

# StrathE2EPolar

*a strategic modelling tool for ecosystem-based  
fisheries management  
Insights from the West Greenland case study*

Matthew Hatton  
University of Strathclyde  
matthew.hatton@strath.ac.uk



Natural  
Environment  
Research Council



University of  
**Strathclyde**  
Glasgow

01

What is StrathE2EPolar?

02

Domain + Sedimentary Mapping

03

NEMO-MEDUSA RCP 8.5



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Machine Learning for predicting  
fishing patterns

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Investigating the impacts of  
changing fishing pressure

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What's next and Questions

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What's next and Questions

Why another model?

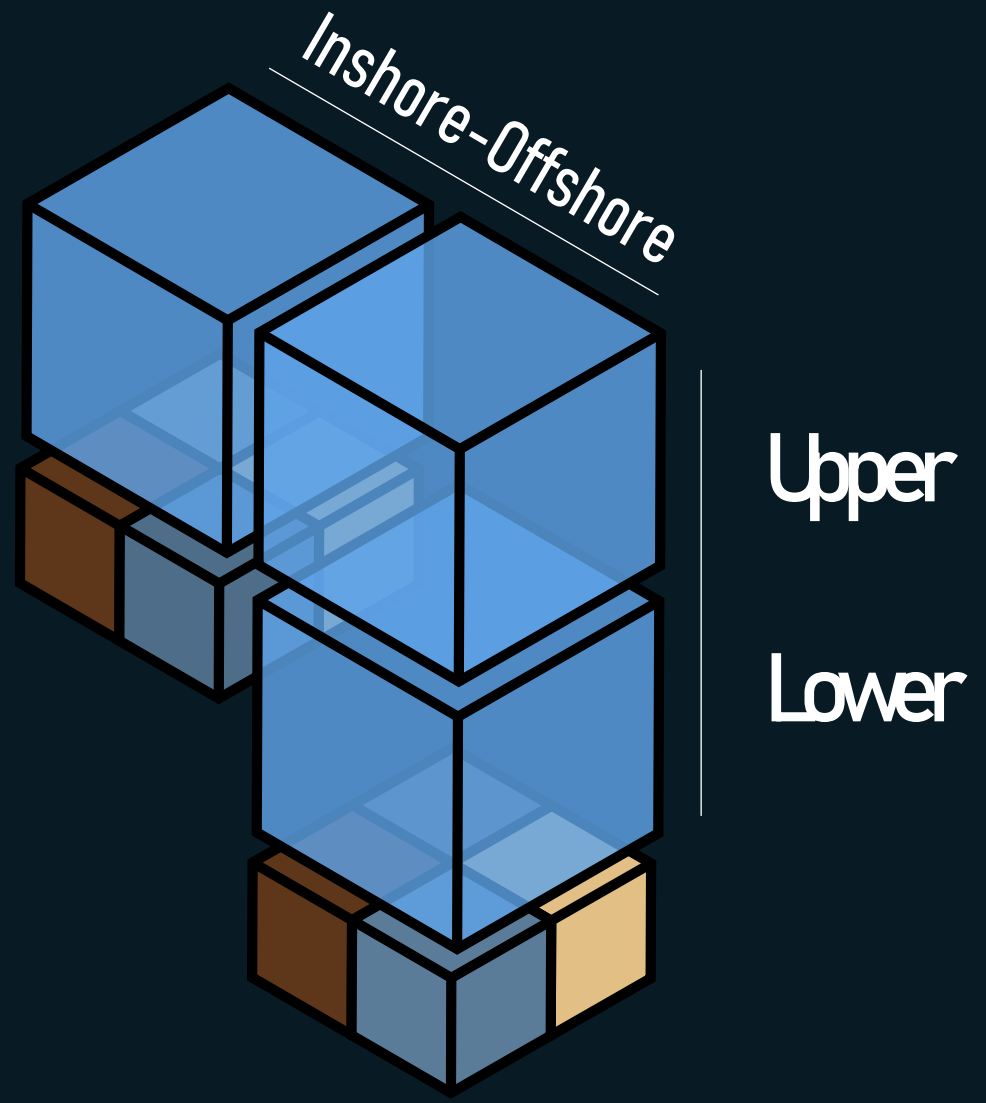
- StrathE2EPolar IS FAST -

# 01 - What is StrathE2EPolar?

Space is simplified to **3** ocean volumes

**8** shelf sea habitats

- Rock
- Mud
- Sand
- Gravel



28 guilds  
12 fleets

A collage of overlapping images related to the StrathE2E model. The central image is a dark blue cover for a 'Guided Tour' of the 'StrathE2E a marine end-to-end ecosystem model'. The cover features a large school of fish, a blue wireframe cube, and a vertical column of circular icons representing different biological components: a mussel, a crab, a shrimp, a fish, and a hand. Below the icons are the chemical formulas NH<sub>4</sub> and NO<sub>2</sub>. Other overlapping images show a search bar, a list of steps (4.1 Load a model, 4.2 Load a model, 4.3 Viewing the model input data), and a section titled 'EXERCISE 2' with text about a source package for Linux and a CRAN compatible R package repository.

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# 02 – Domain + Sedimentary Mapping



