



Spatial variability in the distribution of euphausiids in the NE Pacific during the 2022 IYS Pan-Pacific winter expedition

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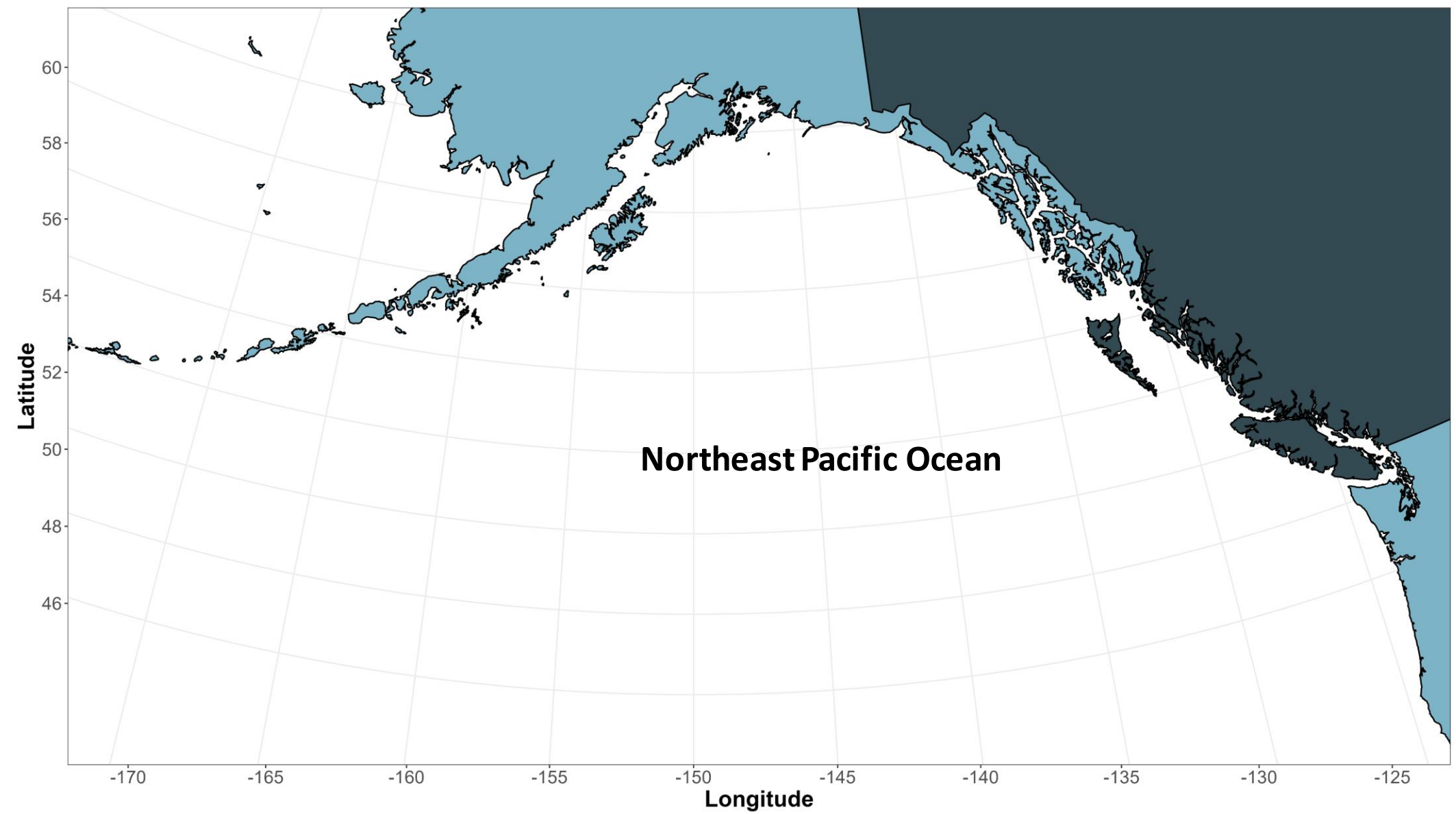
nens@uvic.ca

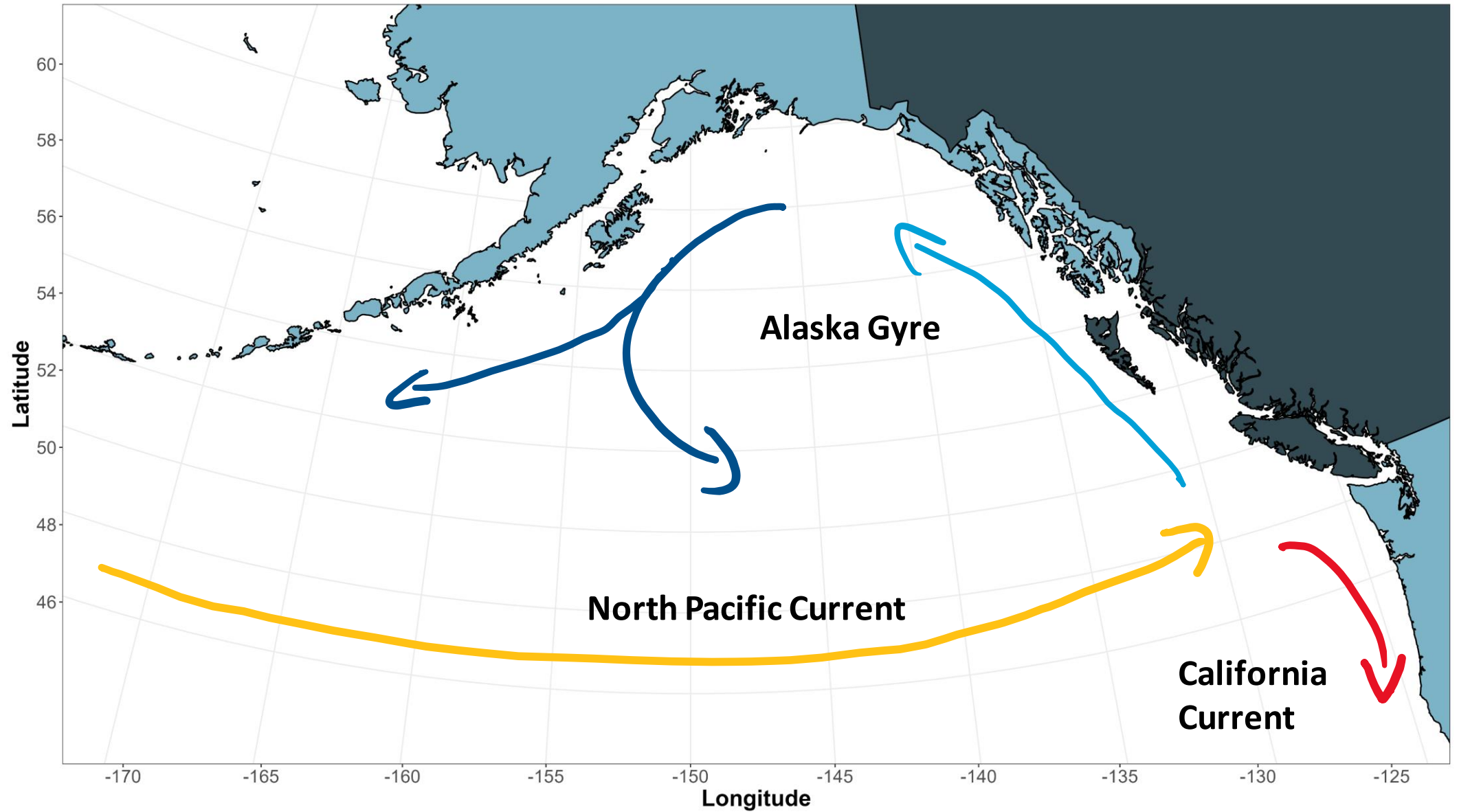
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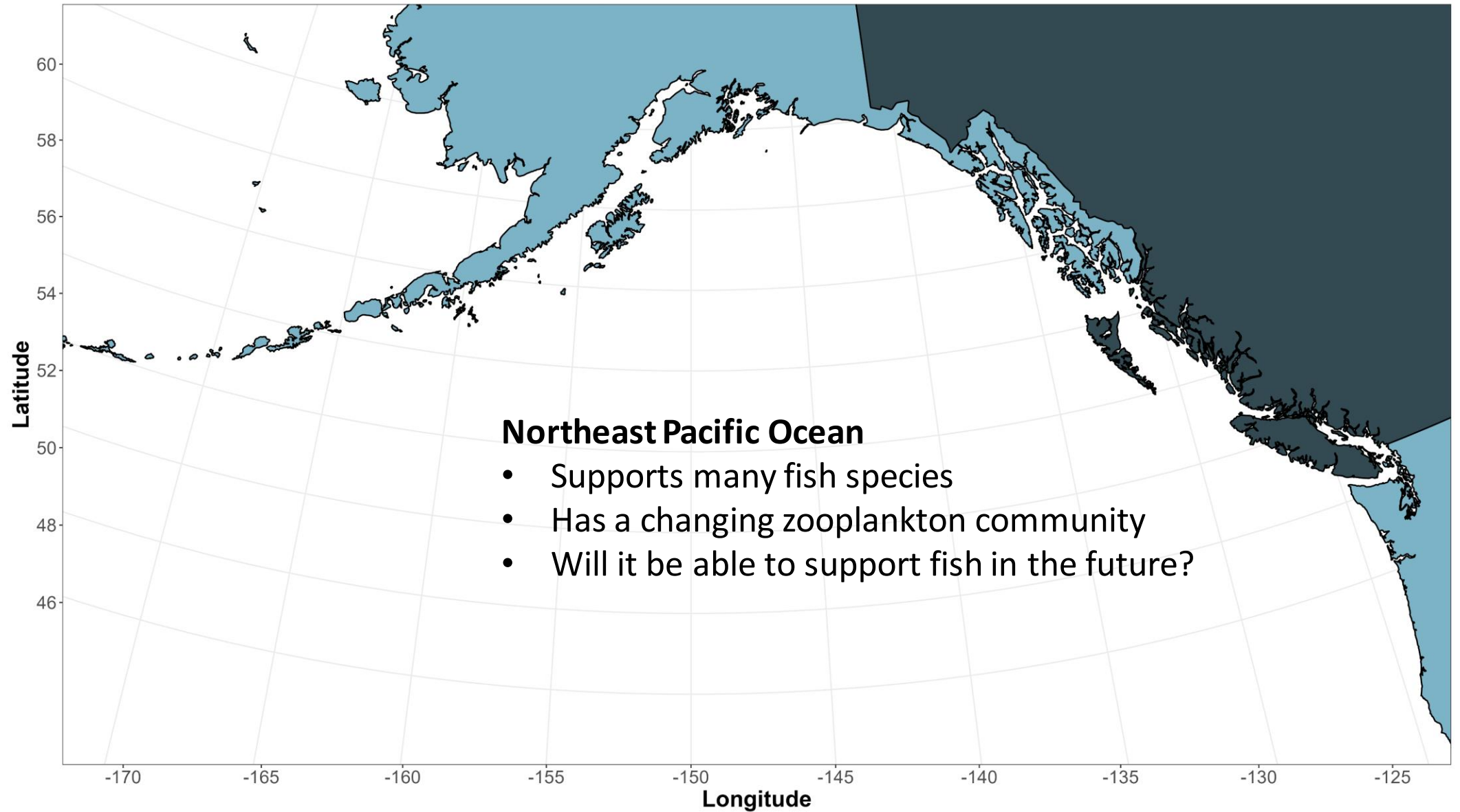
²School of Earth and Ocean Sciences, University of Victoria, Victoria, BC, Canada

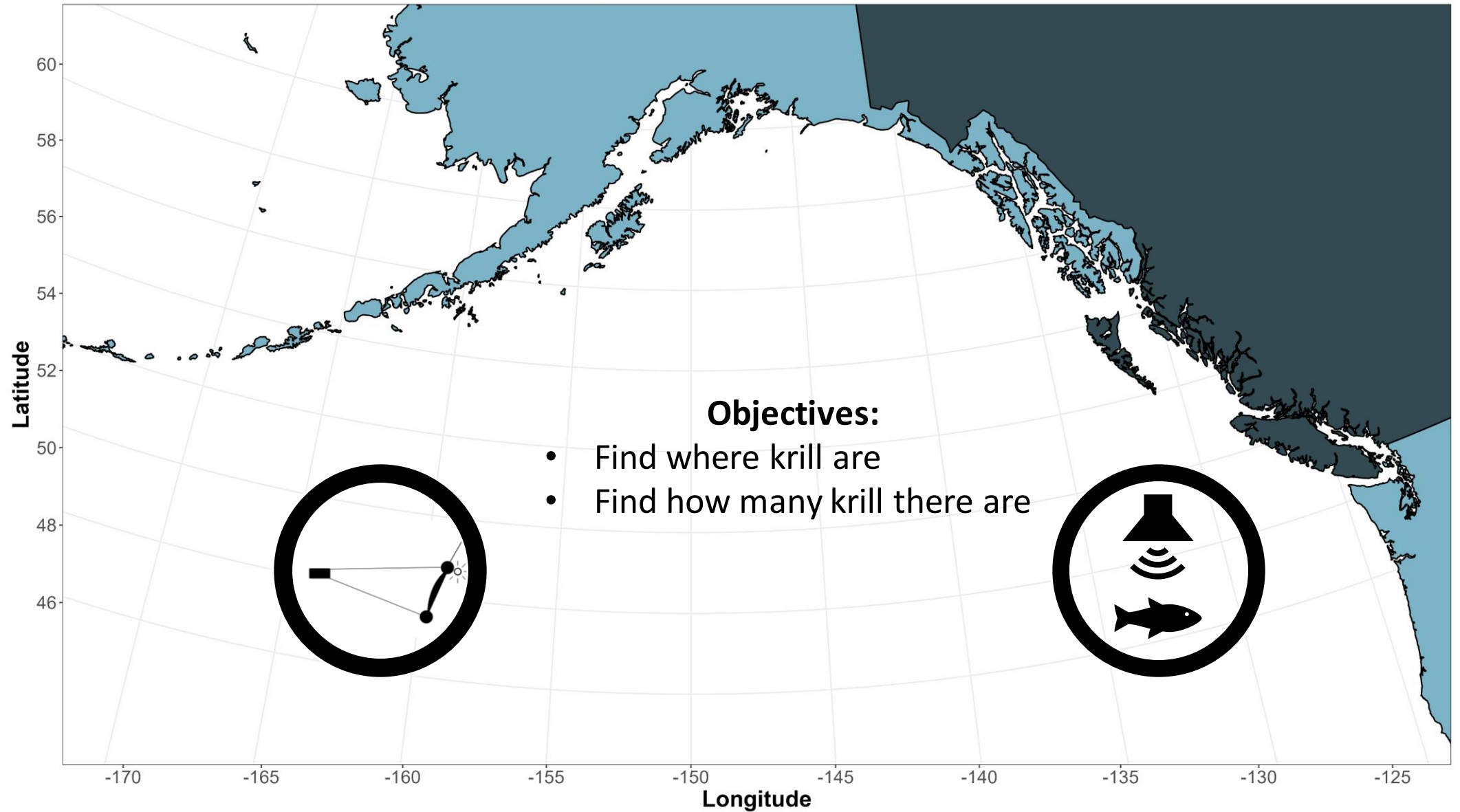
³Institute of Ocean Sciences, Fisheries and Oceans Canada, Sidney, BC, Canada

