

An aerial photograph of the Salish Sea coastline. The foreground shows a dense, dark green forested hillside. In the middle ground, the blue waters of the sea are dotted with several islands and peninsulas. The background features a range of mountains under a bright blue sky with scattered white clouds. A vertical orange line is positioned to the left of the text.

Salish Sea Science Roundtable



Land Acknowledgement

The UW Tacoma community acknowledges that we learn, teach, work and live on the ancestral land of the Coast Salish people. In particular, our campus is situated on traditional lands of the Puyallup Tribe of Indians. We recognize that this is a difficult and painful history, and we understand we must play an active role in remembering, not just what happened to Indigenous communities; post settlement, but also the rich history that existed long before colonization. This land acknowledgement is one small act in an ongoing process of honoring the past while working together with local Tribes to build a more inclusive and thoughtful community.

An illustration of a large black and red commercial freighter at anchor in a bay. The ship has "COMMERCIAL FREIGHTER" written on its side and a whale logo. A red dashed line indicates the anchor's path. The background shows a coastal town, mountains, and other boats. The foreground shows a cross-section of the seabed with various marine life like crabs, shrimp, and fish. The text "The impacts of commercial anchoring in British Columbia" is overlaid in white on a green background.

The impacts of commercial anchoring in British Columbia

Fiona Francis

March 10, 2026

Salish Sea Science Roundtable Series

fiona.francis@dfo-mpo.gc.ca

Talk Overview

- ✍ Background on commercial anchoring
- ✍ Overview of research in Salish Sea
- ✍ Current research in Prince Rupert



Background on commercial anchoring





COSCO SHIPPING

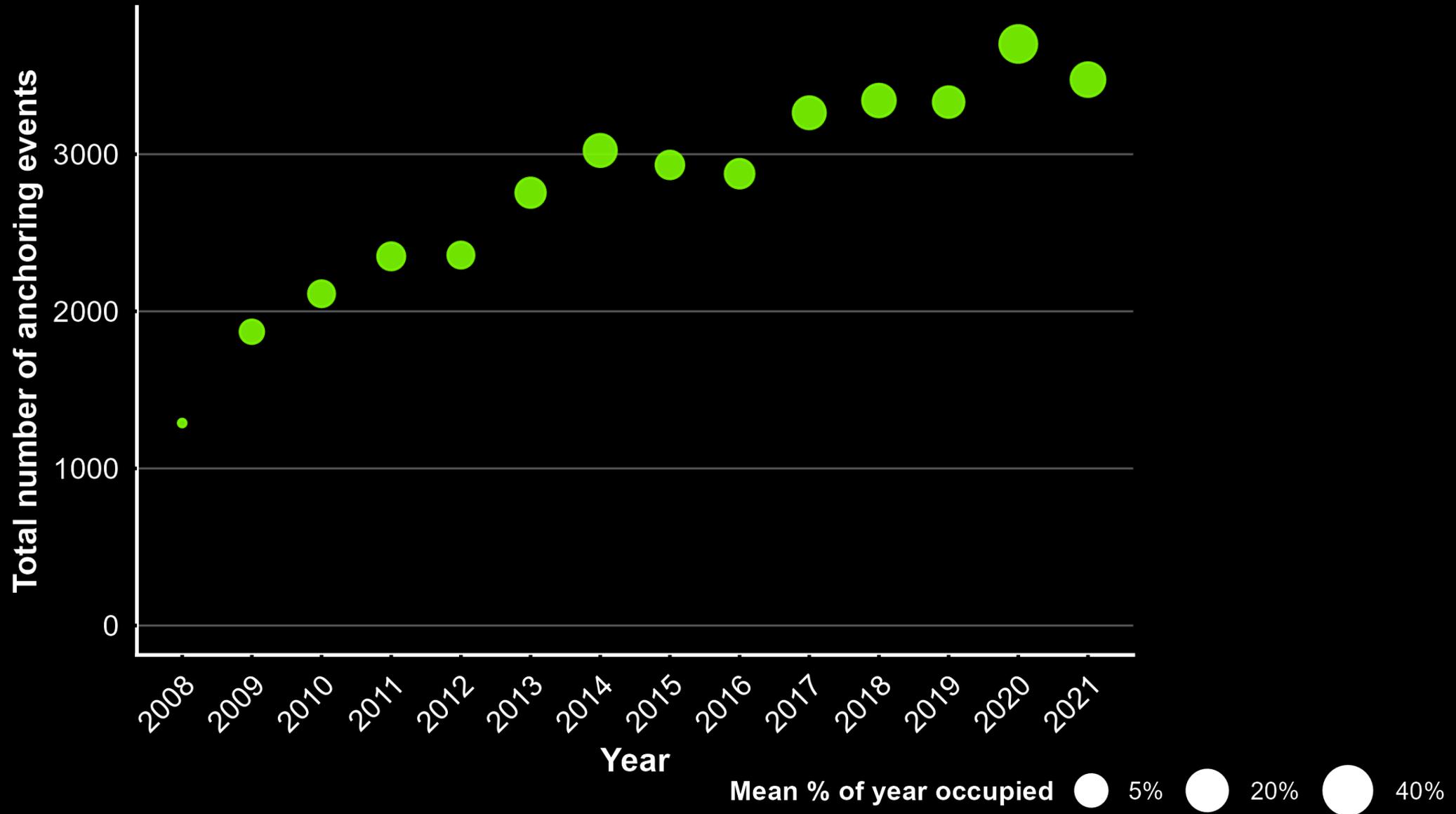
COSCO EUROPE
PANAMA

WANG MING

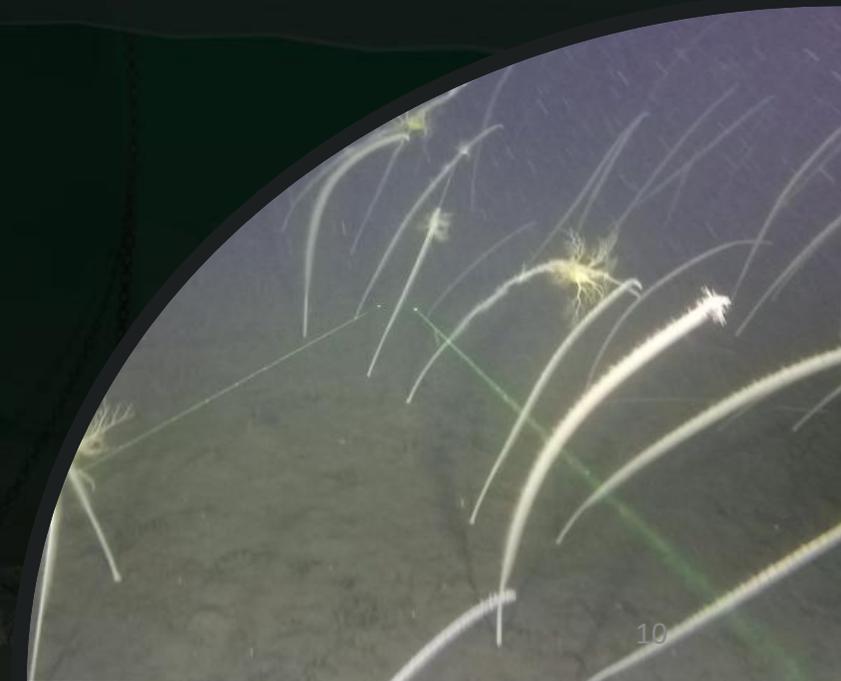
MSC



Commercial anchoring is increasing in BC



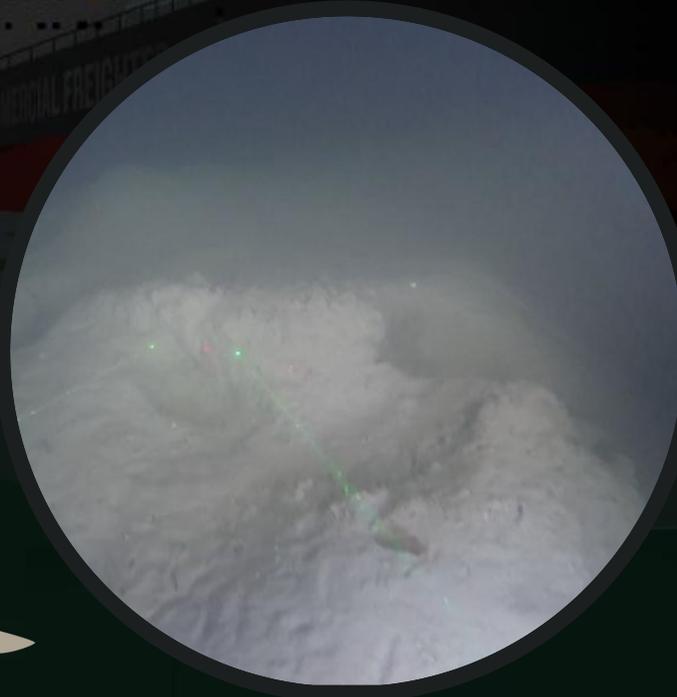
Many different anchoring stressors



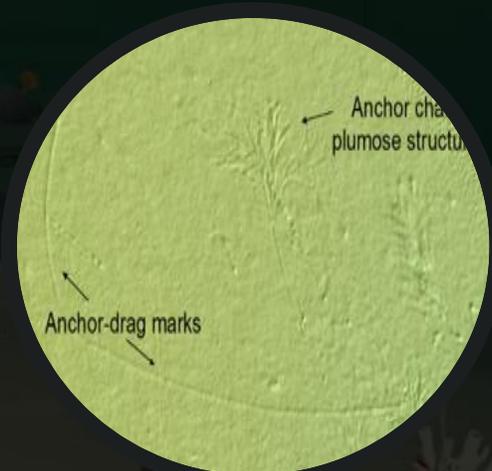
Many different anchoring stressors



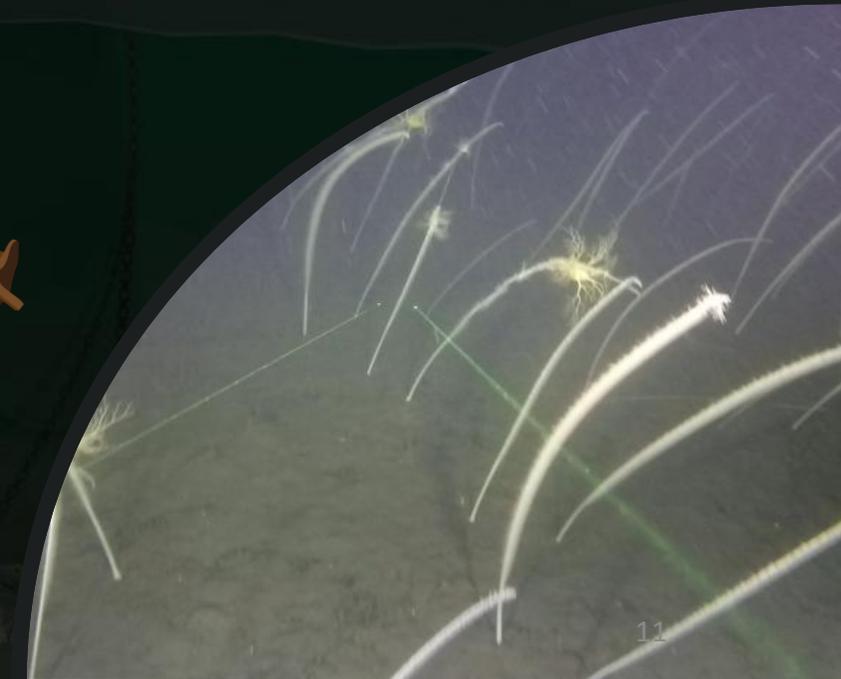
Social and cultural



Marine Organisms



Marine Habitat



Studies on commercial anchoring are limited

Hannah et al. 2020

 Fisheries and Oceans Canada / Pêches et Océans Canada
Ecosystems and Oceans Science / Sciences des écosystèmes et des océans

Canadian Science Advisory Secretariat (CSAS)

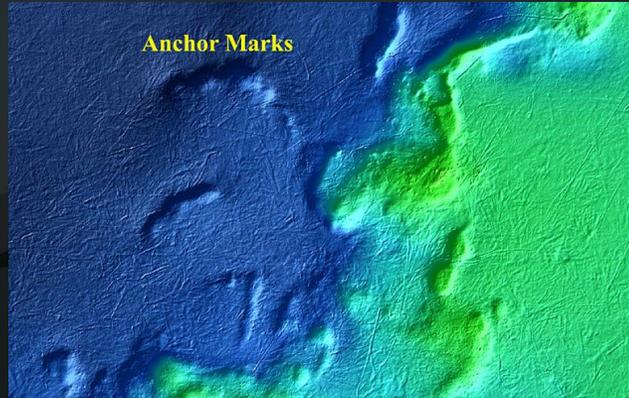
Research Document 2020/077

National Capital Region

Pathways of Effects Conceptual Models for Marine Commercial Shipping in Canada: Biological and Ecological Effects

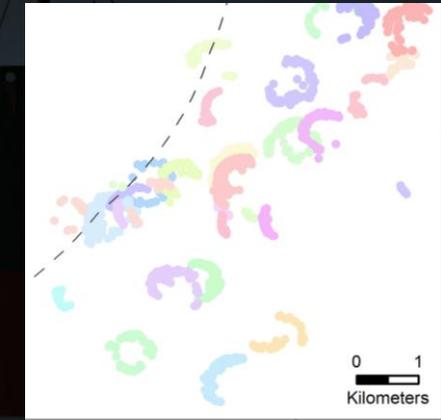
Lucie Hannah¹, Kate Thornborough², Cathryn Clarke Murray¹, Jocelyn Nelson³, Andrea Locke¹, James Mortimer³, and Jack Lawson⁴

Anchorage zones



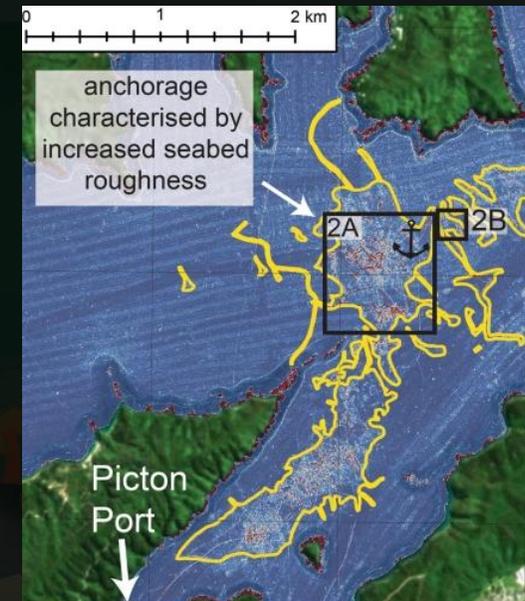
Davis et al. 2025, Schulze et al. 2025,
Qualitative observations

Ship movement



Davis et al. 2016

Single anchorage



Watson et al. 2022

3-year project on anchorage impacts in BC

- 116 active commercial anchorages in BC
- Pacific Pilotage Authority tracks use (since 2008)

 Fisheries and Oceans Canada / Pêches et Océans Canada

 Natural Resources Canada

 Transport Canada / Transports Canada





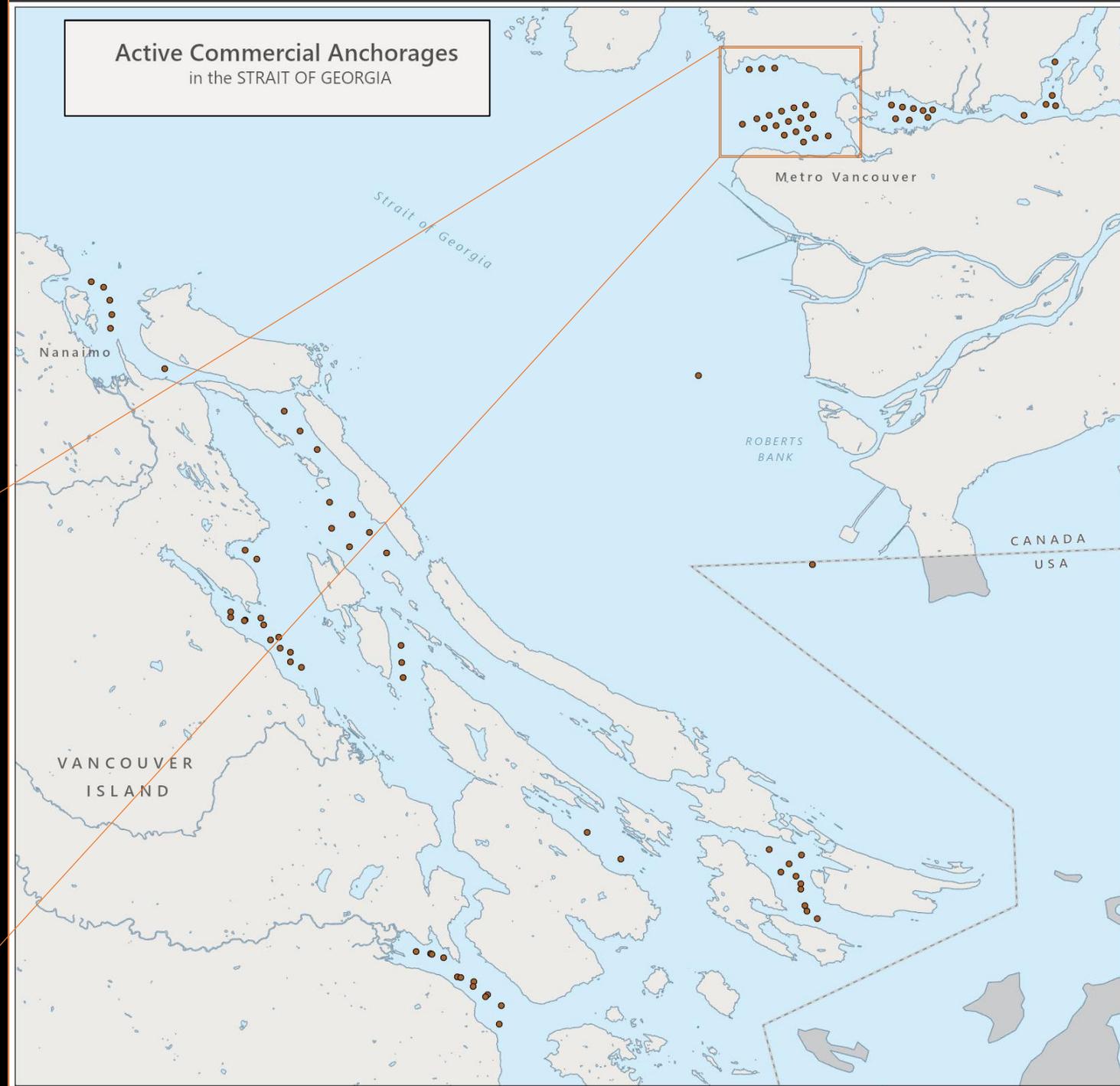
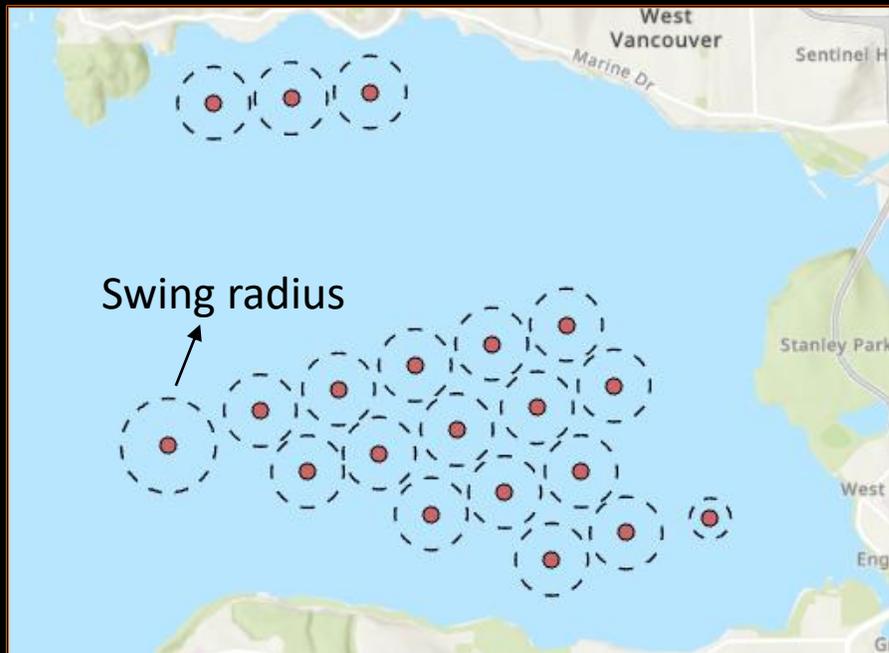
Research in the Salish Sea