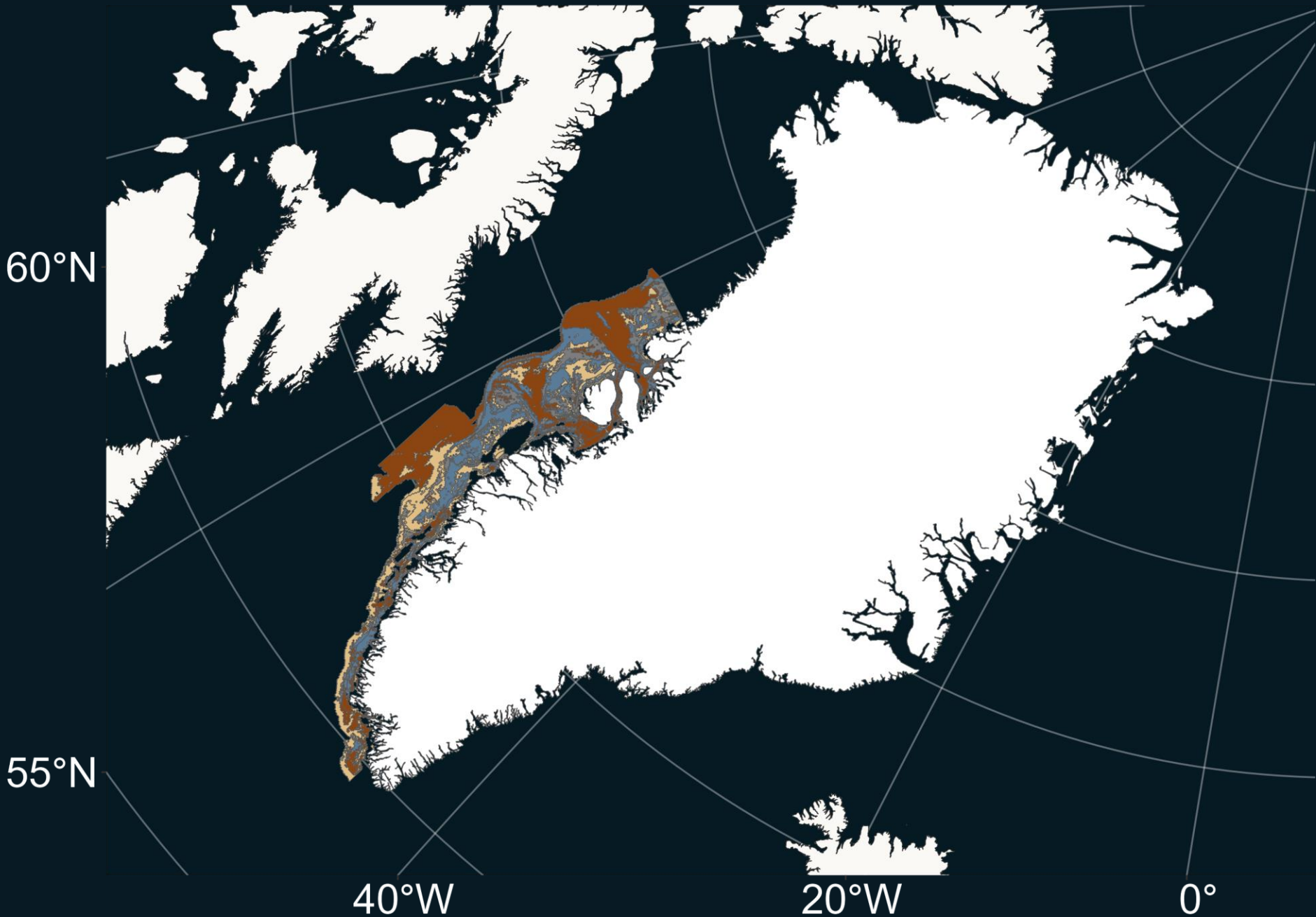
Zone

- Inshore
- Offshore





# 02 – Domain + Sedimentary Mapping



## Sediment Class

- Gravel
- Mud
- Rock
- Sand



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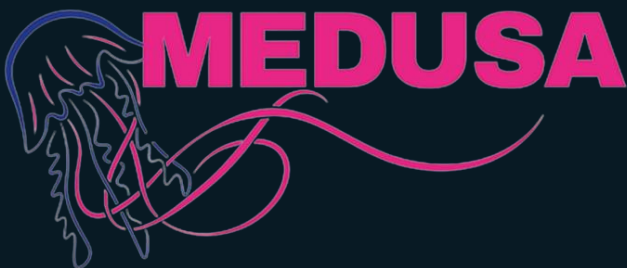
05

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# Model Parametrisation – Physics & Chemistry