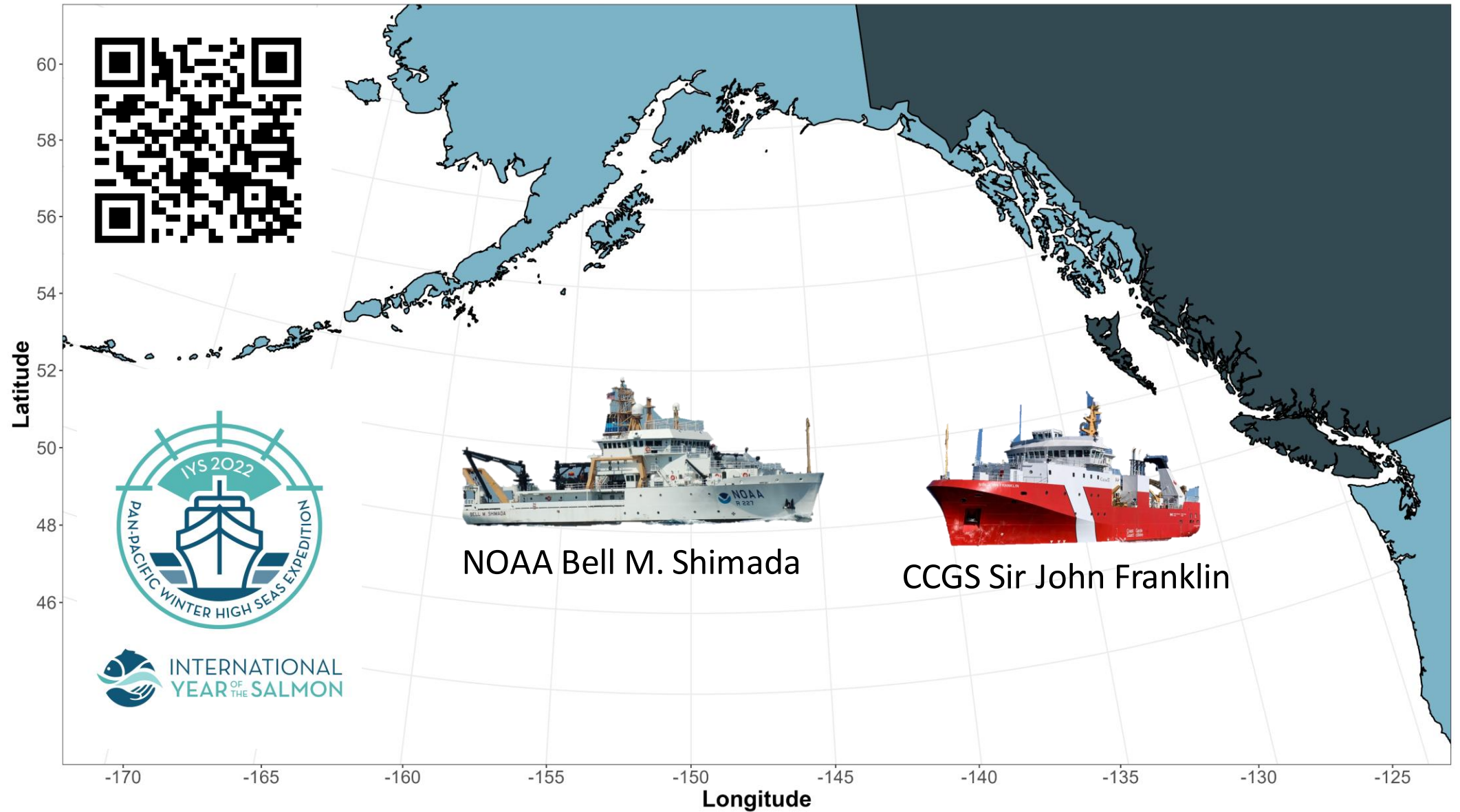


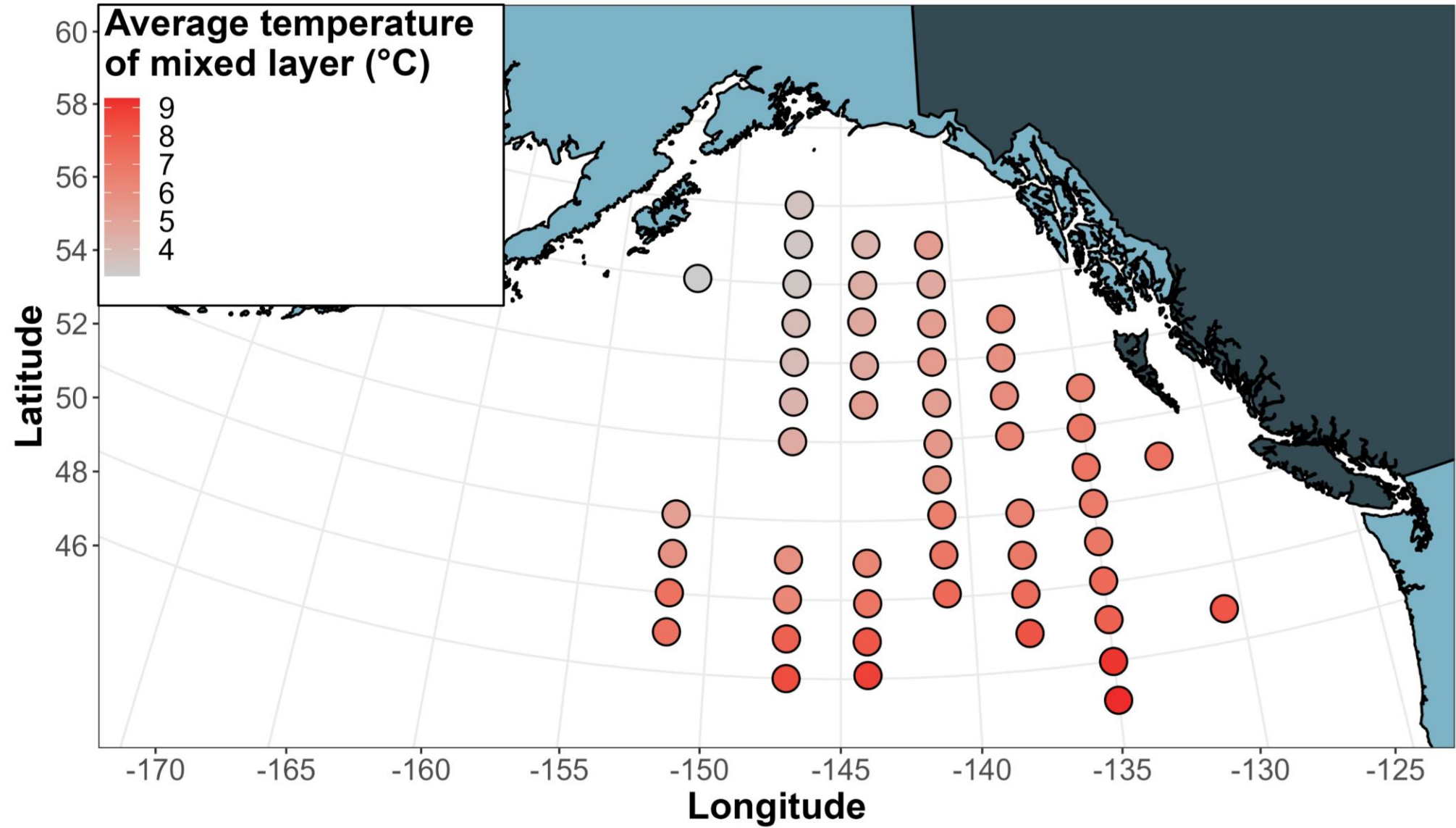


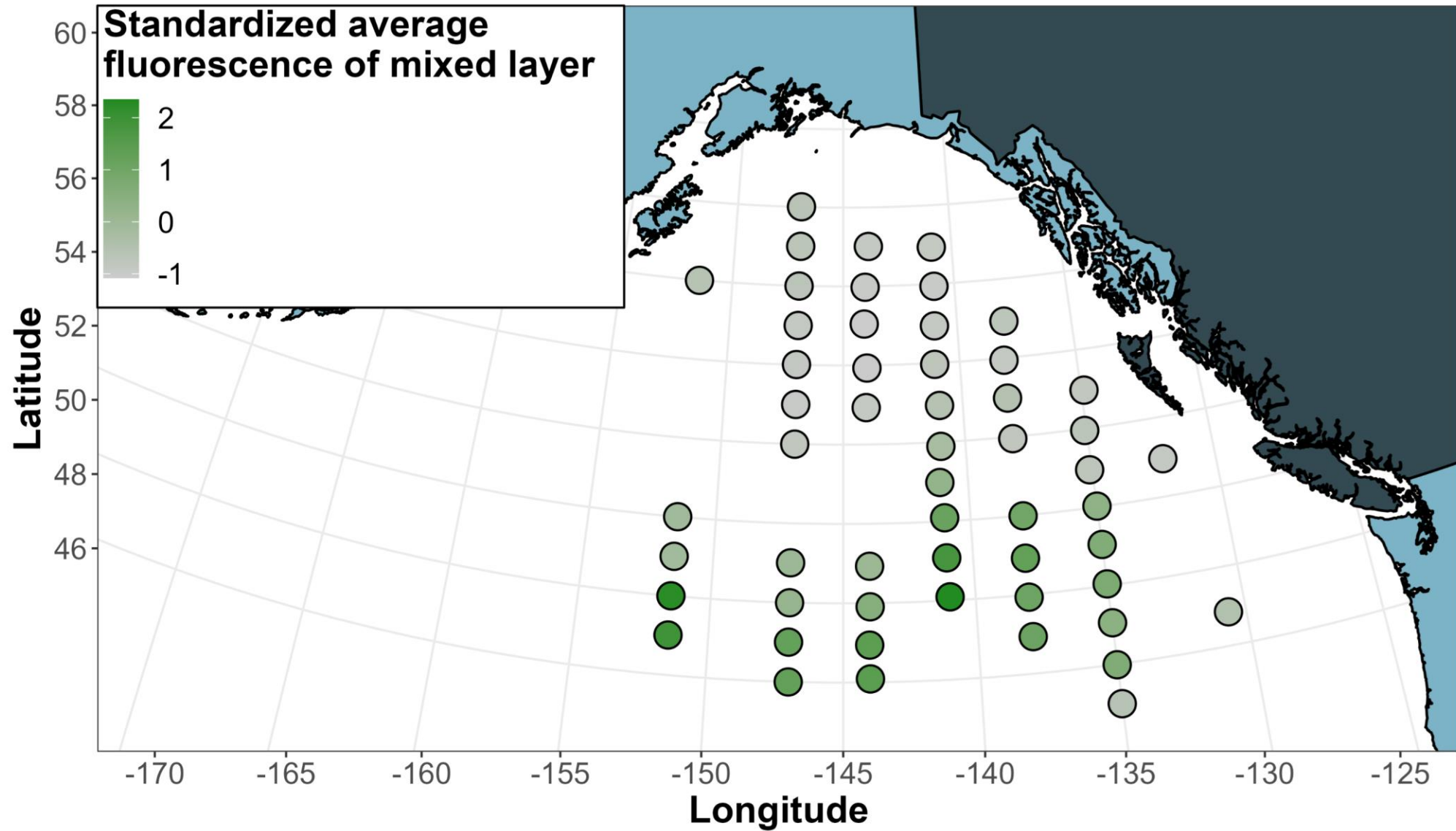




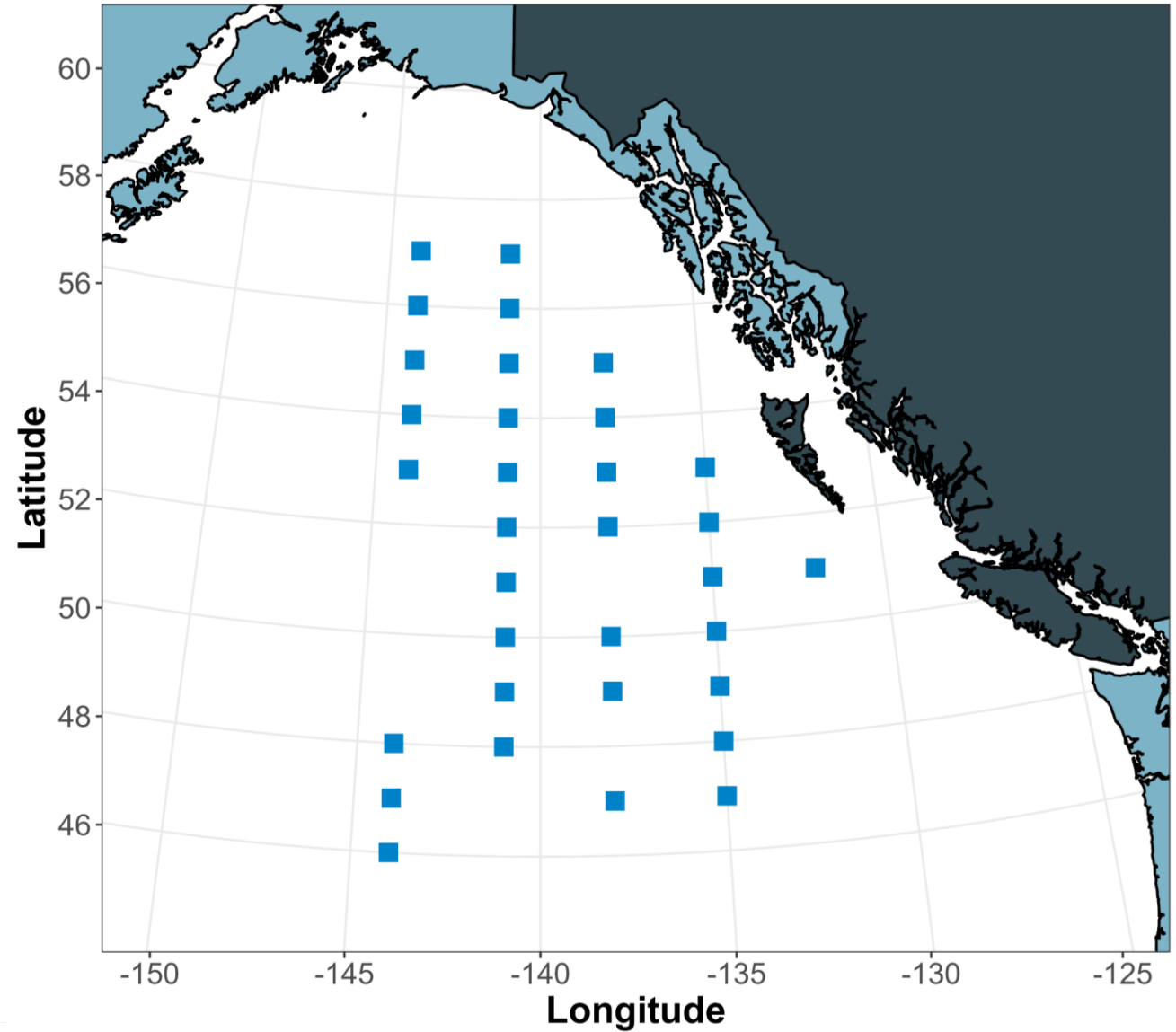
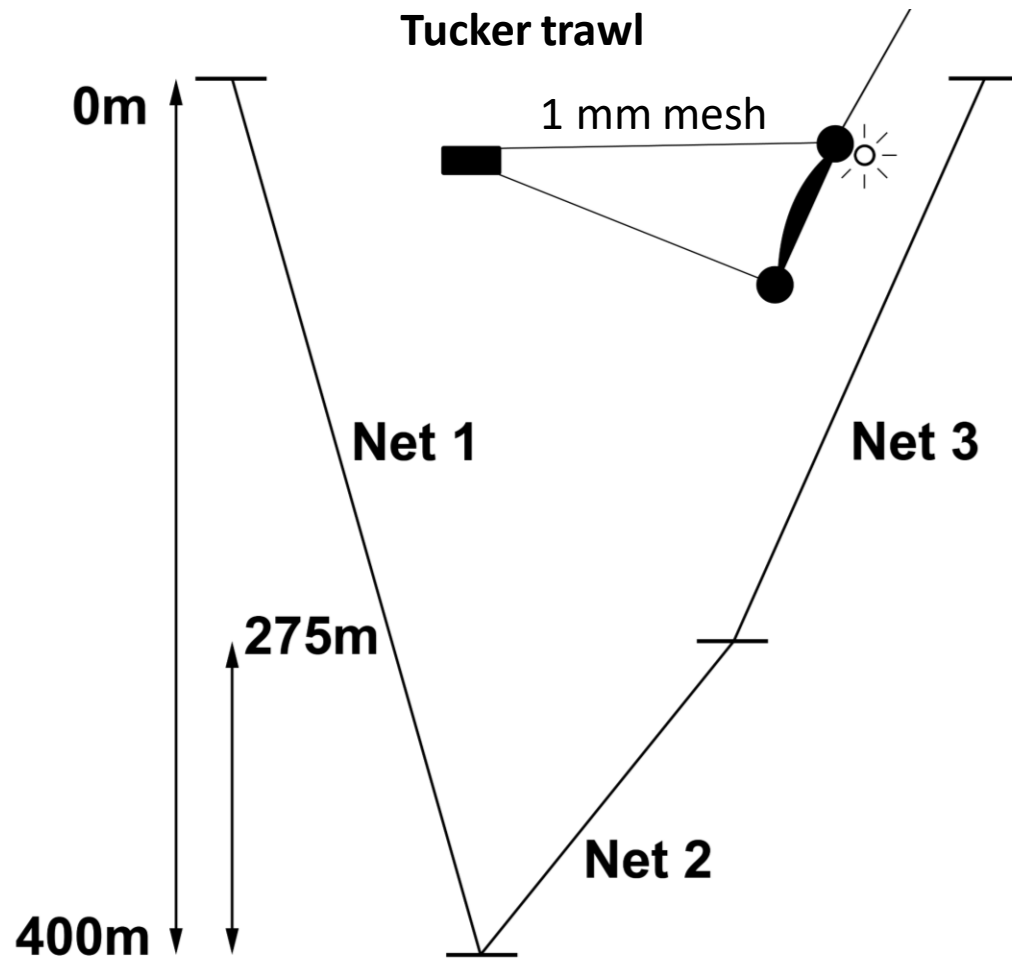






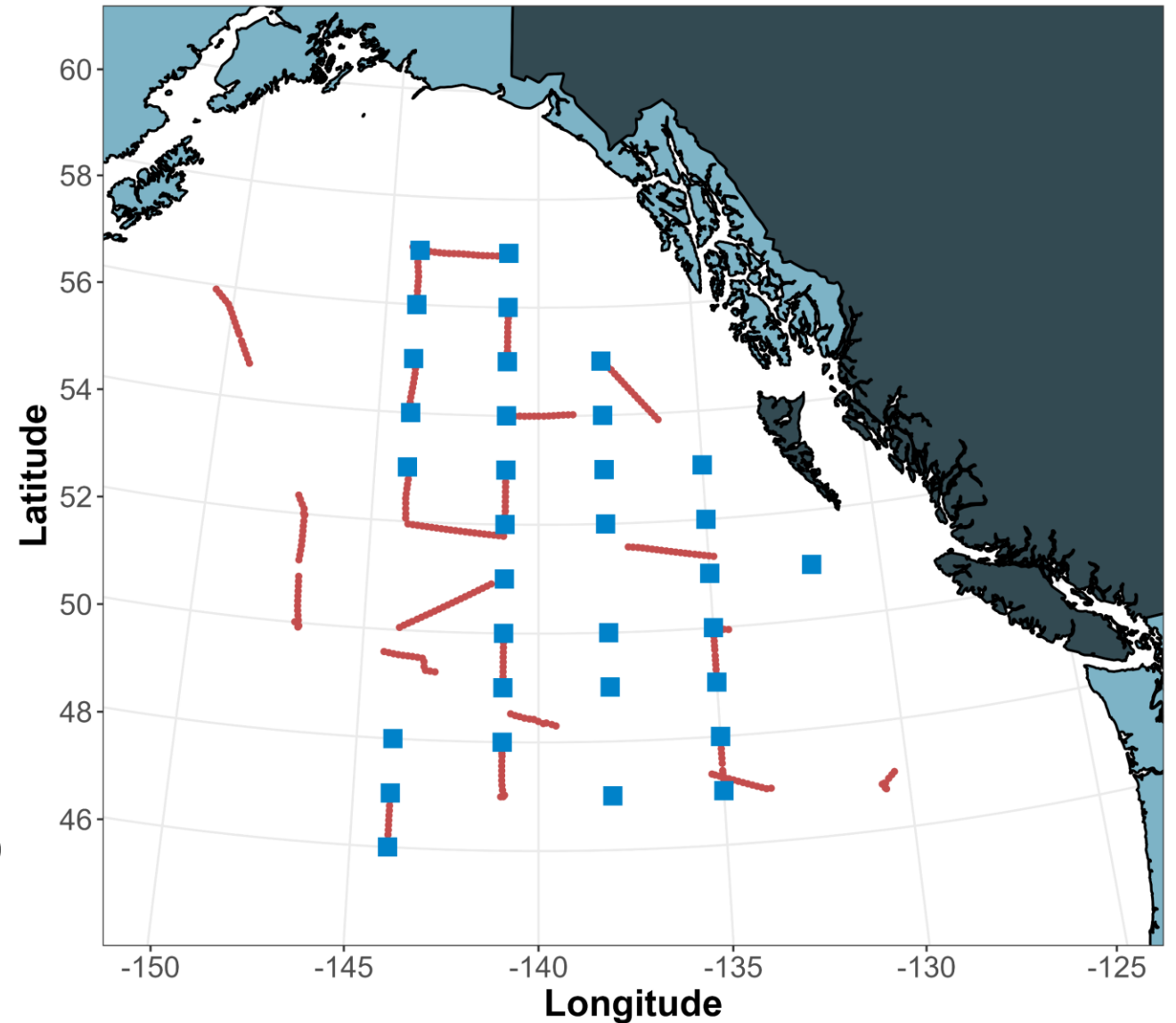


Nets



and Acoustics

- Simrad EK80 Echosounders on ships:
18, 38, 70, 120, 200, 333 kHz
- For krill, only pings during daylight used
(more segregation of taxa)
- Pings aggregated into 10 km long by 5 m
deep integration cells
- Krill-like scattering targets isolated via
 ΔS_v 120 – 38kHz
(see De Robertis et al. 2010 among others)



Main species of krill observed

Euphausia pacifica



Tessarabrachion oculatum



Thysanoessa inspinata



Thysanoessa spinifera



Thysanoessa longipes



Thysanoessa inermis



...as well as:

Stylocheiron maximum

Thysanoessa gregaria

Thysanoessa raschii

Nematobrachion boopis

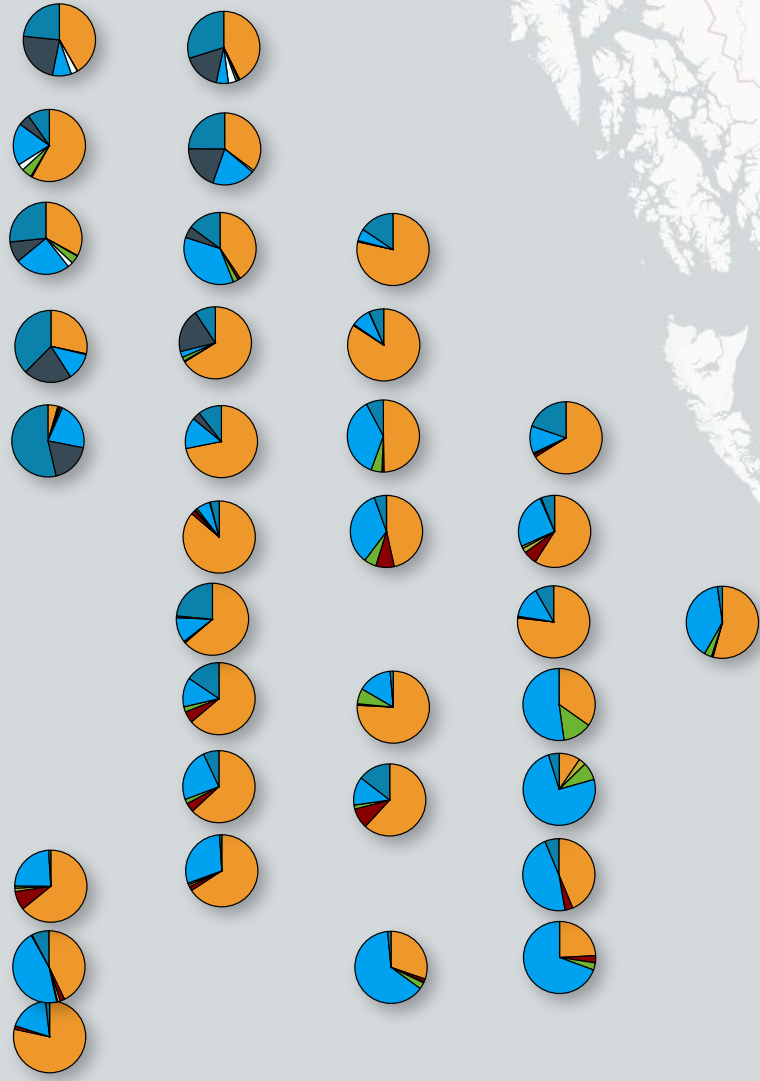
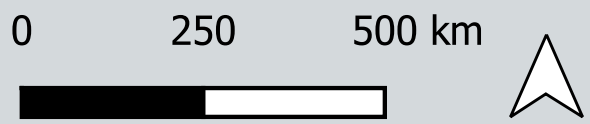
Thysanopoda cornuta



Gulf of Alaska

British Columbia

Pacific Ocean



○ Tucker Trawl Stations

■ *Euphausia pacifica*

■ *Sergestes similis*

■ *Stylocheiron maximum*

■ *Tessarabrachion oculatum*

■ *Thysanoessa inermis*

■ *Thysanoessa inspinata*

■ *Thysanoessa longipes*

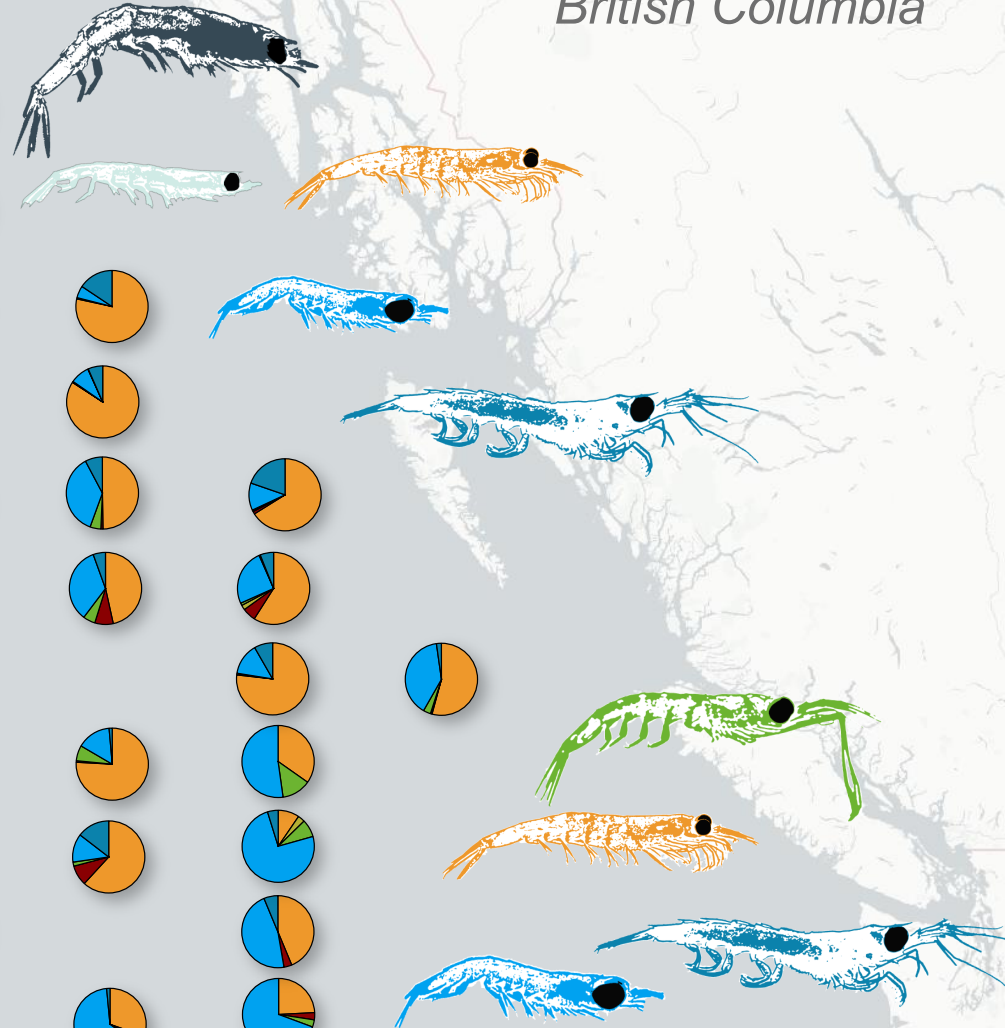
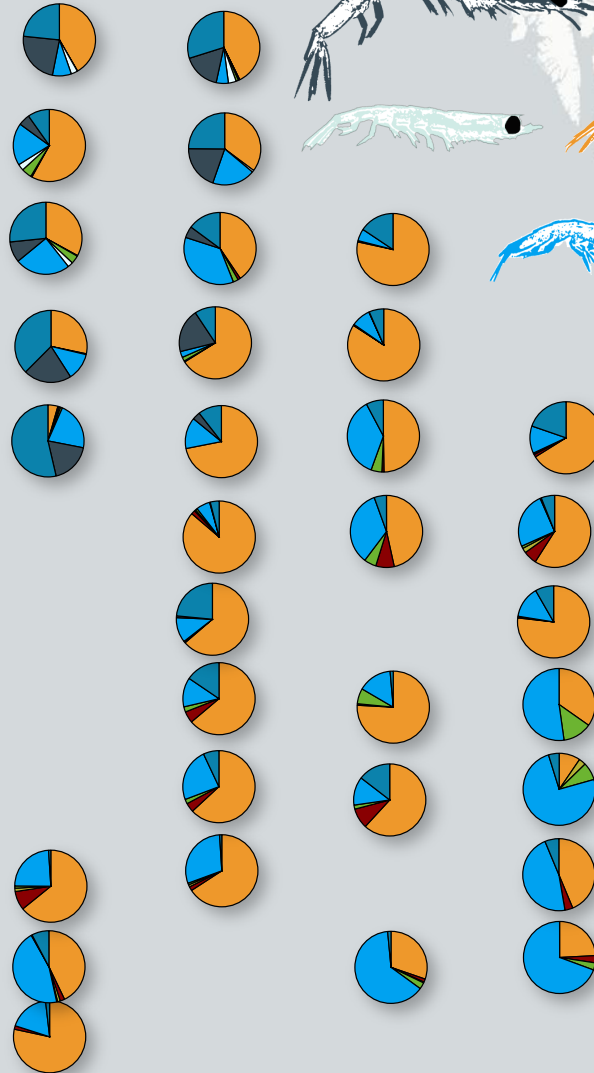
■ *Thysanoessa spinifera*