Study Region: Southern Gulf Islands and Port of Vancouver

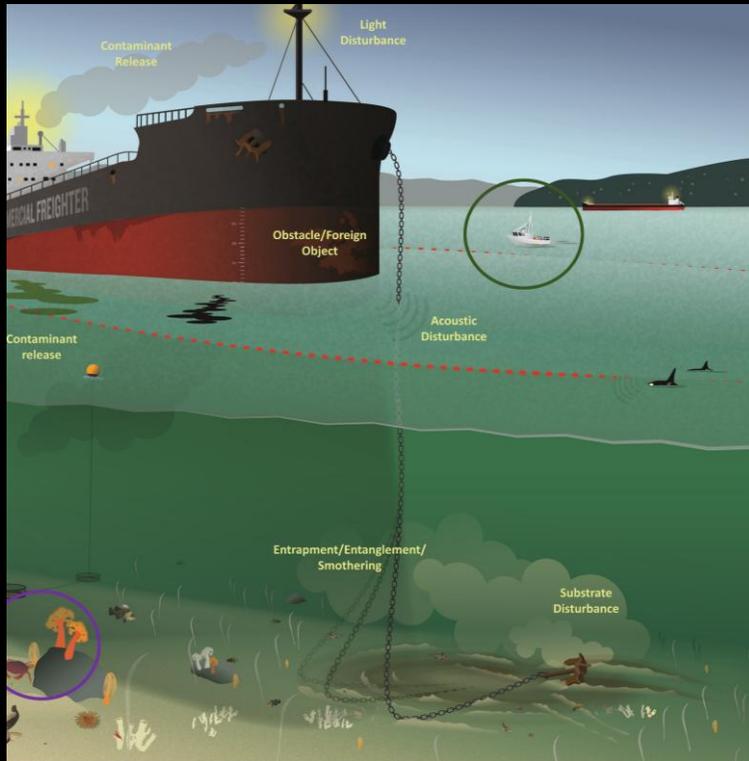


Study Region: Southern Gulf Islands and Port of Vancouver

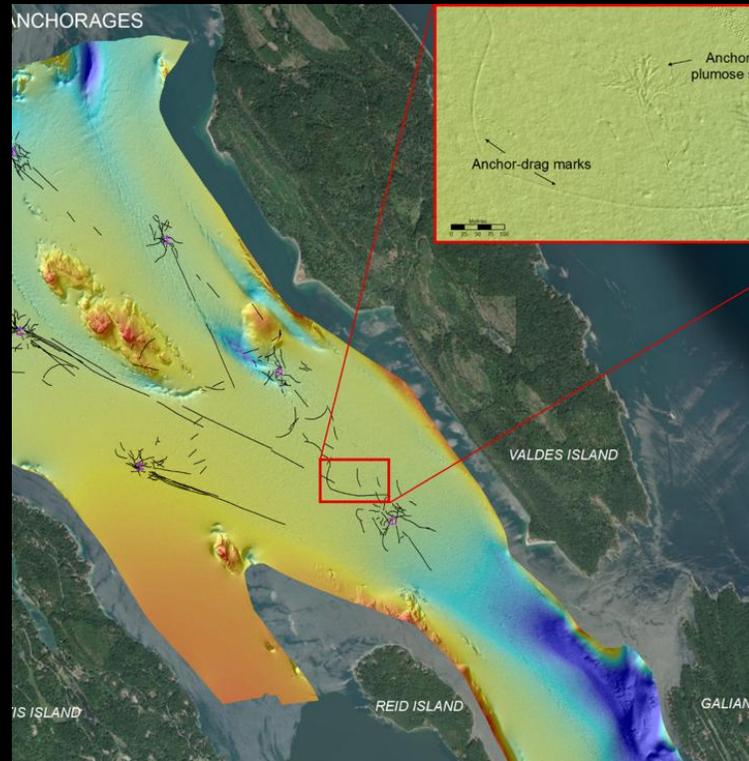


Three areas of research

Stressors and effects



Physical impacts

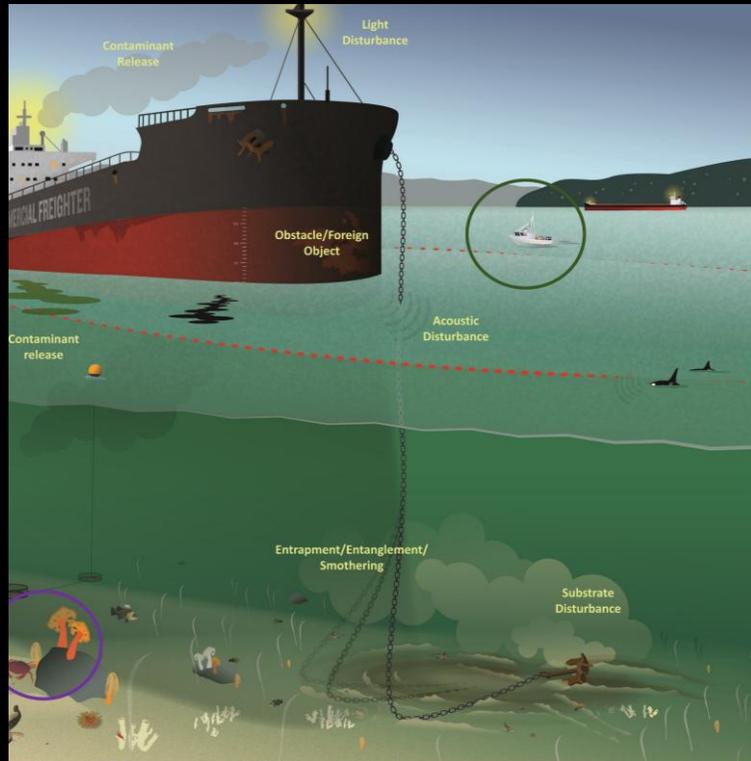


Biological impacts

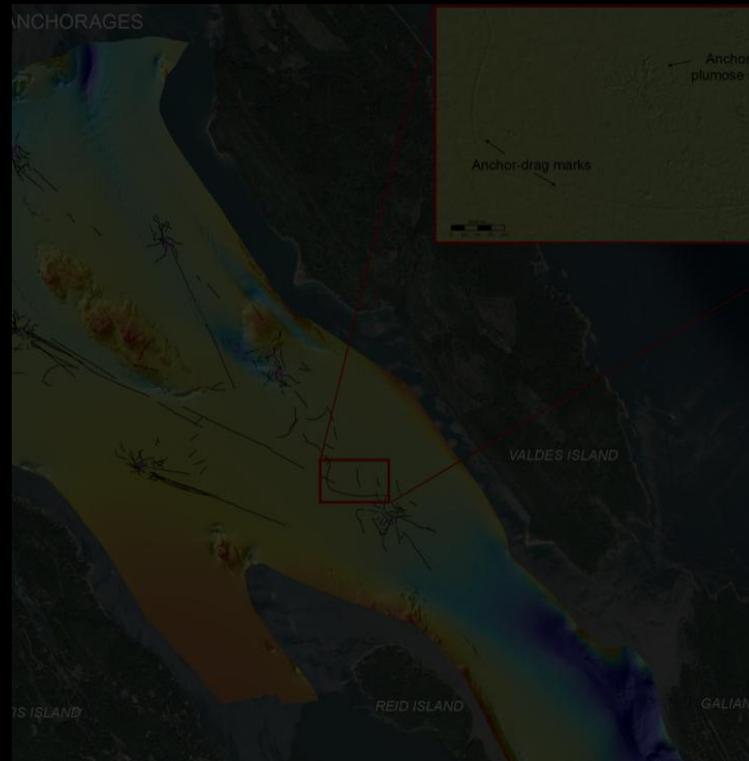


Stressors and Effects of Commercial Anchoring

Stressors and effects

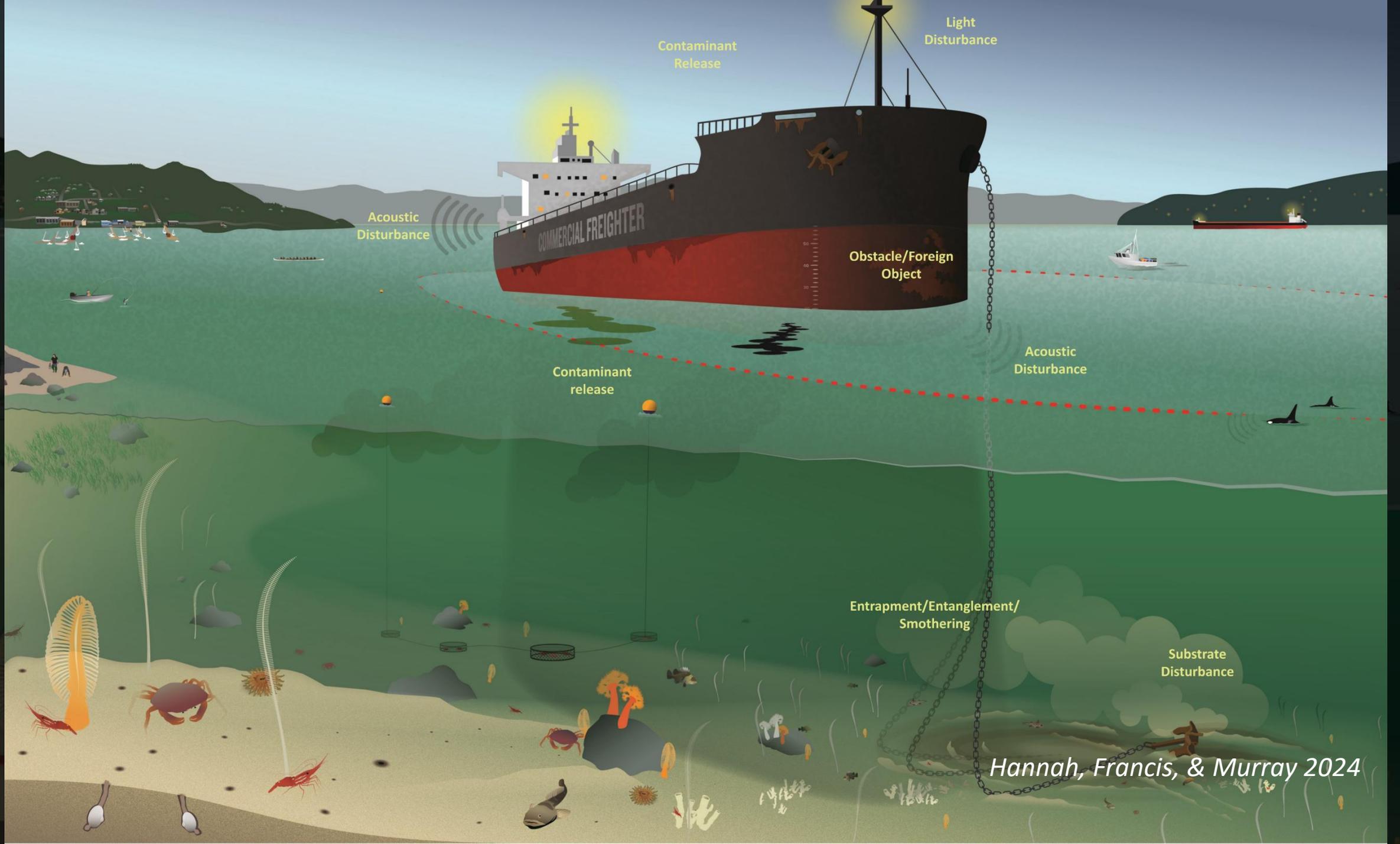


Physical impacts



Biological impacts





Contaminant Release

Light Disturbance

Acoustic Disturbance

COMMERCIAL FREIGHTER

Obstacle/Foreign Object

Contaminant release

Acoustic Disturbance

Entrapment/Entanglement/Smothering

Substrate Disturbance

Hannah, Francis, & Murray 2024

Culture and Community



Human Health



Marine Habitats



Marine Organisms



Economic



Acoustic Disturbance



Contaminant release

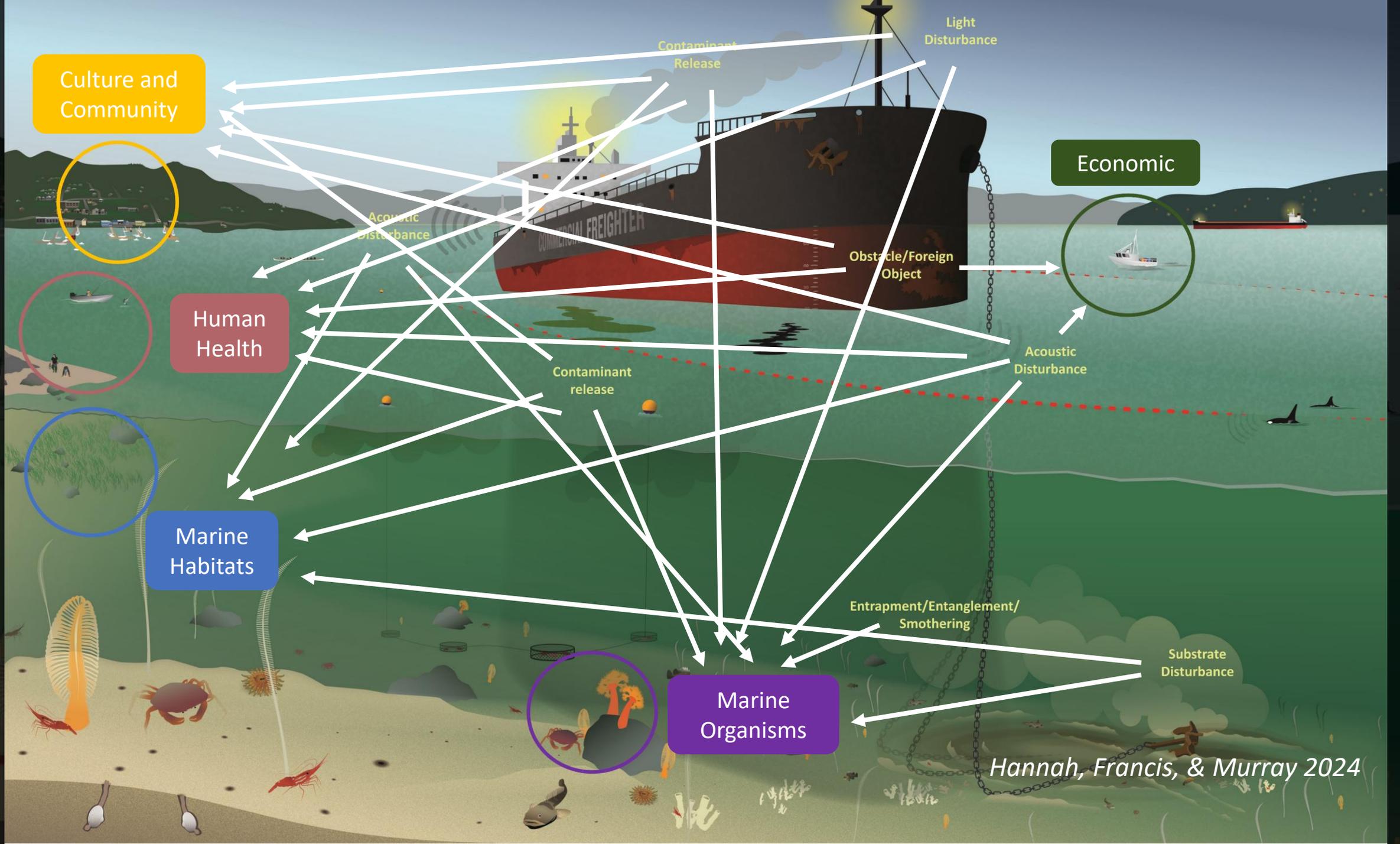


Acoustic Disturbance

Entrapment/Entanglement/Smothering

Substrate Disturbance

Hannah, Francis, & Murray 2024

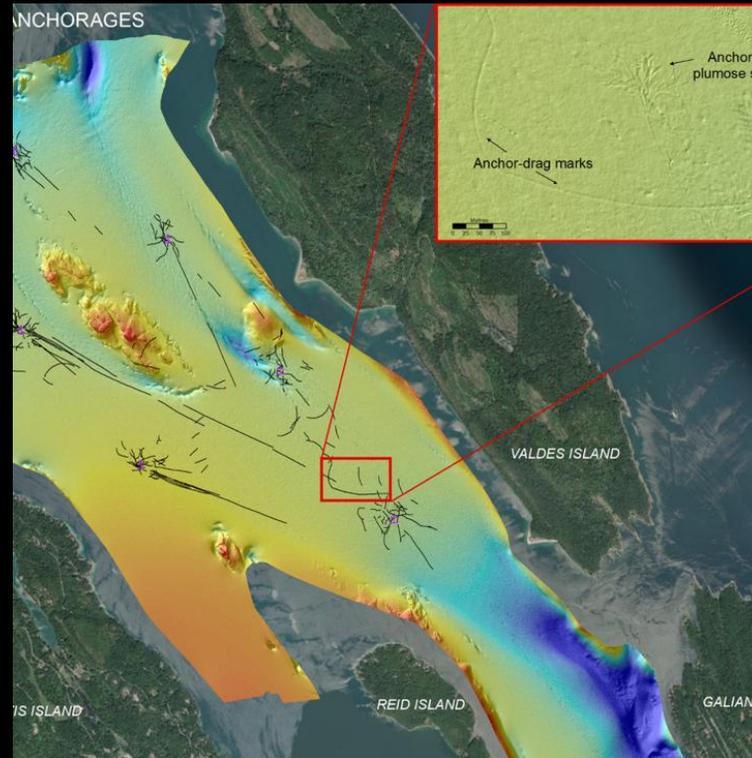


Investigate the impacts of commercial anchorages on marine benthic ecosystems in BC

Stressors and effects



Physical impacts

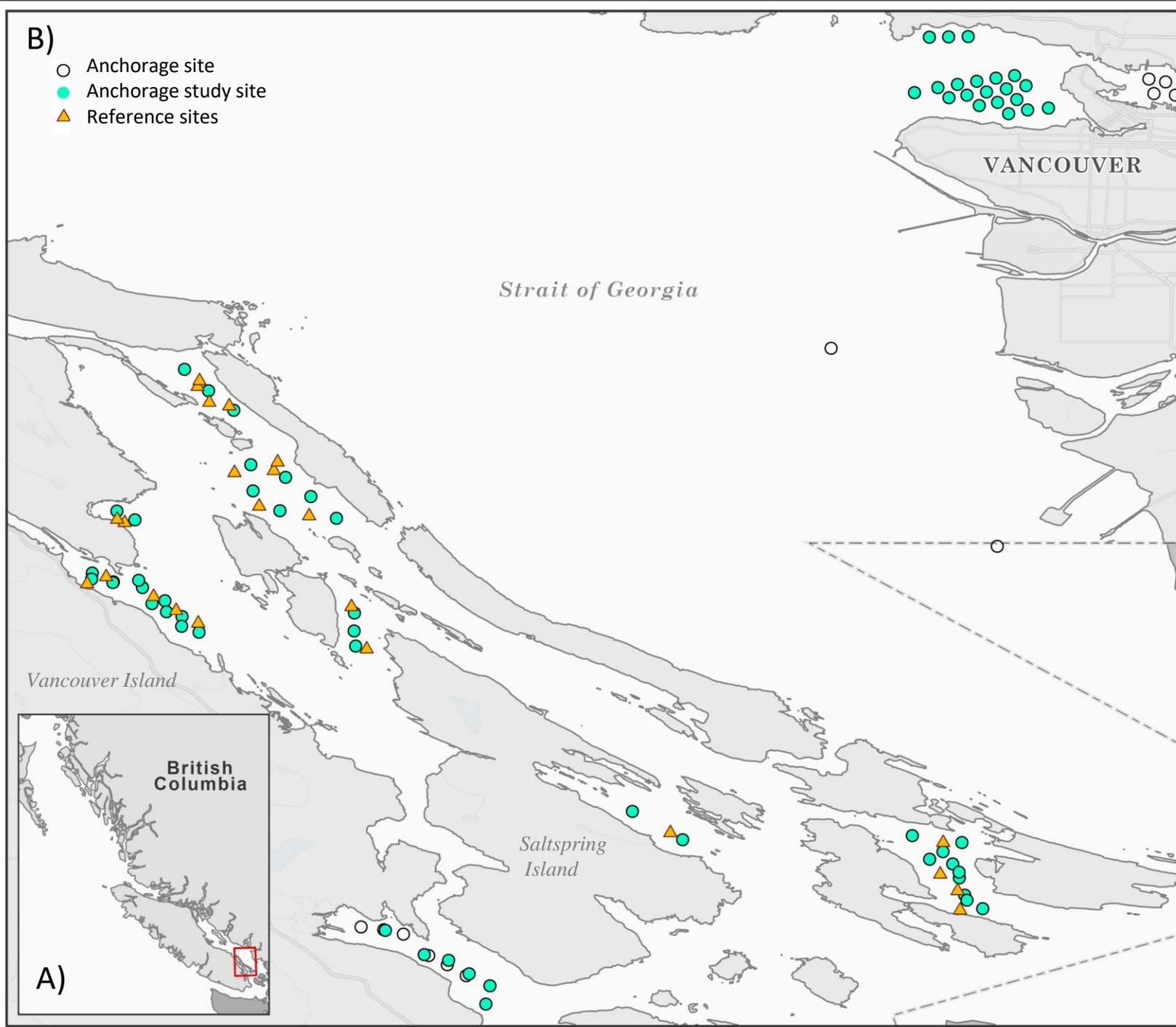


Biological impacts



B)