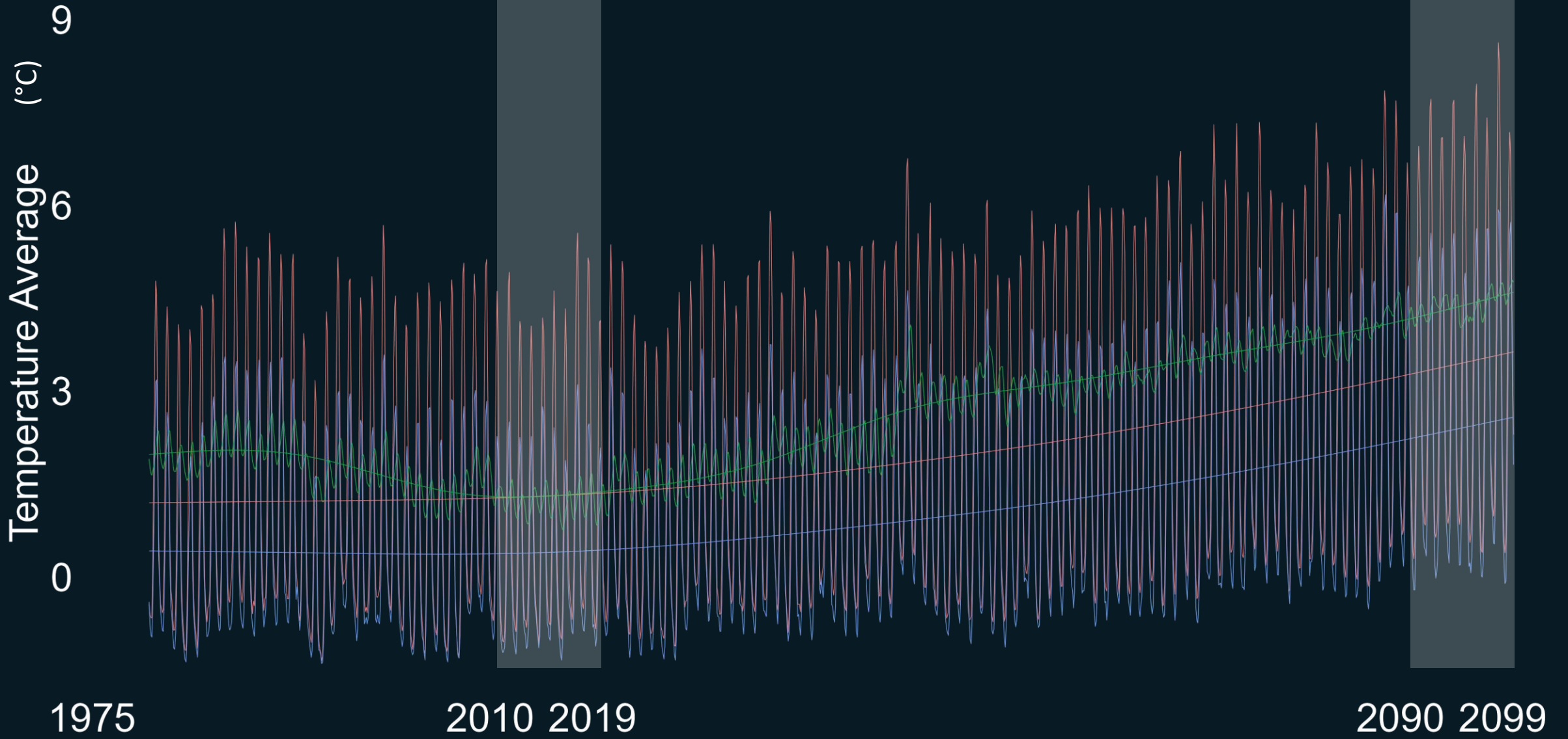
**MEDUSA**

**2010–2019**  
**2090–2099**

Ice Cover  
Ice Thickness  
Temperature  
Ntrate  
Ammonia  
Detritus



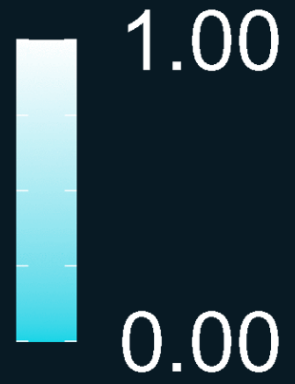
Compartment — Inshore S — Offshore D — Offshore S