Gulf of Alaska

British Columbia

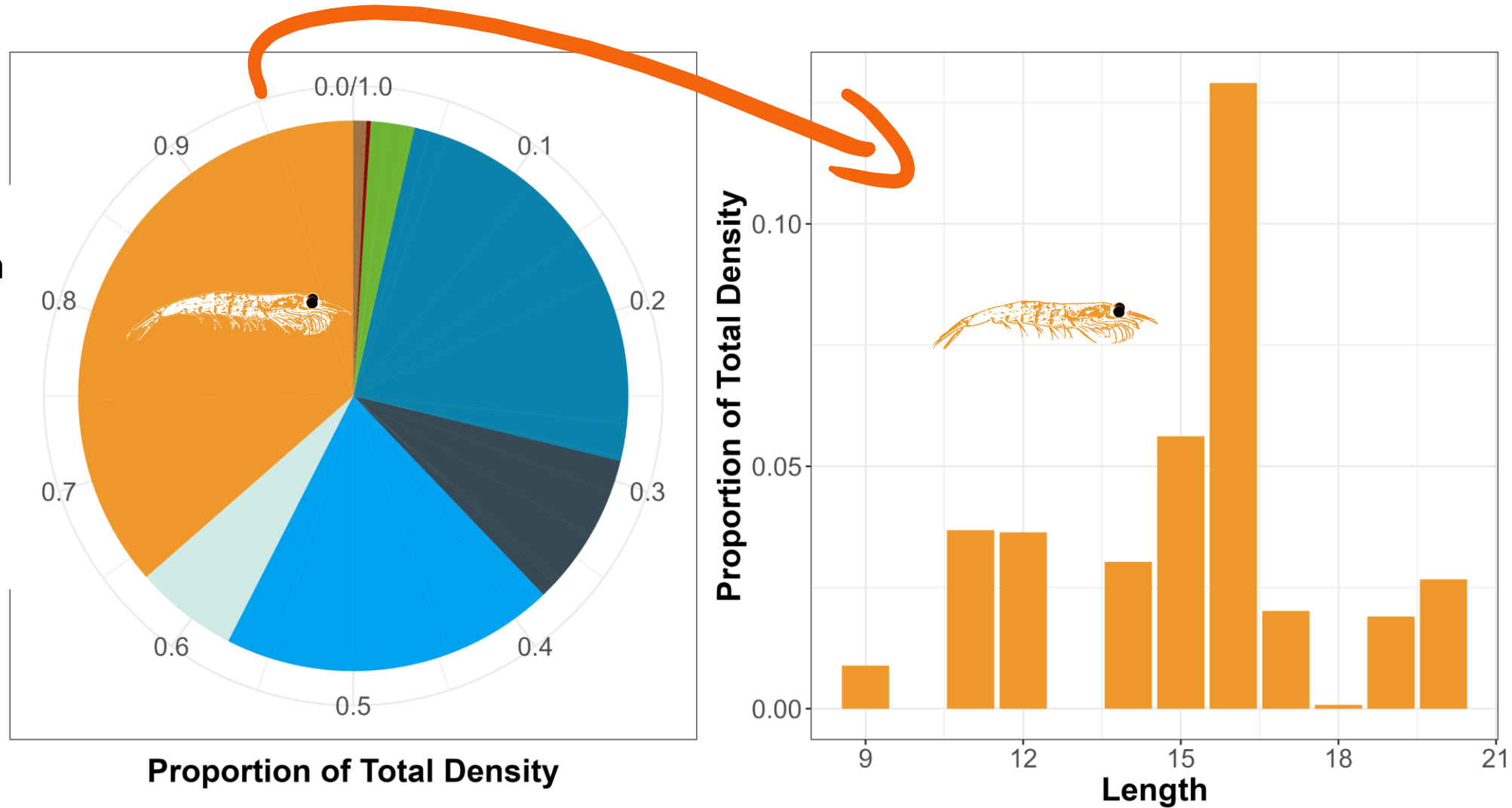
Pacific Ocean

0 250 500 km



Integrating Nets and Acoustics

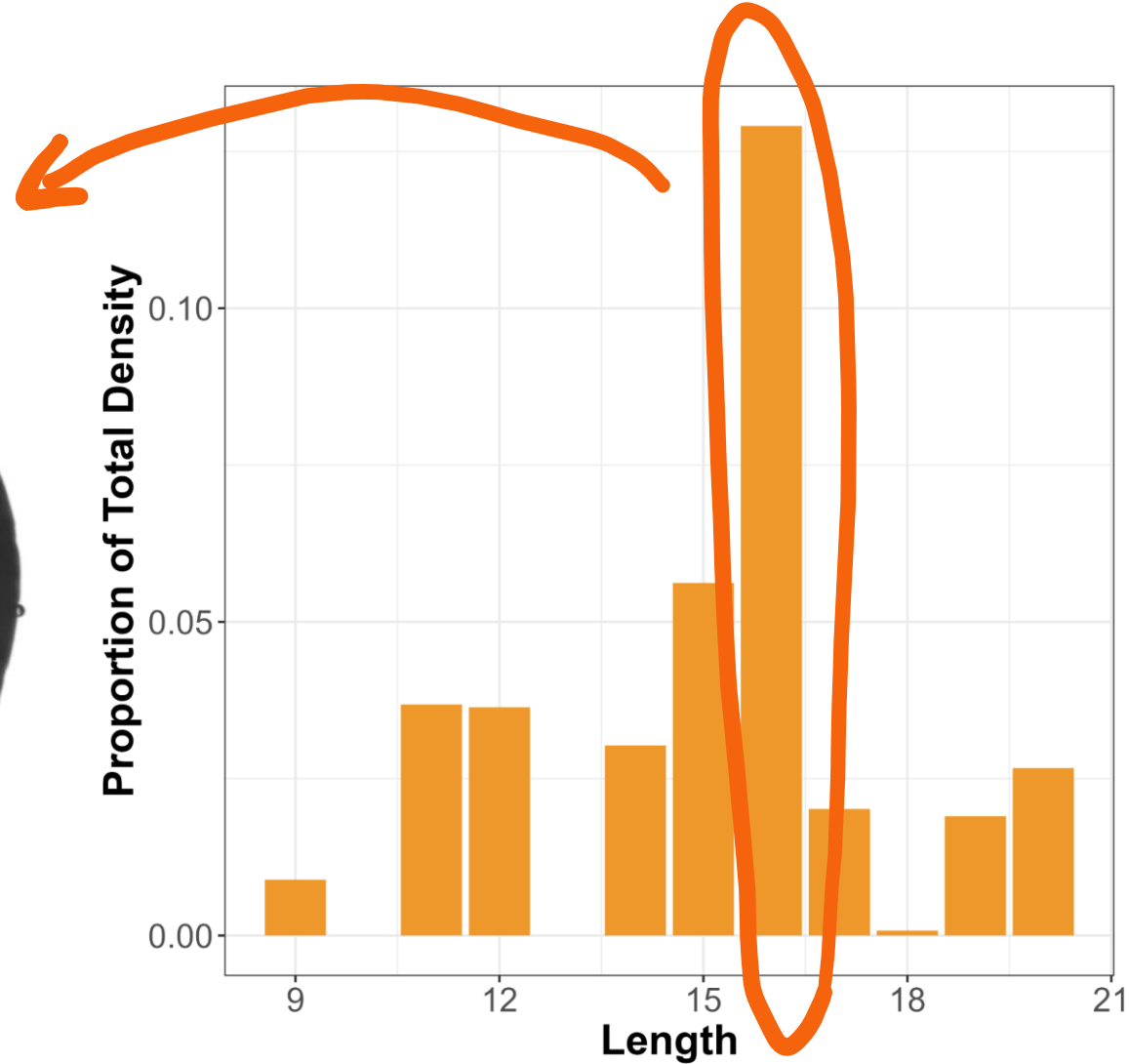
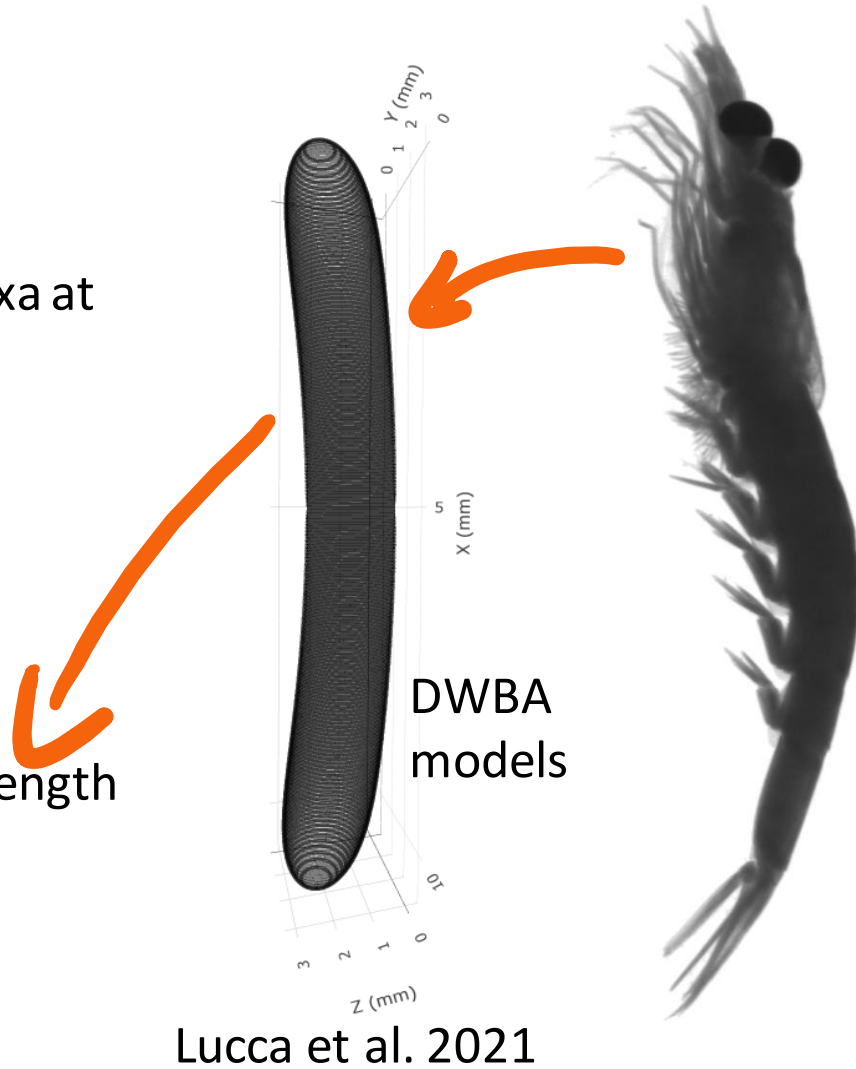
Distance-weighted proportions of each taxa at each size observed in nearby nets



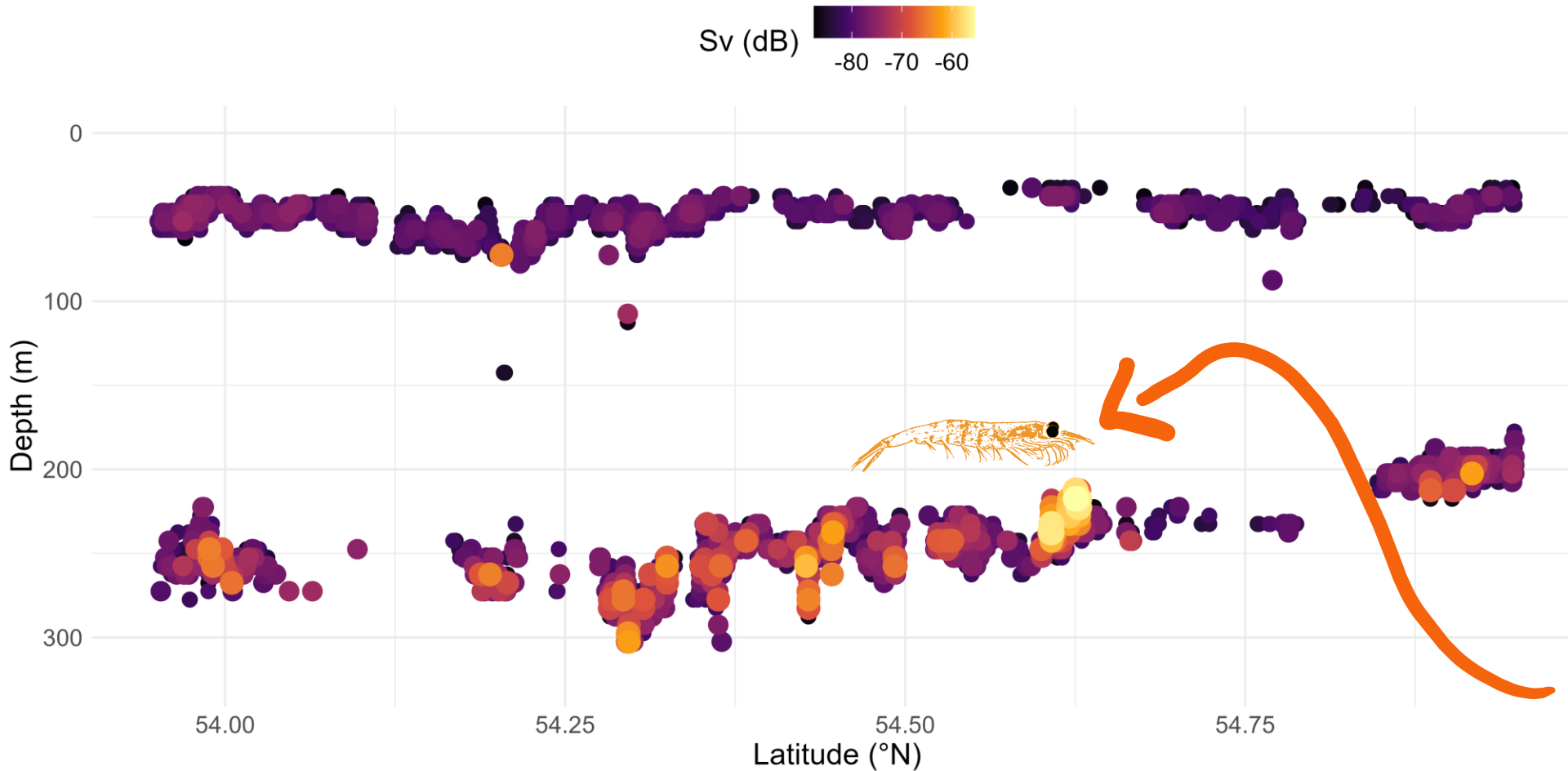
Integrating Nets and Acoustics

Modelled target strength of each taxa at each size

Expected target strength at 120 kHz = -79 dB



Integrating Nets and Acoustics



Distance-weighted proportions of each taxa at each size observed in nearby nets

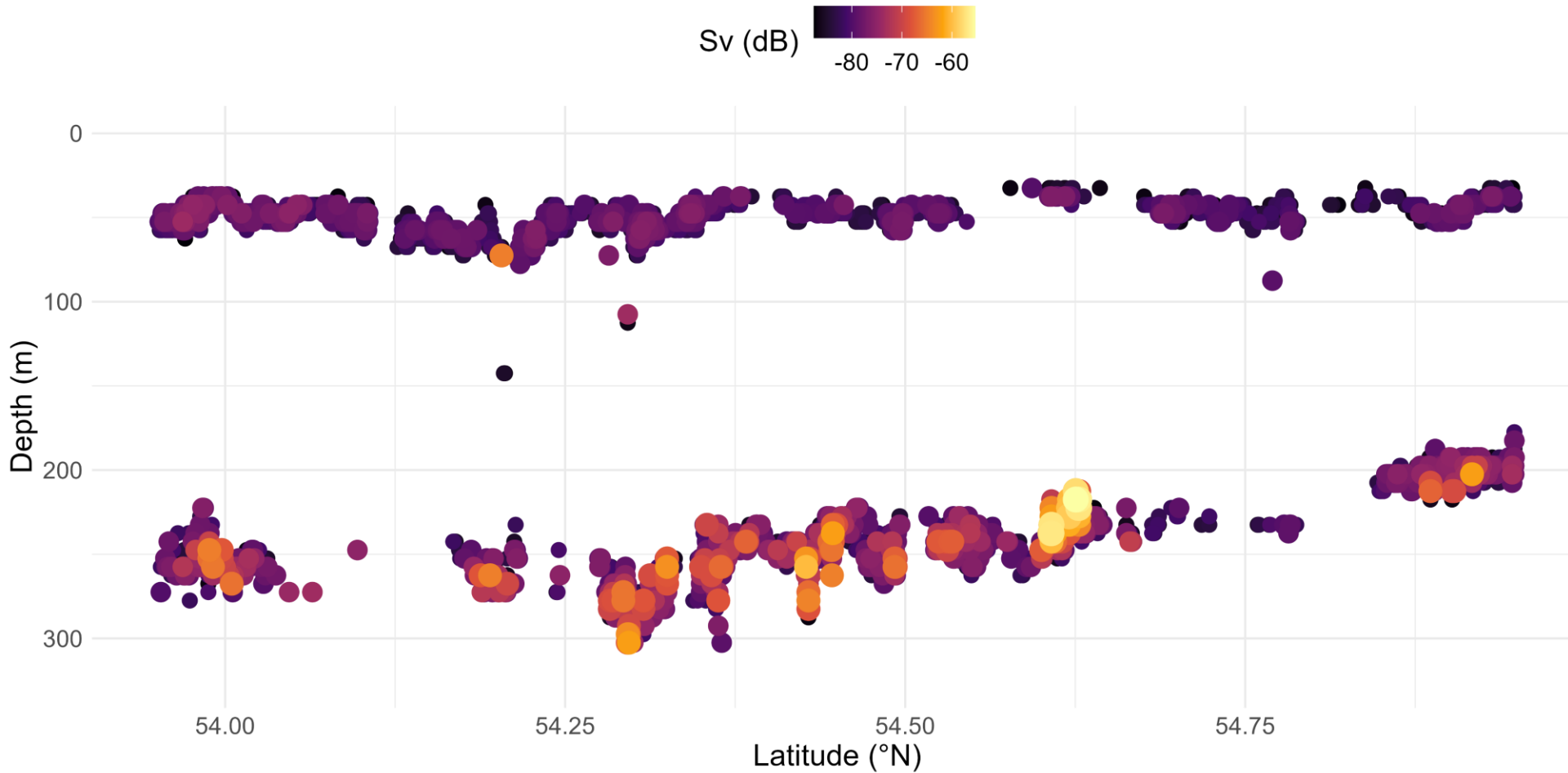
+

Modelled target strength of each taxa at each size

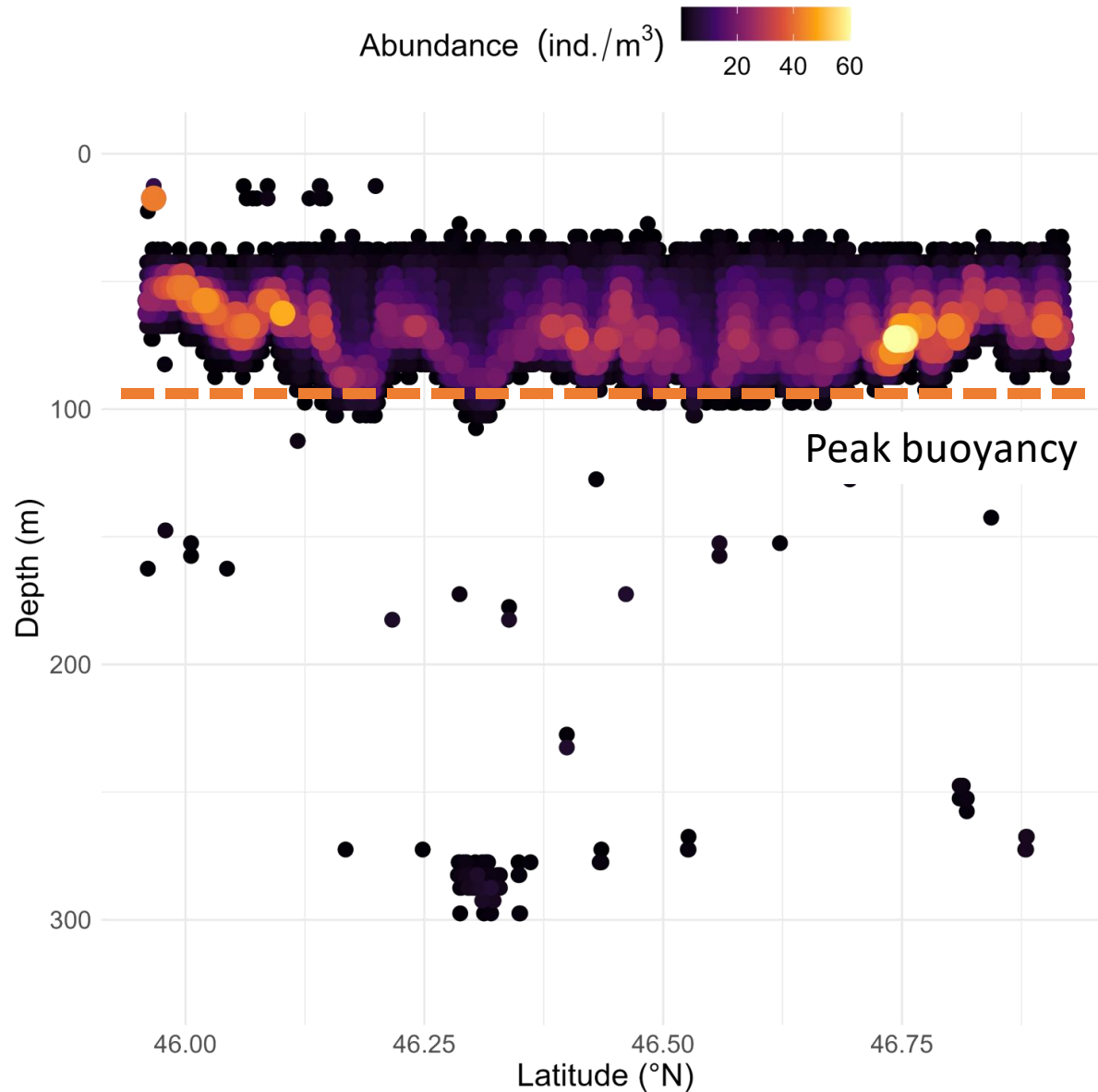
=

Acoustic estimates of density by species and size

Acoustics



Two main
scattering layers
present in the
region



Acoustics

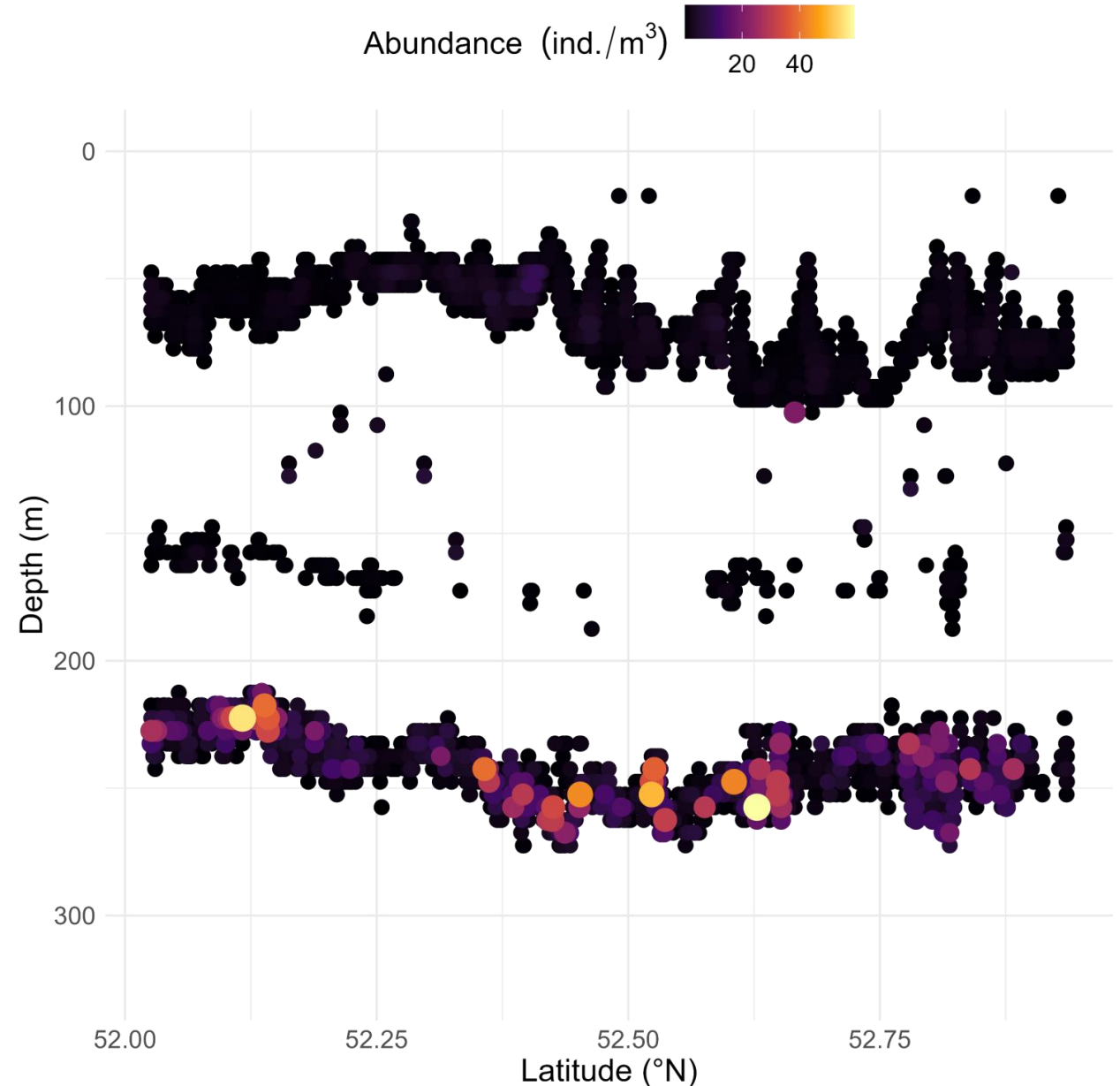
Upper scattering layer:

