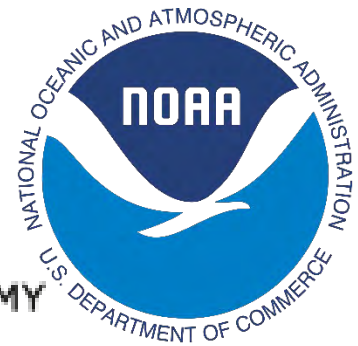




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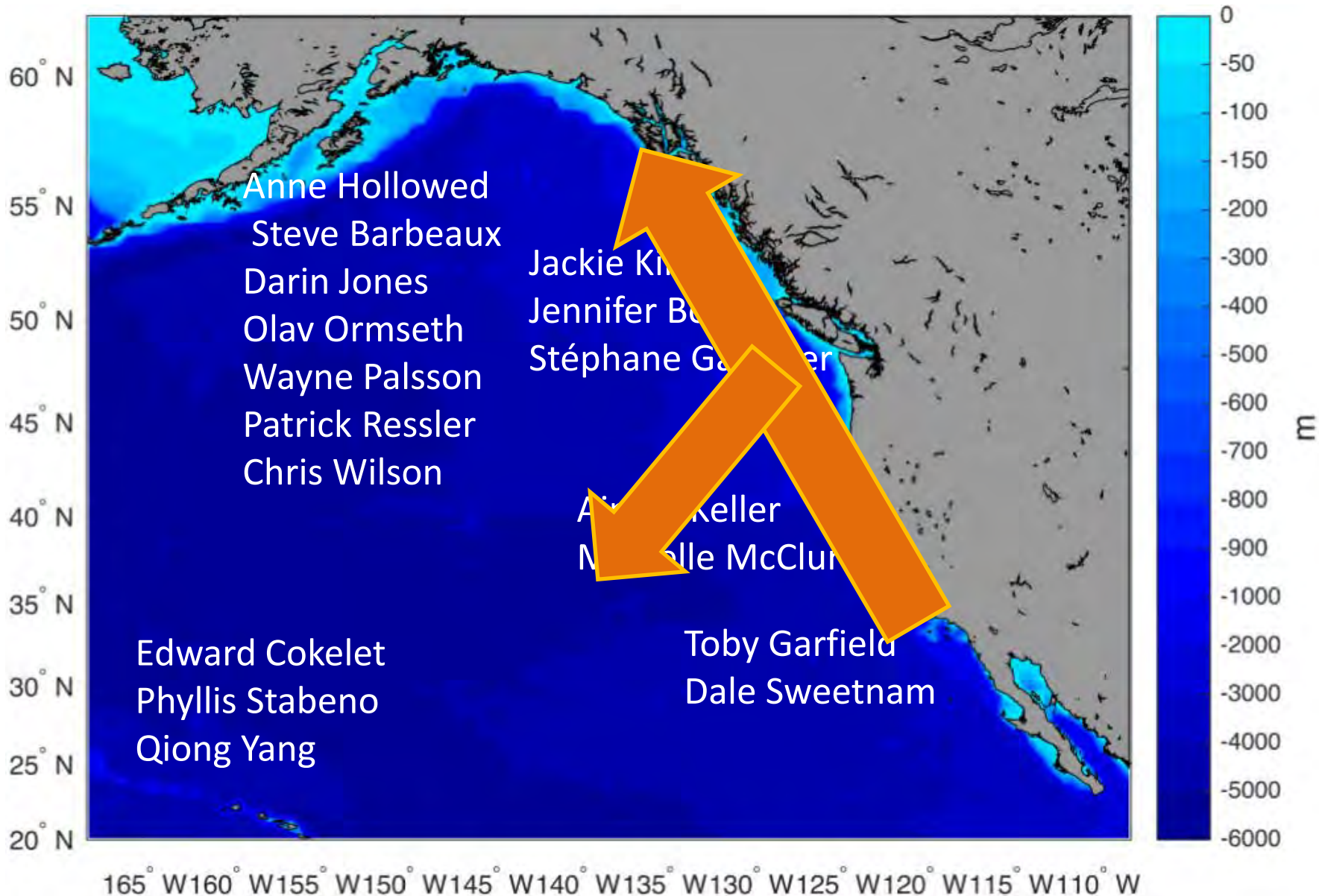


