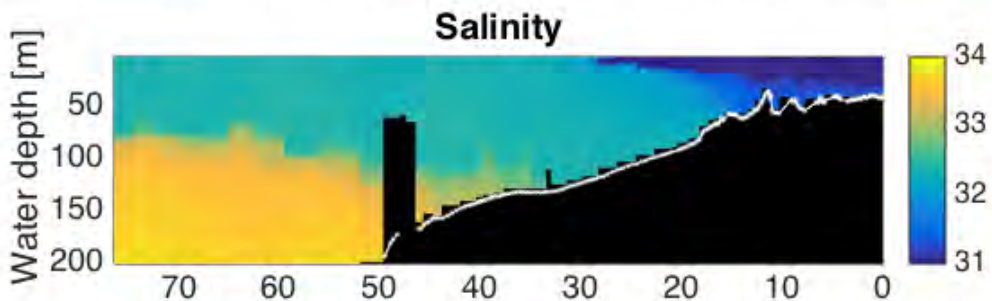
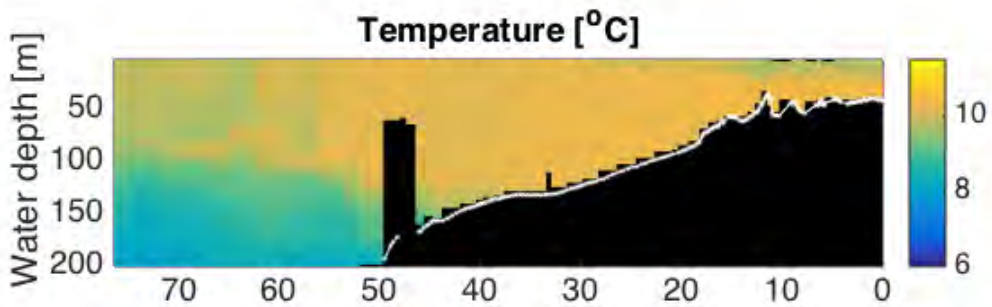


integral of Sv in upper 200 m [dB]

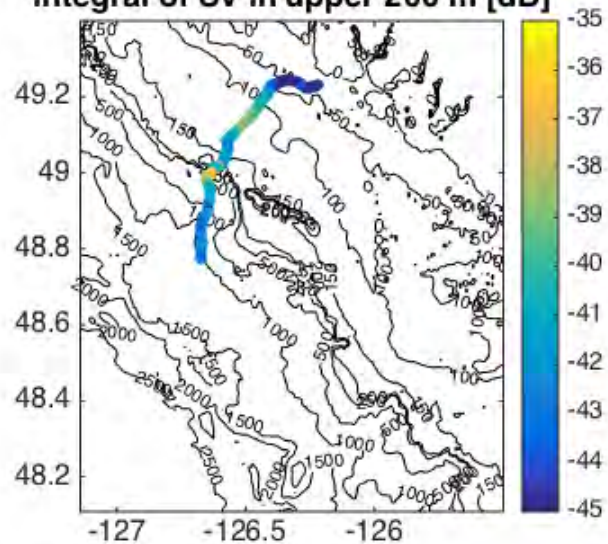


Glider track [17-Mar-2016 19:00 to 21-Mar-2016 18:00]