- Average depth = 67m
- Consistently above peak buoyancy, along pycnocline
- Non-migratory
- Denser towards south of survey region
- Probably smaller euphausiids and amphipods

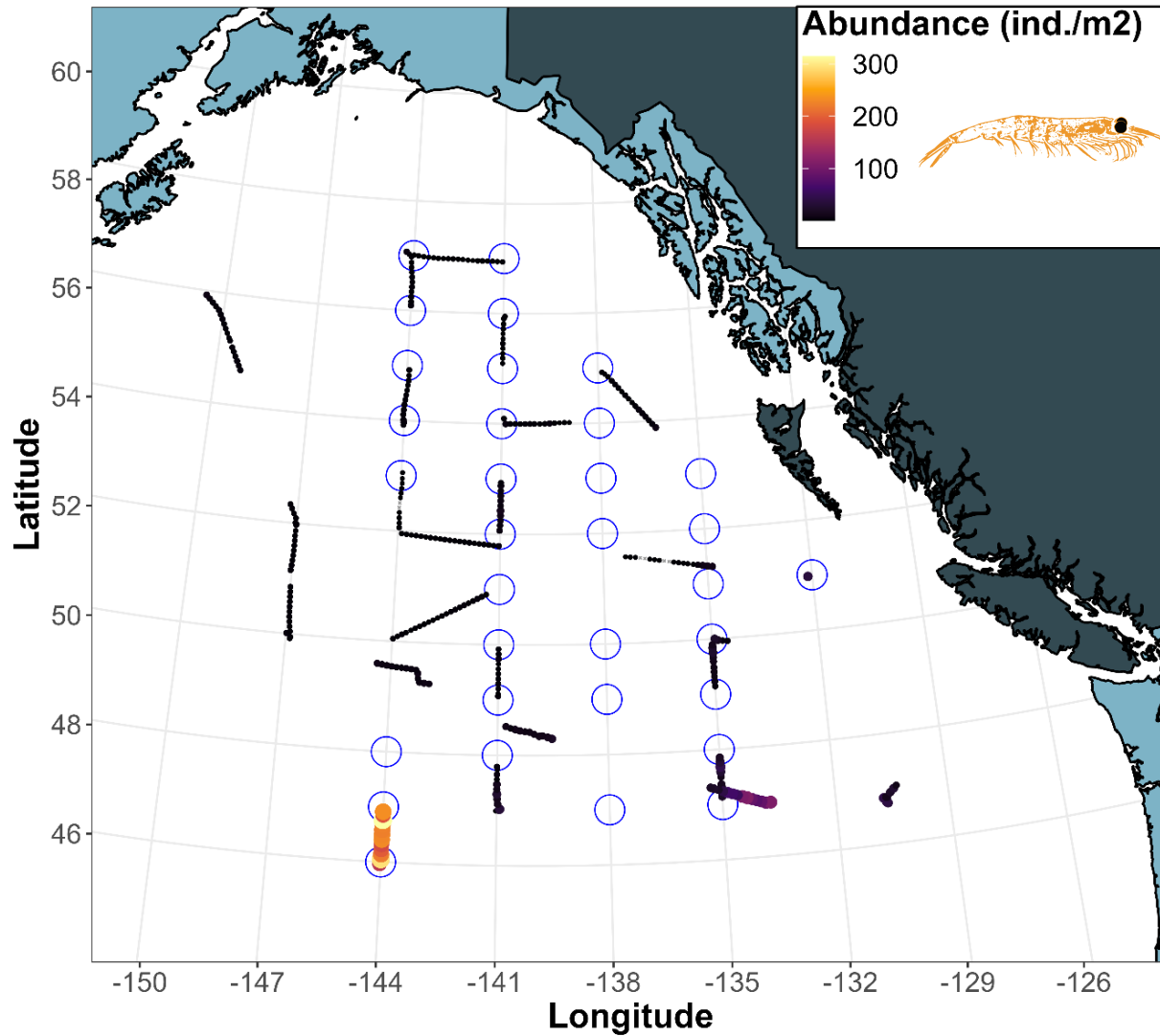
Acoustics

Lower scattering layer:

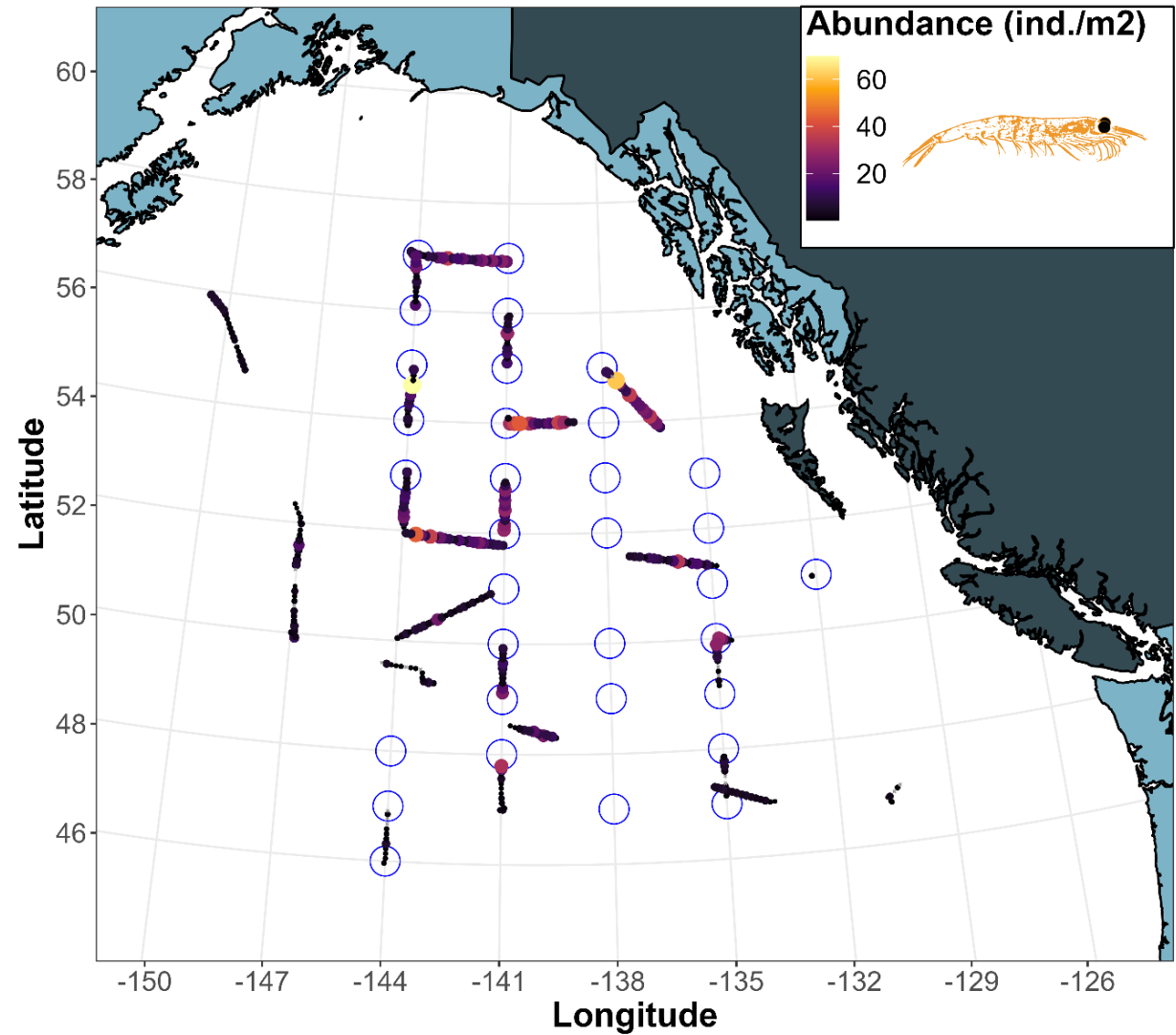
- Average depth = 225m
- Below peak buoyancy at day, migrates above at night
- Highly patchy swarms
- Denser towards north of survey region
- Probably larger euphausiids