# The impacts of climate variability on the distribution of groundfish along the Northeast Pacific coastal shelf

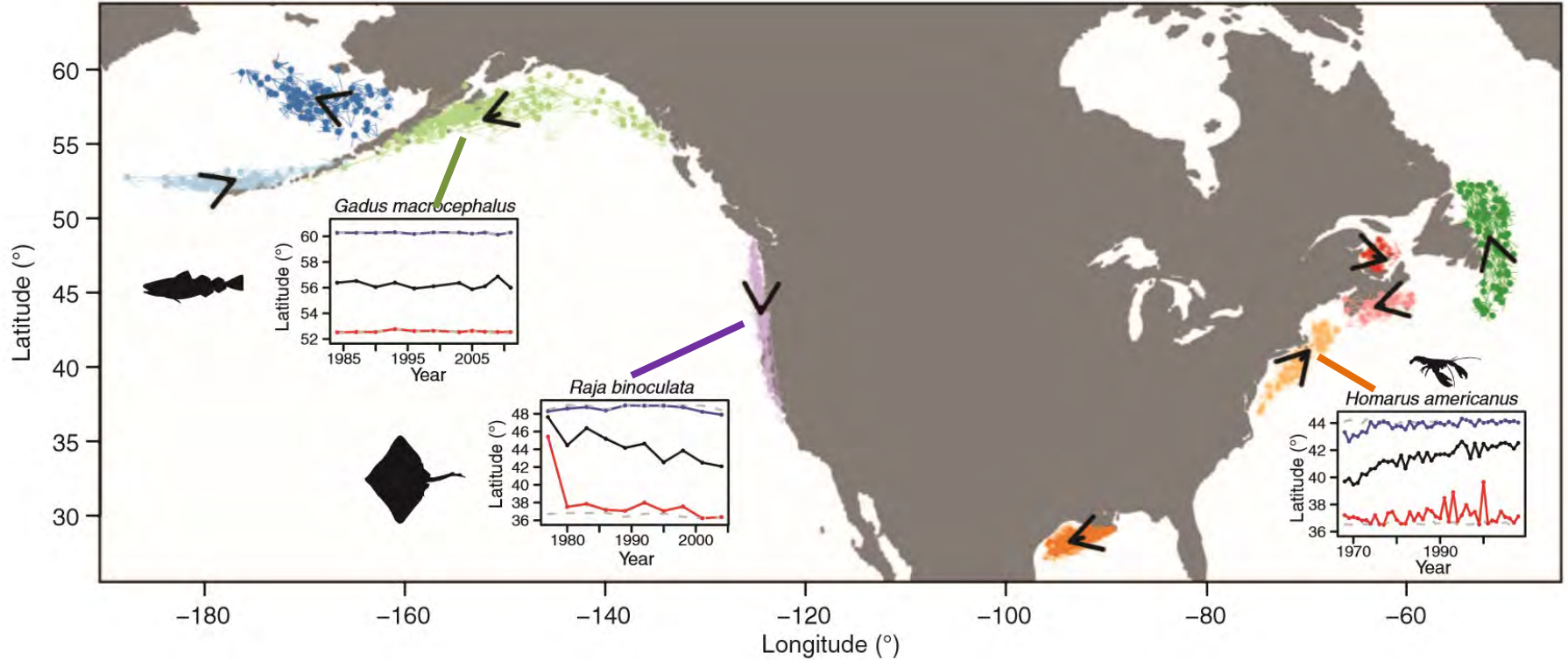
Lingbo Li, Anne Hollowed, Steve Barbeaux, Jennifer Boldt, Edward Cokelet, Toby Garfield, Stéphane Gauthier, Darin Jones, Aimee Keller, Jackie King, Michelle McClure, Olav Ormseth, Wayne Palsson, Patrick Ressler, Dale Sweetnam, Phyllis Stabeno, Qiong Yang, and Chris Wilson