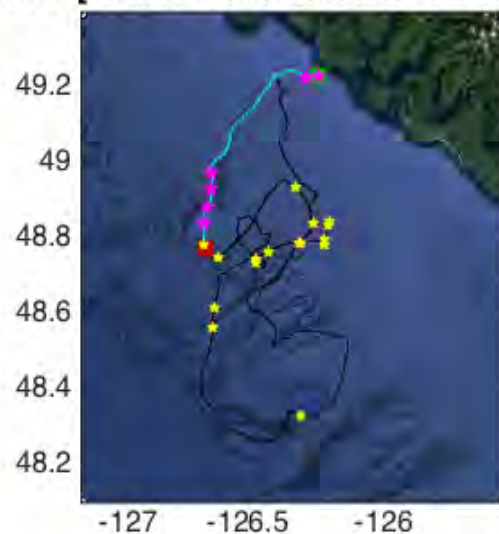




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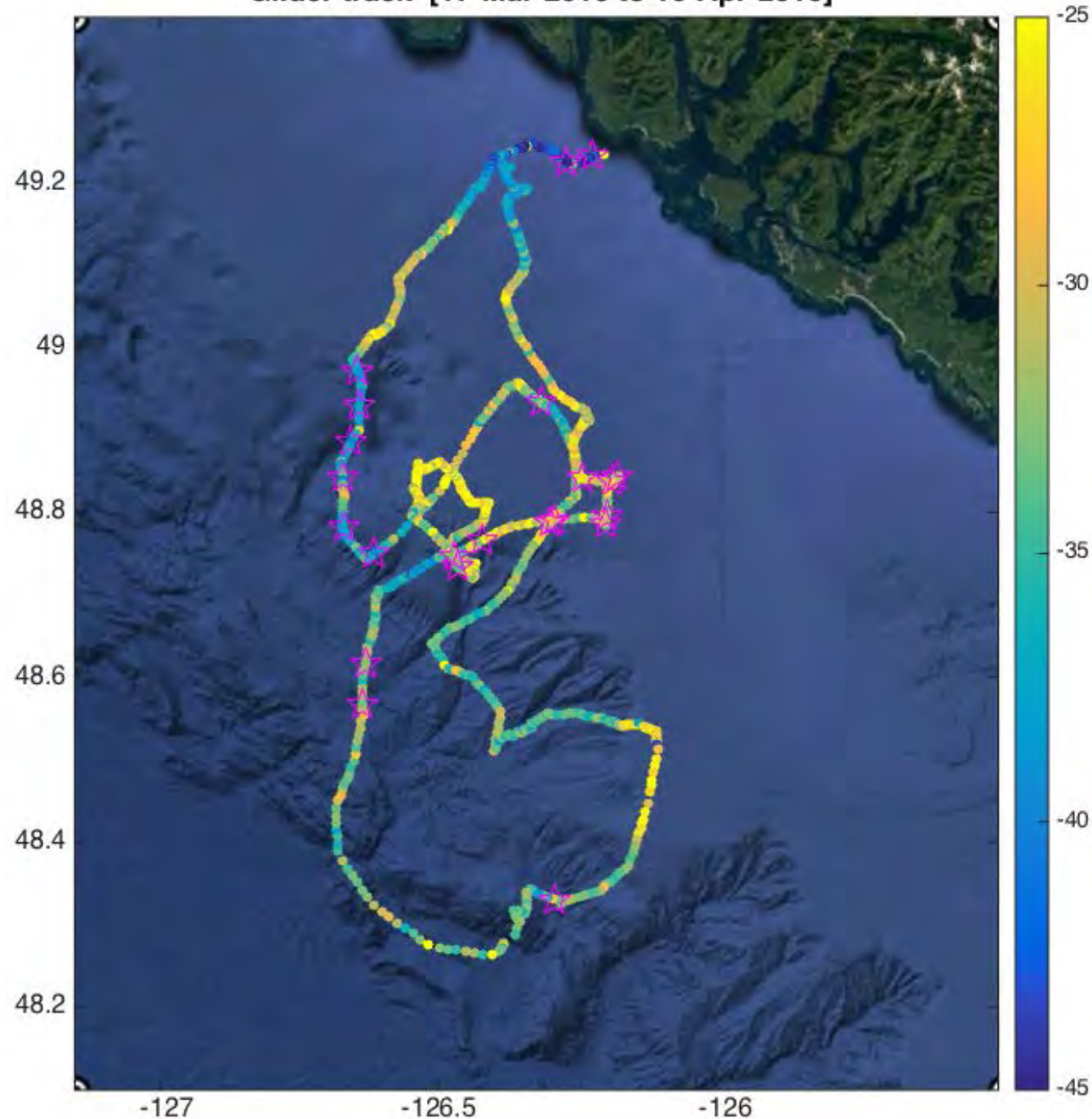