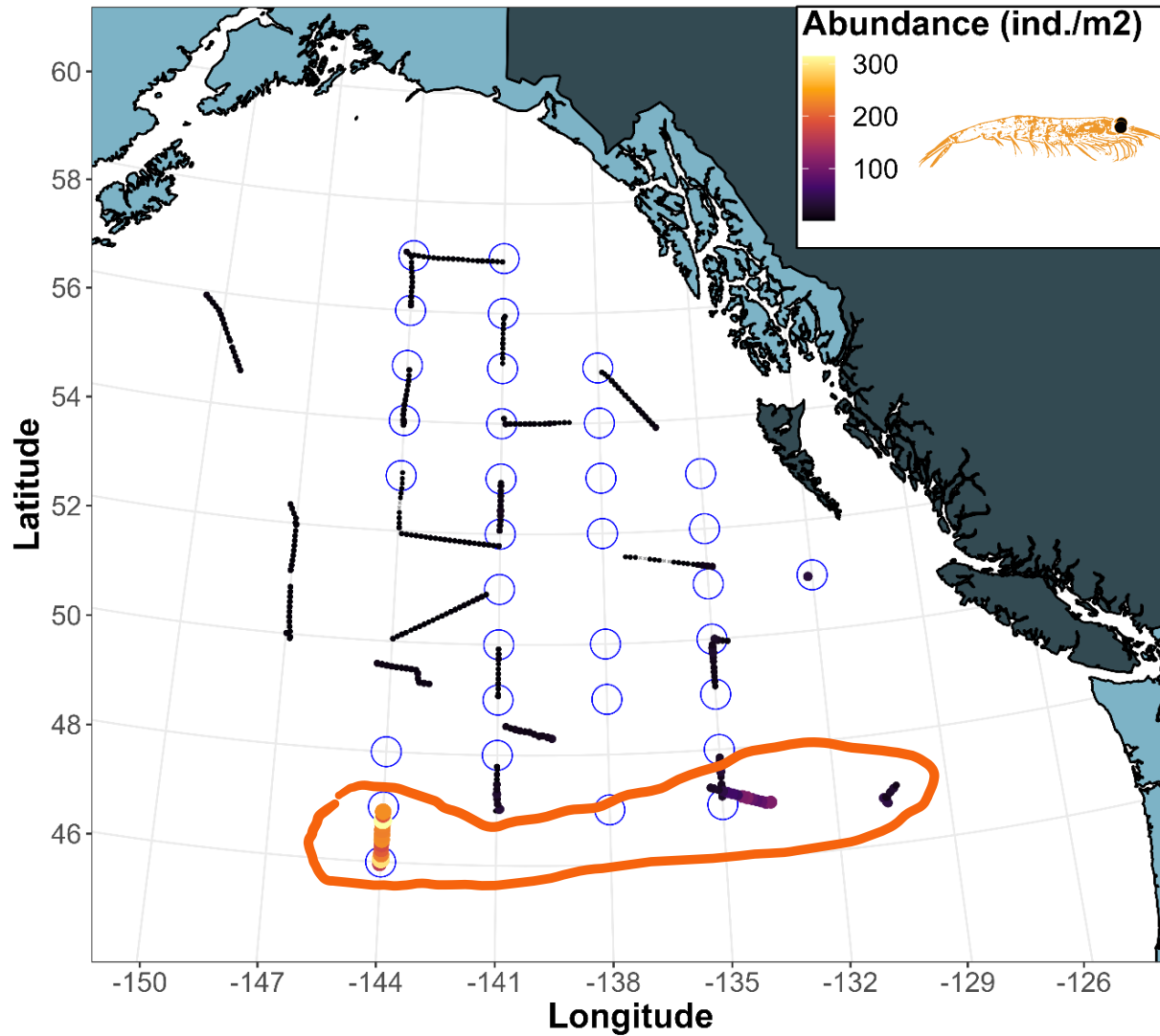
Euphausia pacifica Upper layer



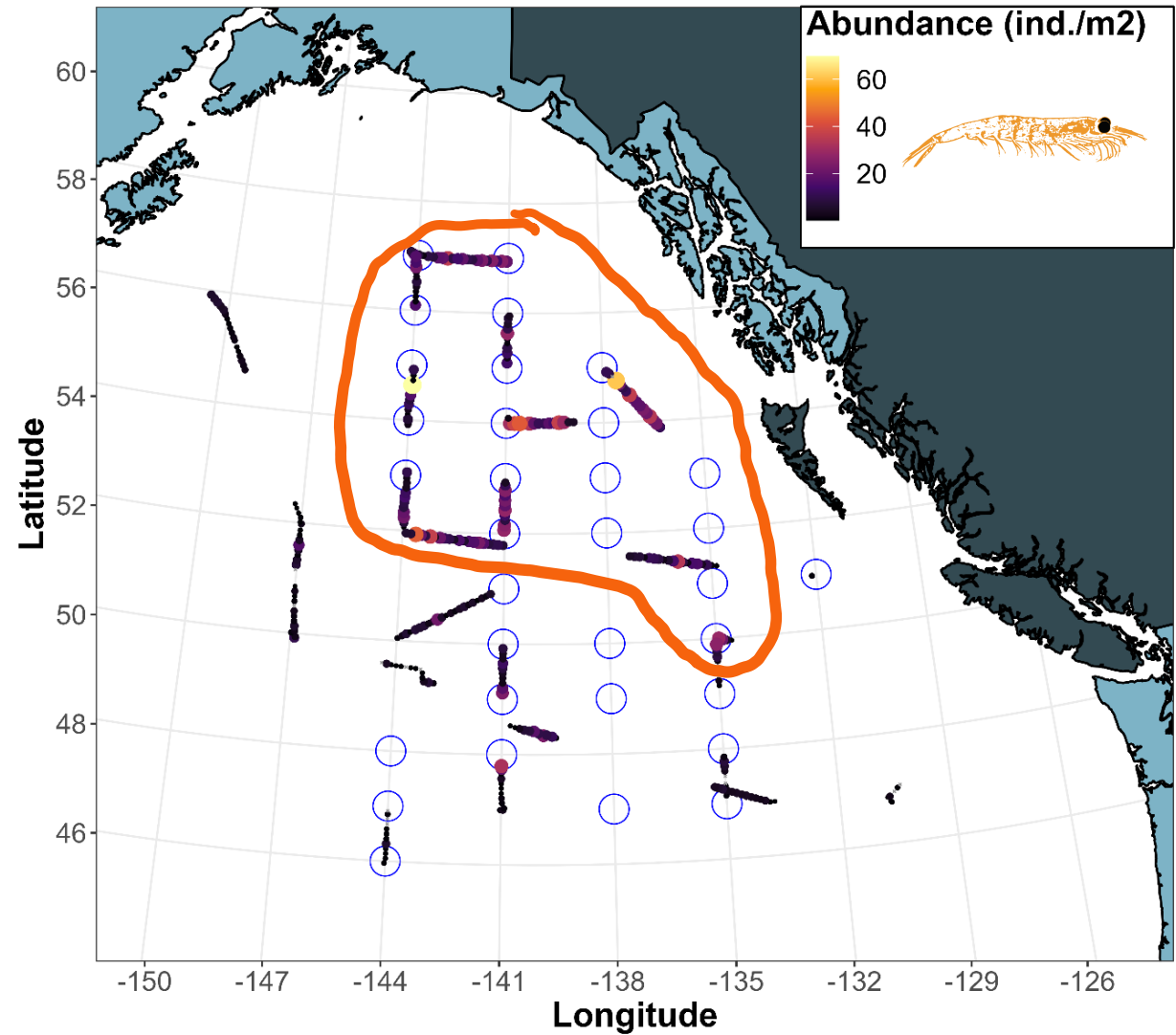
Euphausia pacifica Lower layer

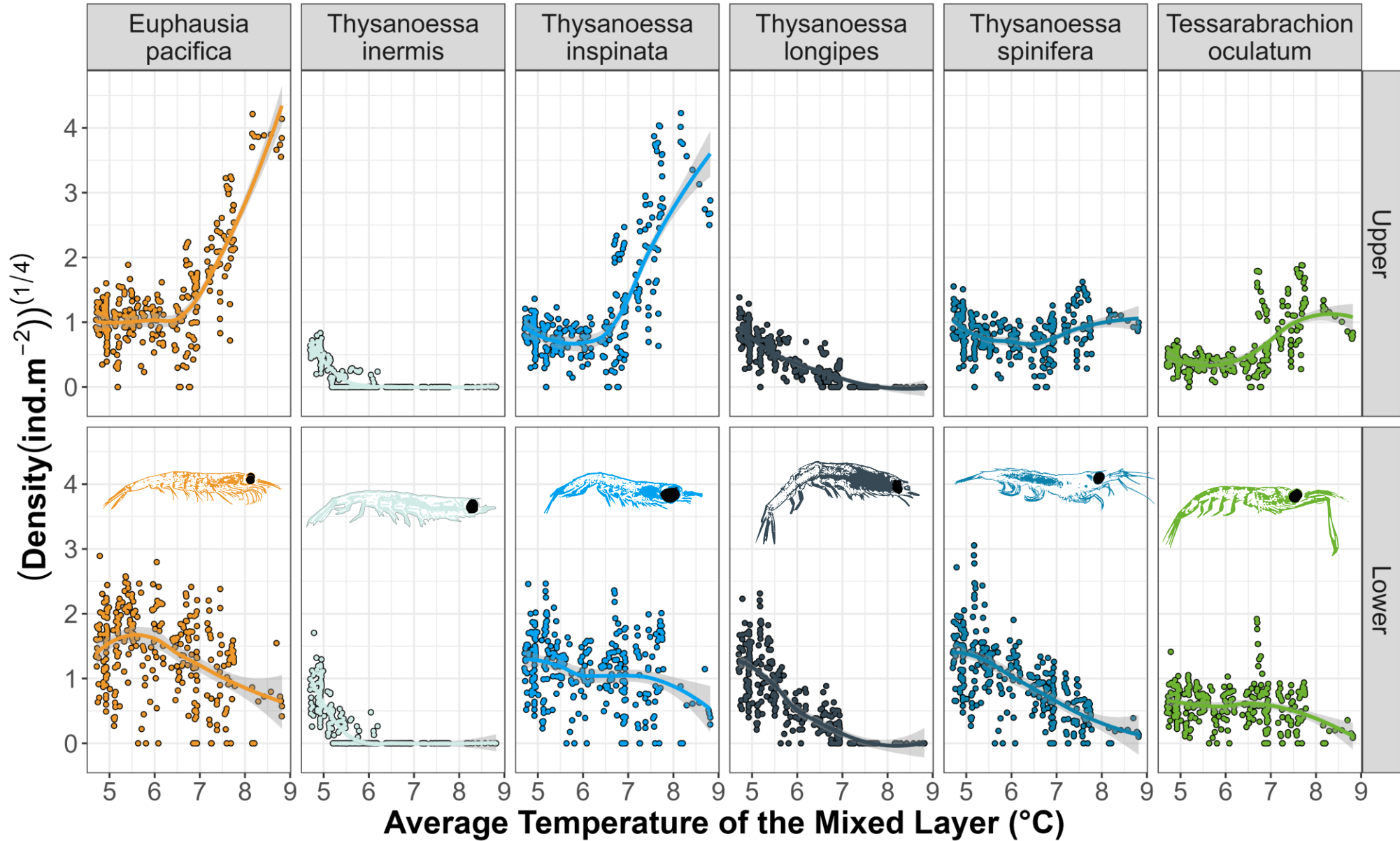


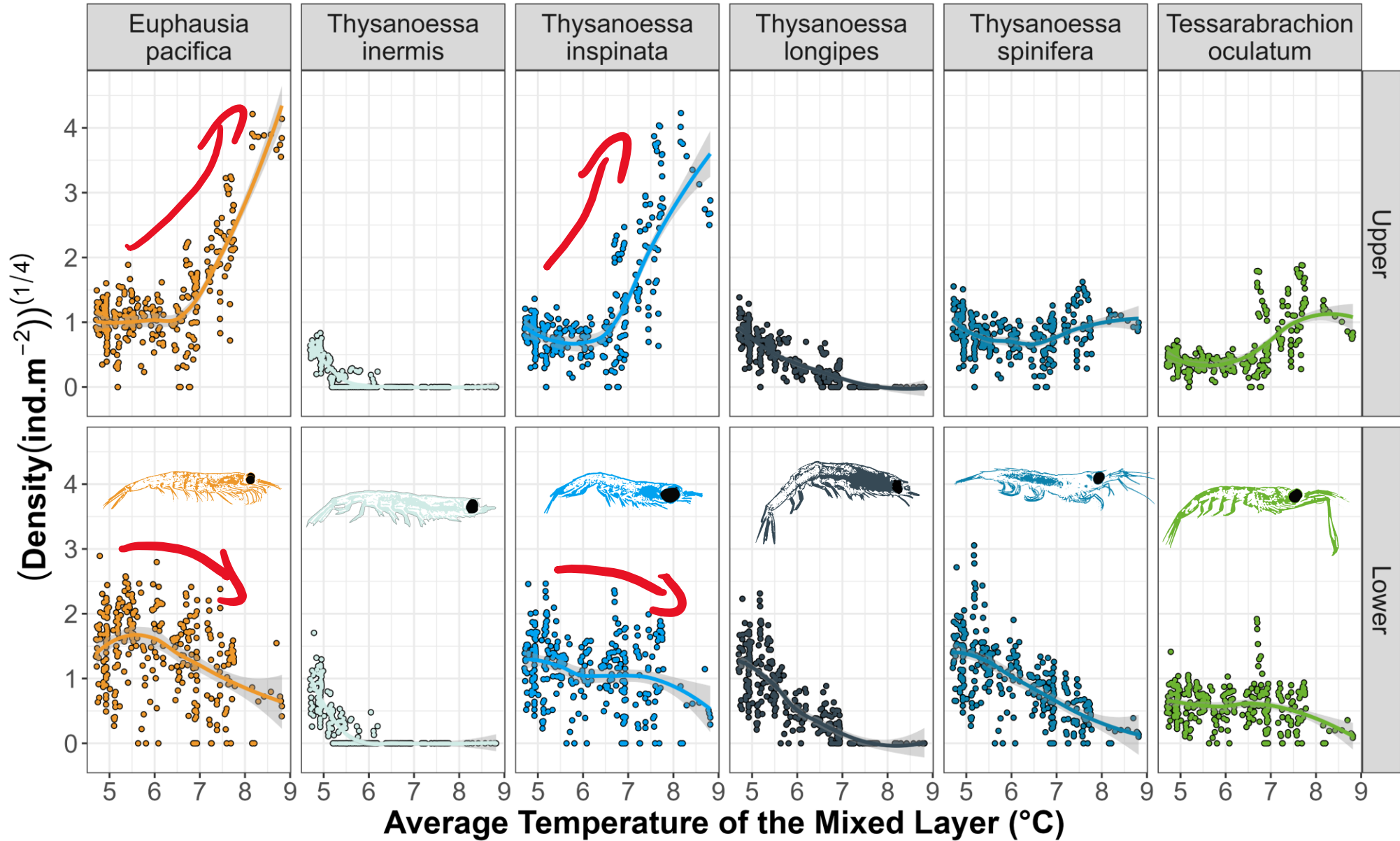
Euphausia pacifica Upper layer

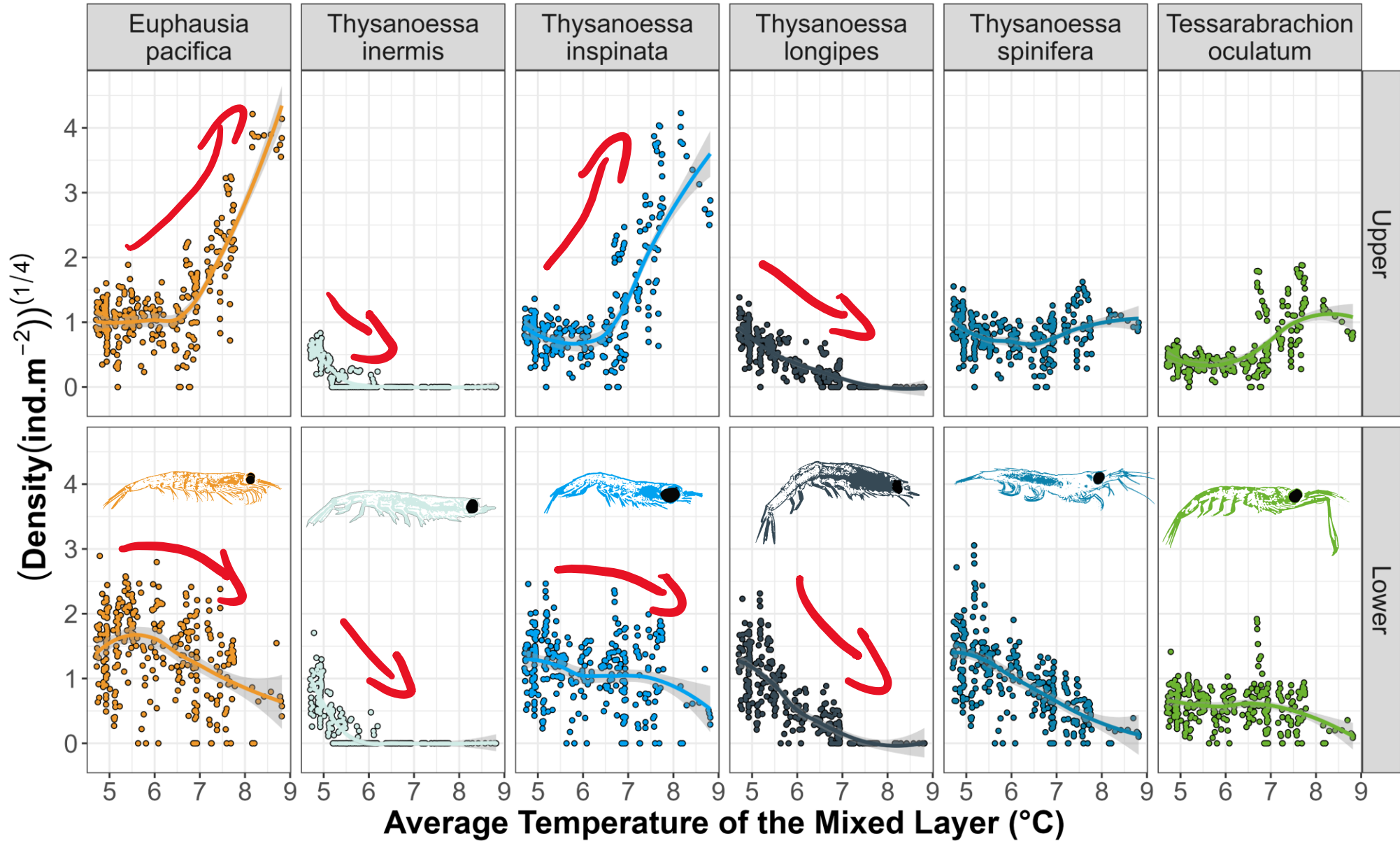


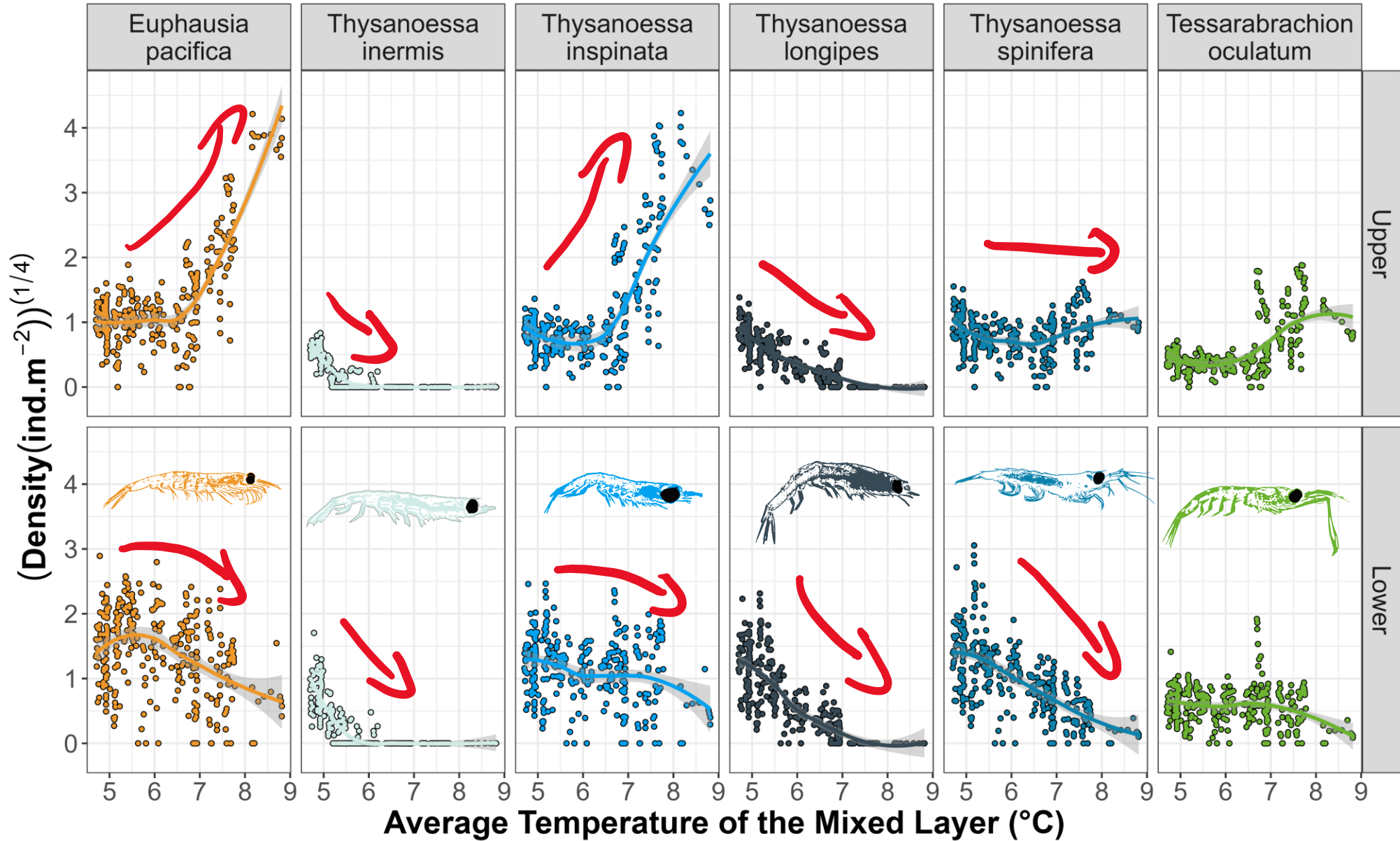
Euphausia pacifica Lower layer

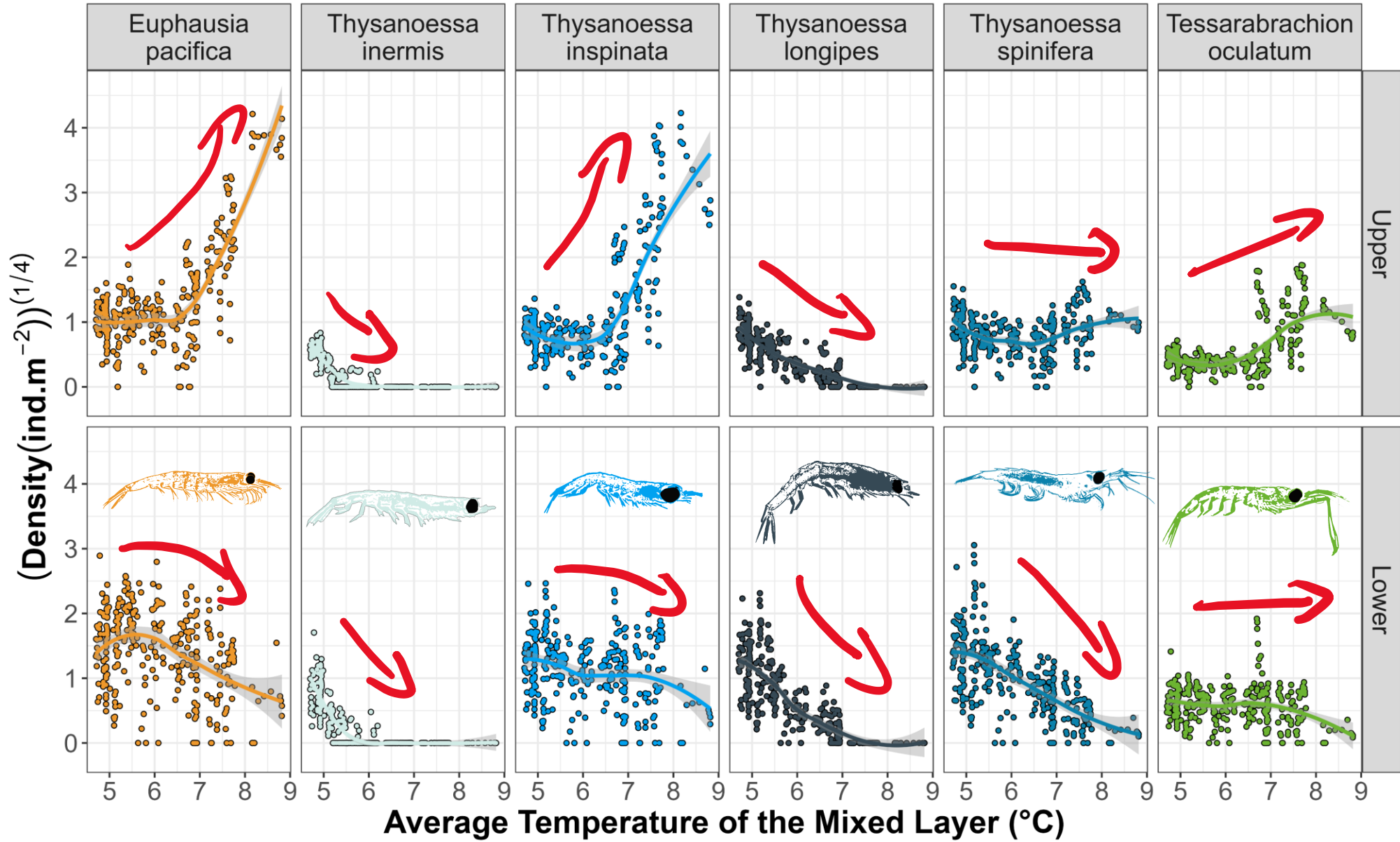


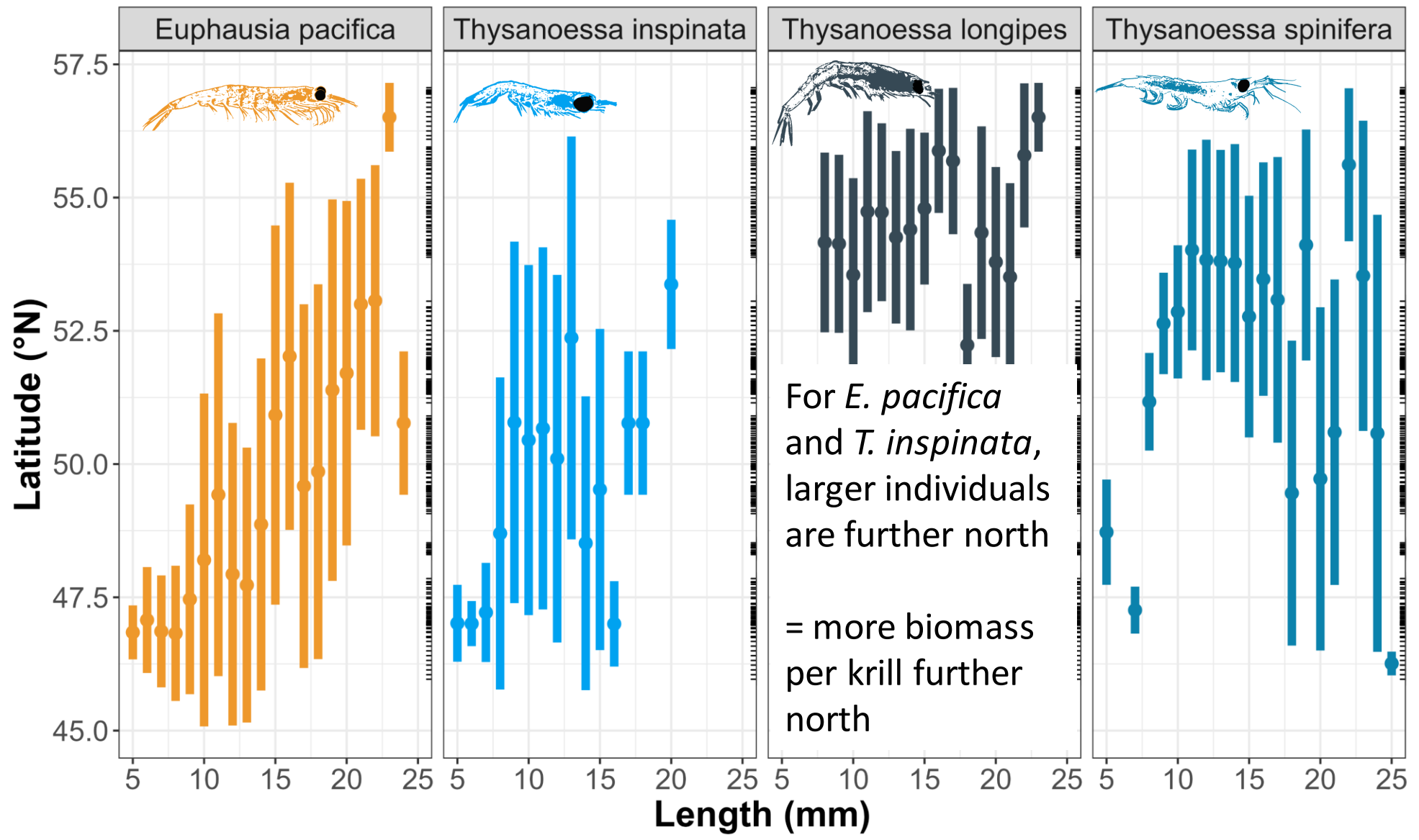




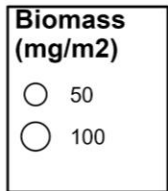
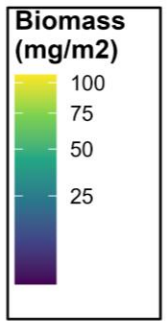
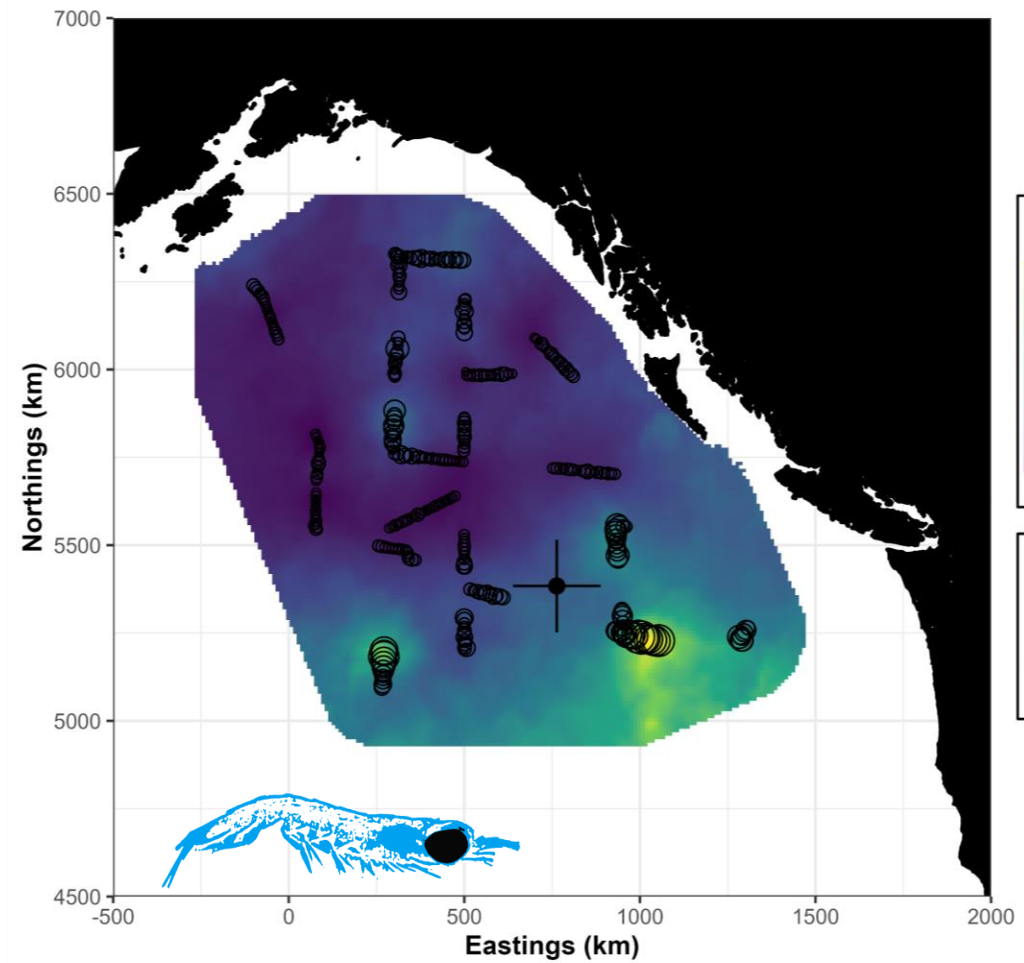
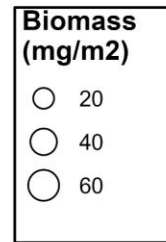
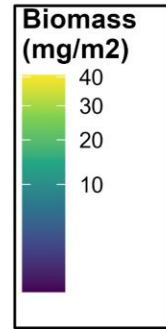
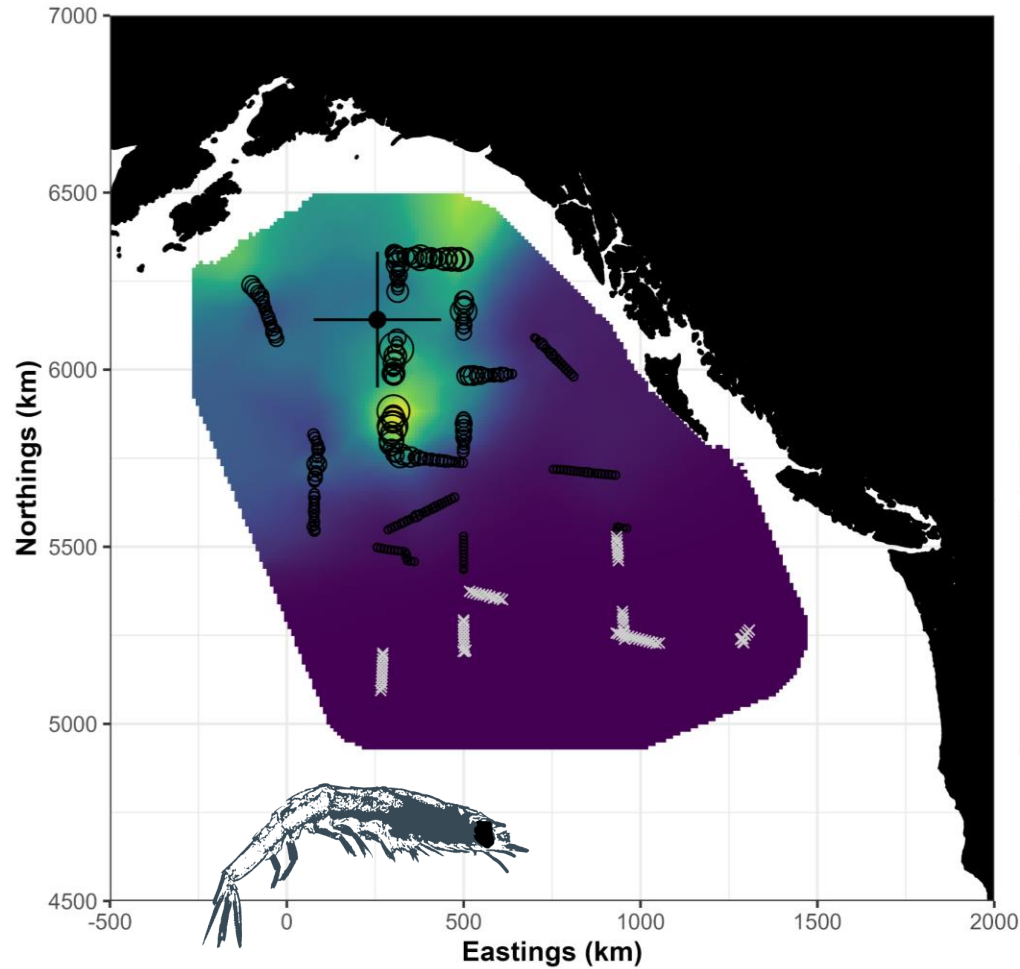