- Anchorage site
- Anchorage study site
- ▲ Reference sites



Vancouver Island

Strait of Georgia

VANCOUVER

British Columbia

Saltspring Island

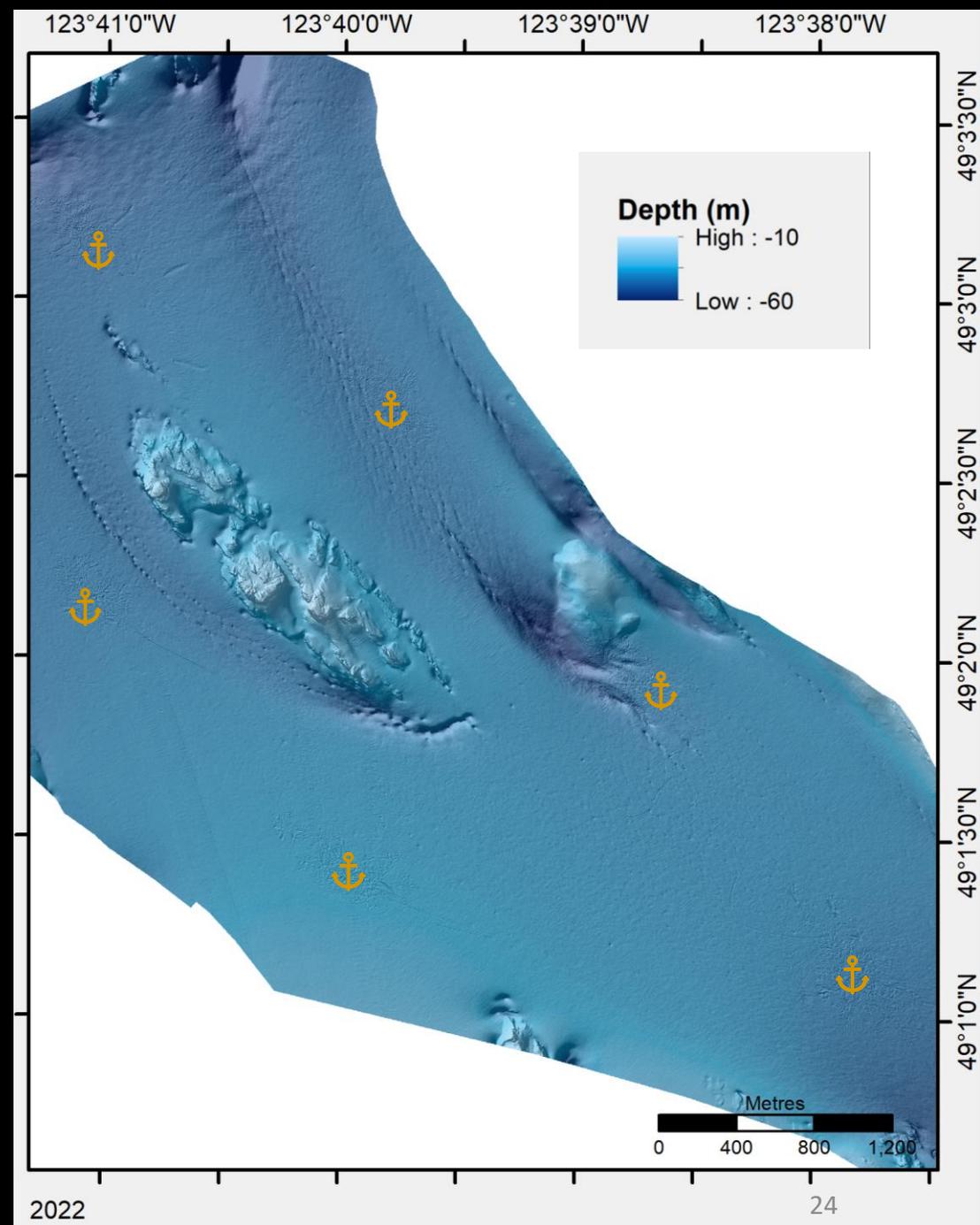
A)

Multibeam data

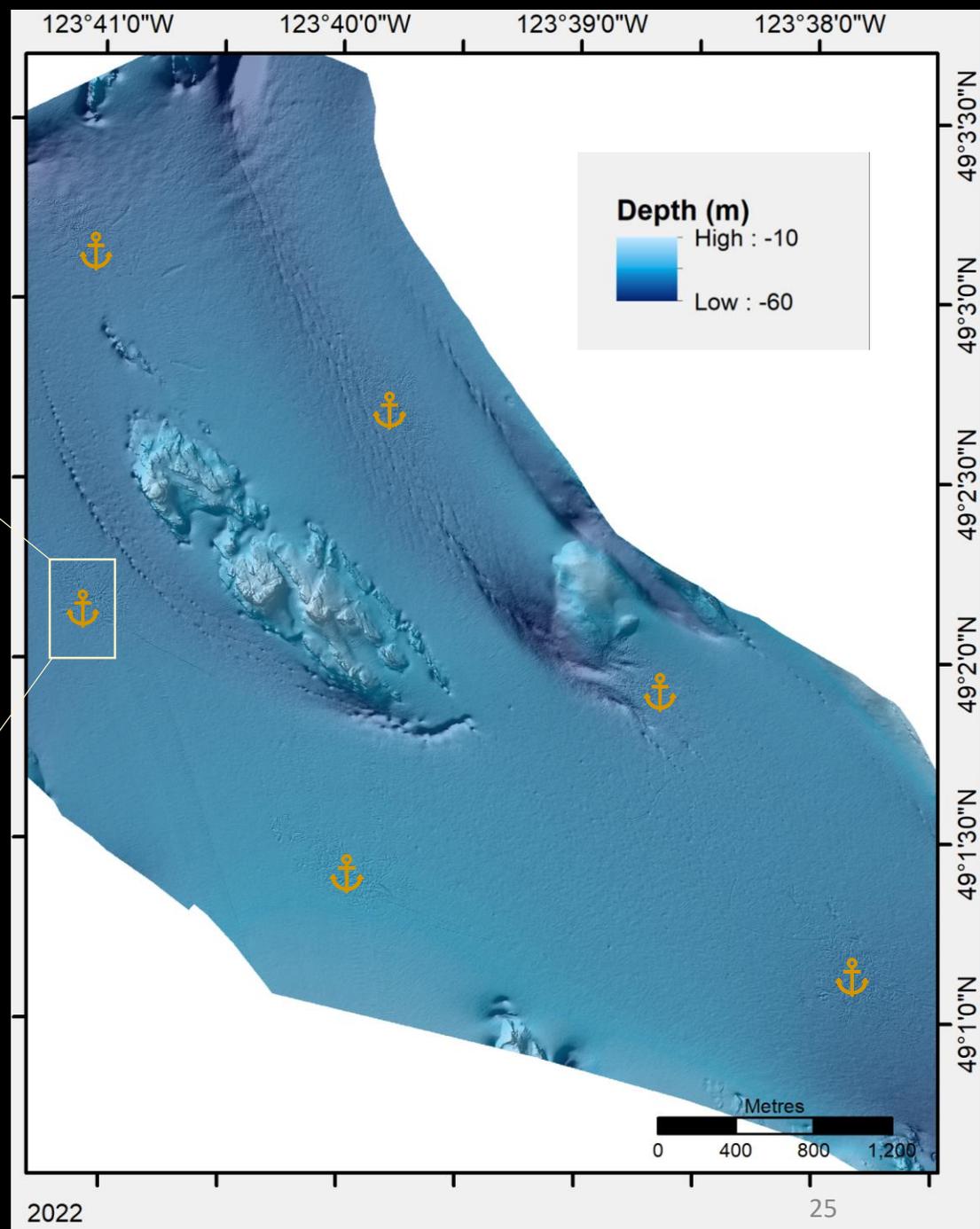
High resolution mapping of the seafloor by the Canadian Hydrographic Survey



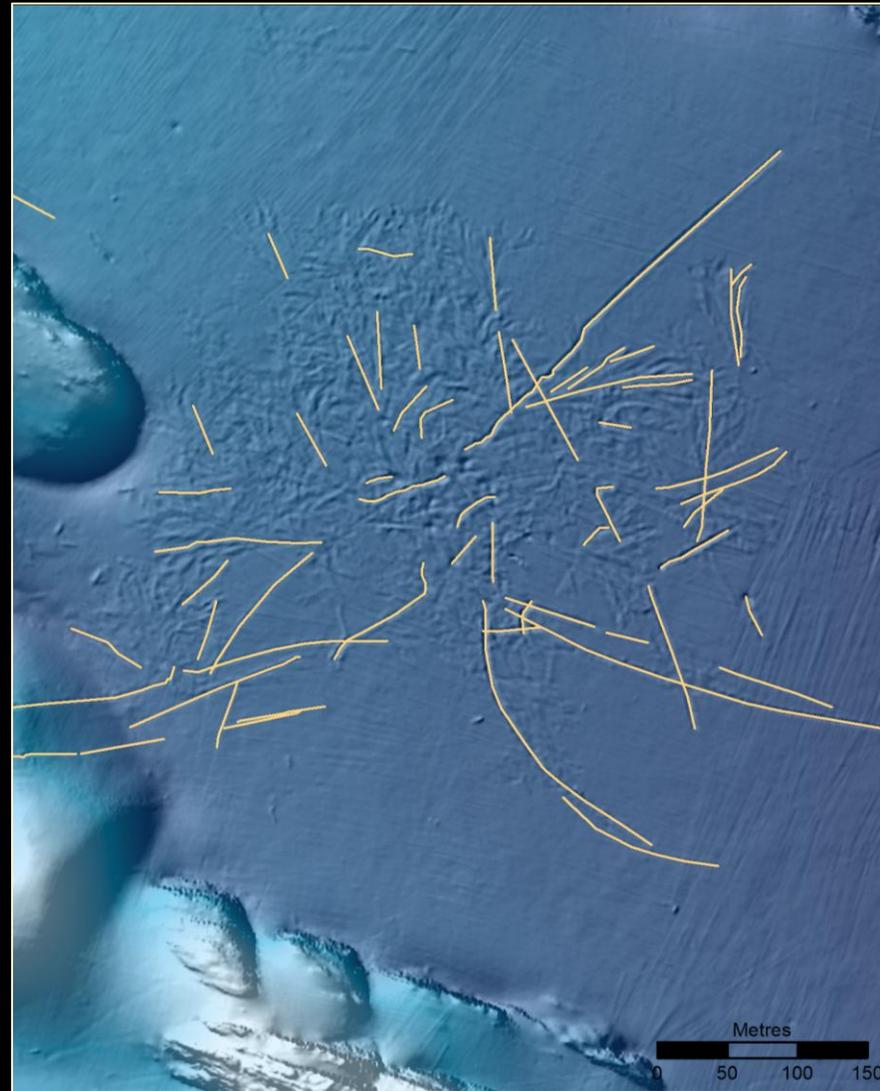
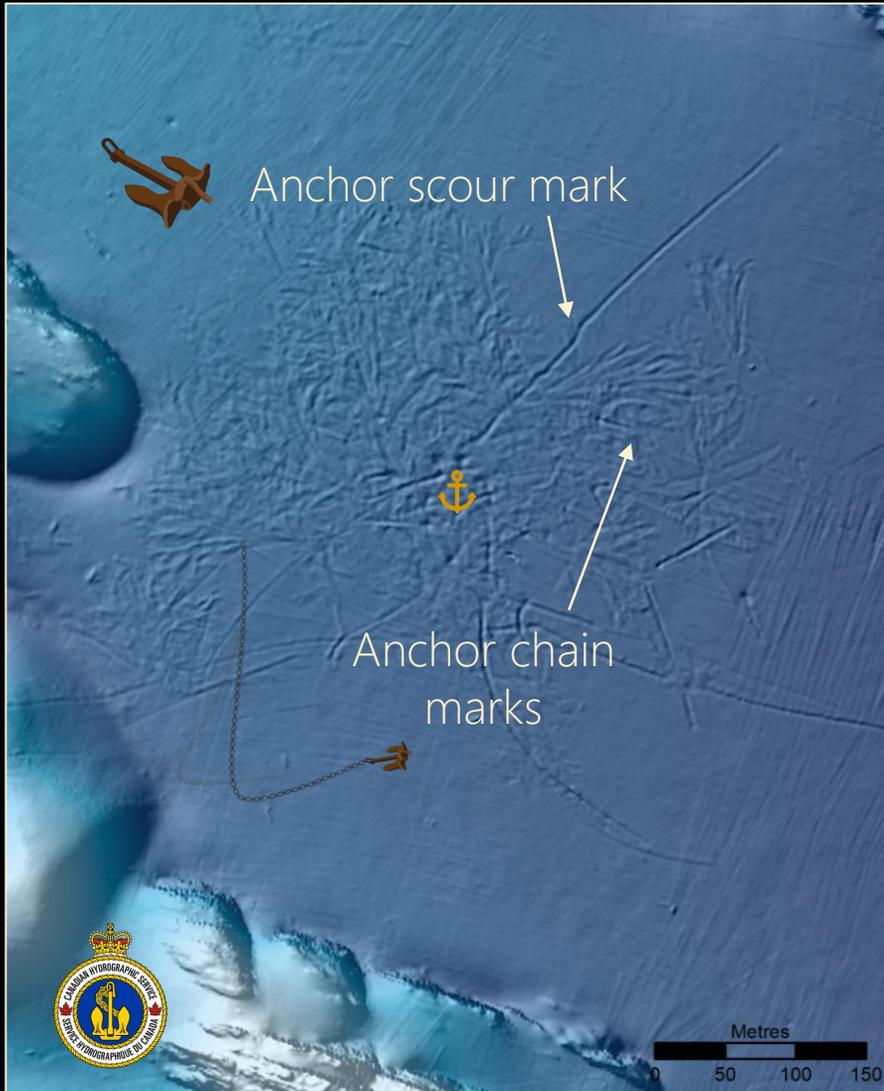
Data portal: <https://data.chs-shc.ca/dashboard/map>



Multibeam data



Scours



NRCAN scour dataset

<https://doi.org/10.4095/331346>

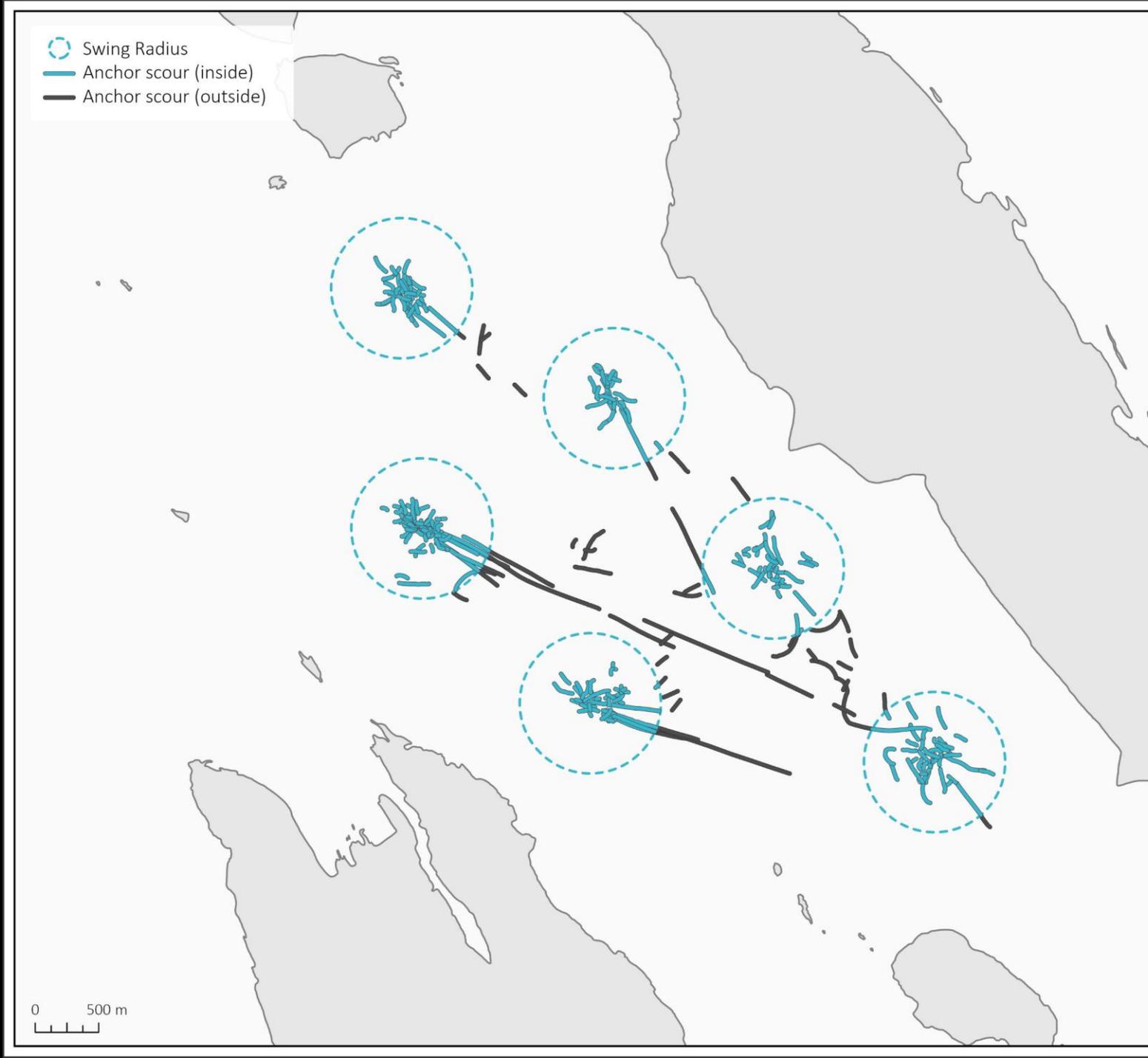
Contact:

[Karen.Douglas@NR](mailto:Karen.Douglas@NRCan-RNCan.gc.ca)

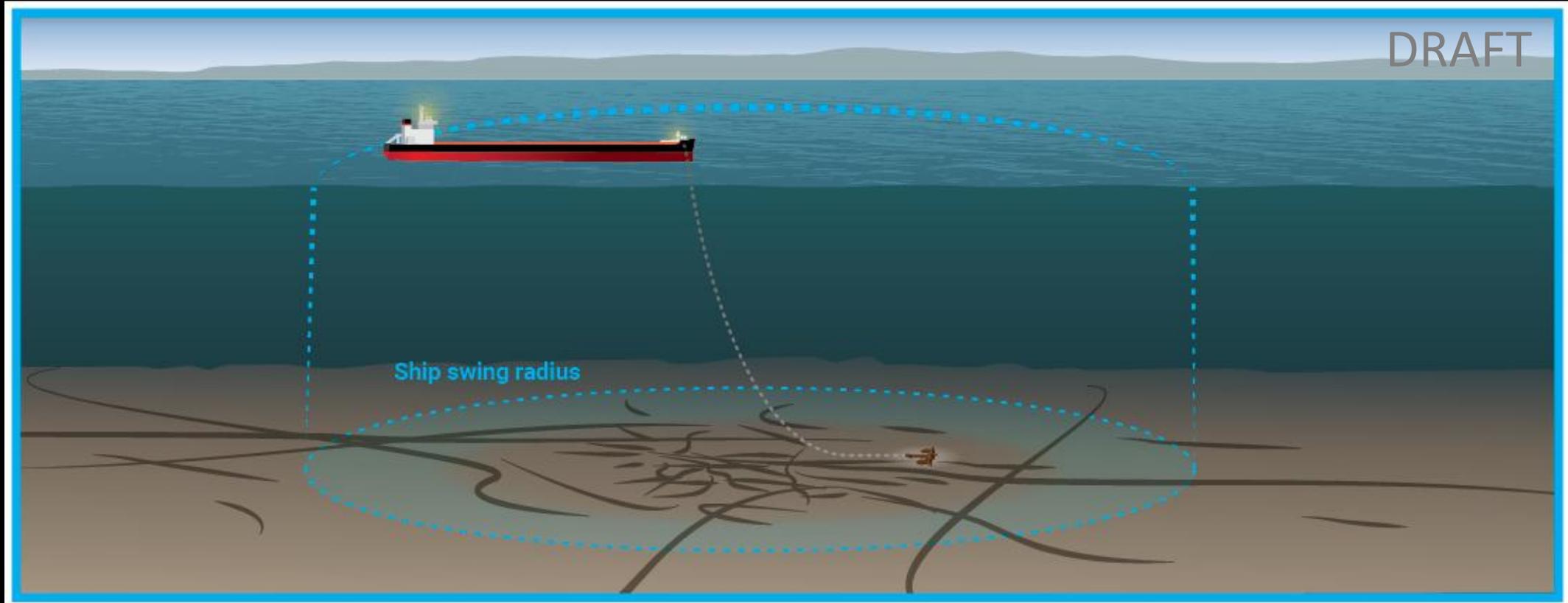
Can-RNCan.gc.ca

Multibeam figures are produced by Natural Resources Canada and incorporate Canadian Hydrographic Service data, pursuant to CHS MOU# 2022-0324-1260-N for illustrative, non-navigational purposes only. The incorporation of data sourced from CHS in this product shall not be construed as constituting an endorsement by CHS of this product.