Glider track [17-Mar-2016 19:00 to 21-Mar-2016 18:00]



integral of Sv in upper 200 m [dB]
Glider track [17-Mar-2016 to 16-Apr-2016]

with fish

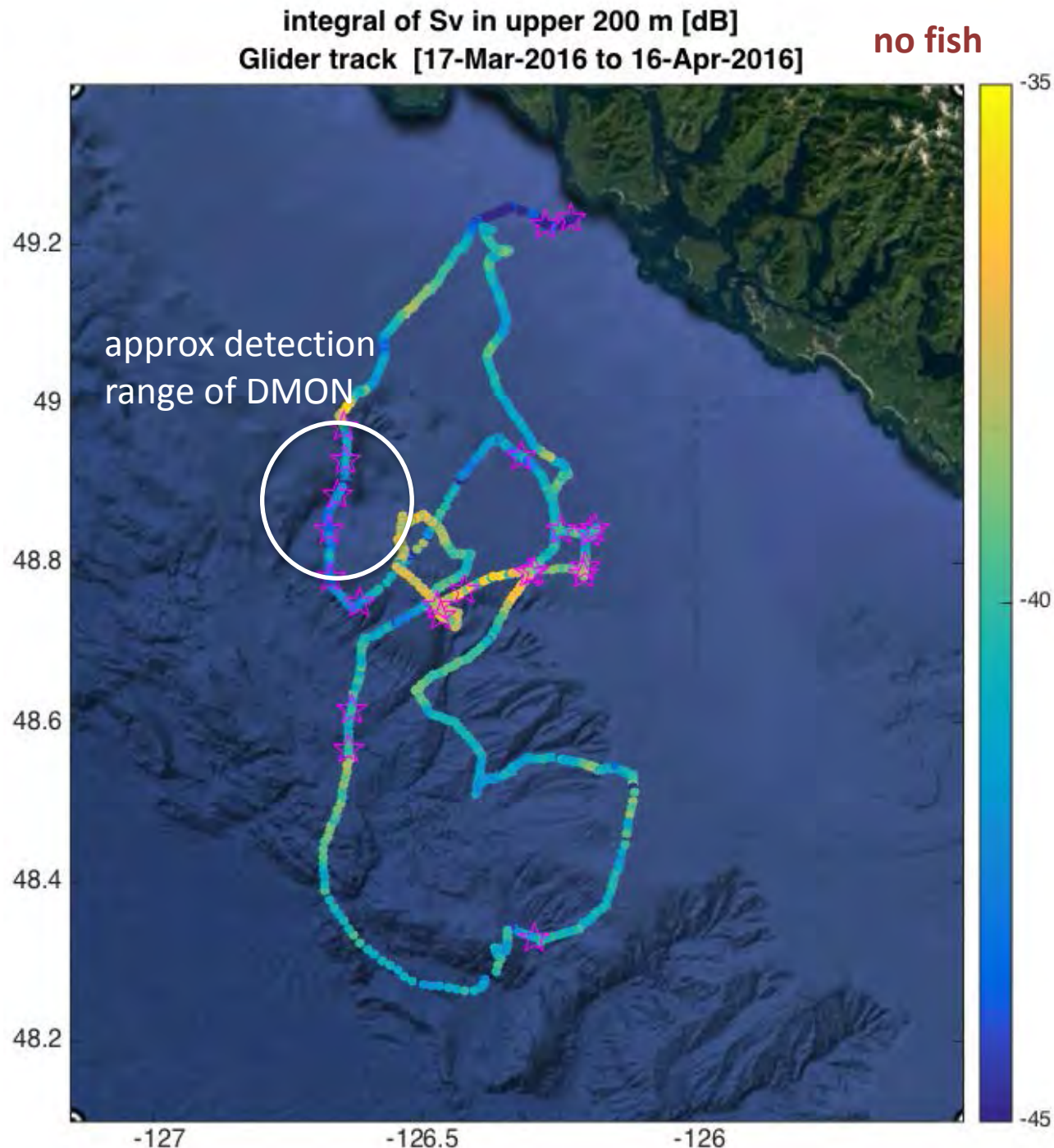


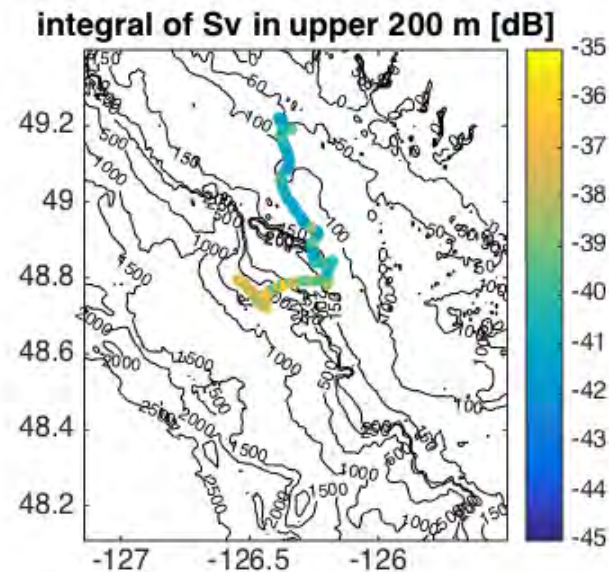
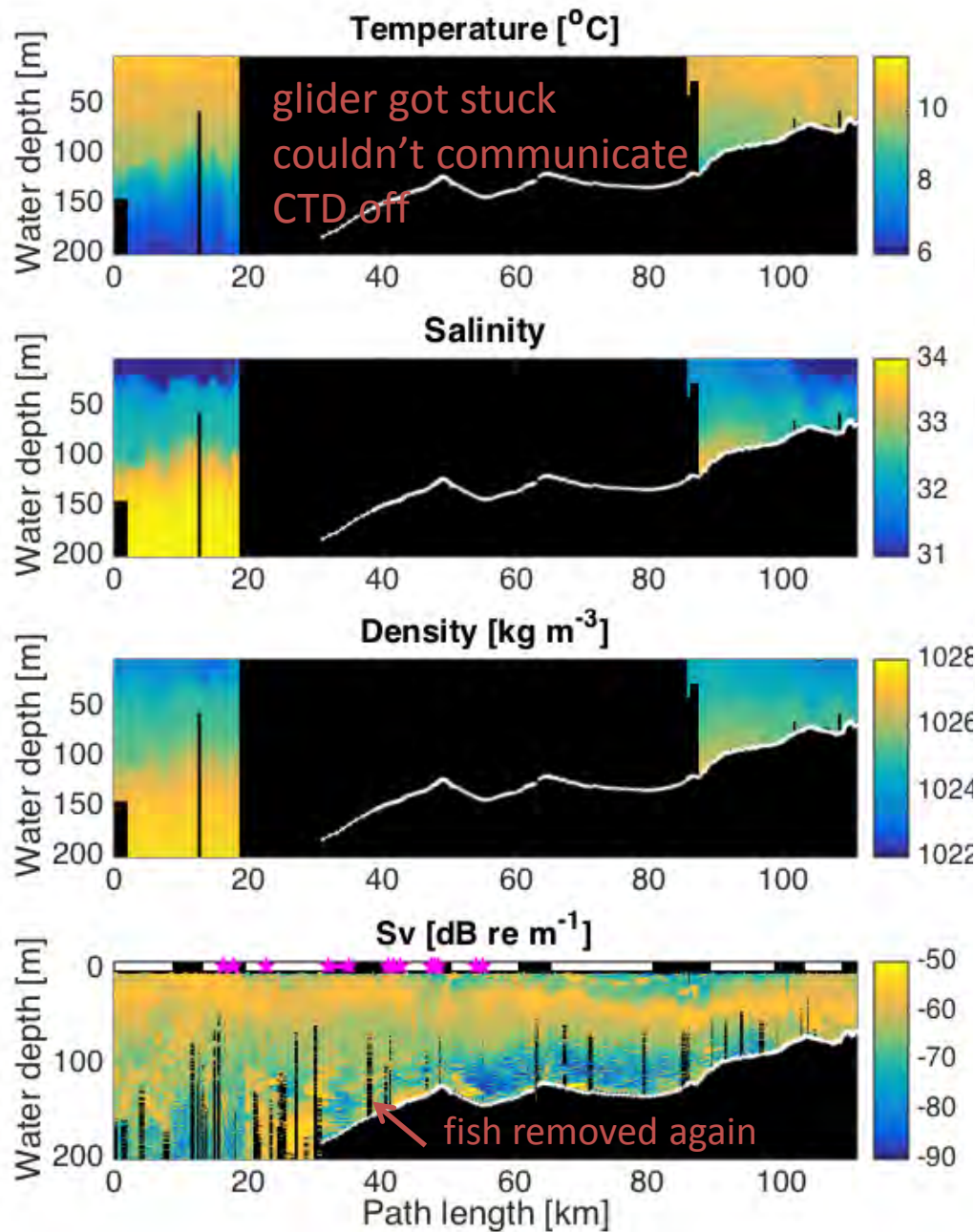
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