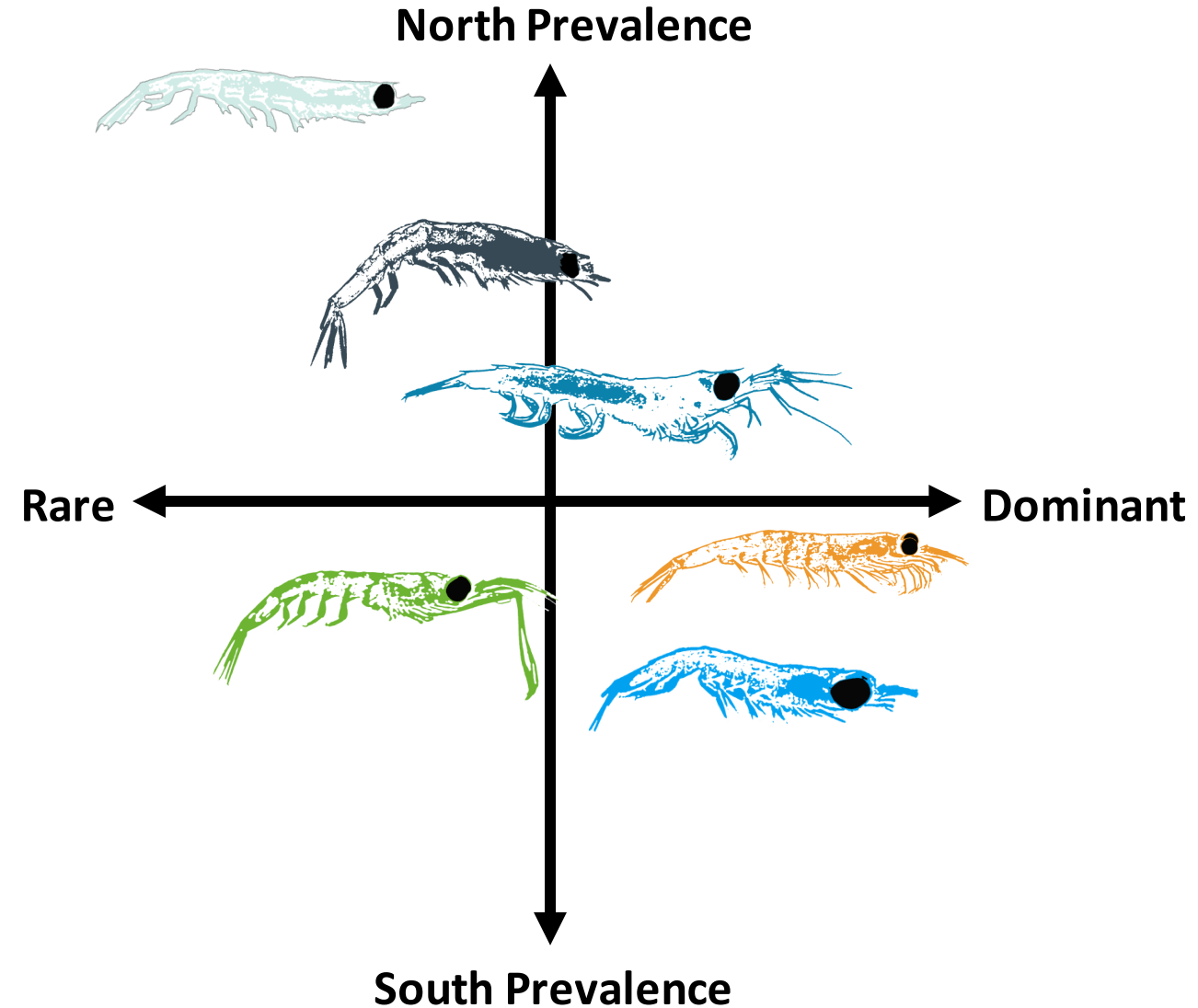


Next Steps – Species distribution models

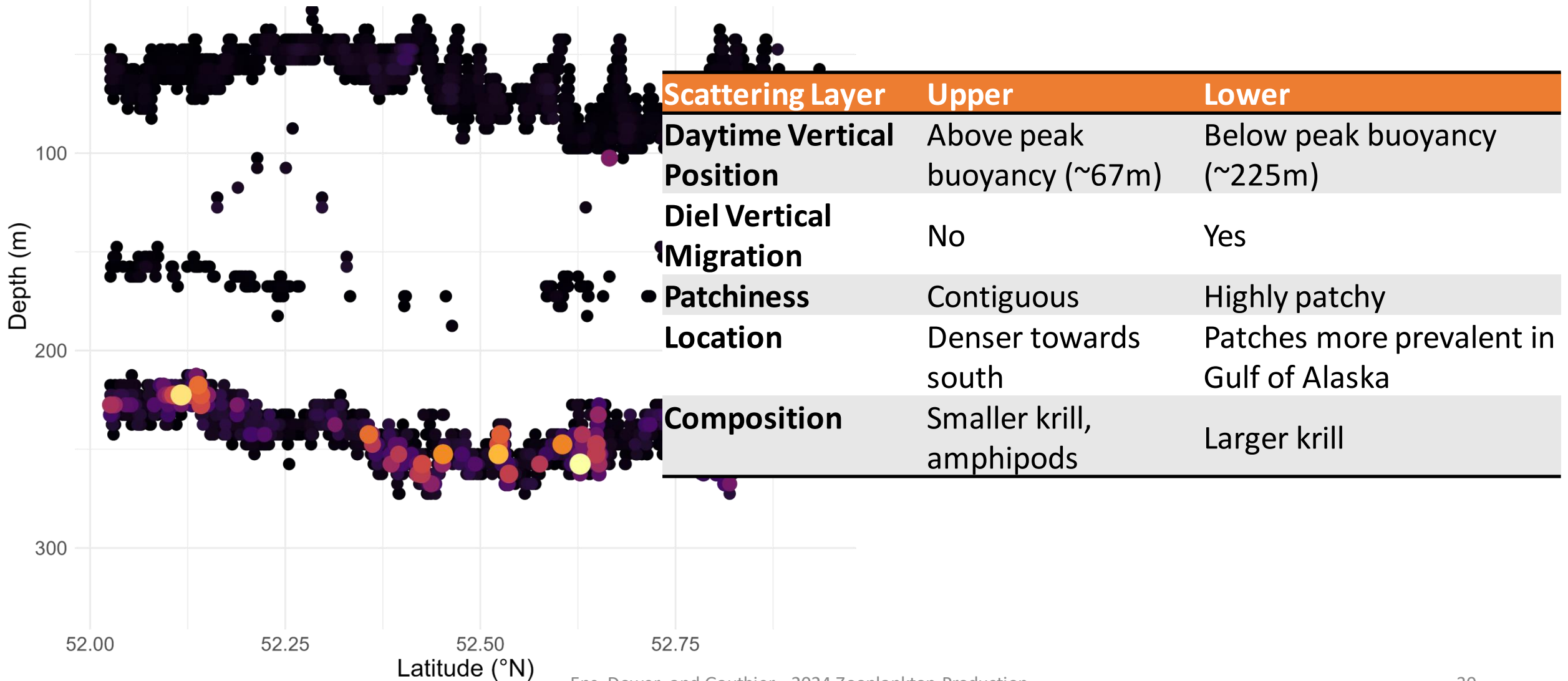


Key Takeaways

Species	Abundance	Latitudinal Prevalence
<i>Euphausia pacifica</i>	Dominant (~10/100m ²)	Widespread
<i>Thysanoessa inspinata</i>	Abundant (~7.5/100m ²)	Slightly southern
<i>Thysanoessa spinifera</i>	Common (~2/100m ²)	Slightly northern
<i>Thysanoessa longipes</i>	Uncommon (~0.5/100m ²)	Northern (<7°C)
<i>Thysanoessa inermis</i>	Rare (~0.05/100m ²)	Northern (<6.5°C)
<i>Tessarabrachion oculatum</i>	Uncommon (~0.5/100m ²)	Widespread



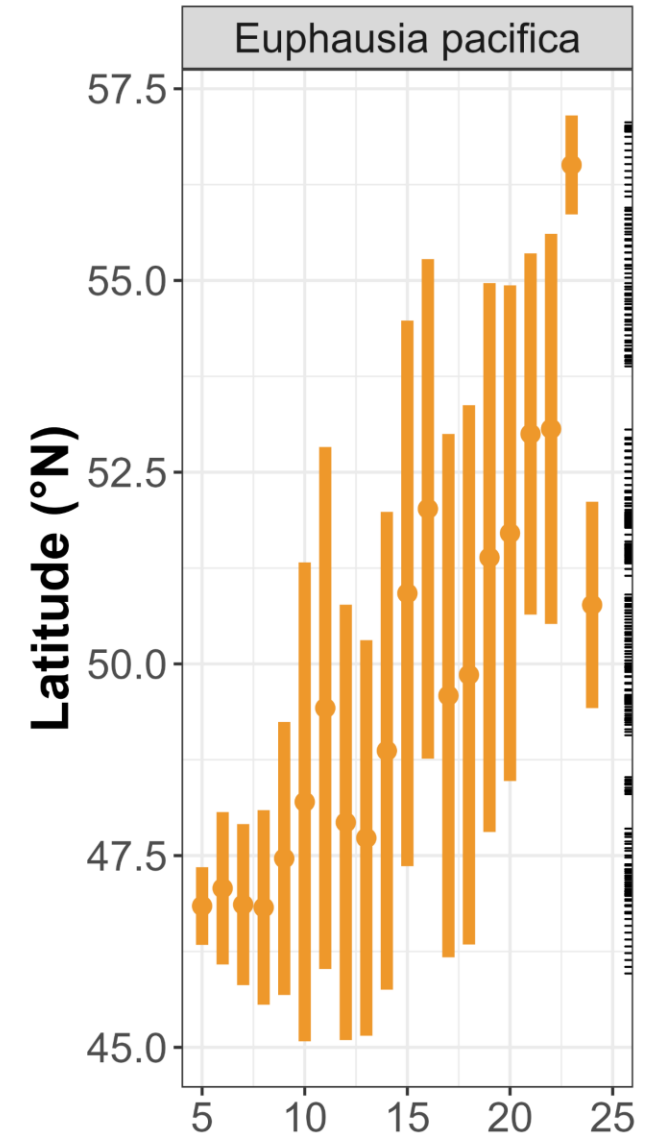
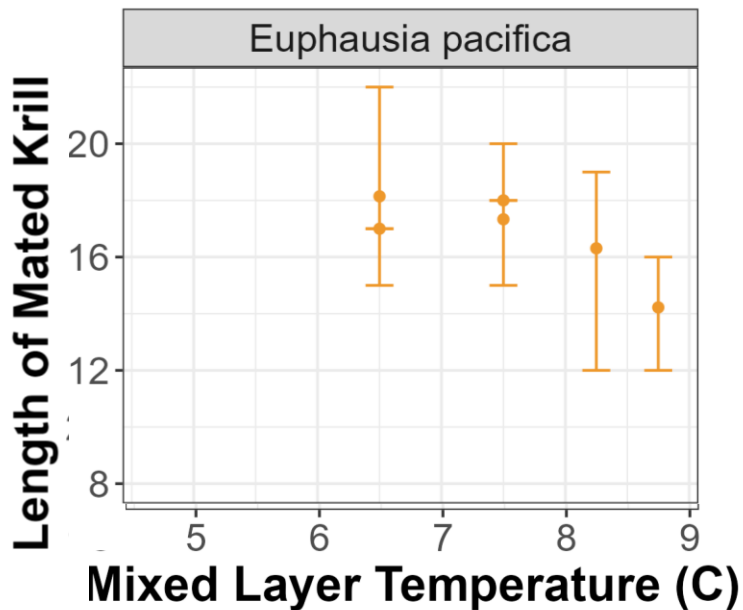
Key Takeaways



Key Takeaways



Euphausiids were larger further north
(and seem to be smaller when mating further south)

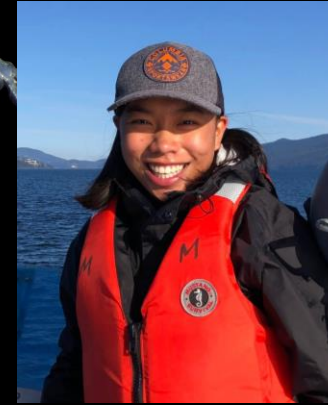


Thank you!

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Nicole Fung



Elise Hummelbrunner



Fisheries and Oceans Canada:

- Moira Galbraith
- Chelsea Stanley
- Jackie King
- Coast Guard crew of the Franklin

NOAA

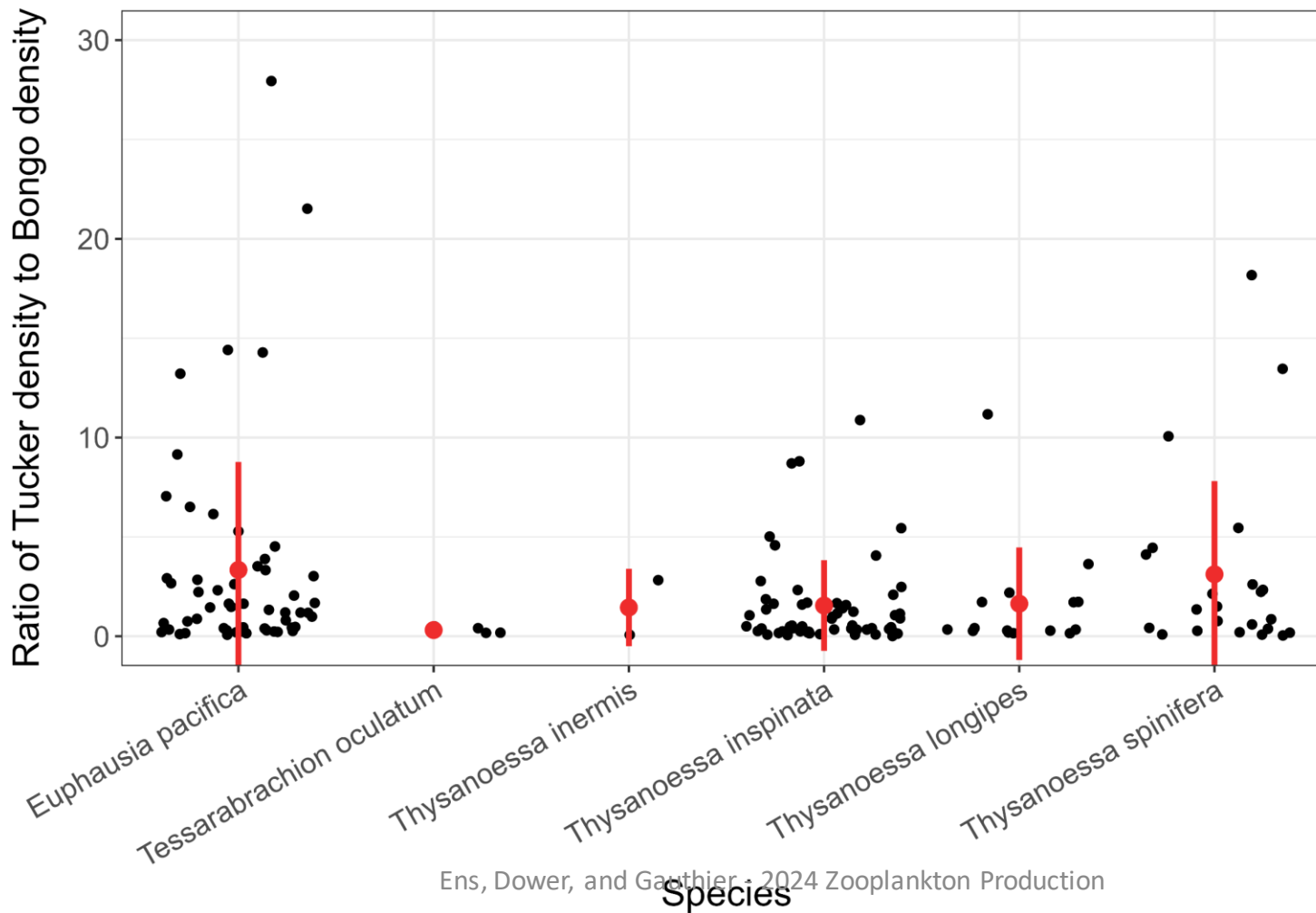
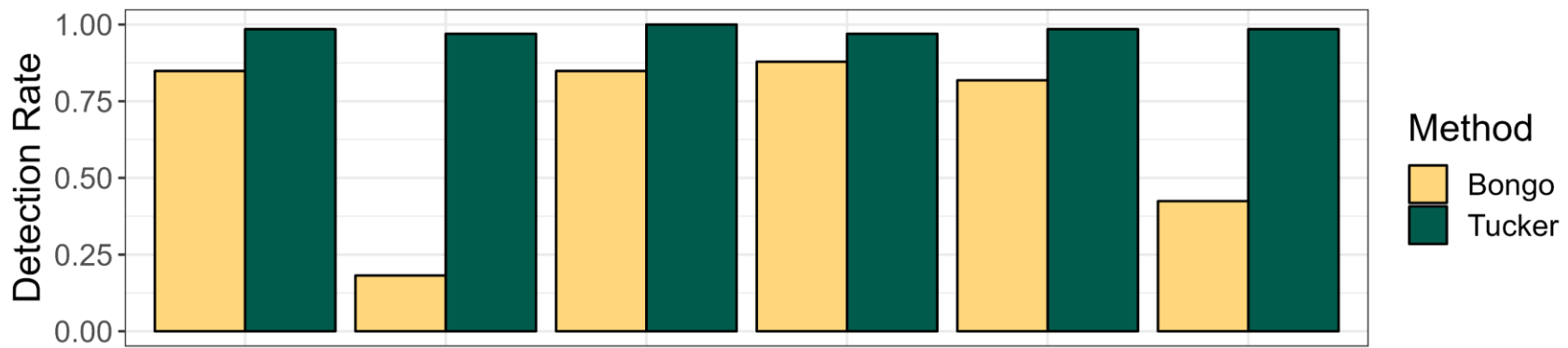
- Brian Wells
- Brandon Chasco
- NOAA crew of the Shimada