[Lingboli.fish@gmail.com](mailto:Lingboli.fish@gmail.com)

# The Northeast Pacific Ocean



# Distributional shifts in different directions



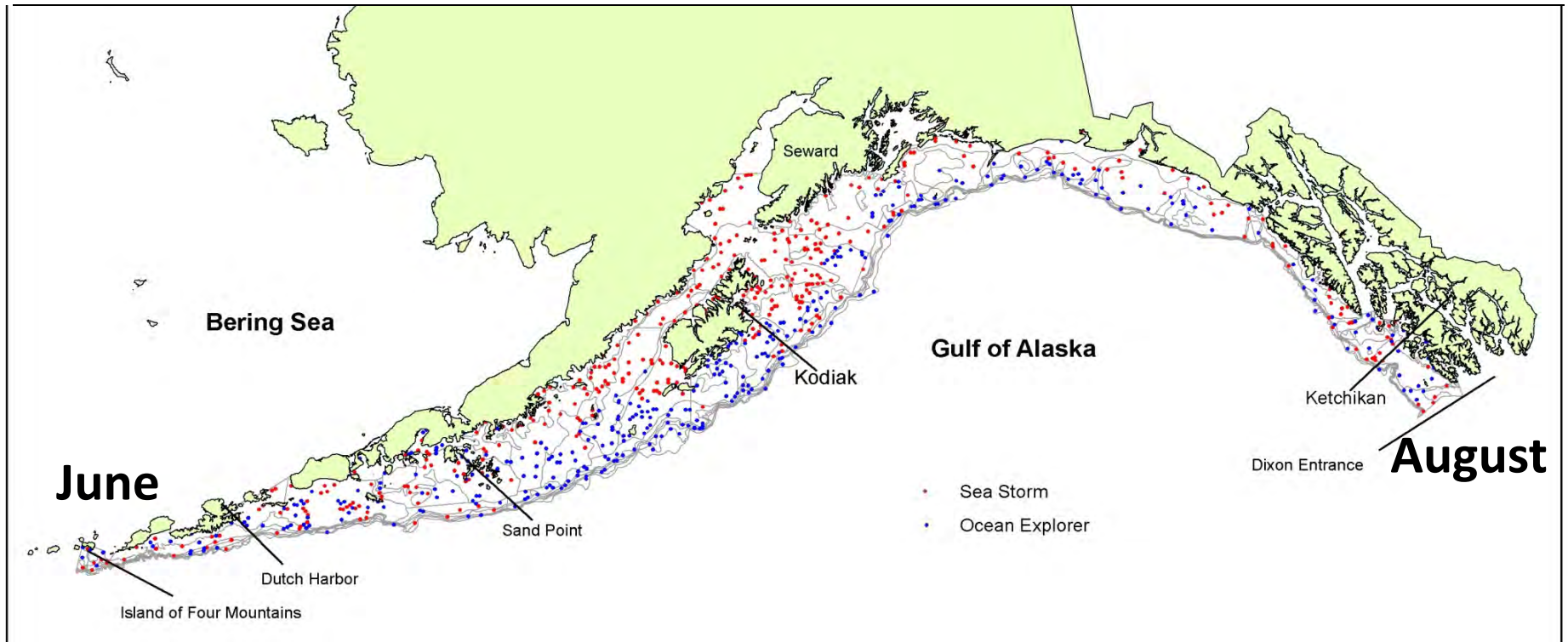
Pinsky et al. 2013 Science

# Ontogeny matters

- Centroids (centre of fish distribution) by size bin (Barbeaux & Hollowed. in review. Nature)
  - Methods: abundance-weighted average
  - Latitude, longitude, depth, temperature
- Species
  - Walleye pollock
  - Arrowtooth flounder
  - Pacific cod, Petrale sole, Dover sole, Pacific Ocean Perch, Yelloweye rockfish
- The Gulf of Alaska (GOA)
  - Bottom trawl summer survey