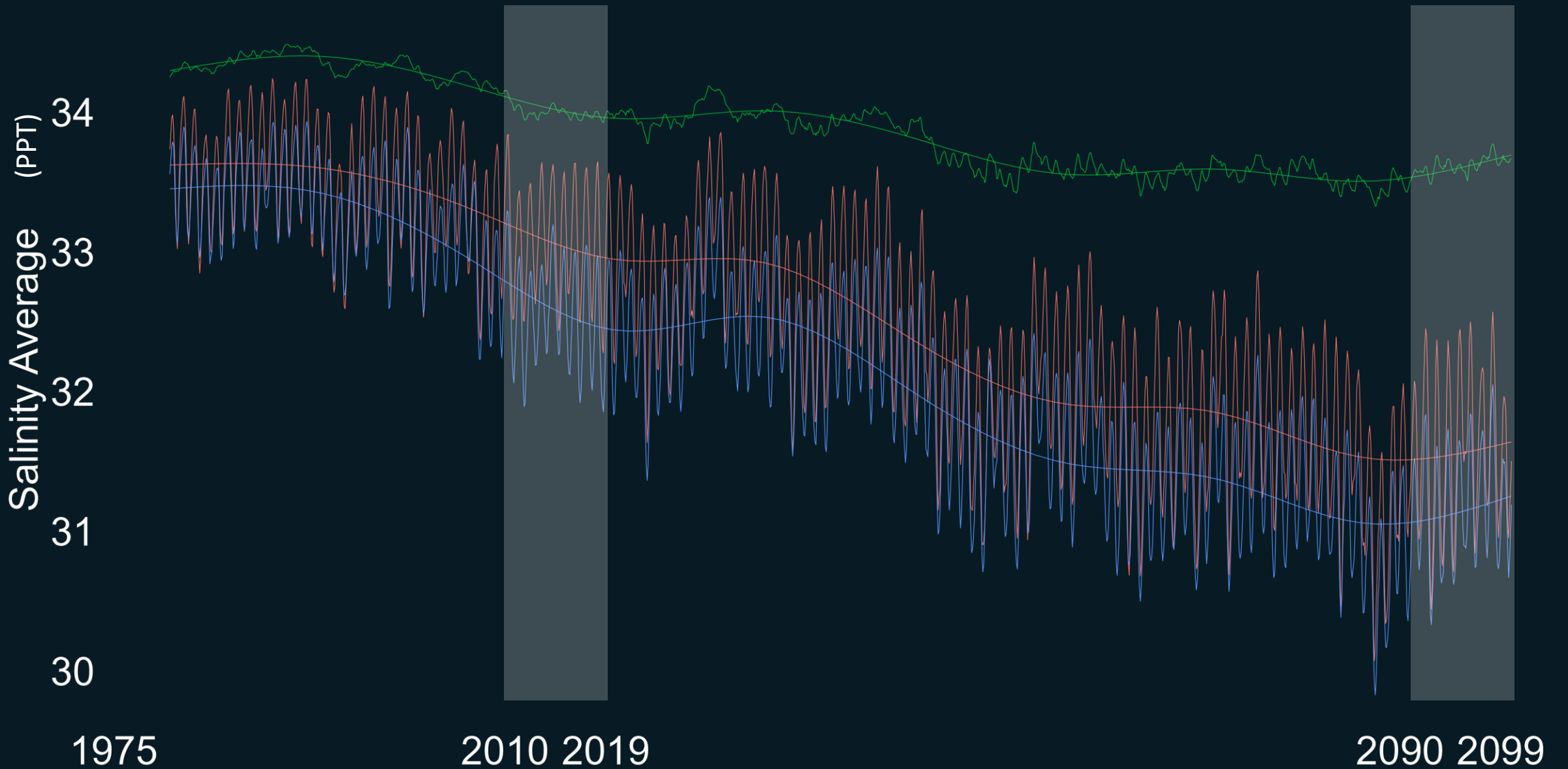
2010

January  
average  
Ice Presence

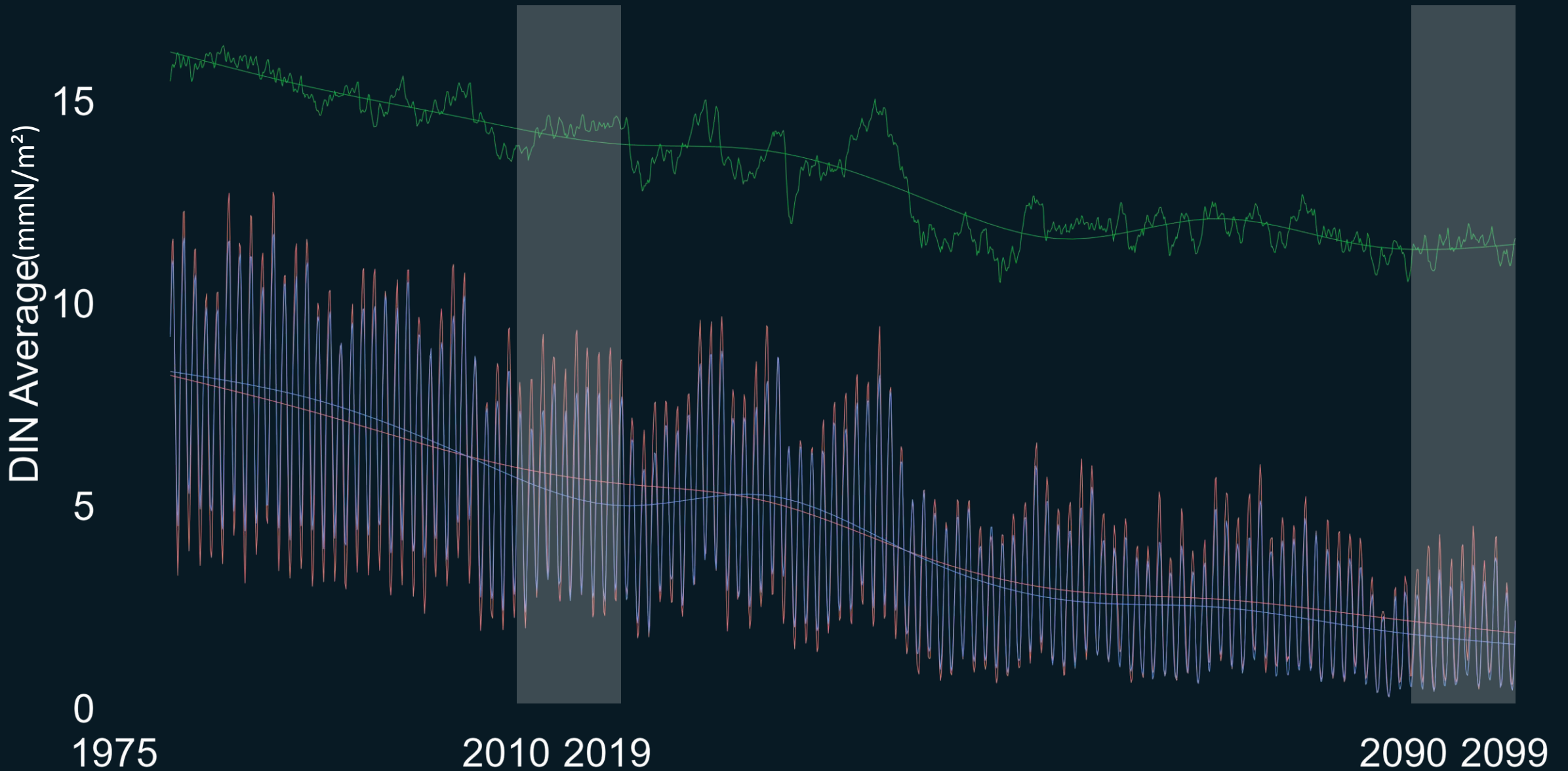


2090

Compartment — Inshore S — Offshore D — Offshore S



Compartment — Inshore S — Offshore D — Offshore S



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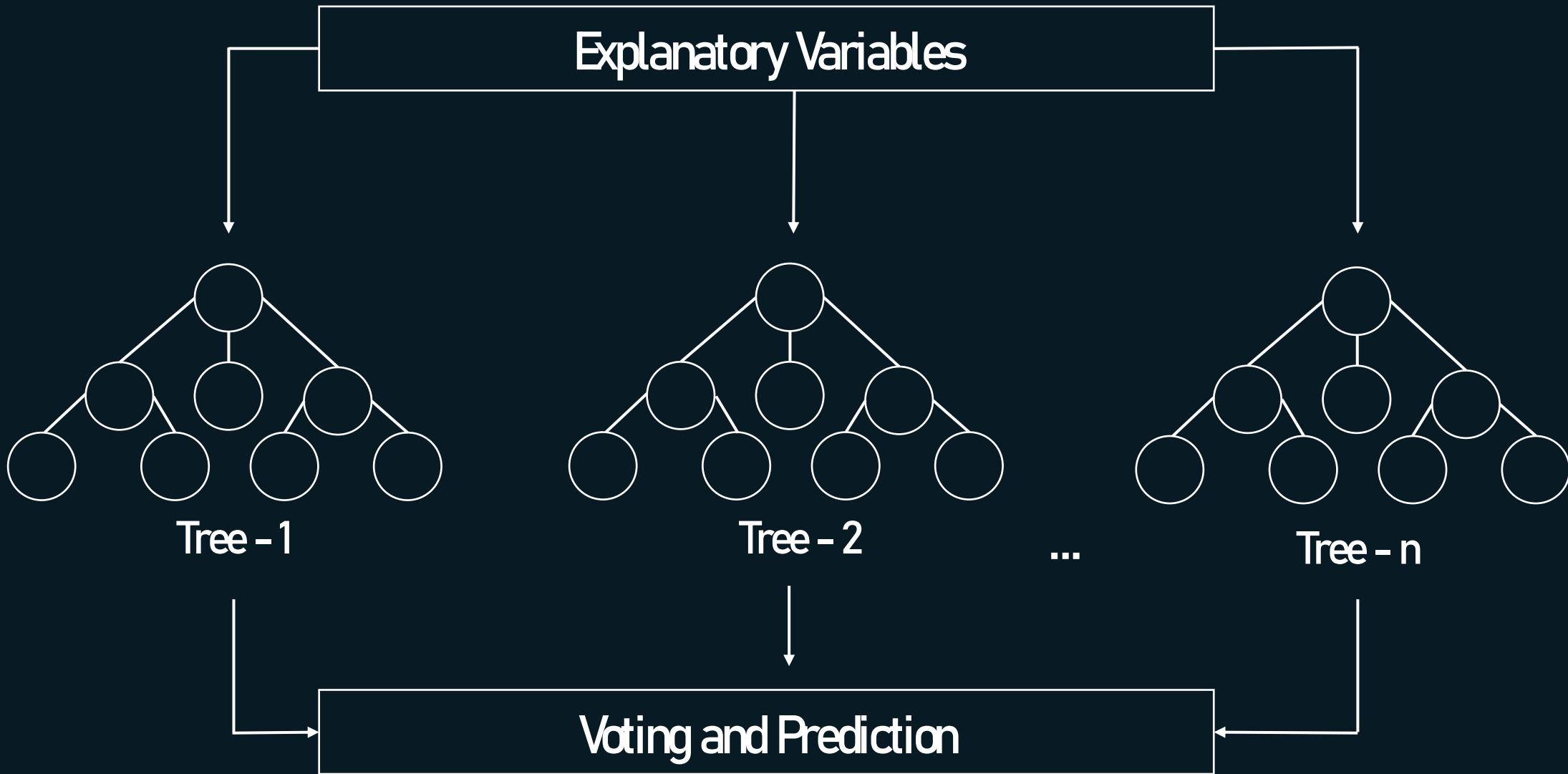