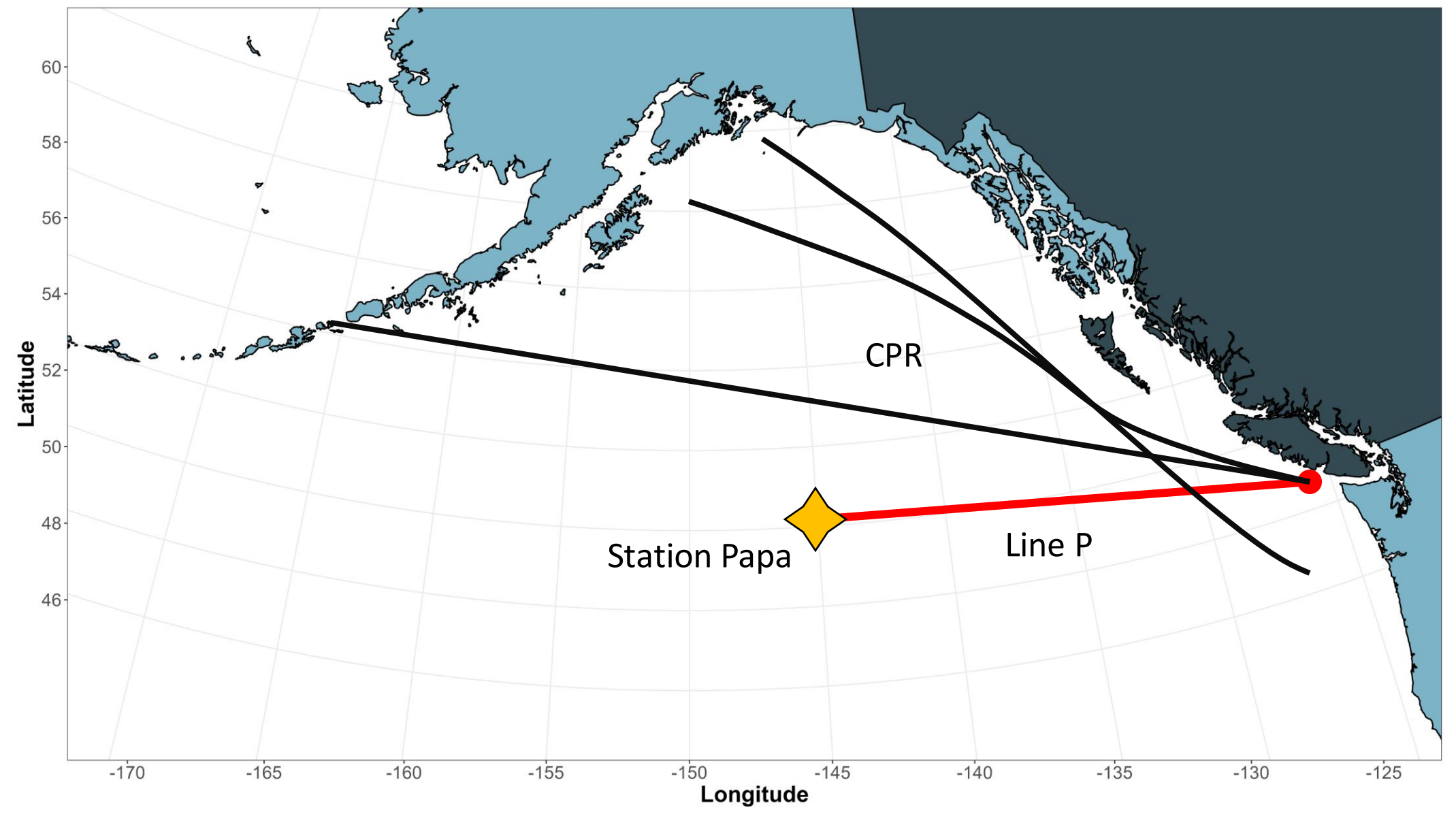


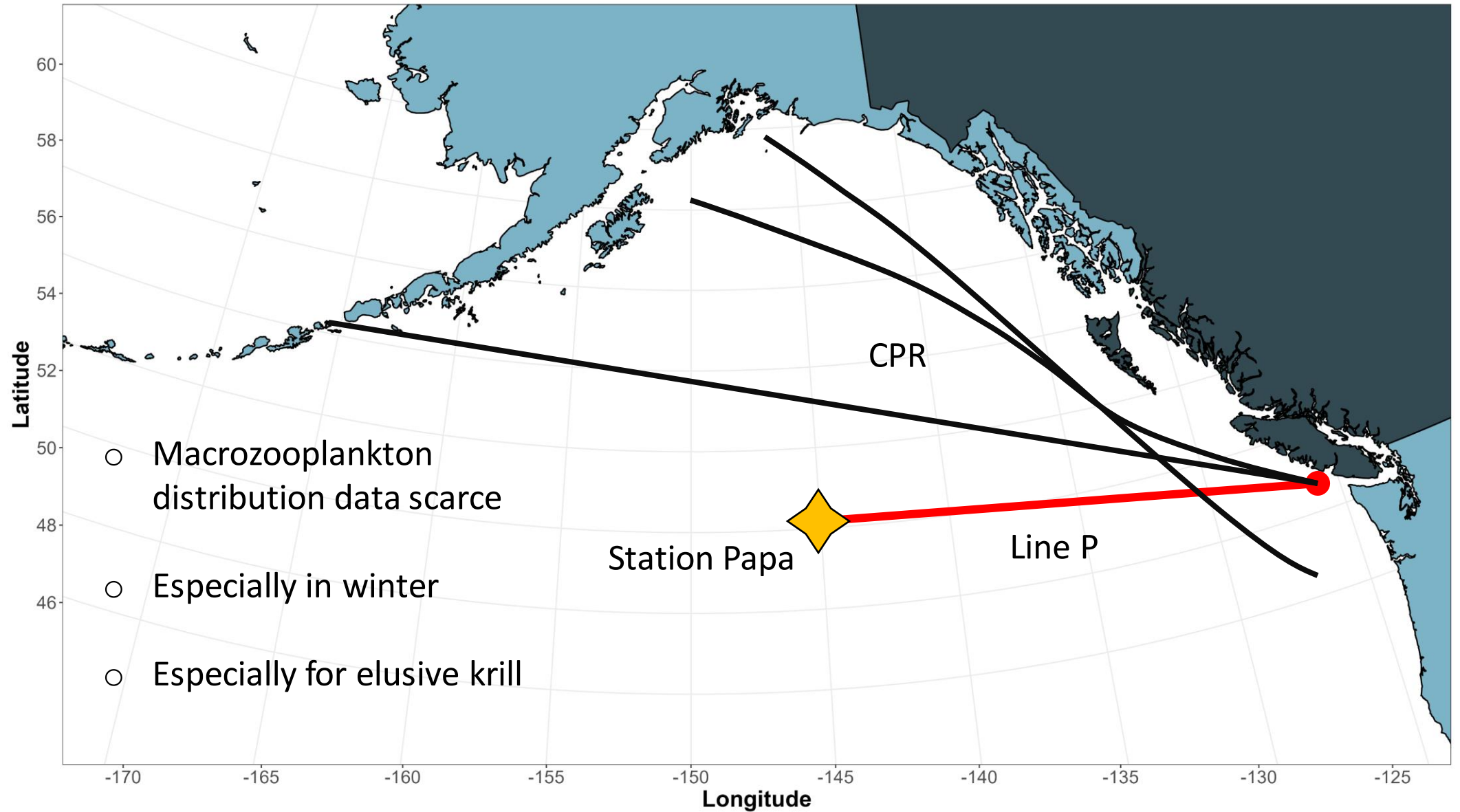
Fisheries and Oceans
Canada

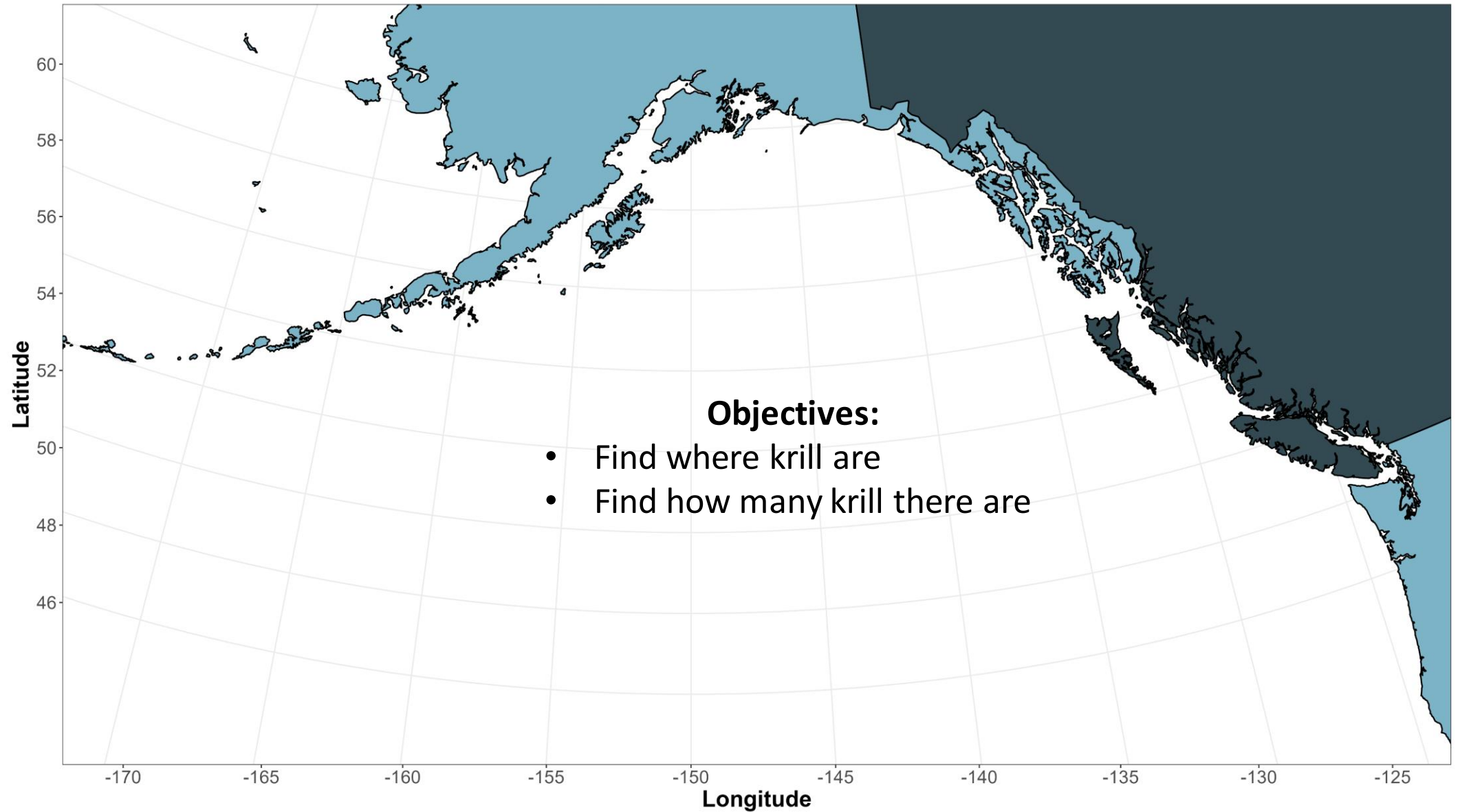


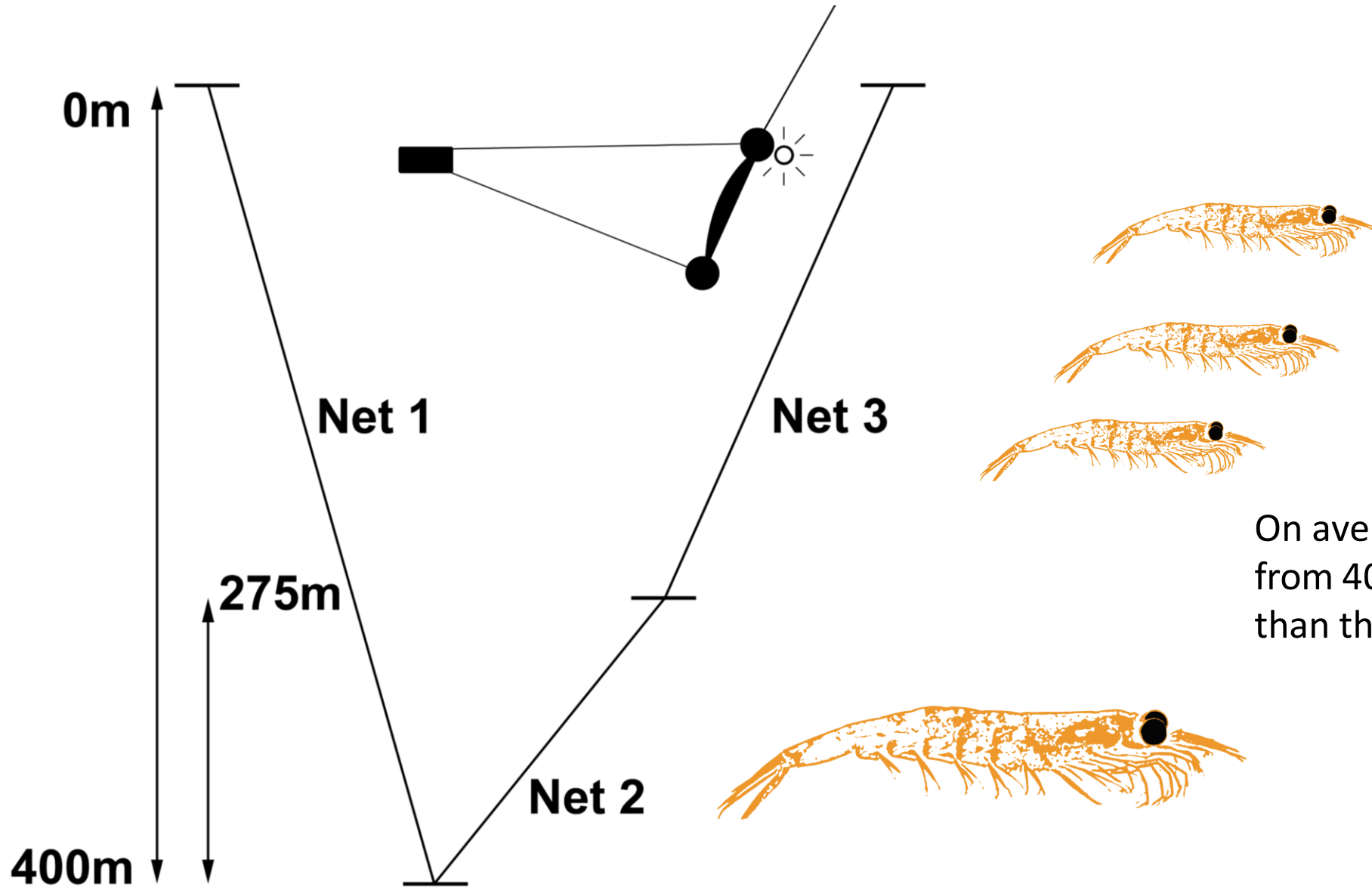
University
of Victoria



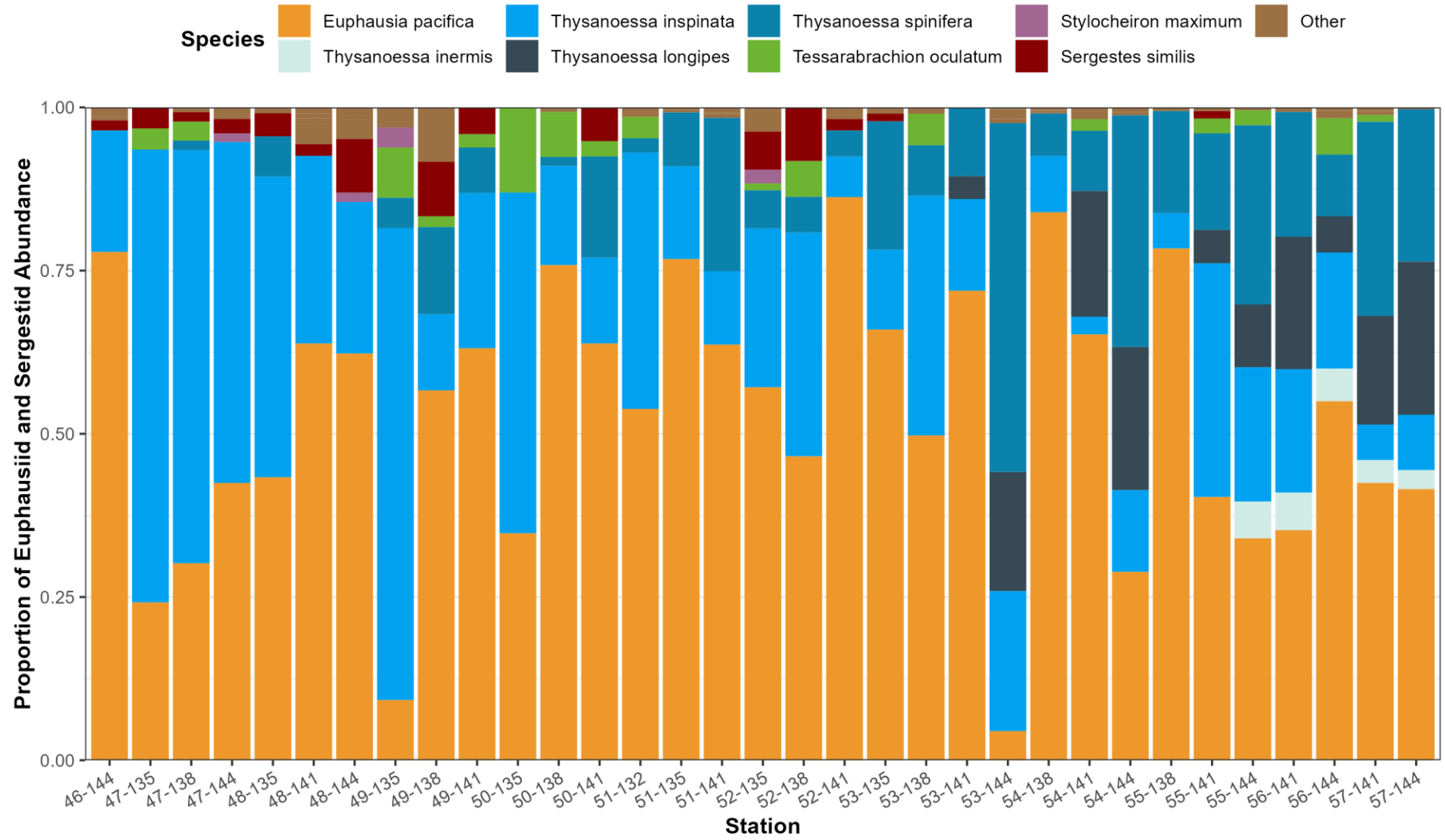


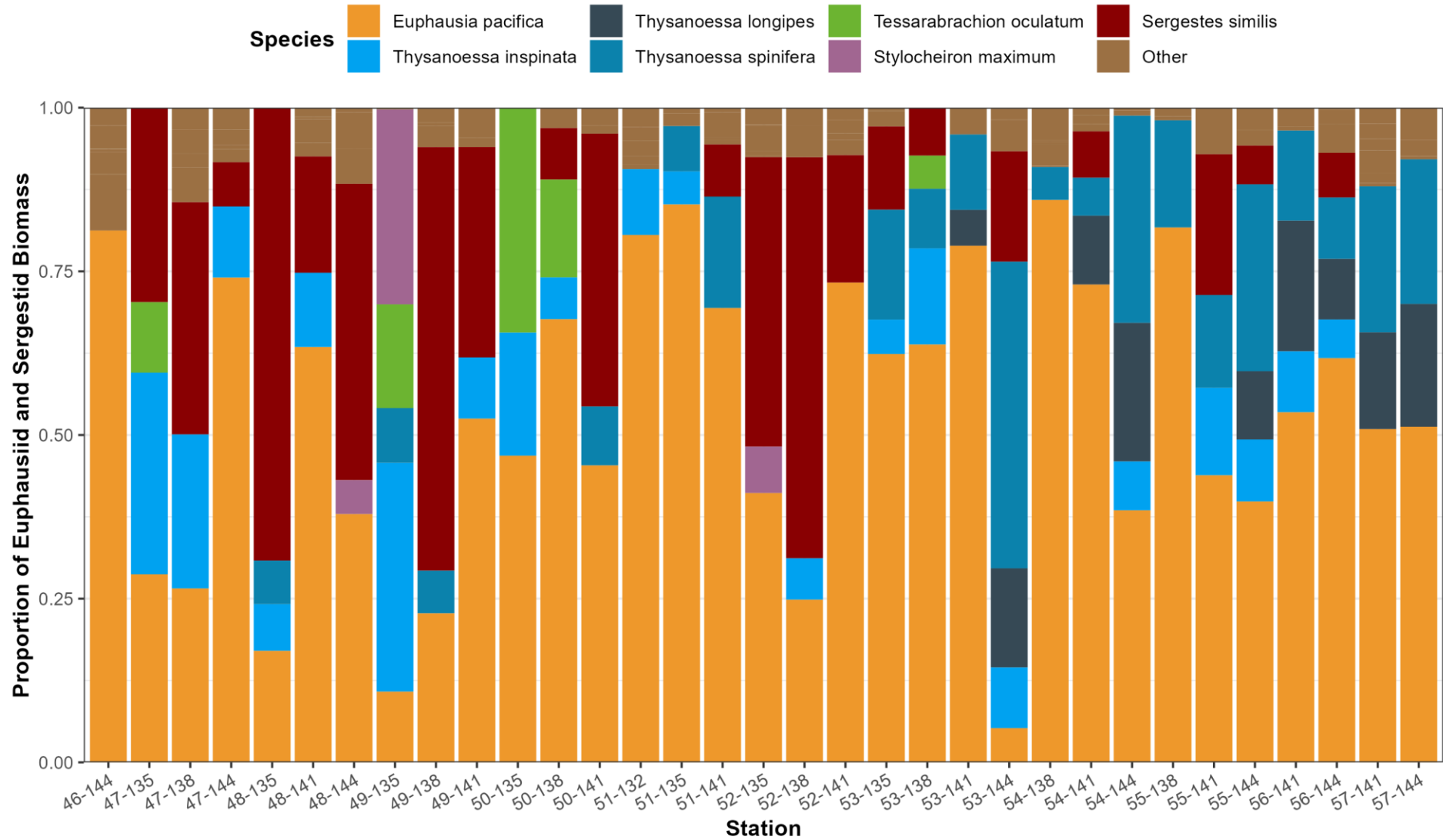


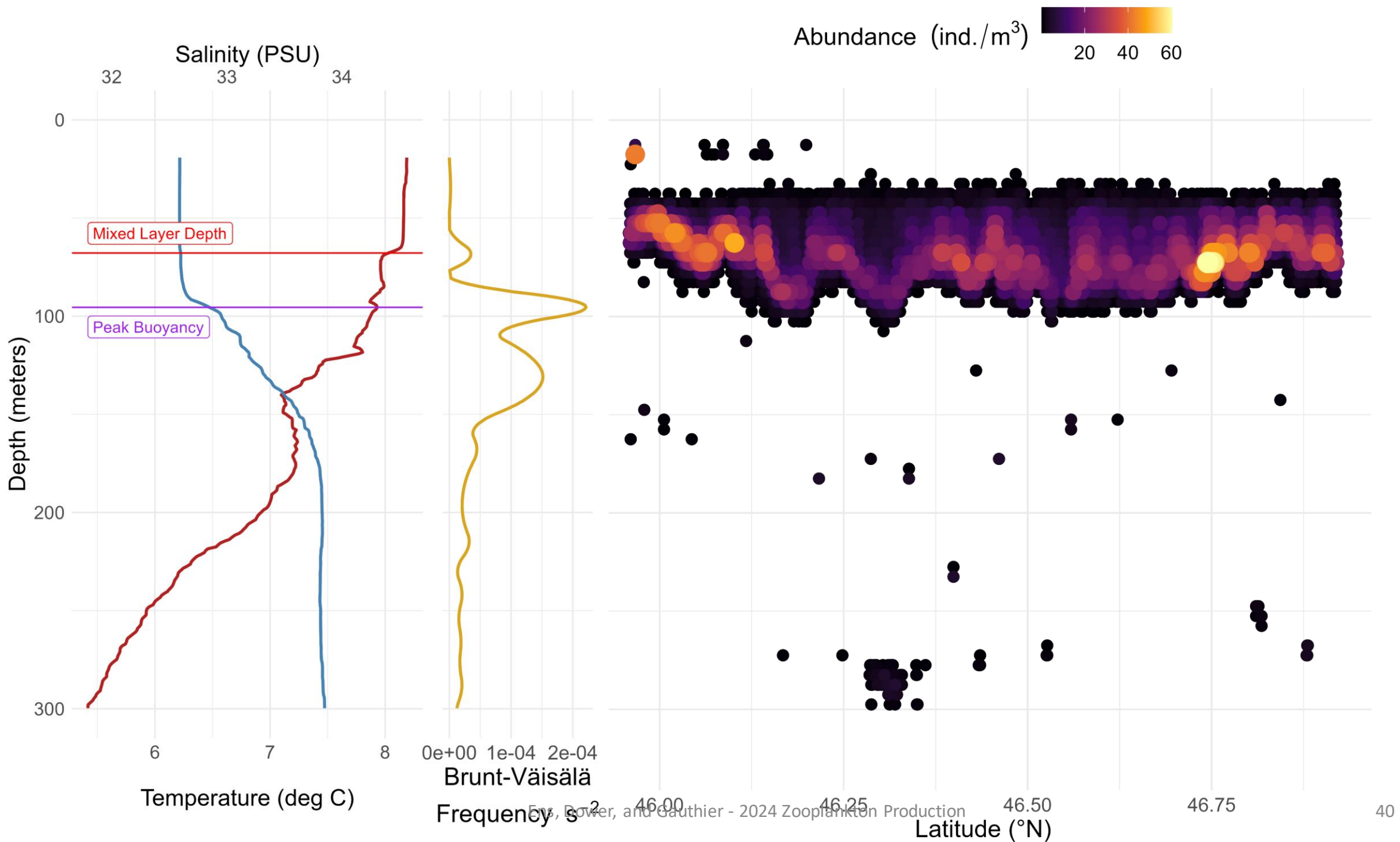


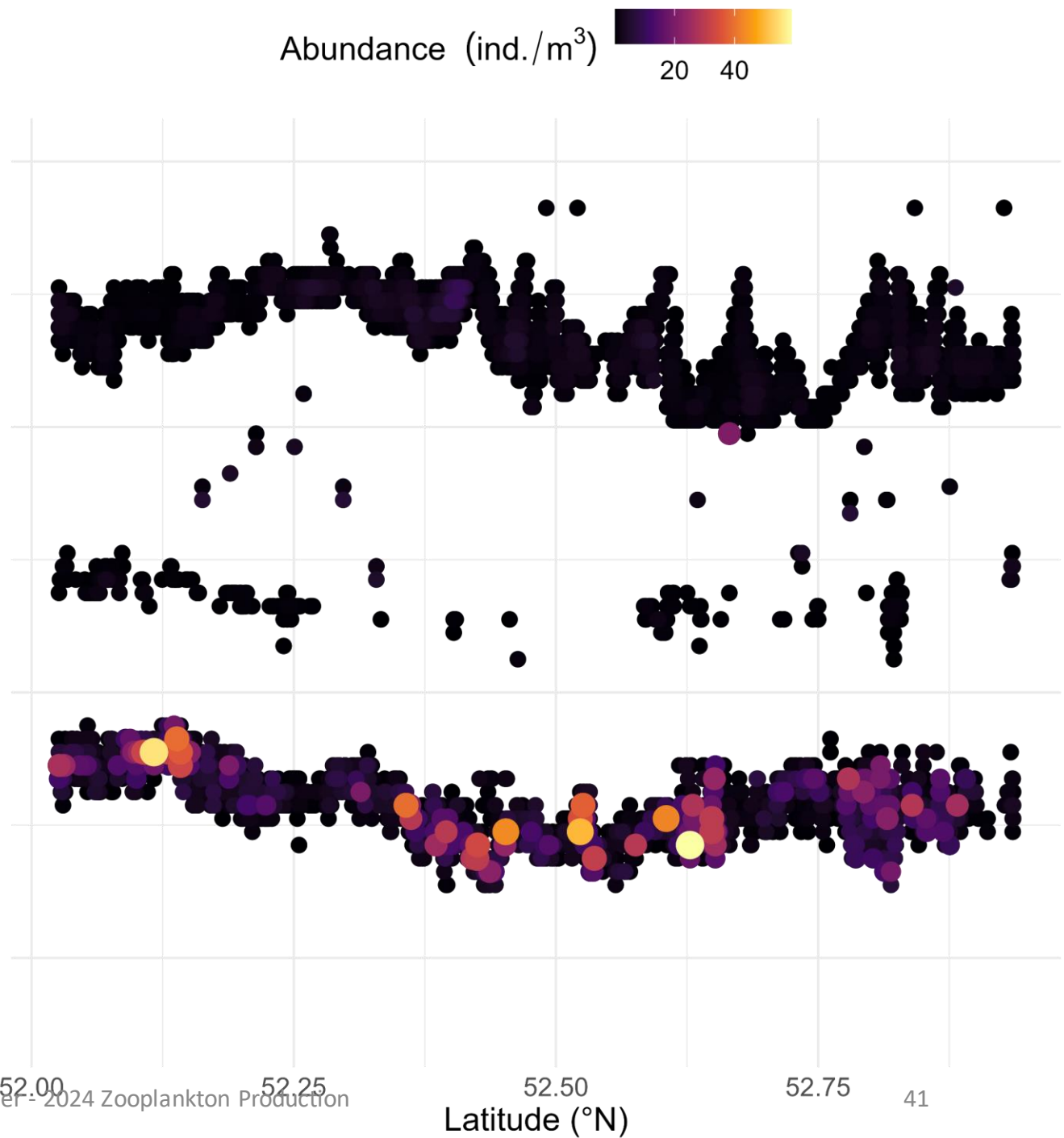
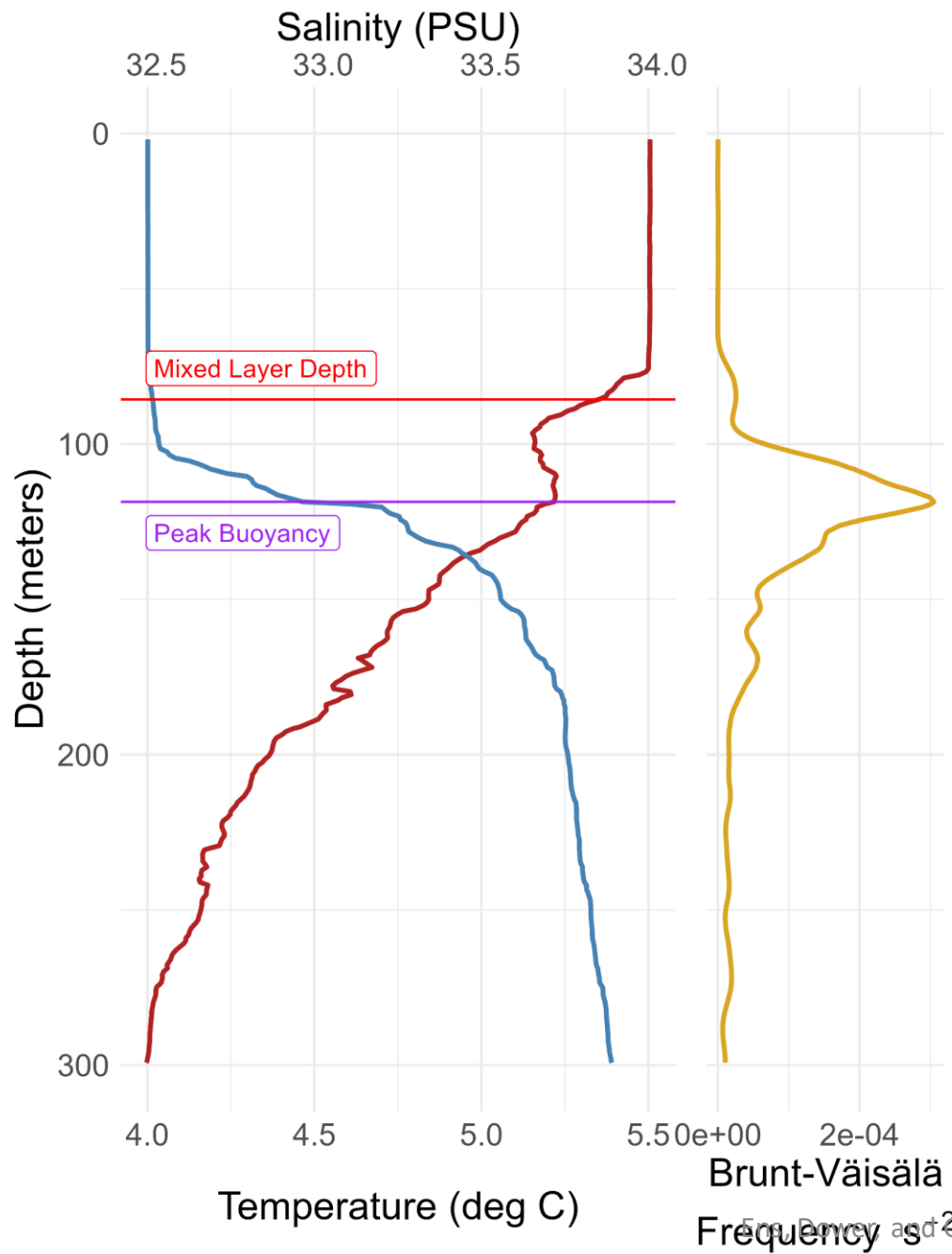