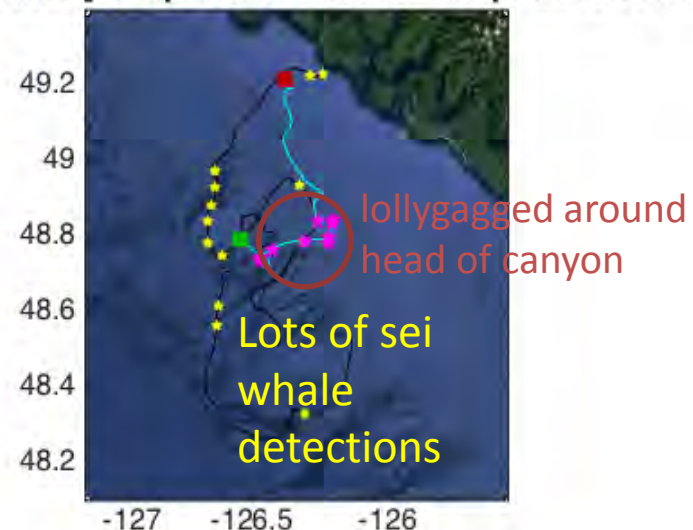
**Sei whale
detections still
don't co-occur
with strongest
integrated
backscatter, but
they are closer**