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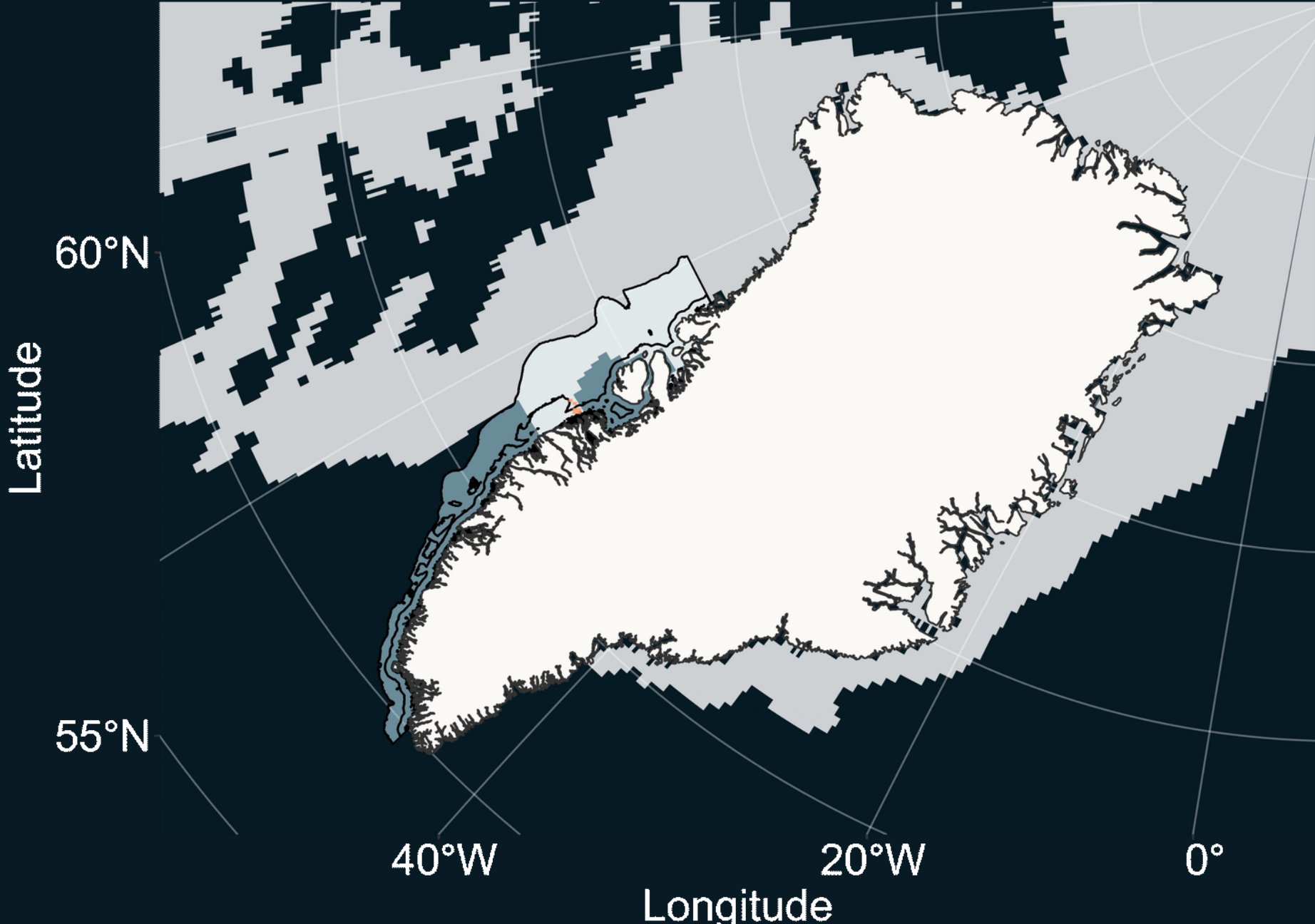
What's next and Questions





# 04 - Machine Learning for predicting fishing patterns

2012-01-01



## Fishing Hours



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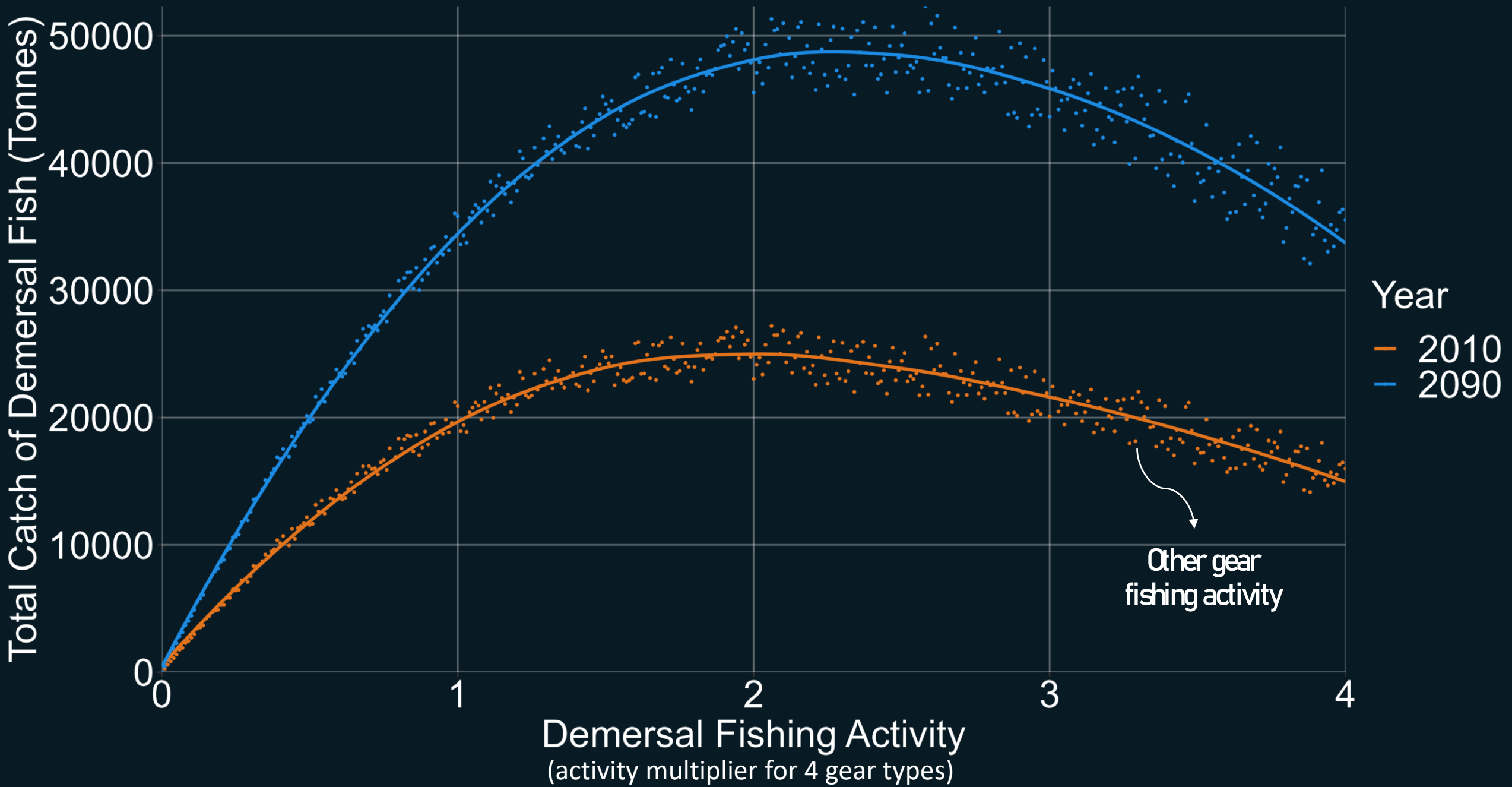
05