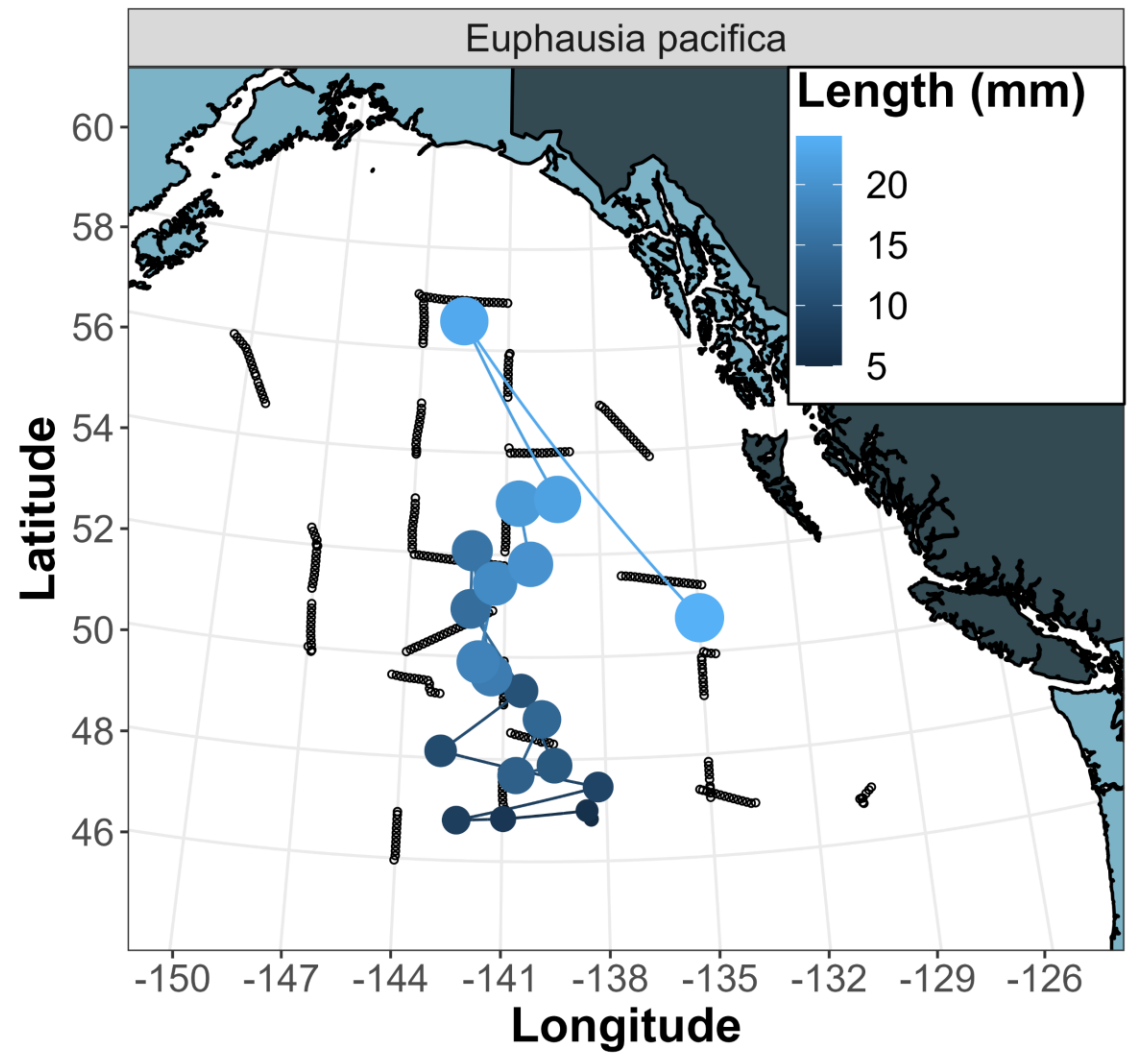
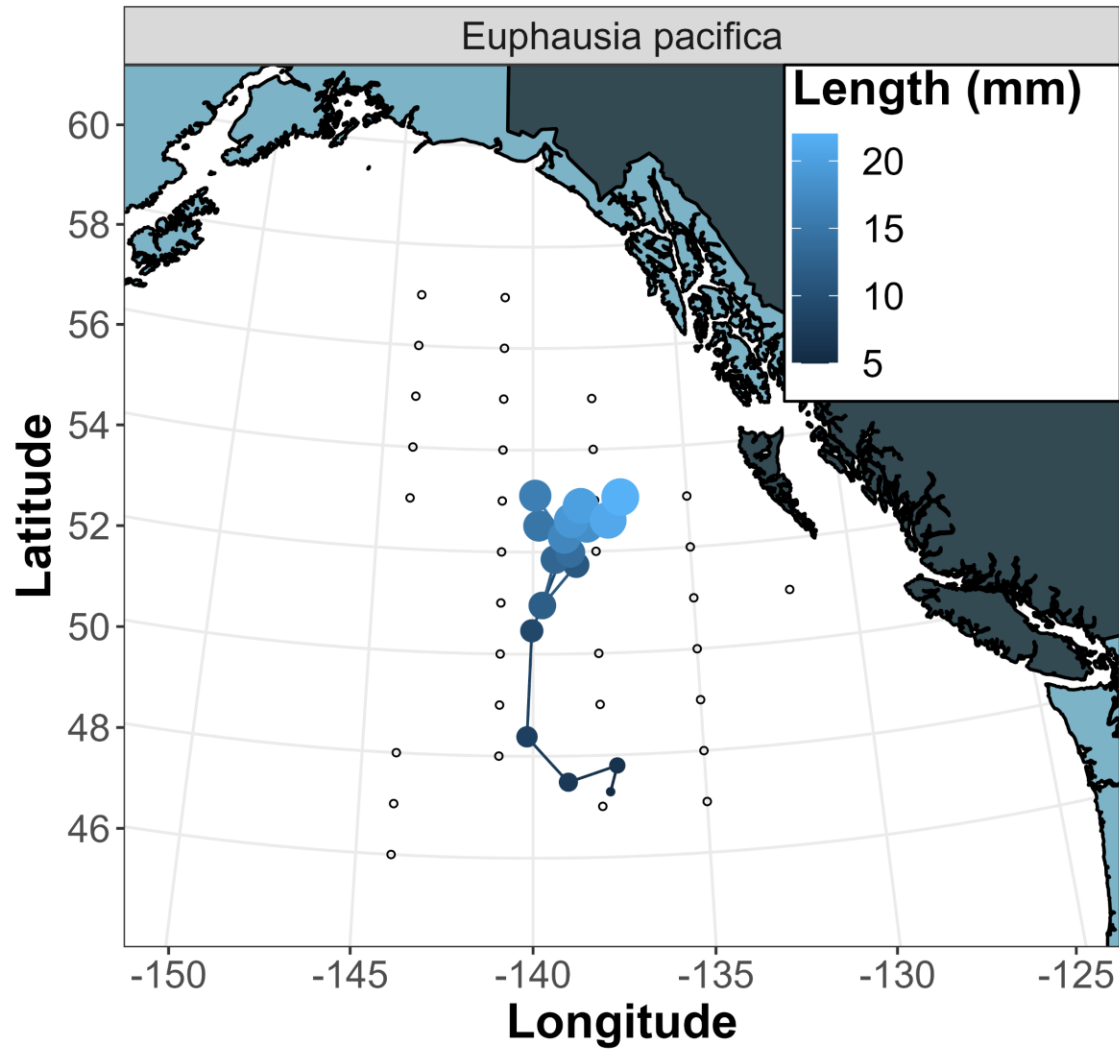
On average, euphausiids caught from 400 – 275m were 2mm longer than those caught from 275 – 0m

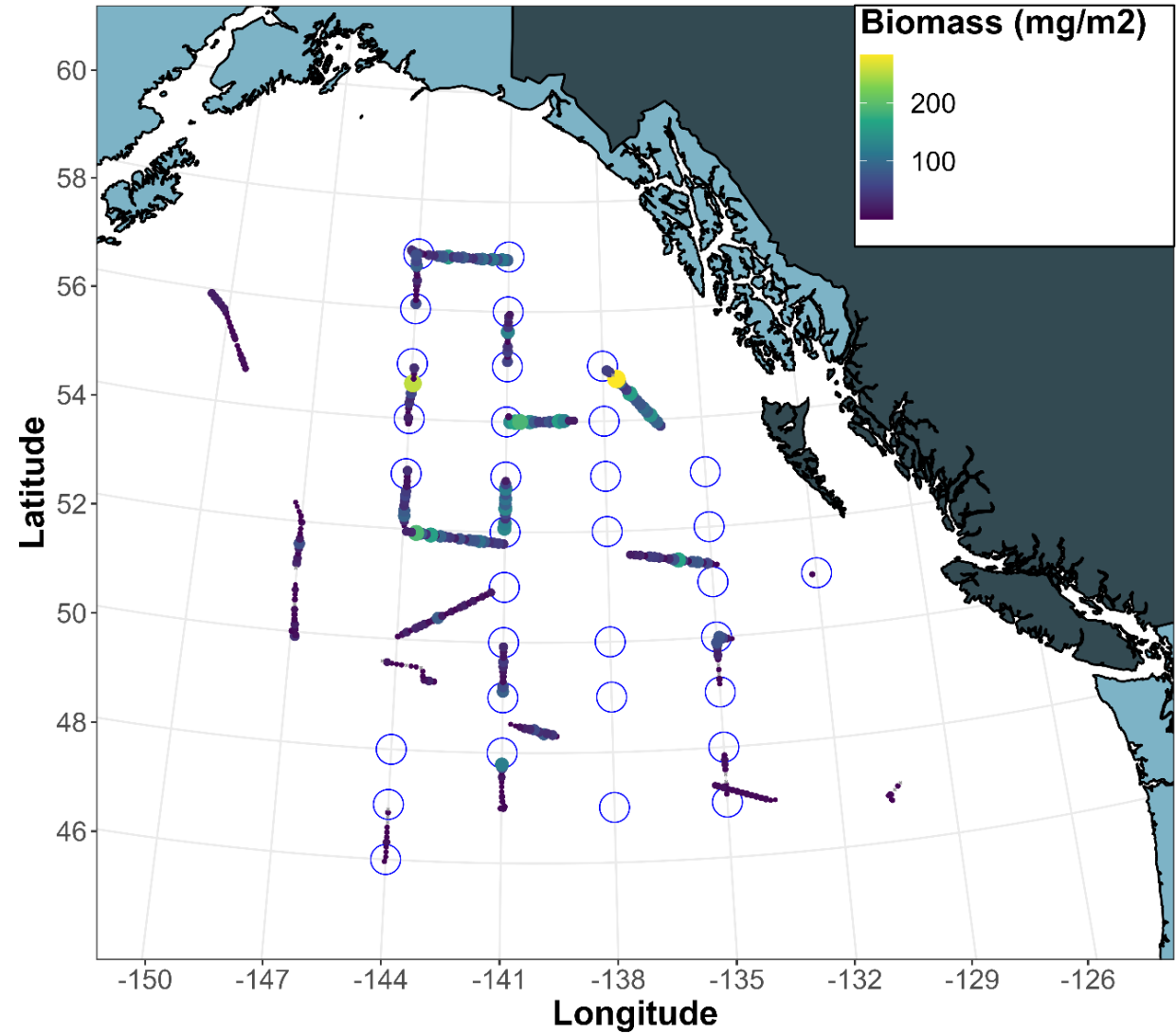
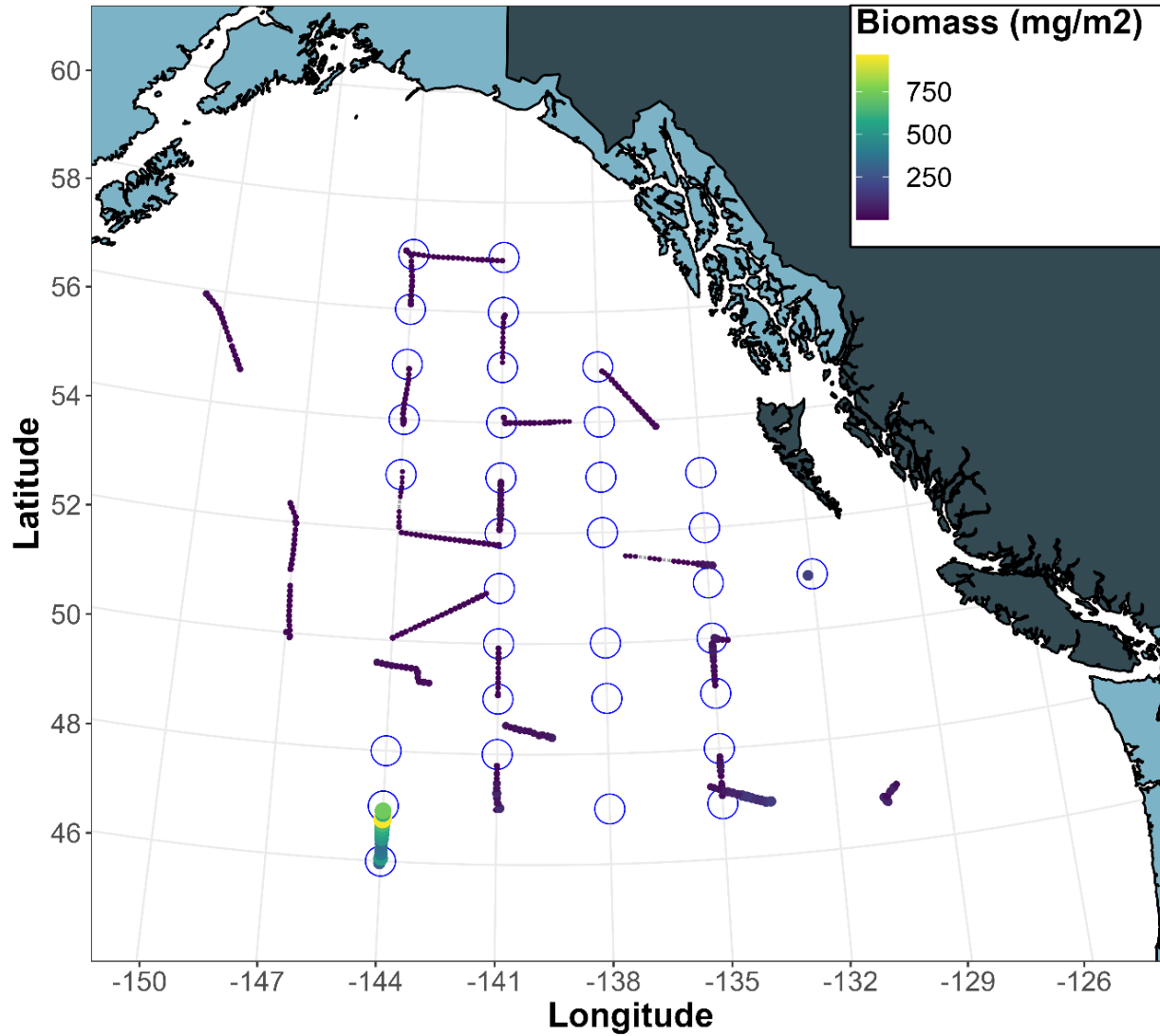




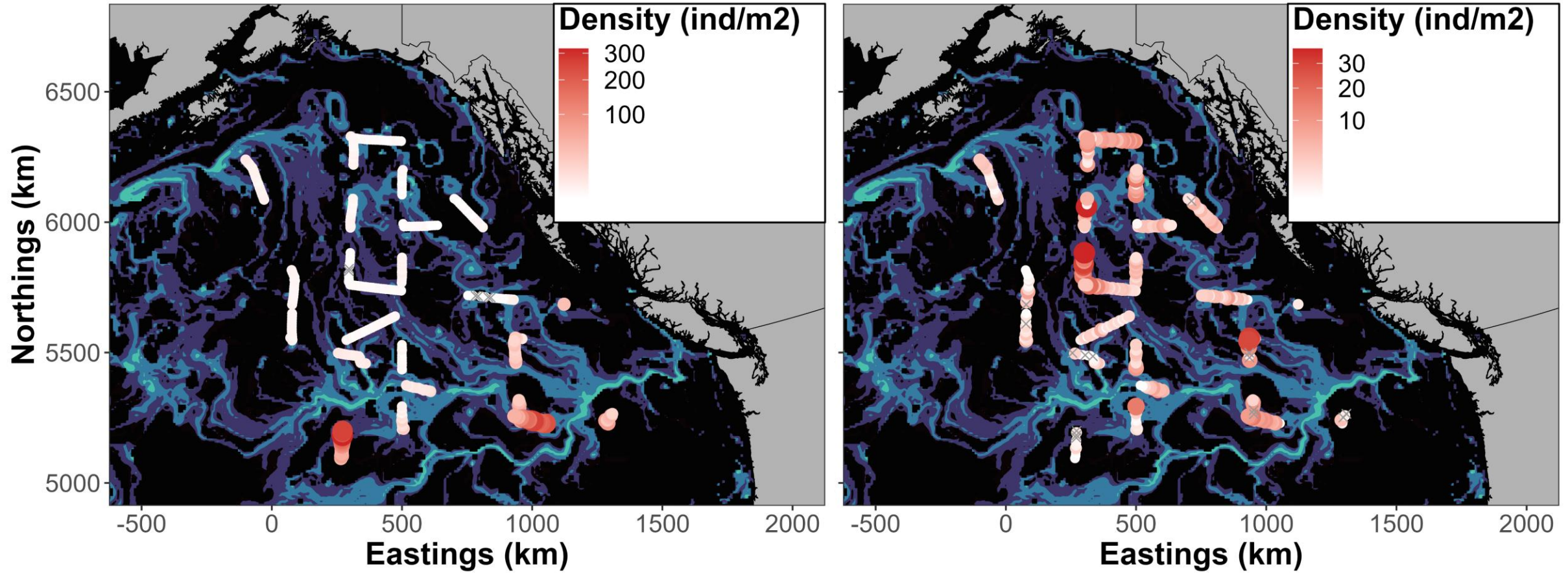




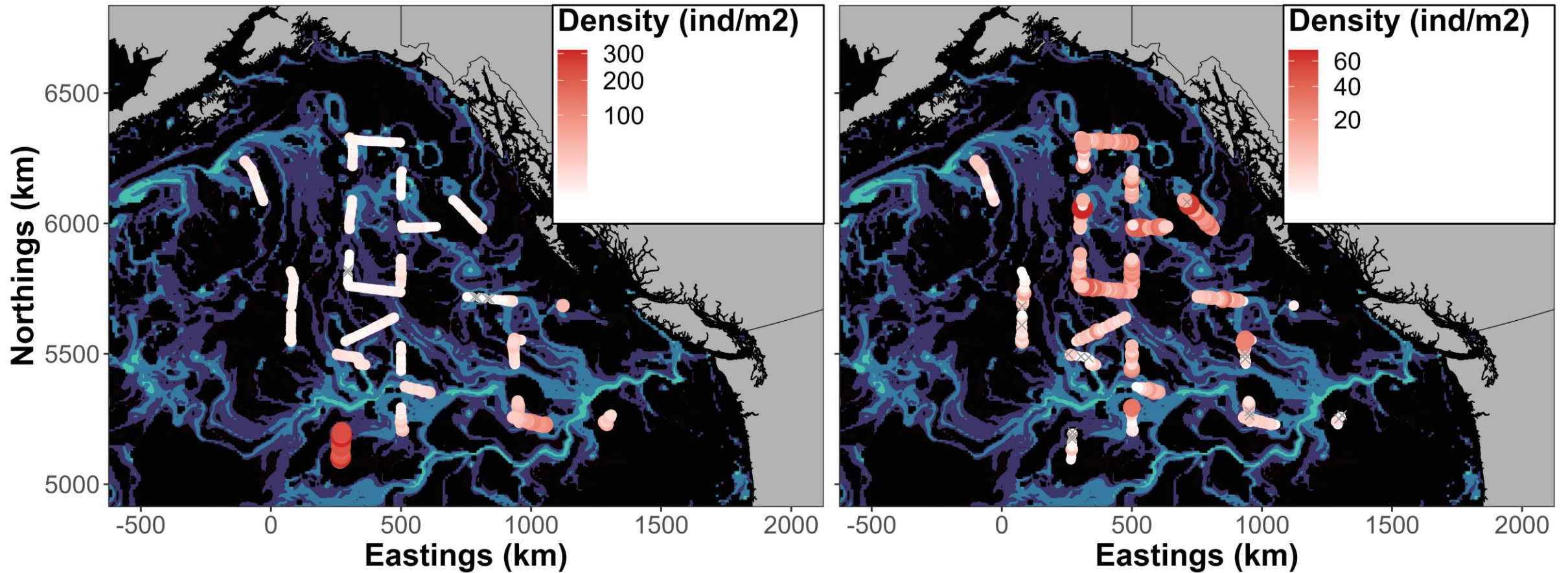










THYIN



EUPPA



Species

	<i>Euphausia pacifica</i>		<i>Thysanoessa inspinata</i>		<i>Thysanoessa spinifera</i>
	<i>Thysanoessa inermis</i>		<i>Thysanoessa longipes</i>		<i>Tessarabrachion oculatum</i>