We can look at scours in relation to where ships are supposed to be

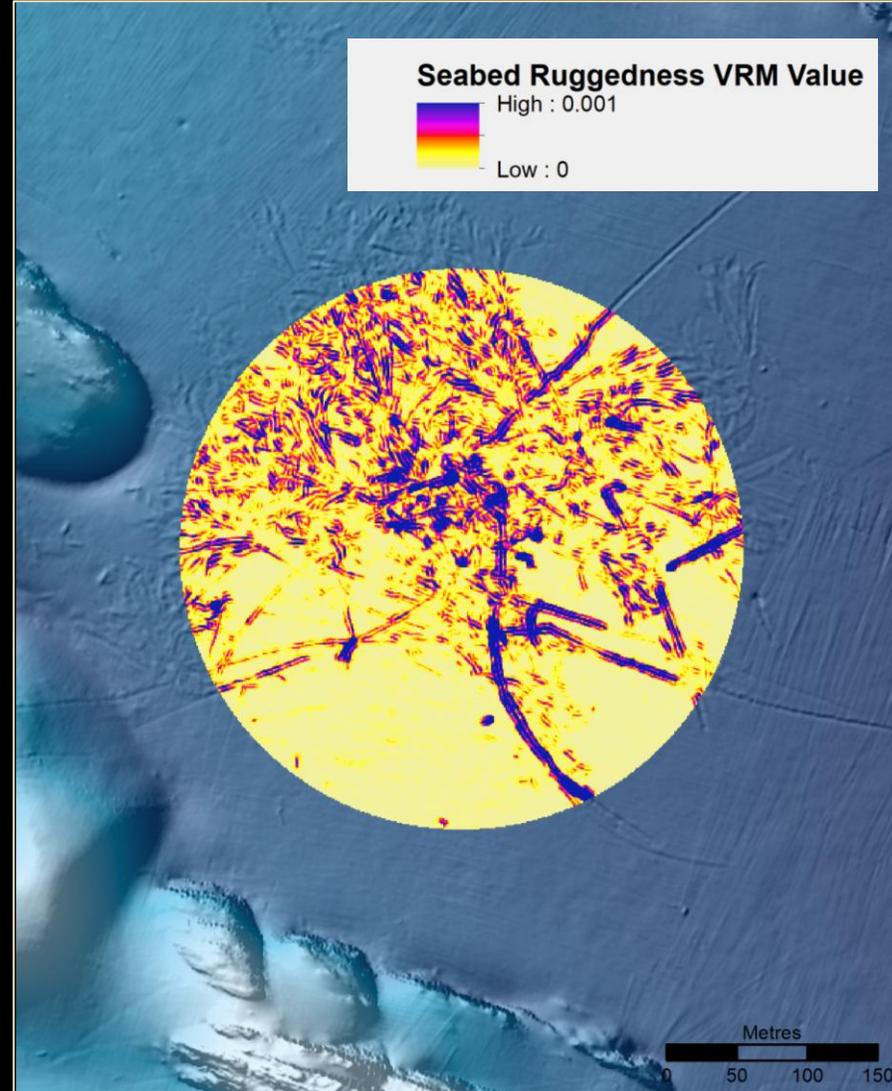
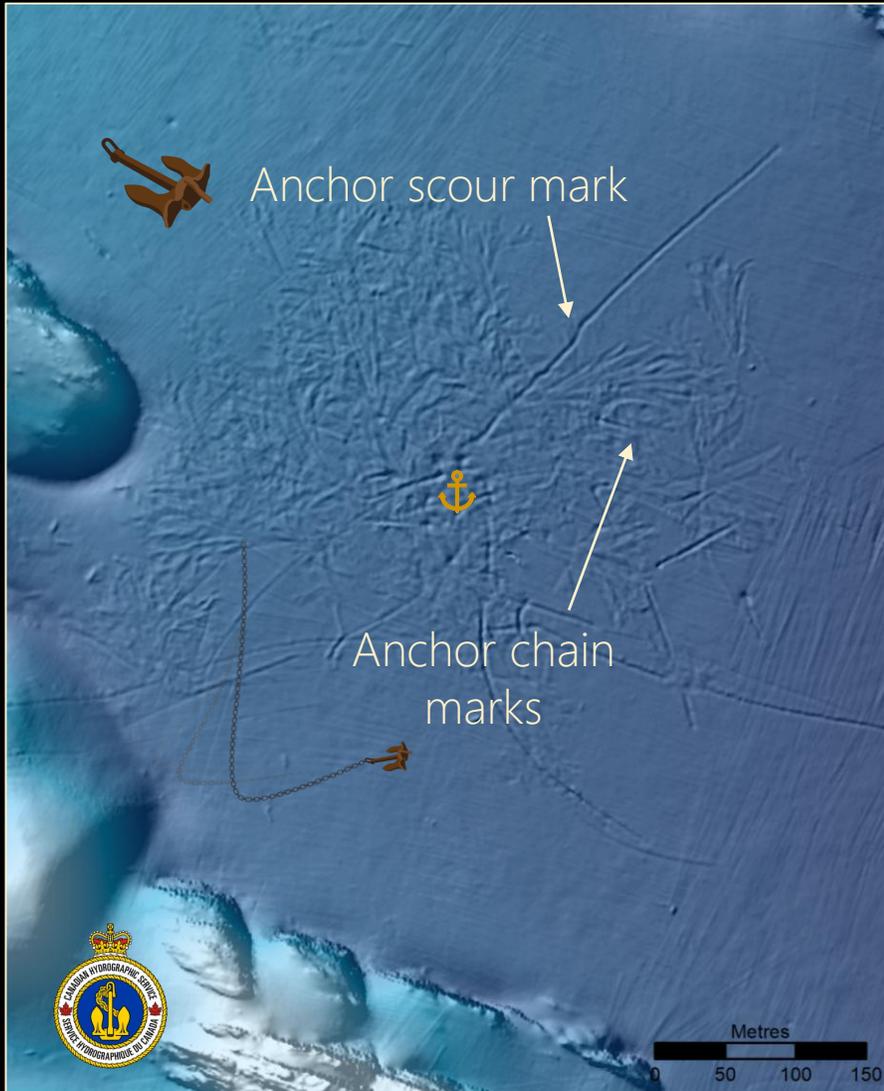


Scour marks can be over 2 km long around anchorages
Scour marks can extend outside swing radius

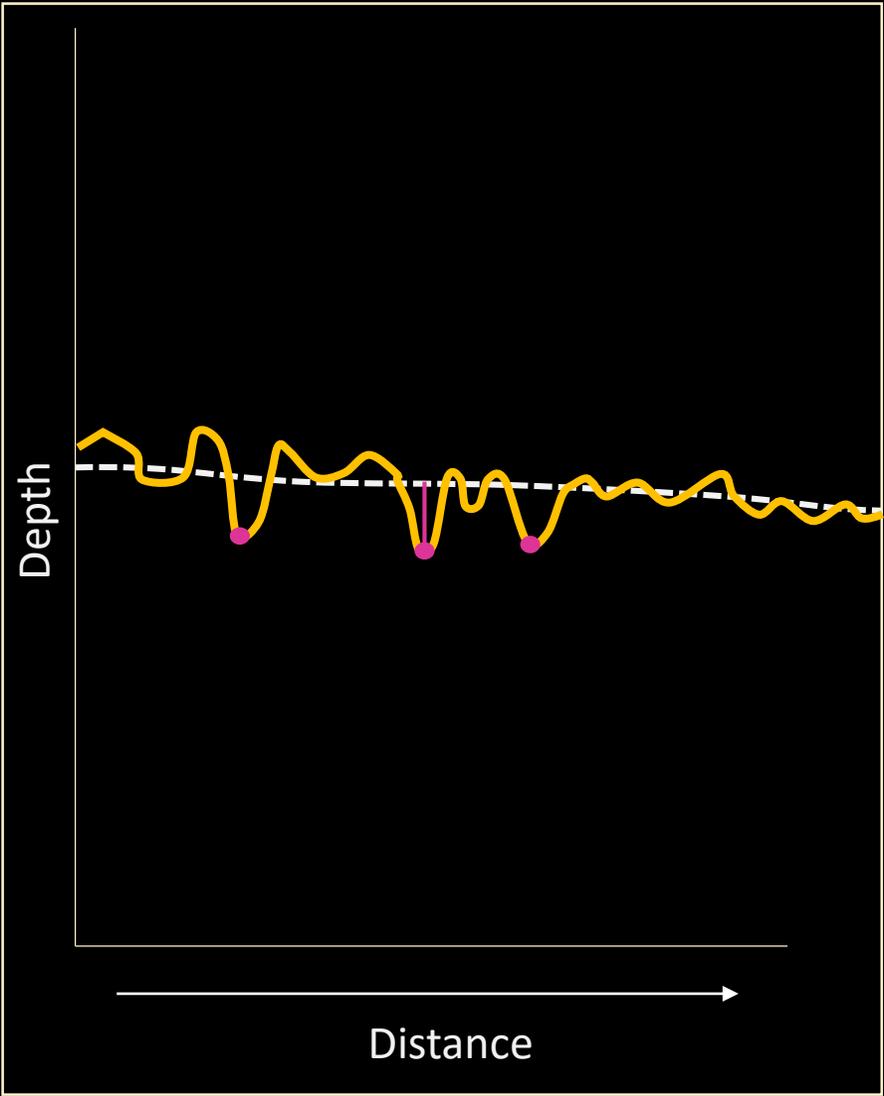


Francis et al. *In prep*

Ruggedness



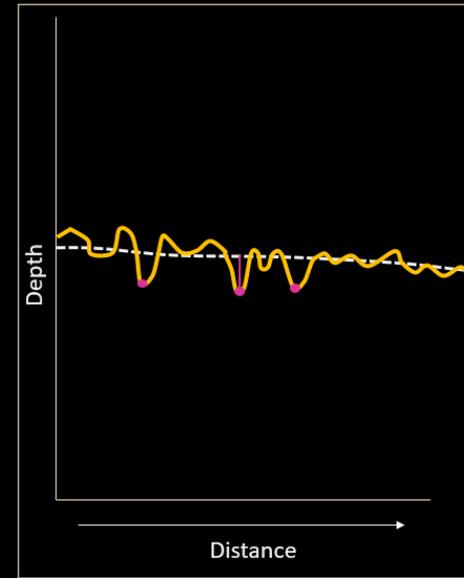
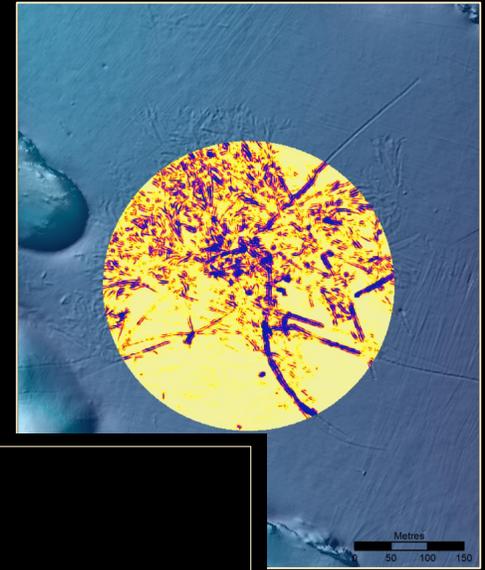
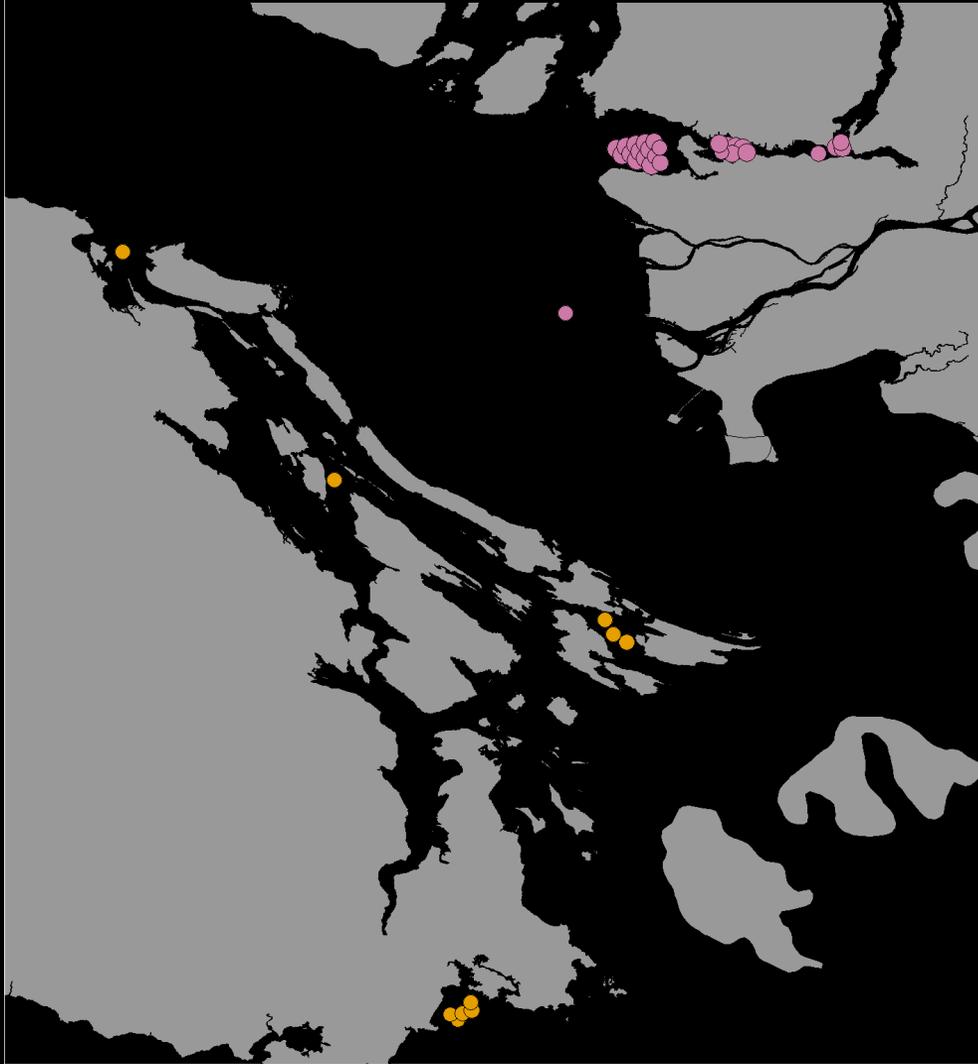
Depth of disturbance

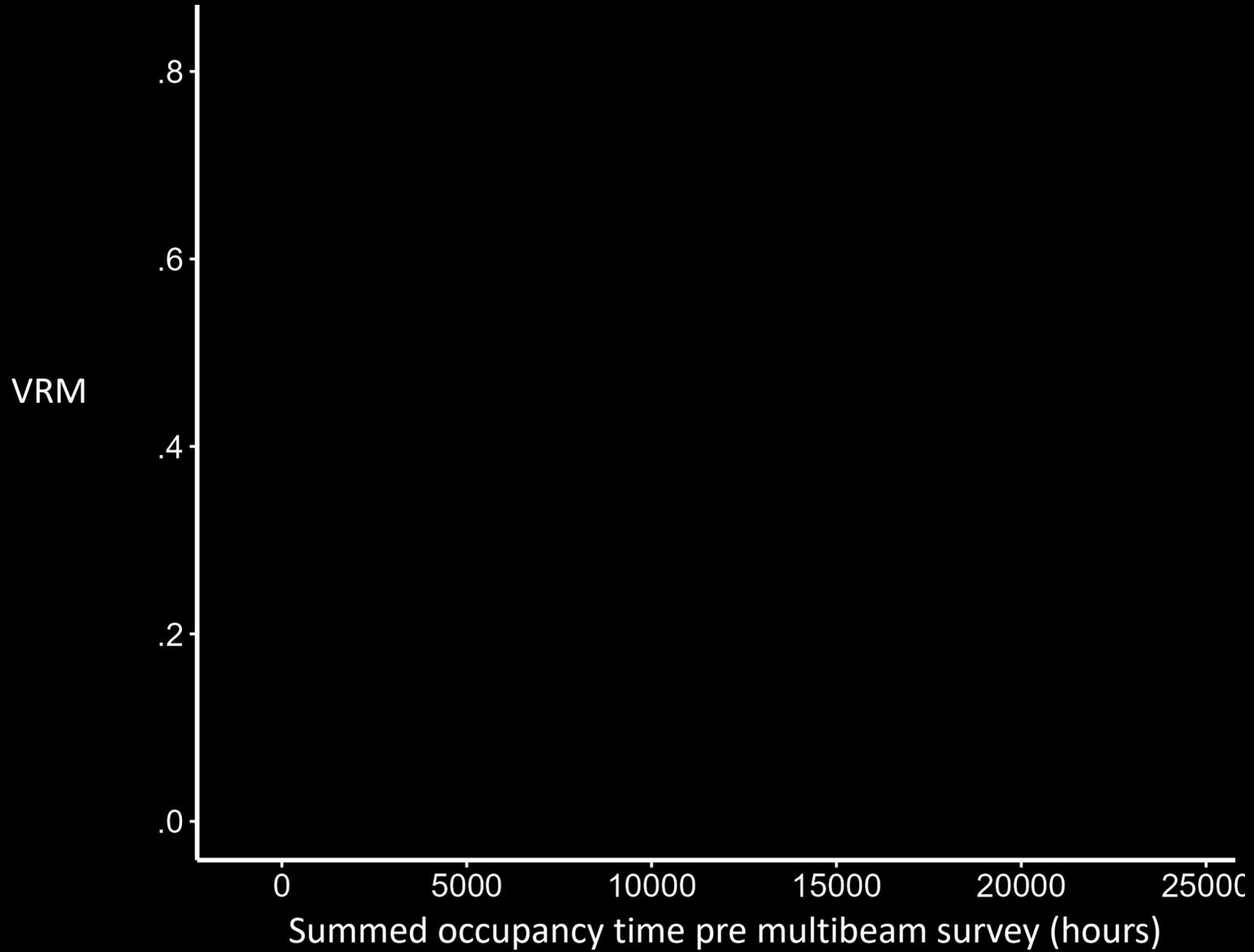
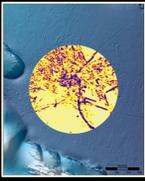


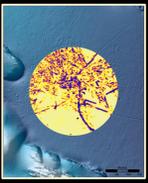
Calculate depth of depressions

How does anchorage use affect these measurements?