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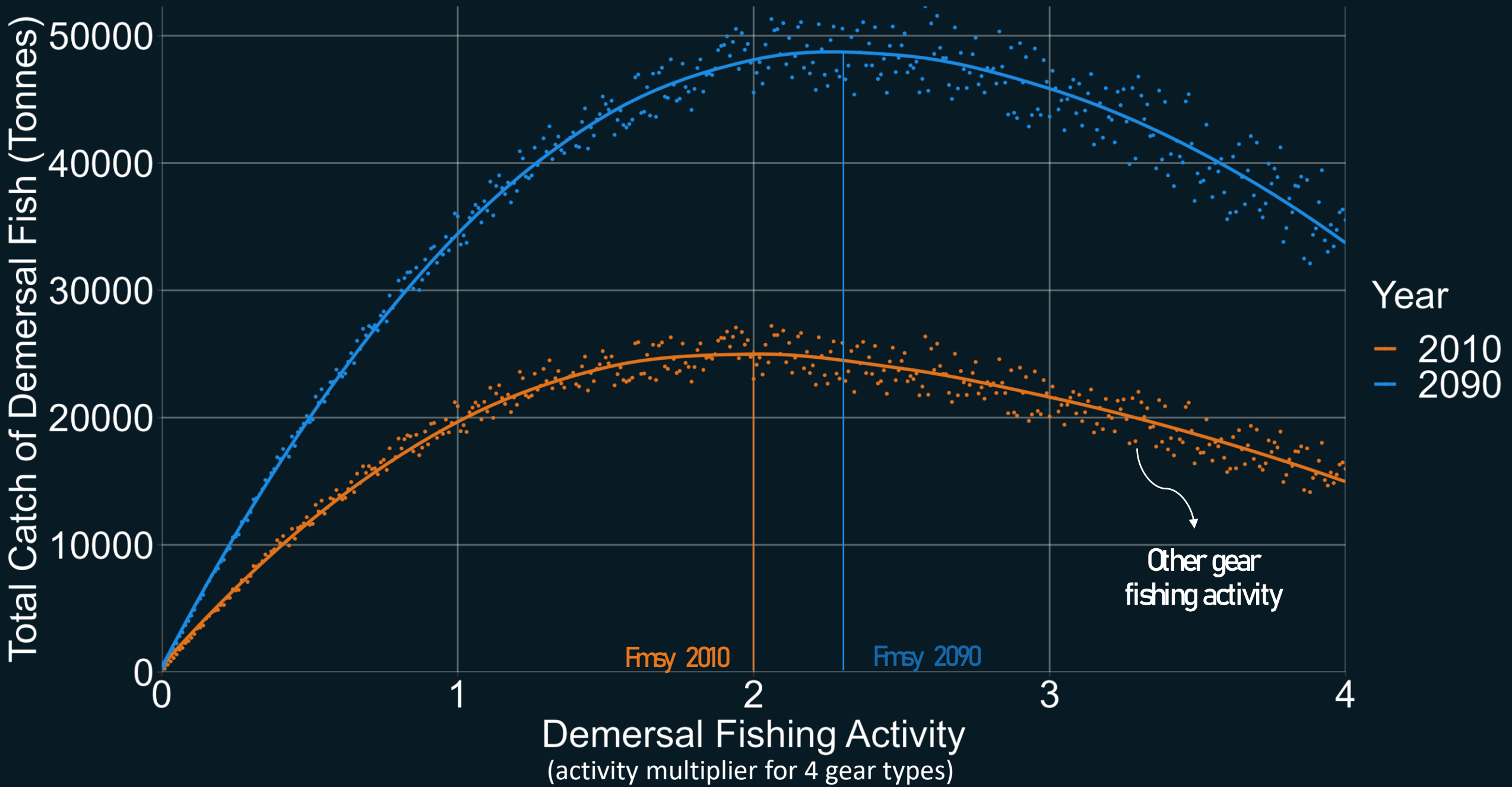
06