There seems to be a spatial relationship between increased zooplankton backscatter and the heads of the canyons





Glider track [08-Apr-2016 14:00 to 16-Apr-2016 13:00]



Summary

- Ultimate goal is to protect baleen whales from ship strike. Need to:
 - understand population size, distribution and habitat use of baleen whales in B.C.
 - preliminary glider deployment suggests canyons are important, need to sustain observations
 - communicate whale locations to the fleet to avoid collision
- Next step:
 - multiple-glider deployment in same location in Feb 2017 and 2018: adding parameters (turbulence) and **real-time whale detection**

SAVING CANADA'S GREAT WHALES

STARTS WITH KNOWING WHERE THEY SPEND THEIR TIME IN THE OCEAN



WHALE



apps.cwf-fcf.org/whales/

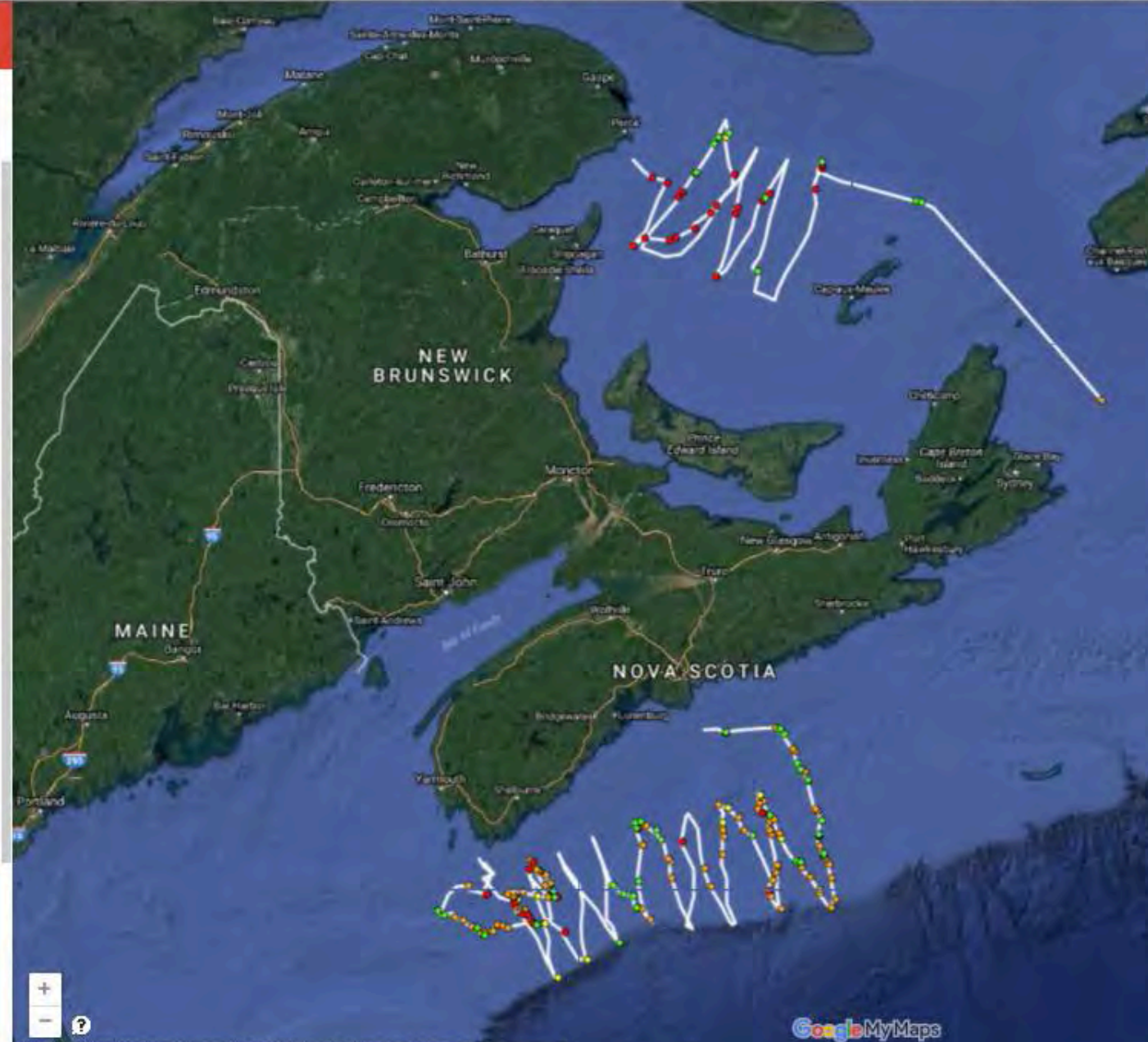
The Quest to Find Can...

- Sei Whale
 - 6/27/2016
 - 6/28/2016
 - 7/2/2016
 - 7/5/2016
 - ... 38 more

- Fin Whale
 - 8/6/2016
 - 8/6/2016
 - 8/6/2016
 - 8/11/2016
 - ... 93 more

- Right Whale
 - 6/29/2016
 - 7/8/2016
 - 7/11/2016
 - 8/12/2016
 - ... 30 more

- Humpback Whale
 - 7/24/2016
 - 8/4/2016
 - 8/5/2016
 - 8/5/2016
 - ... 43 more



Thanks



WHaLE

Whales, Habitat and Listening Experiment



BellAliant



MarTrans



IRVING