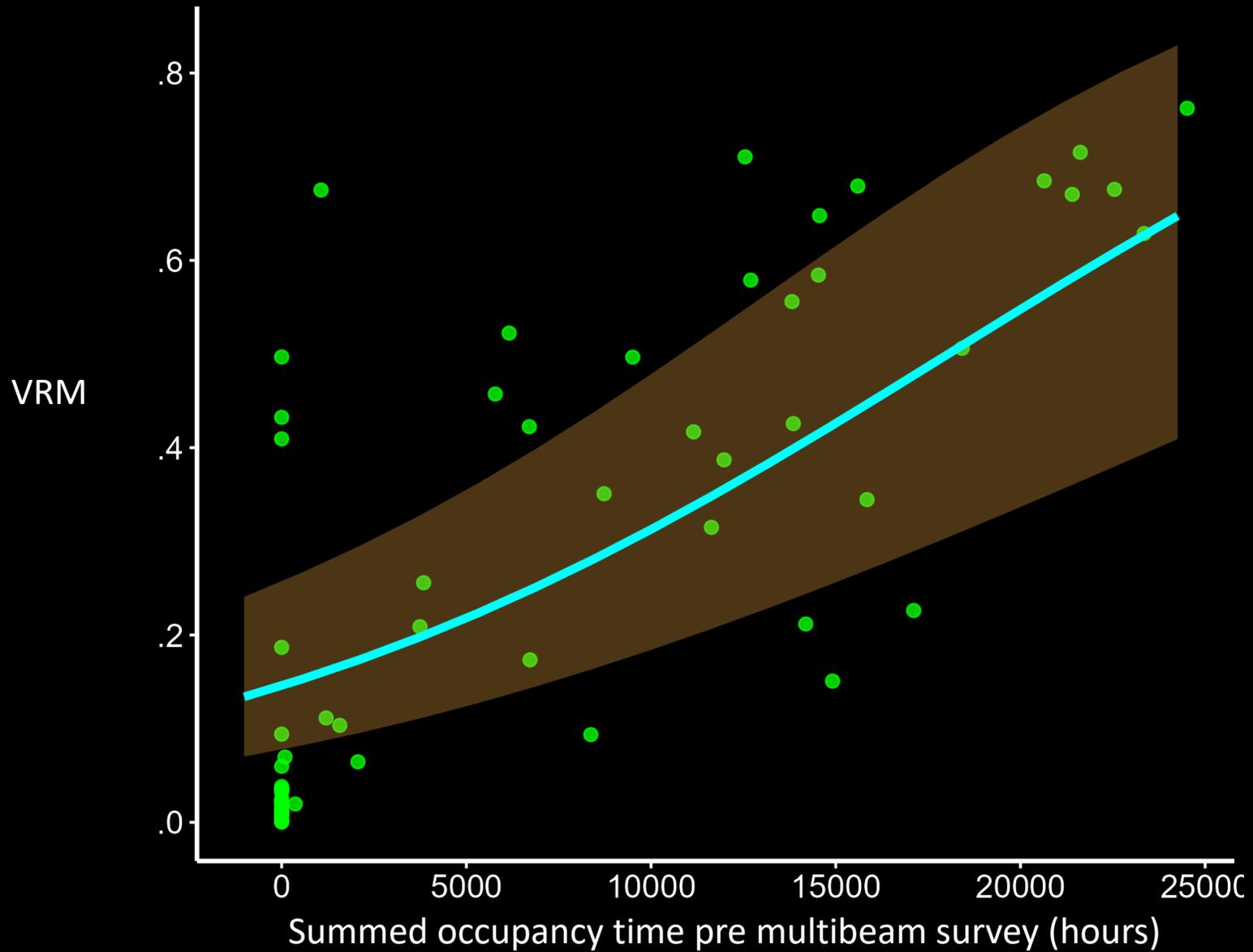
Year: 2008

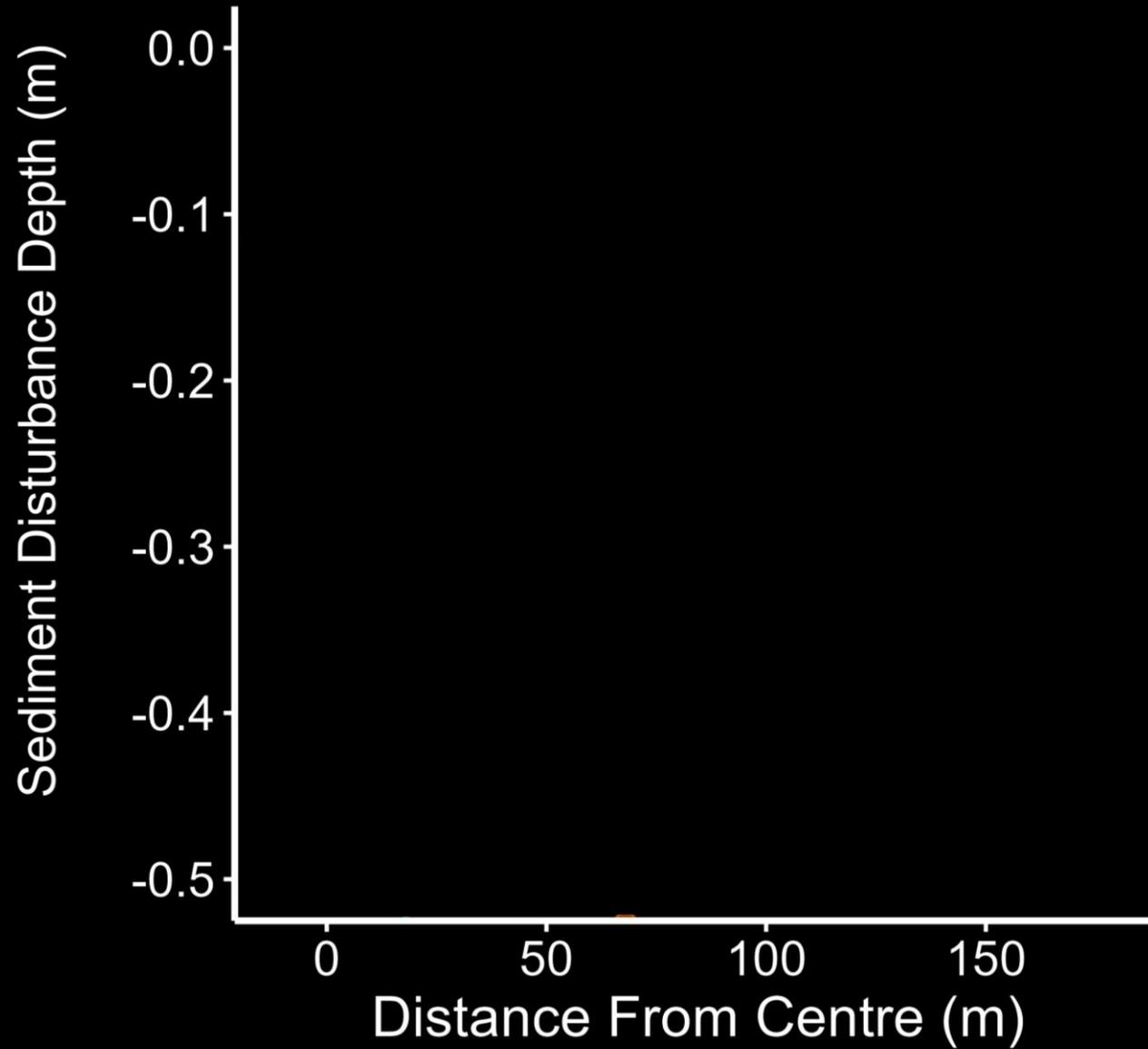
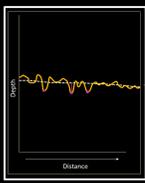


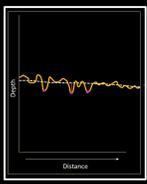




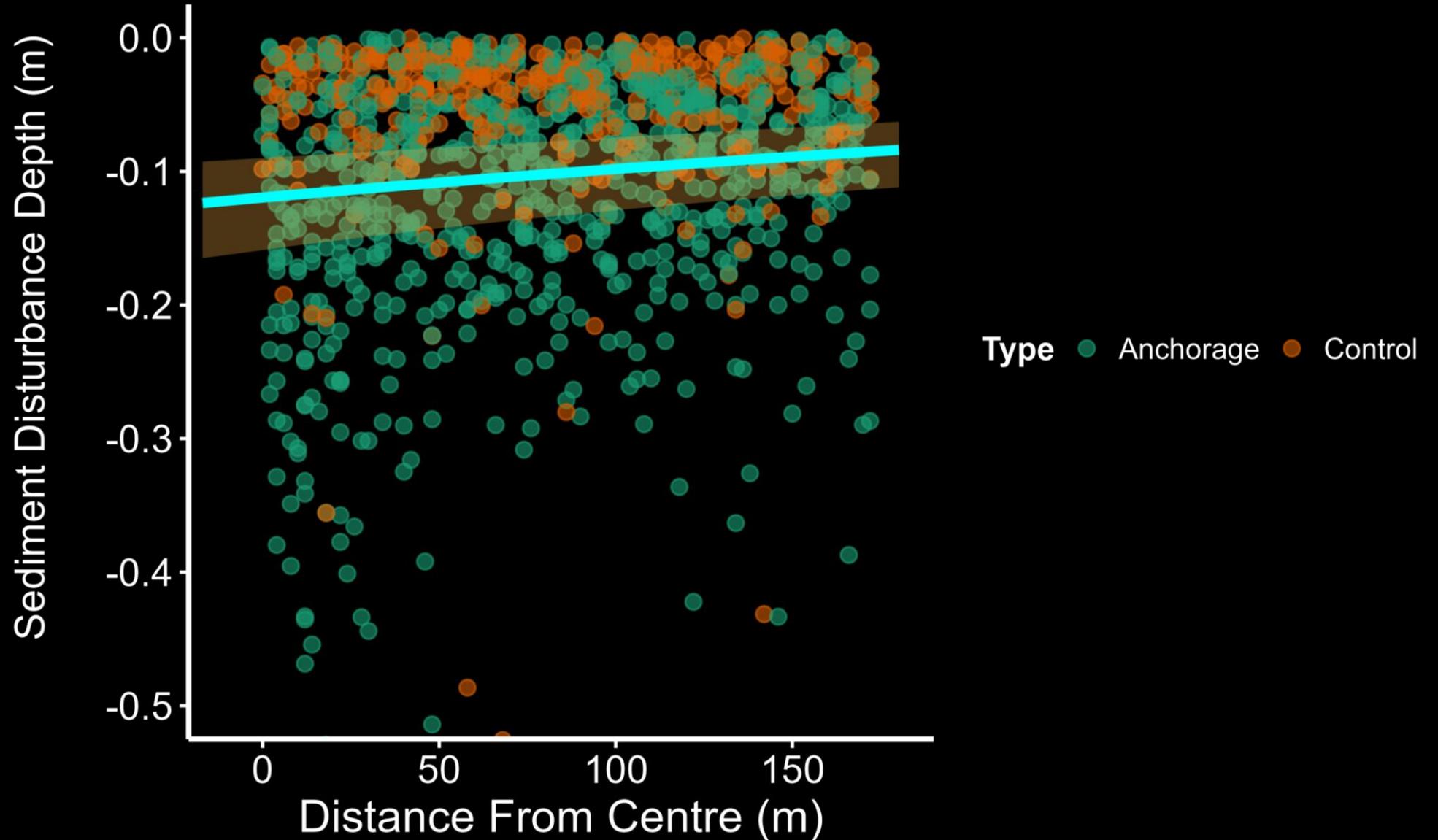
More anchorage use increases ruggedness

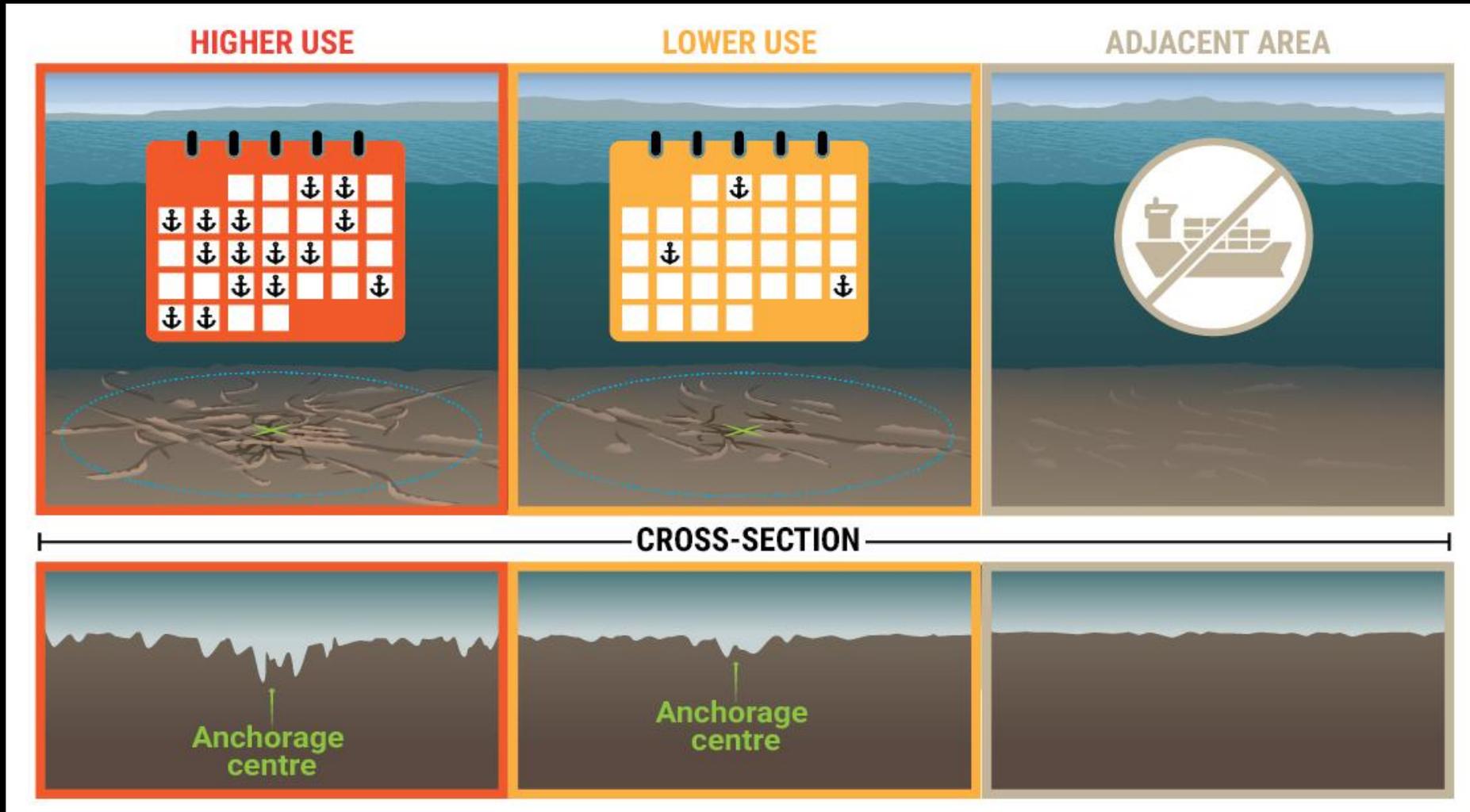






Disturbance depth was deeper at anchorage centre



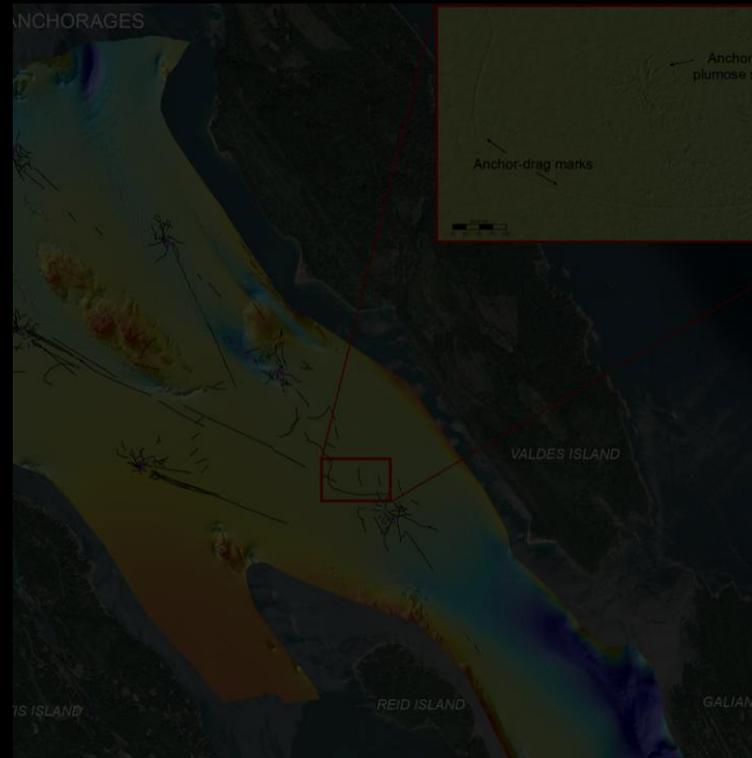


Investigate the impacts of commercial anchorages on marine benthic ecosystems in BC