What's next and Questions

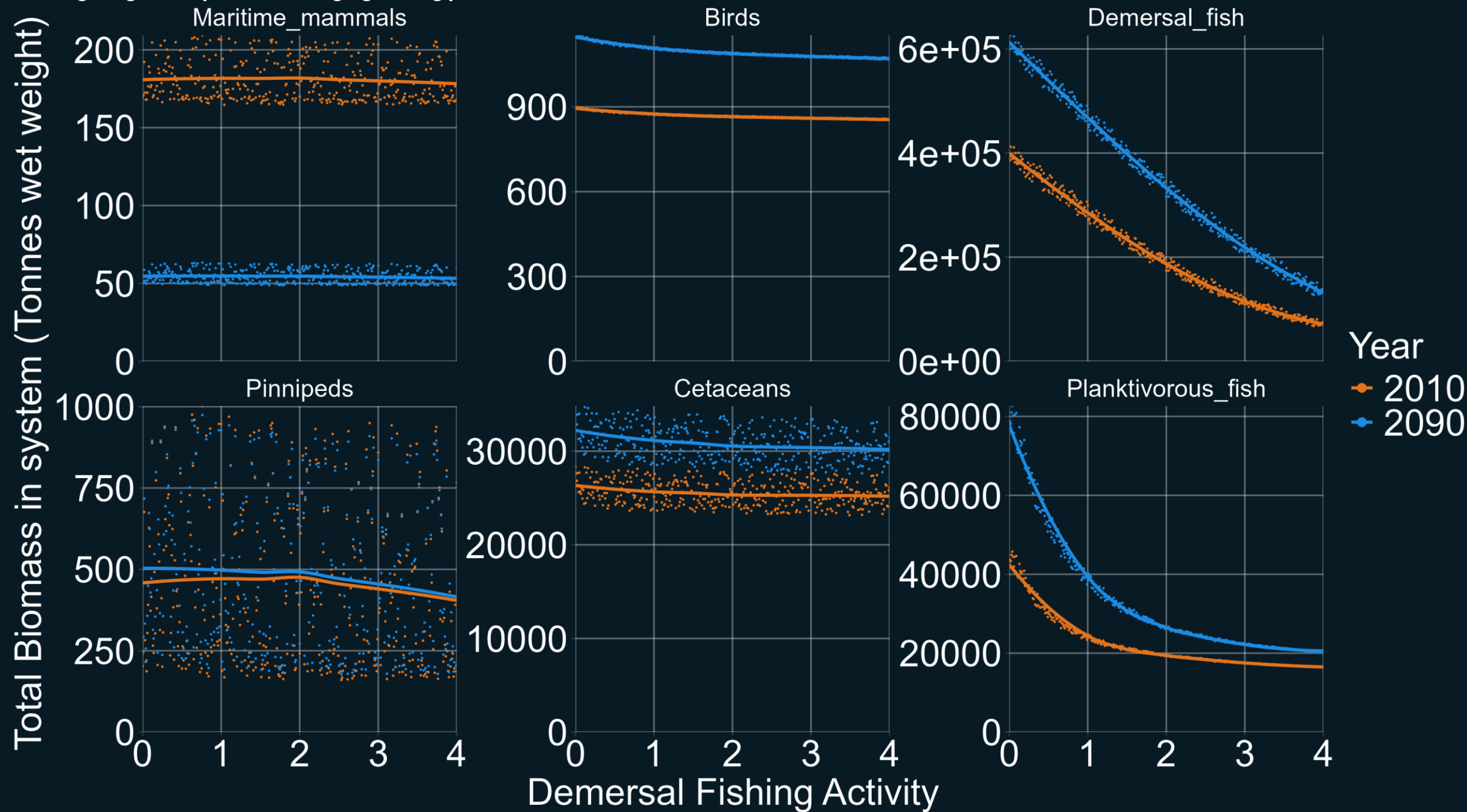
05 - Investigating the impacts of changing fishing pressure



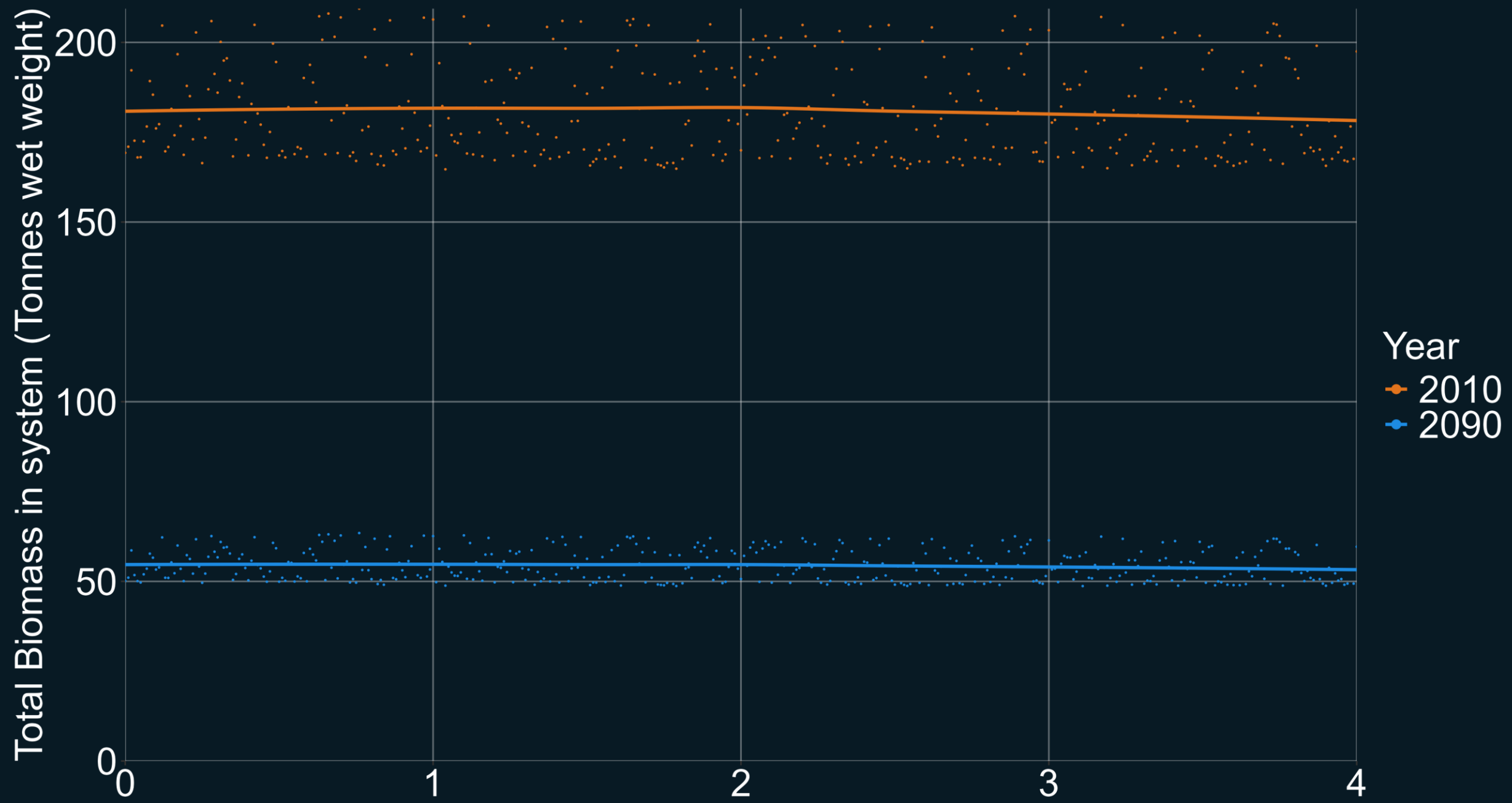
05 - Investigating the impacts of changing fishing pressure