Stressors and effects



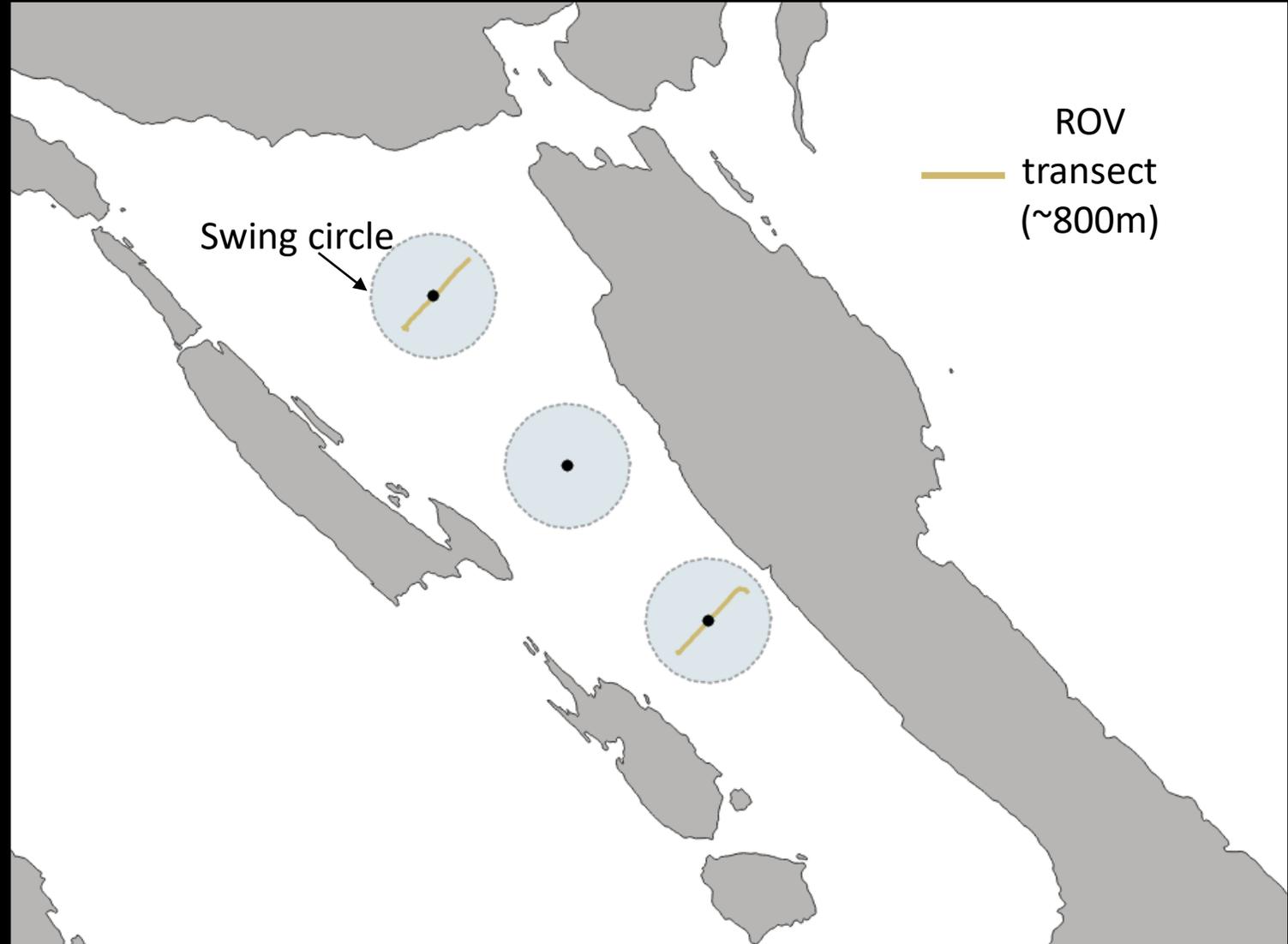
Physical impacts



Biological impacts



ROV surveys at 21 anchorages



Sediment grabs for grain size and infauna



Euphilomedes producta
*Euphilomedes producta*⁴



Galathowenia oculata
*Galathowenia oculata*⁴



Magelona
*Magelona*⁴



Nephtys ferruginea
*Nephtys ferruginea*³⁴



Bipalponephlys cornuta
*Bipalponephlys cornuta*⁴



Sphaerodoropsis
*Sphaerodoropsis*³⁵



Sthenelais
*Sthenelais*³



Pholoe
*Pholoe*⁴



Gattyana
*Gattyana*²



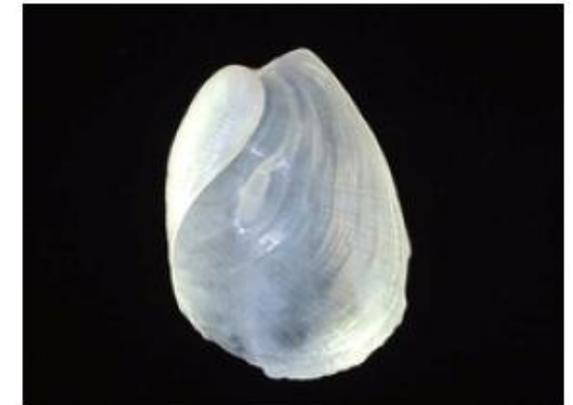
Tenonia priops
*Tenonia priops*³⁶



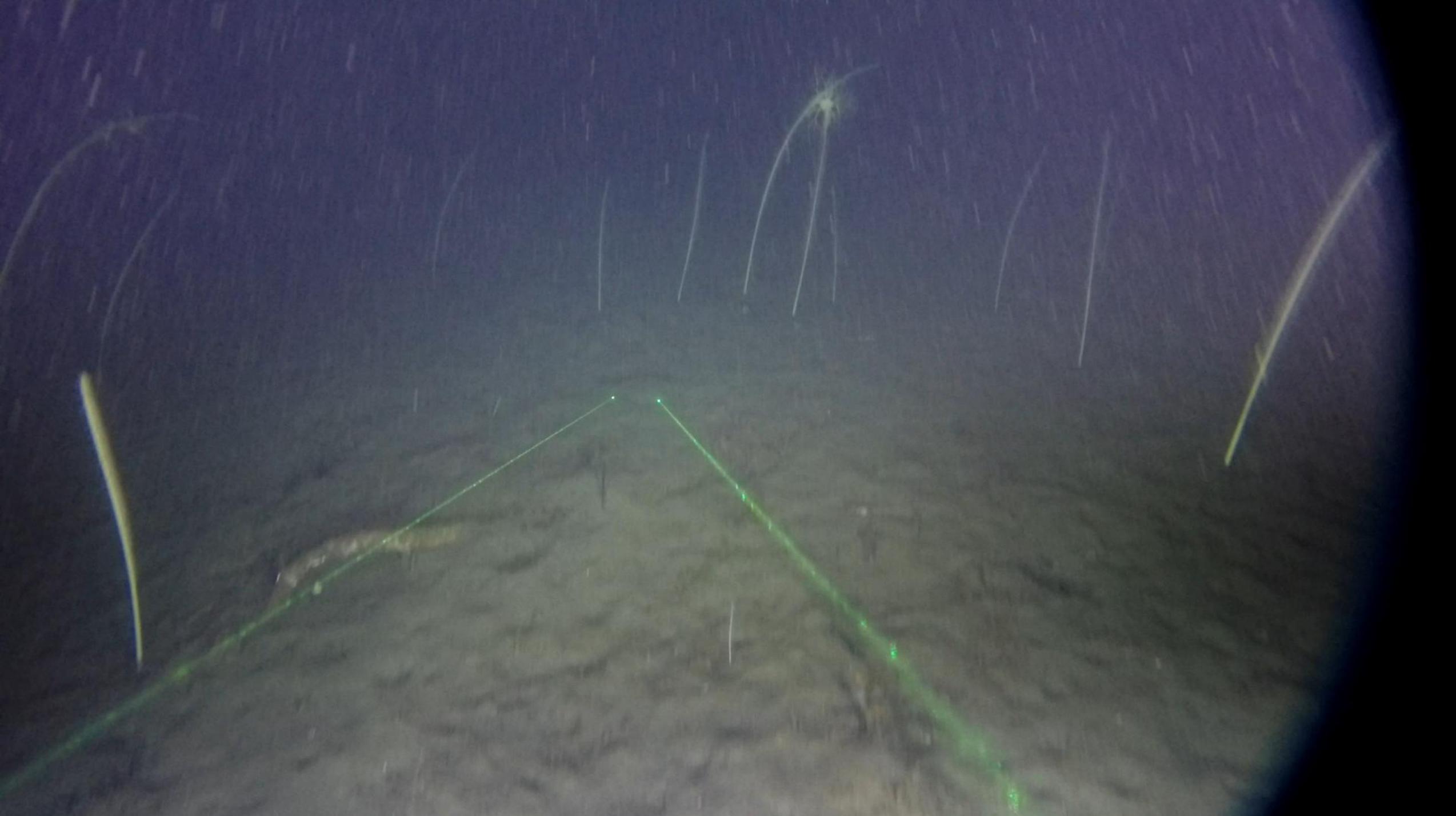
Glycera nana
*Glycera nana*³⁴

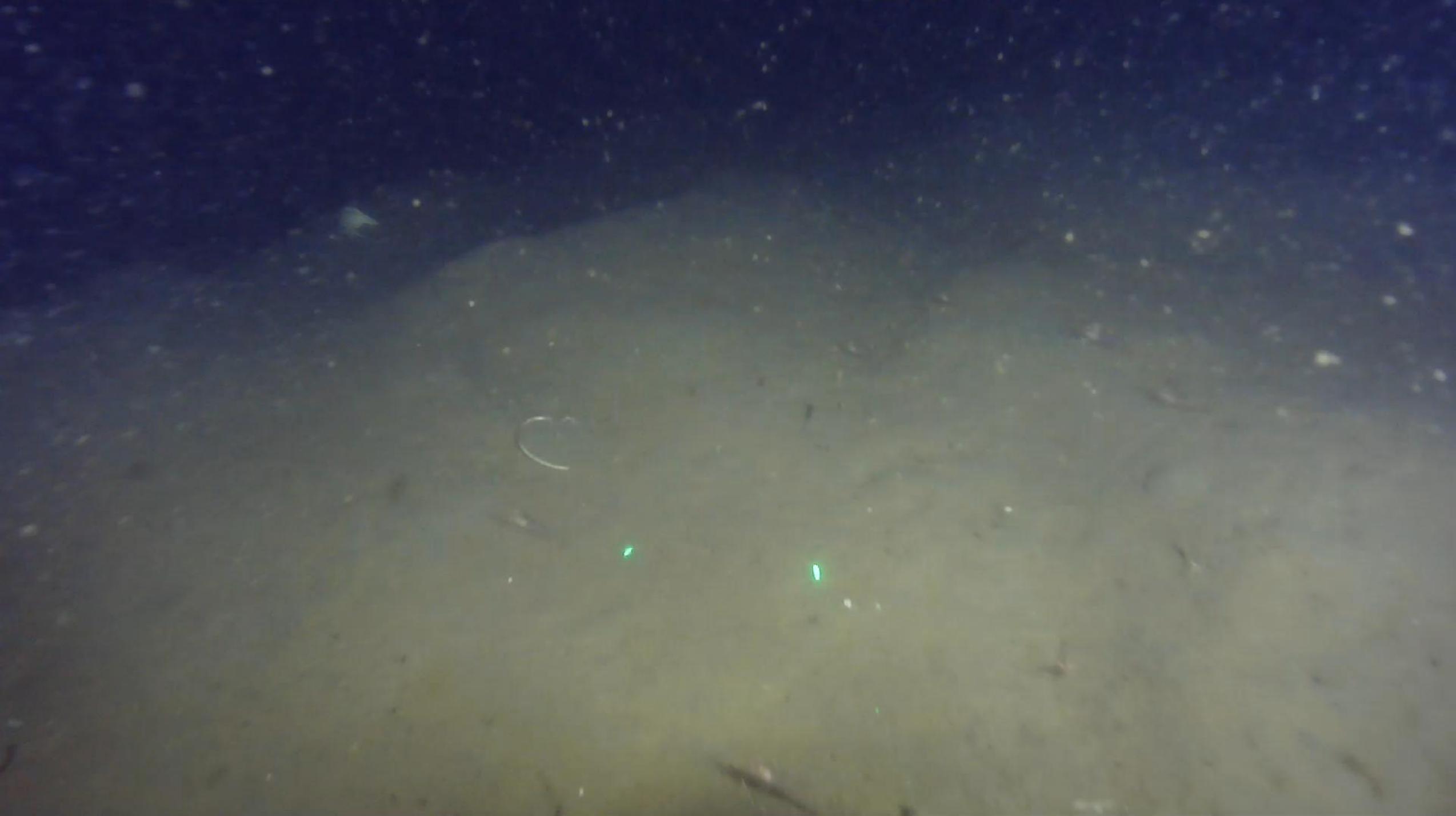


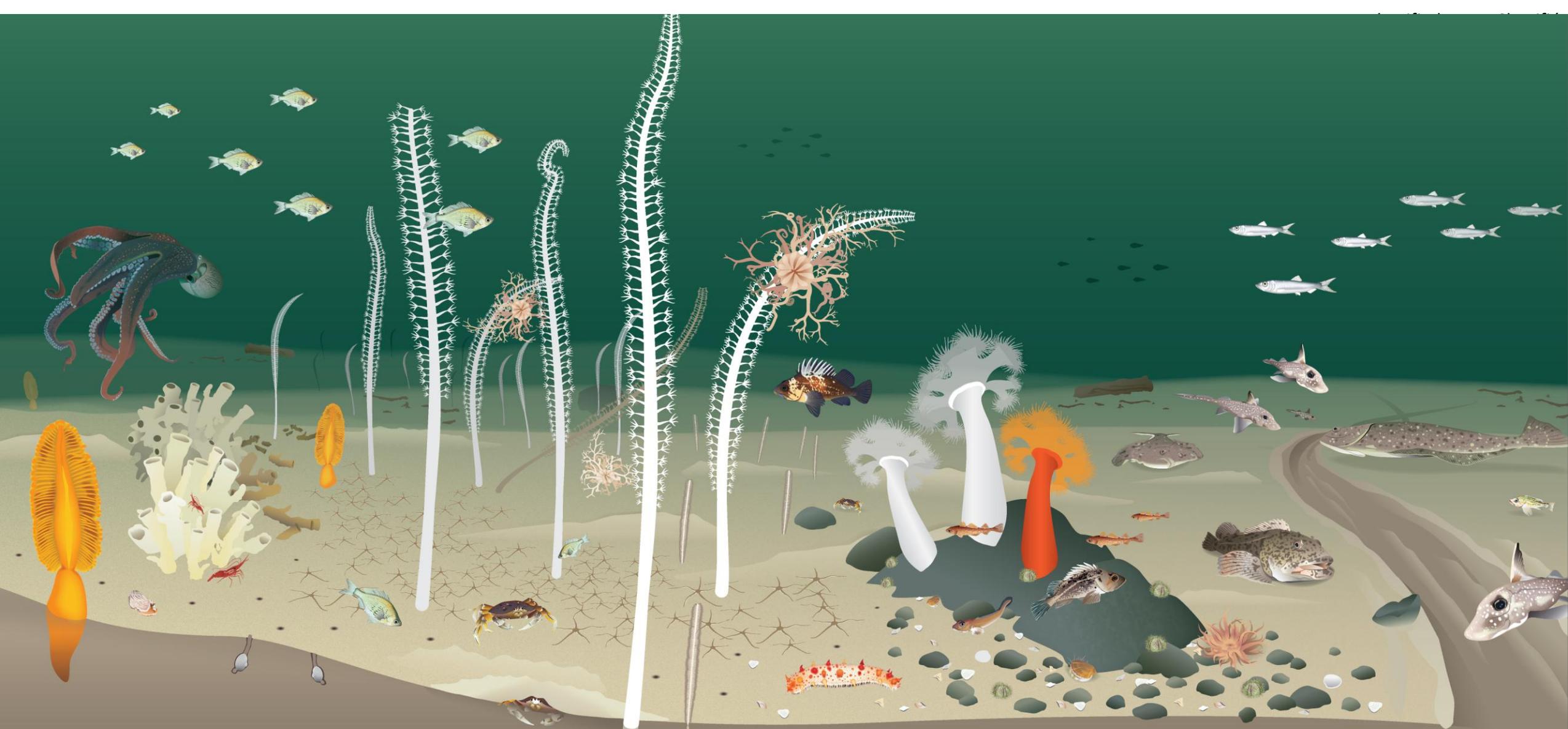
Hesionidae
*Hesionidae*⁴



New Zealand Tortellini Snail
*Philine auriformis*¹⁴

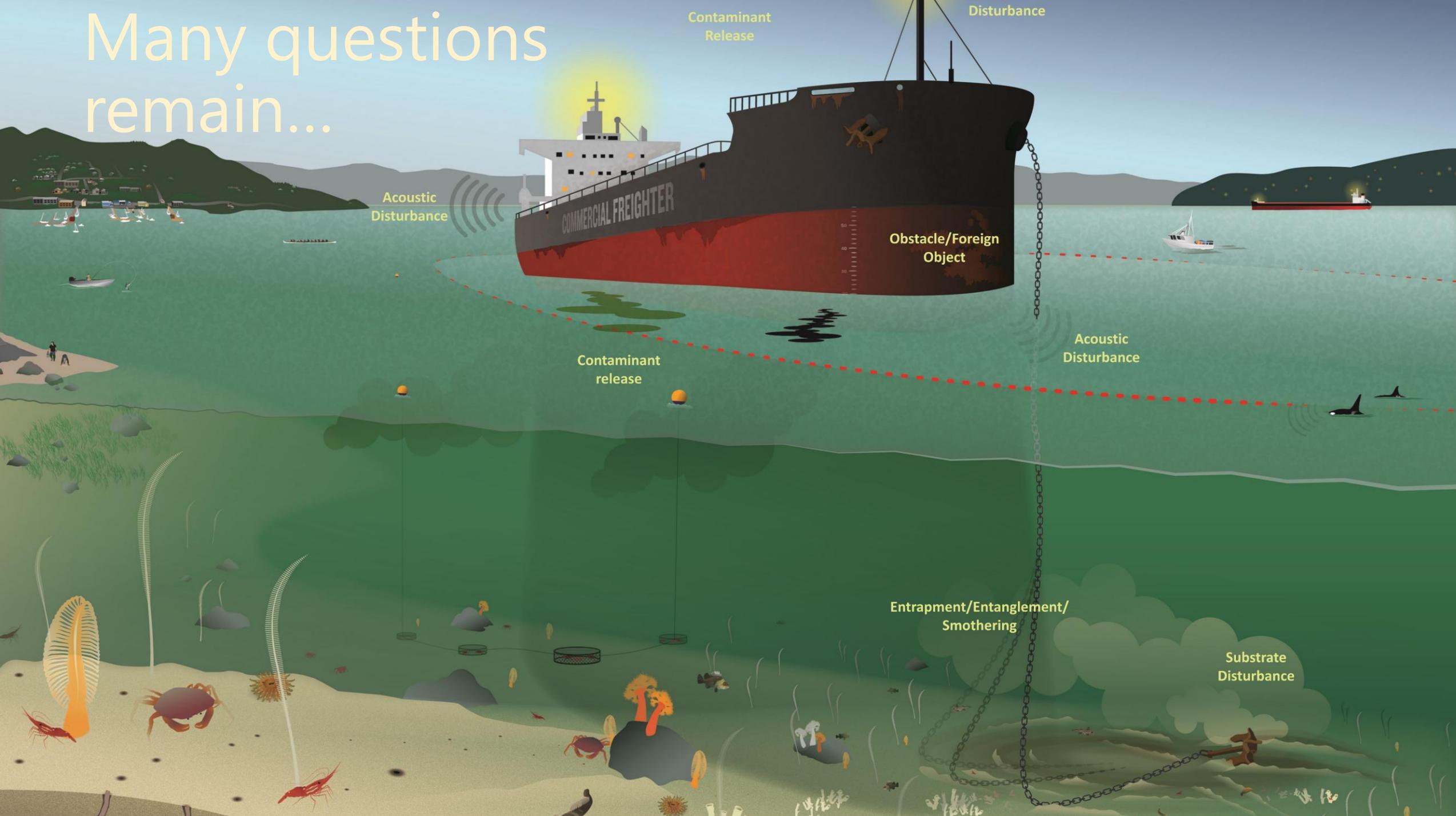






Soft sediment communities are diverse!

Many questions remain...



Contaminant Release

Disturbance

Acoustic Disturbance

Obstacle/Foreign Object

Contaminant release

Acoustic Disturbance

Entrapment/Entanglement/Smothering

Substrate Disturbance



Research in Prince Rupert



Commercial Anchorages in BC NORTH COAST

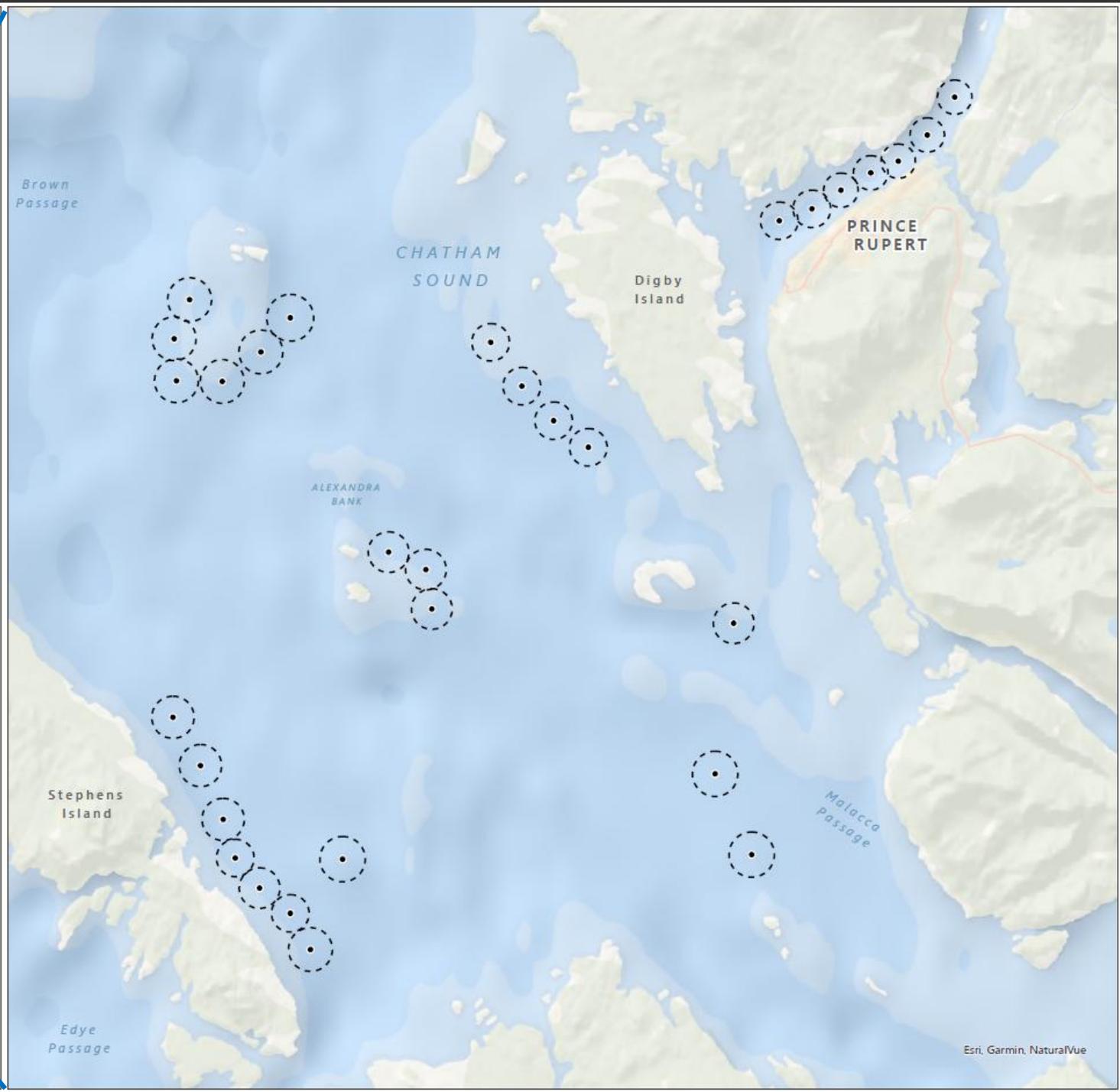
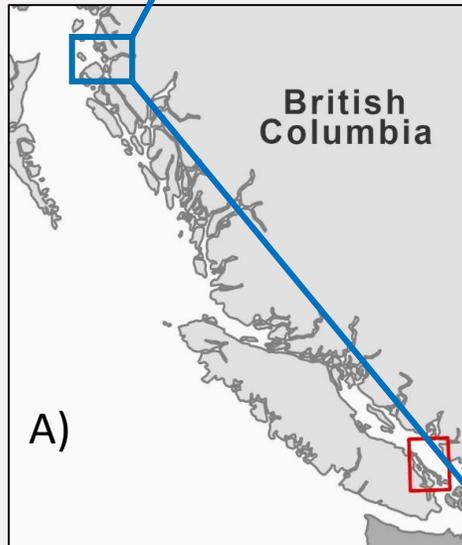
Scale: 1:150,000

Projection: NAD 1983 BC Environment Alter
Datum: Topographic Data of Canada (Can)

Commercial Anchorage point



Anchorage Swing Radius



Commercial Anchorages in BC NORTH COAST

Scale: 1:150,000

Projection: NAD 1983 BC Environment Atlas
Basemap: Topographic Data of Canada (CanVec)



Commercial Anchorage point

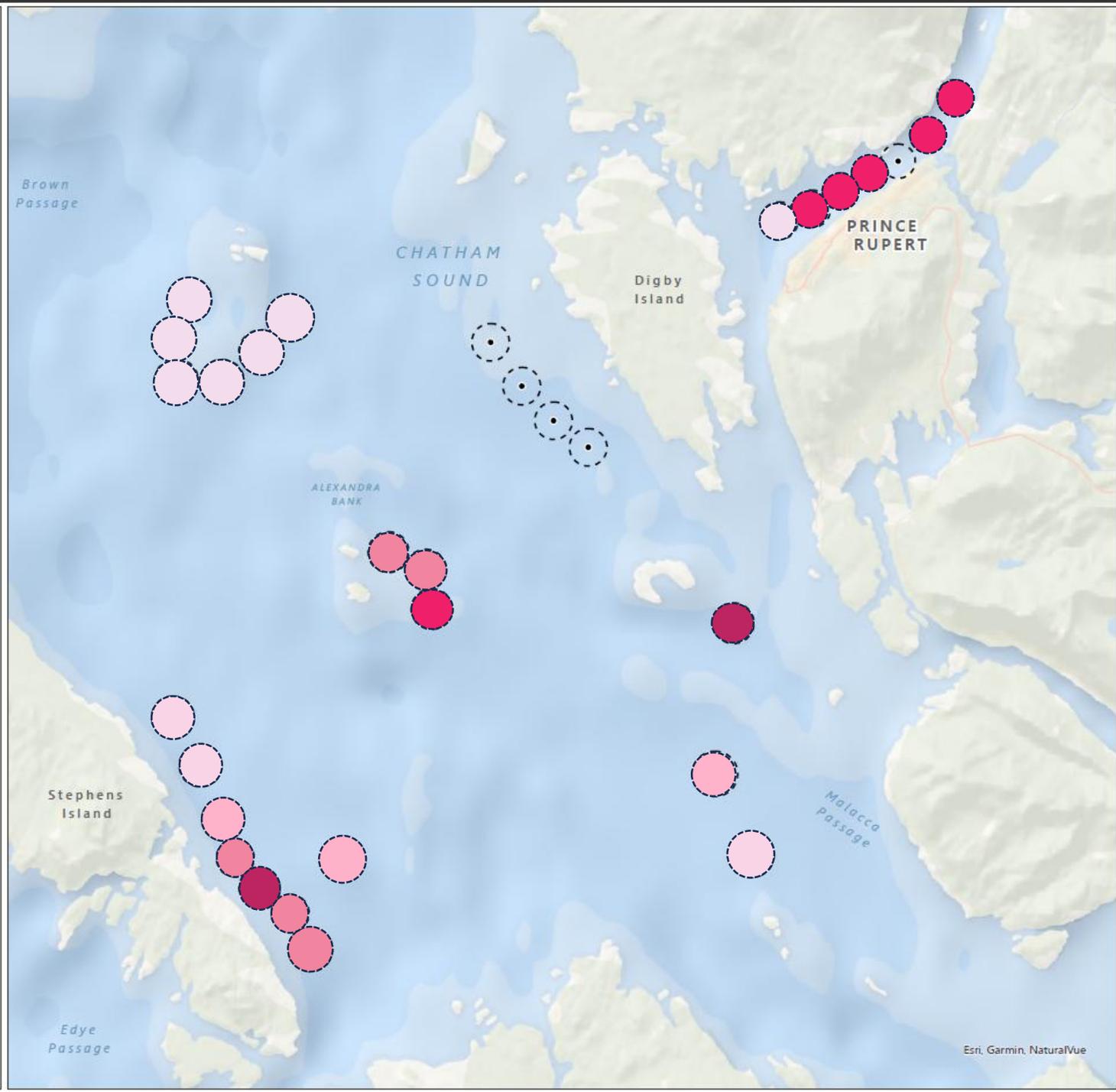


Anchorage Swing Radius



Anchoring events (2023/24)

- 1-8
- 9-19
- 20-37
- 38-52
- 53-74



Collaborative research in Prince Rupert

Science research grant (2024-2027)

Collaboration between North Coast Nations, CHS, NRCAN, and DFO

Working with Lax Kwa'alaams and Kitsumkalum technical teams



Project Purpose

To assess the impacts of commercial anchoring on significant benthic areas, including glass sponge reefs and areas of cultural, social, and ecological importance to First Nations



- 1. How does physical disturbance vary at anchorages?**
- 2. What is the sediment type around the PR anchorages?**
- 3. What is the overlap of sponge reefs with anchorages?**
- 4. What culturally important species are at anchorages?**

1. How does physical disturbance vary at anchorages?

CHS Multibeam Bathymetry

2. What is the sediment type around the PR anchorages?

CHS Multibeam Backscatter

Sediment Grabs

ROV

3. What is the overlap of sponge reefs with anchorages?

CHS Multibeam Backscatter

Sediment Grabs

ROV

4. What culturally important species are at anchorages?

Baited Remote Underwater Videos

Sediment Grabs

ROV

Collaborative data collection



KITSUMKALUM BAND



Fisheries and Oceans Canada
Pêches et Océans Canada



CHS Multibeam



Commercial Anchorages in BC NORTH COAST

Scale: 1:150,000

Projection: NAD 1983 BC Environment Albers
Datum: Topographic Data of Canada (CanVec)



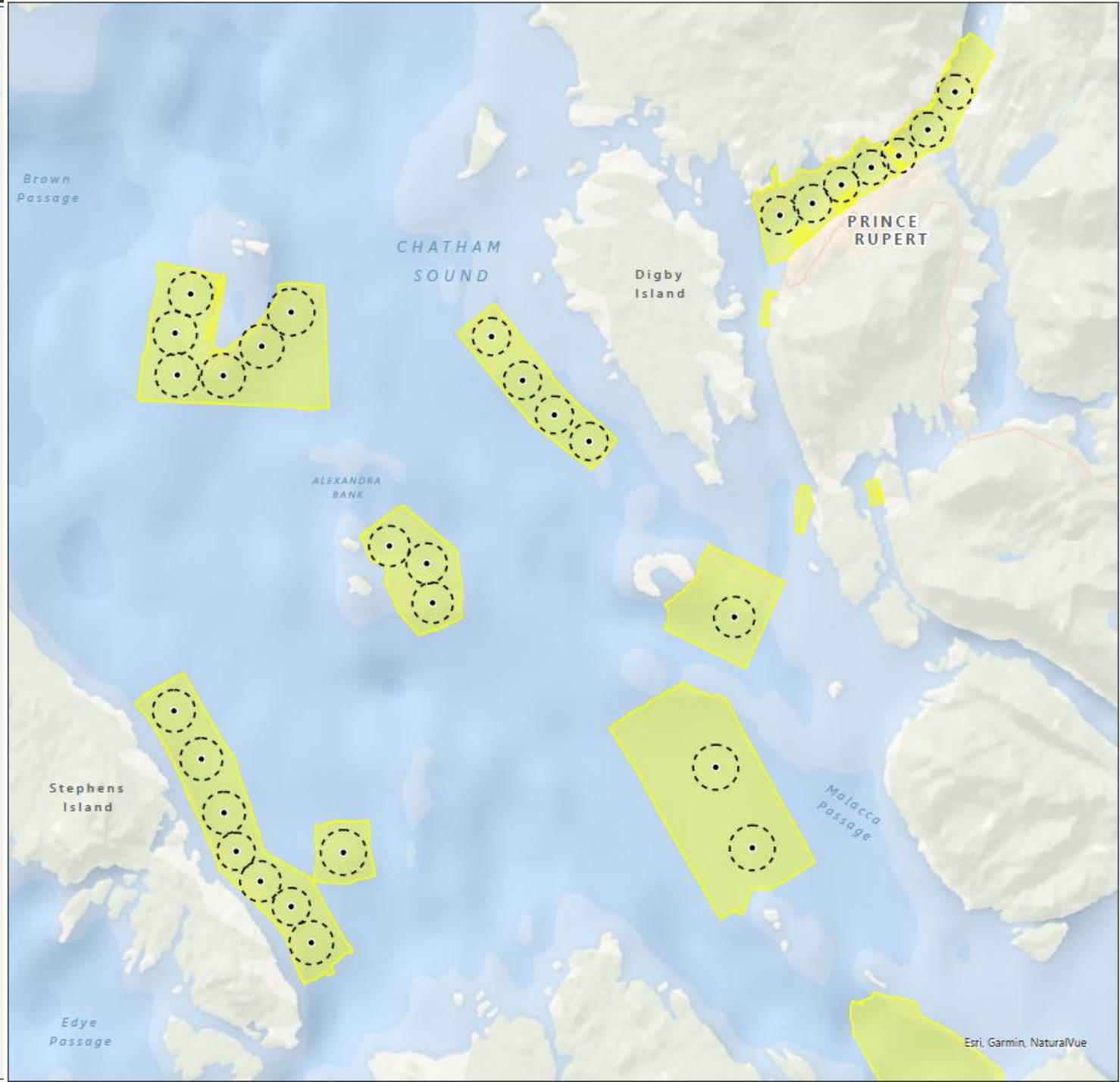
Commercial Anchorage point



Anchorage Swing Radius



2021-2025 Multibeam Survey Areas



Commercial Anchorages in BC NORTH COAST

Scale: 1:150,000

Projection: NAD 1983 BC Environment Albers
Datum: Topographic Data of Canada (CanVec)



Commercial Anchorage point



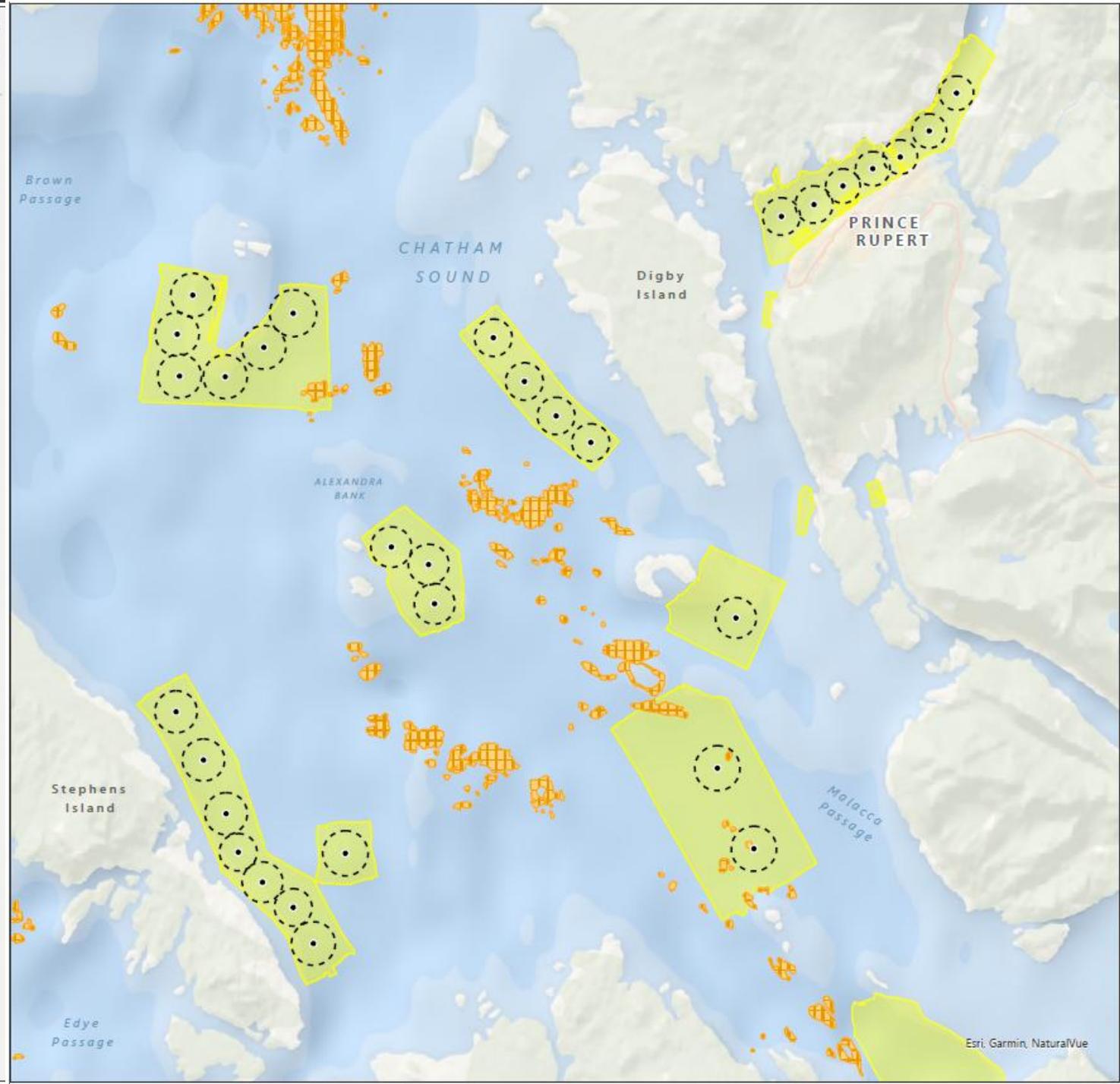
Sponge Reefs



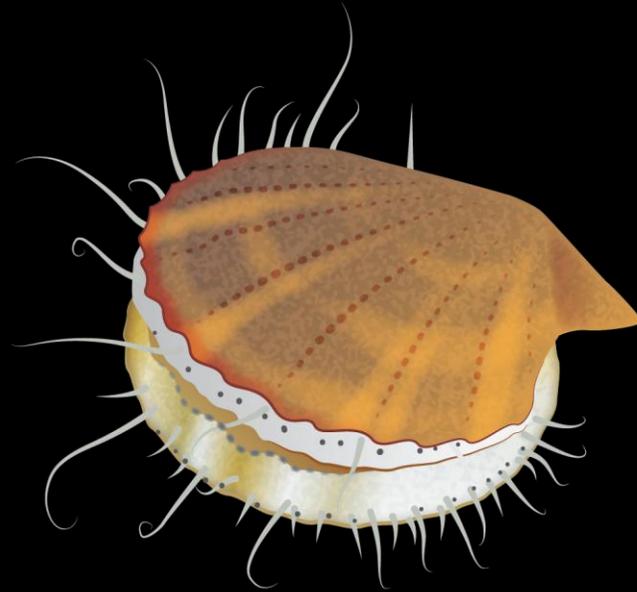
Anchorage Swing Radius

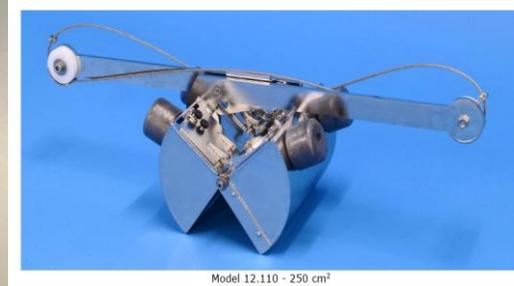
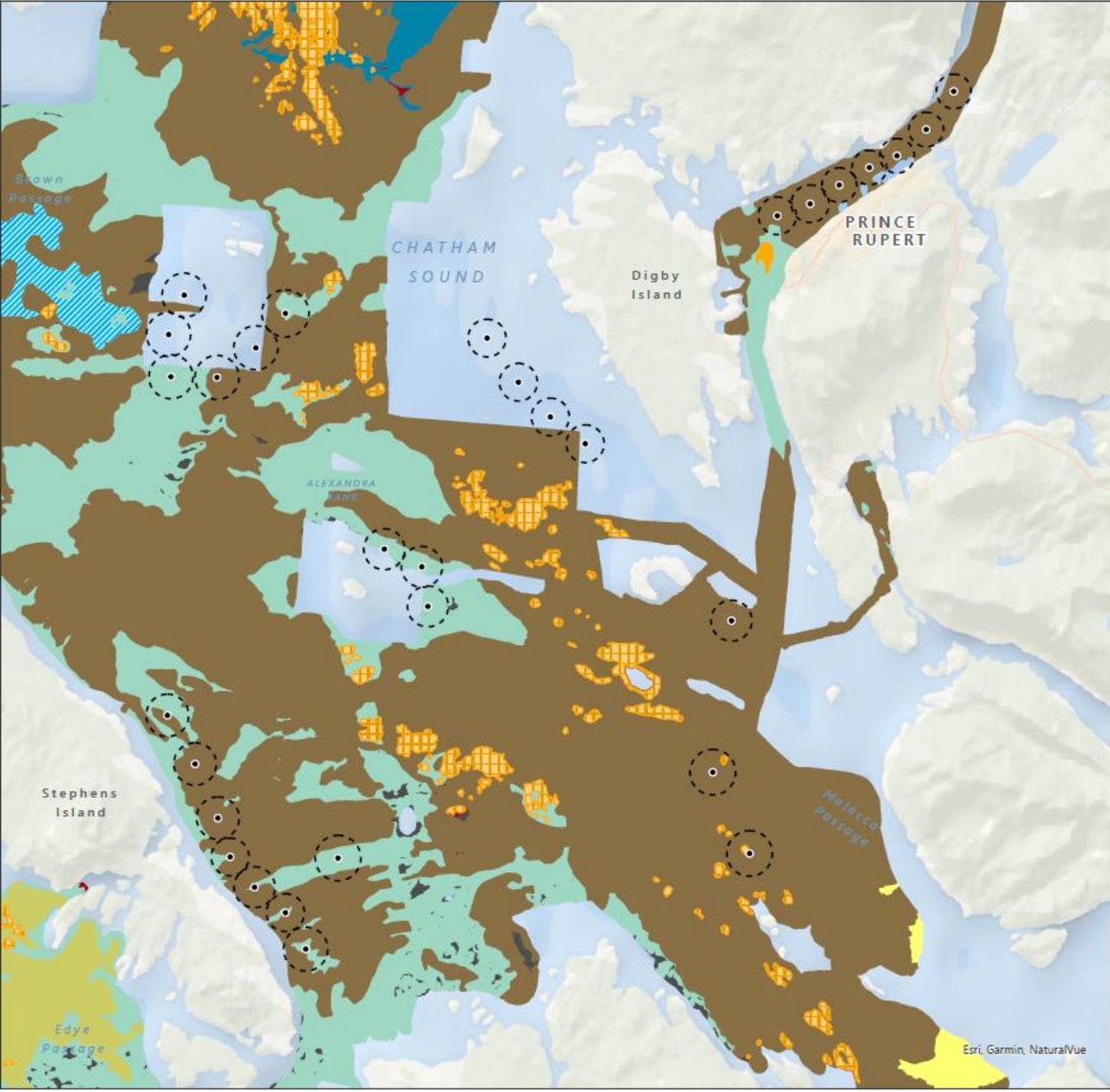