# 05 - Investigating the impacts of changing fishing pressure



05 - Investigating the impacts of changing fishing pressure



# Summary

- The coupled effects of climate change and Demersal fishing is minimal on some upper trophic levels (Birds and Cetaceans) but has a larger effect further down the food web (Demersal/Planktivorous)
- Shifts in climate are causing larger variations of biomass when using non-Demersal fishing gears
- Significant decrease in maritime mammal biomass within the system between the two decadal periods



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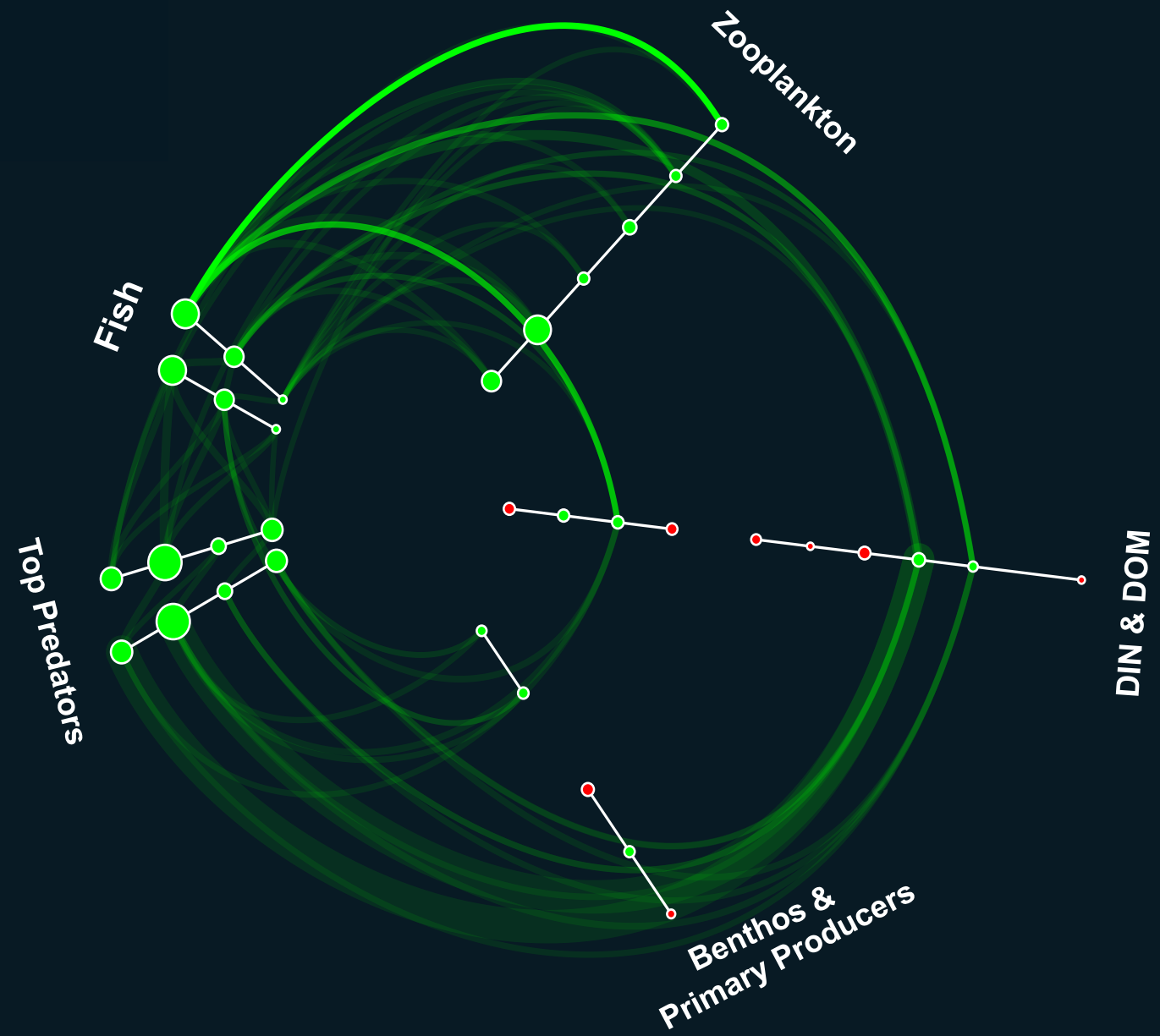
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# Questions for you

What would you like to see implemented into StrathE2EPolar?

How could we tell a local story through StrathE2EPolar?

How would you like to see StrathE2EPolar used?

Email your suggestions to

[matthew.hatton@strath.ac.uk](mailto:matthew.hatton@strath.ac.uk)

# Thank you for listening

## References

- [1] Long, Stephen, and Peter JS Jones. "Greenland's offshore Greenland halibut fishery and role of the Marine Stewardship Council certification: A governance case study." *Marine Policy* 127 (2021): 104095.
- [2] Yool, Andrew, Ekaterina E. Popova, and Tom R. Anderson. "MEDUSA-2.0: an intermediate complexity biogeochemical model of the marine carbon cycle for climate change and ocean acidification studies." *Geoscientific Model Development* 6.5 (2013): 1767-1811.
- [3] Heath, Michael R., et al. "Ecosystem approach to harvesting in the Arctic: Walking the tightrope between exploitation and conservation in the Barents Sea." *Ambio* 51 (2022): 456-470.
- [4] Nogueira, A. "Assessment of the Greenland Halibut Stock Component in NAFO Subarea 0+ 1 (Offshore) MA Treble Fisheries and Oceans Canada, Freshwater Institute, 501 University Cres., Winnipeg, Manitoba, Canada R3T 2N6."

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