2021-2025 Multibeam Survey Areas

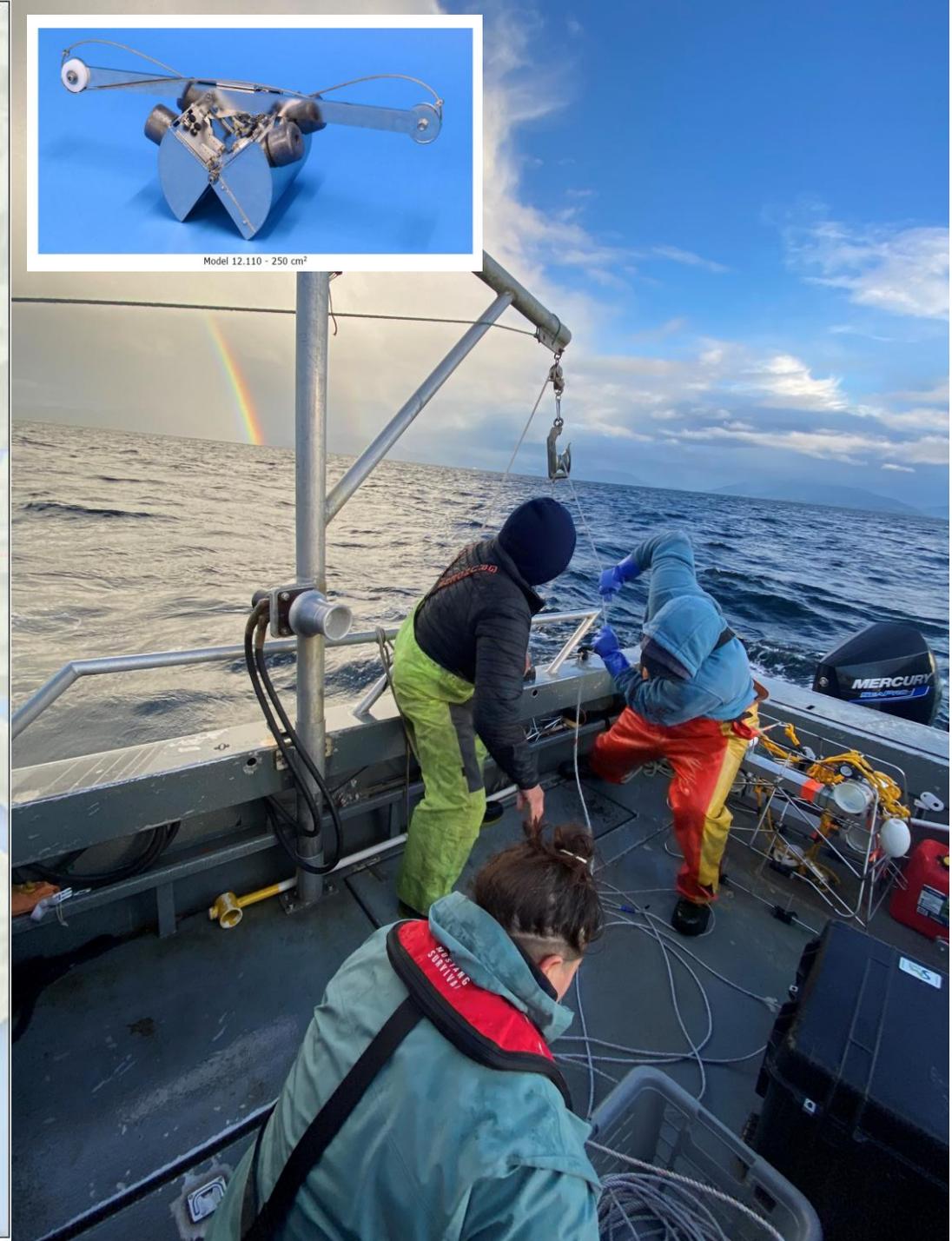


Sediment Grabs





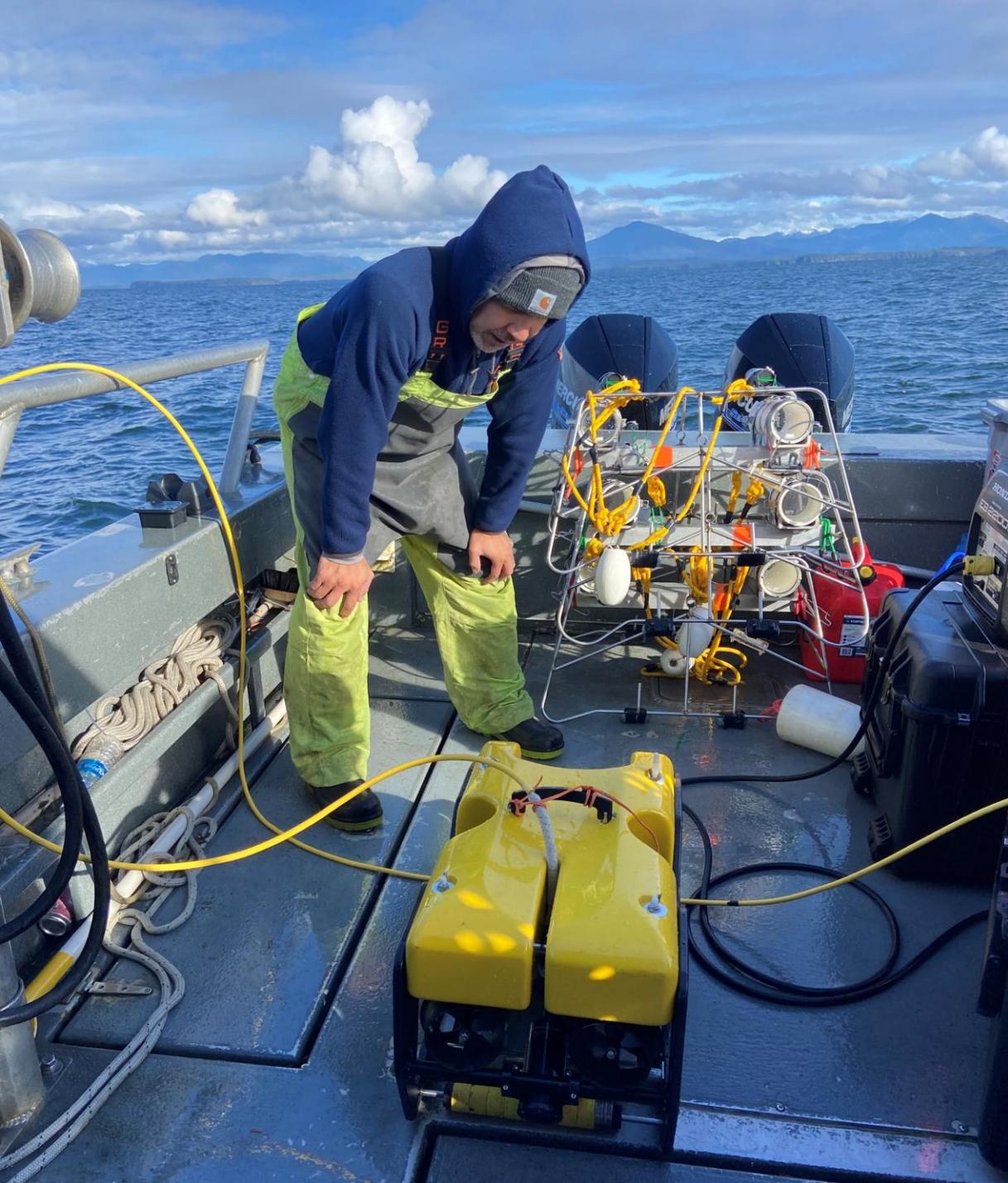
Model 12.110 - 250 cm²

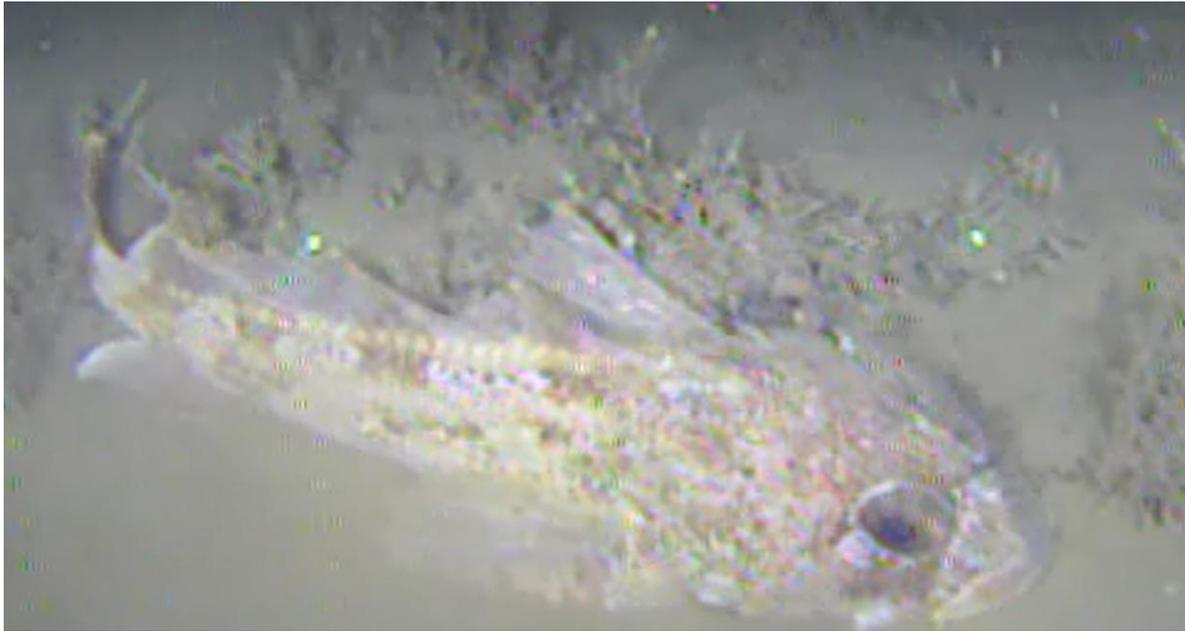




ROV (Remotely Operated Vehicle)







000000 2025:10:30 02:15:54

D: 140.7°
H: 53 T=0

HD--

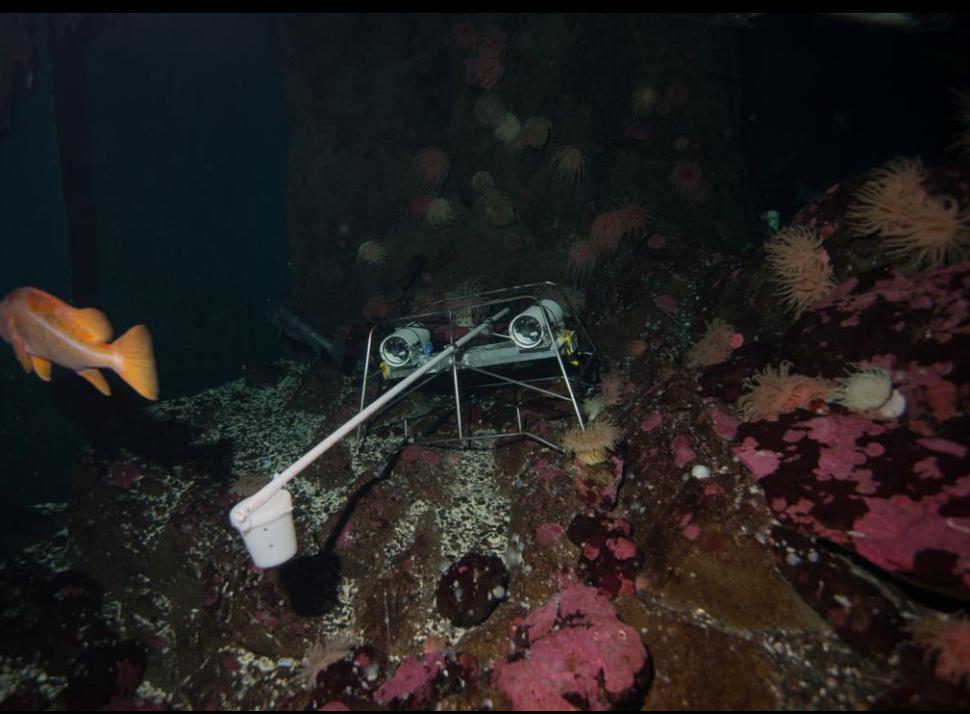
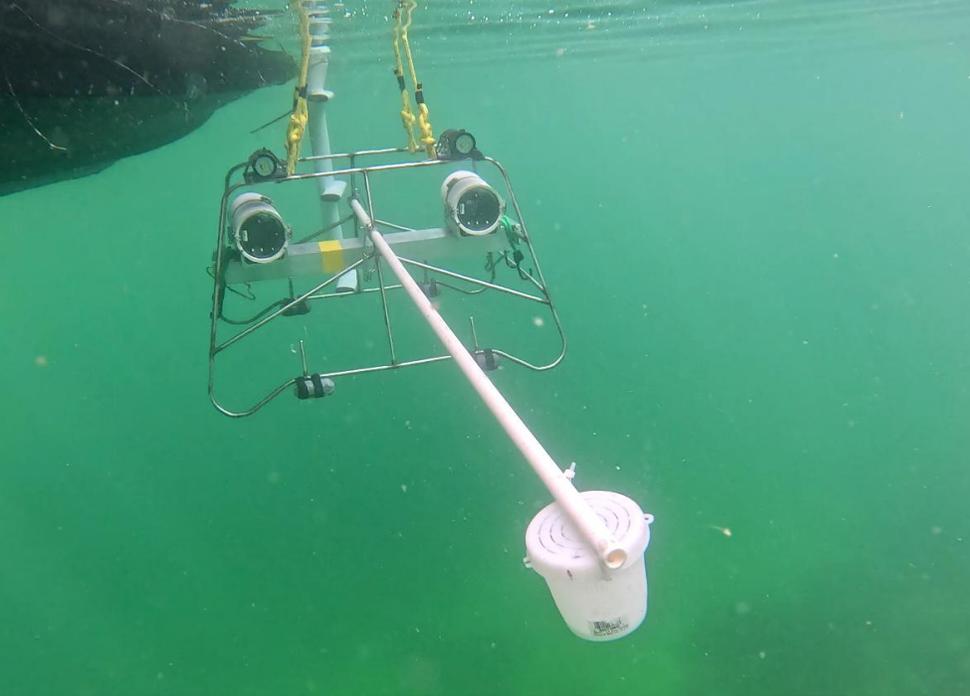
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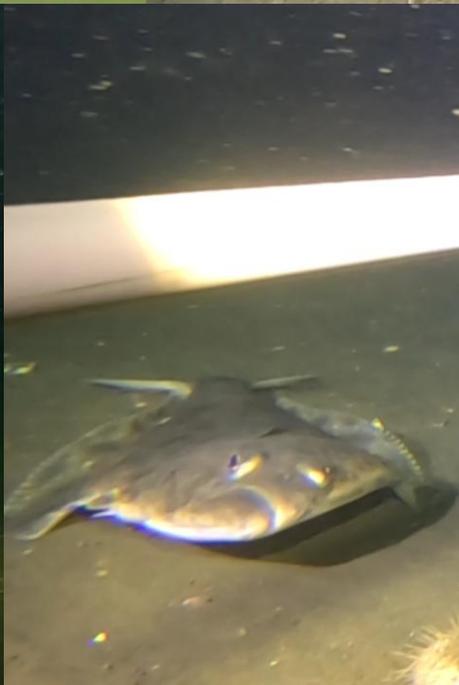
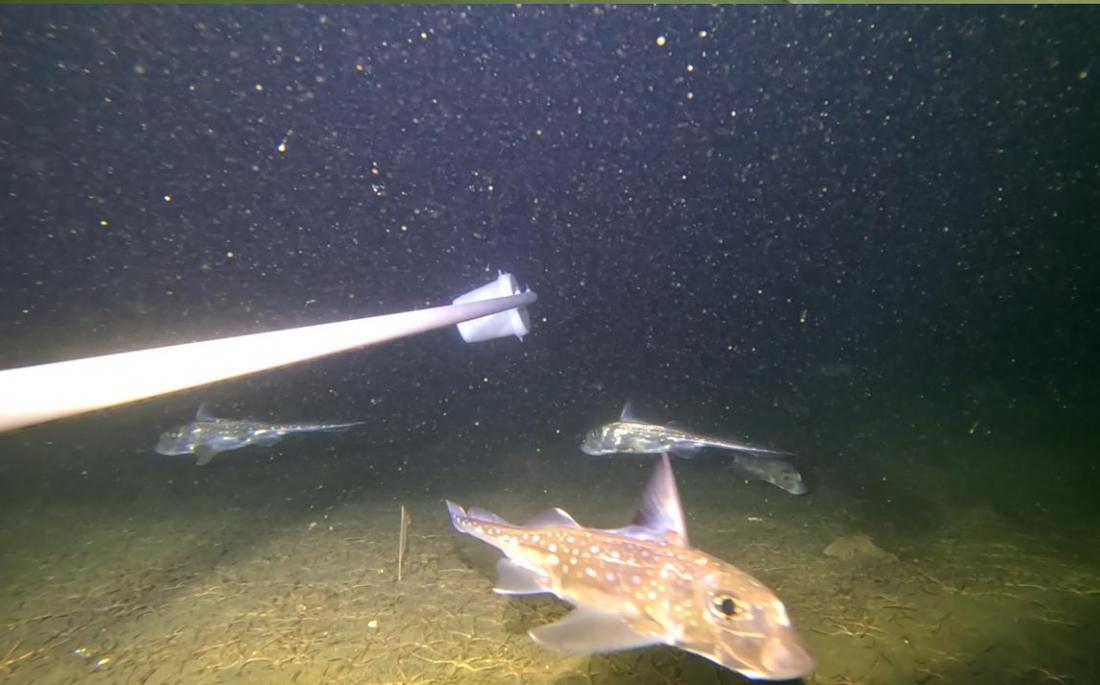
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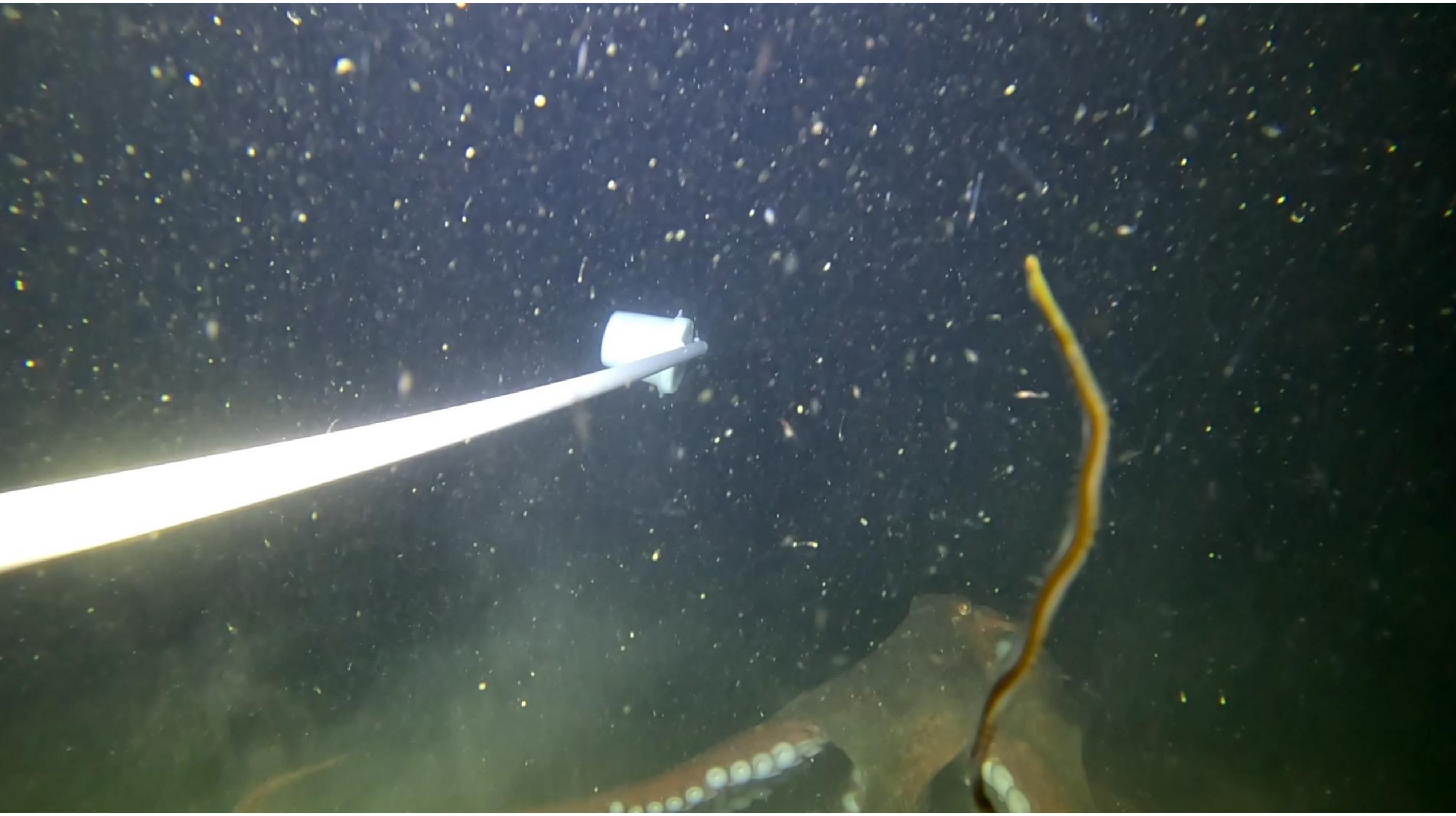
BRUV

(Baited Remote Underwater Video)







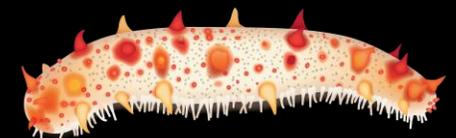
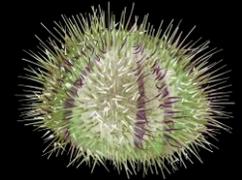


Next Steps and Outcomes

annotate videos, analyze grain size, multibeam calculations

create a biophysical report on the North Coast anchorages

baseline information for environmental assessments, best practices, decision-making processes



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Questions?

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