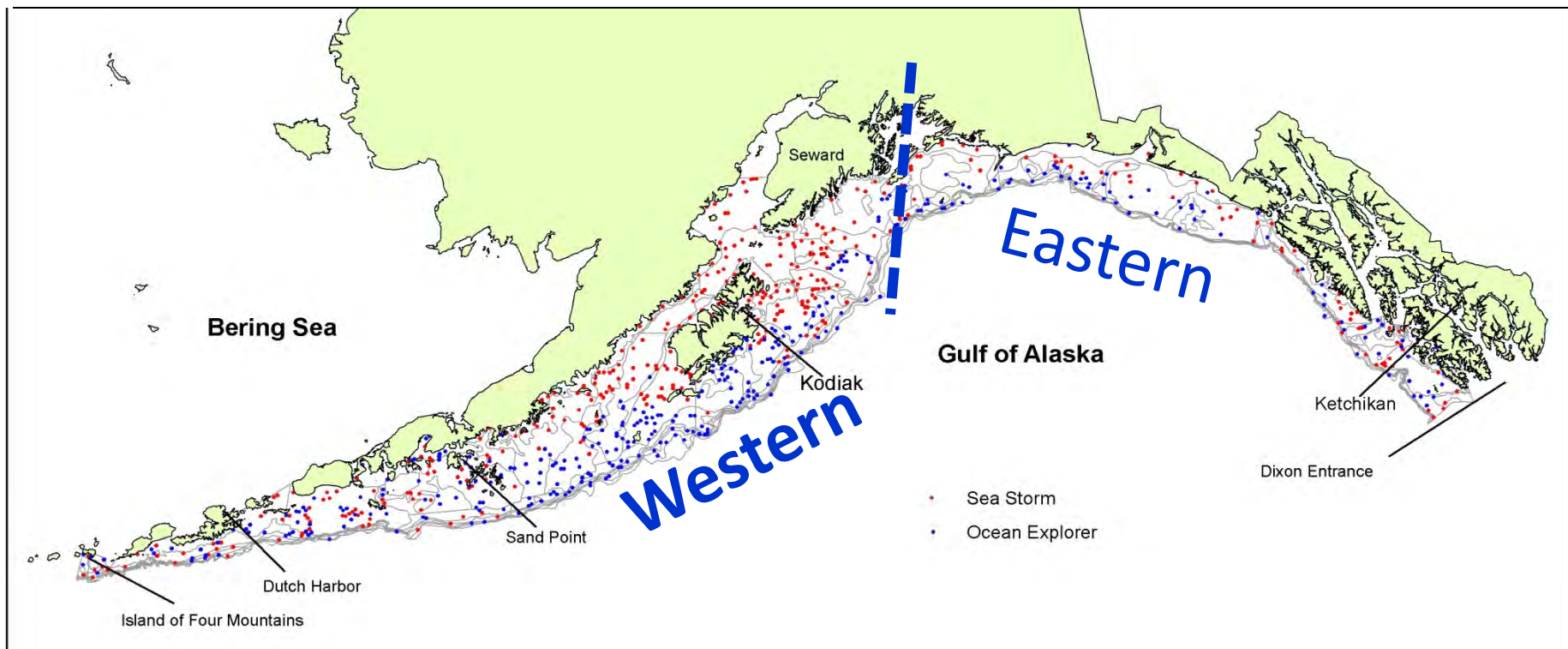
# The bottom trawl survey in the GOA



- Biennial stratified-random survey
- 59 strata based on geography, habitat, and depth
- Temperature at gear



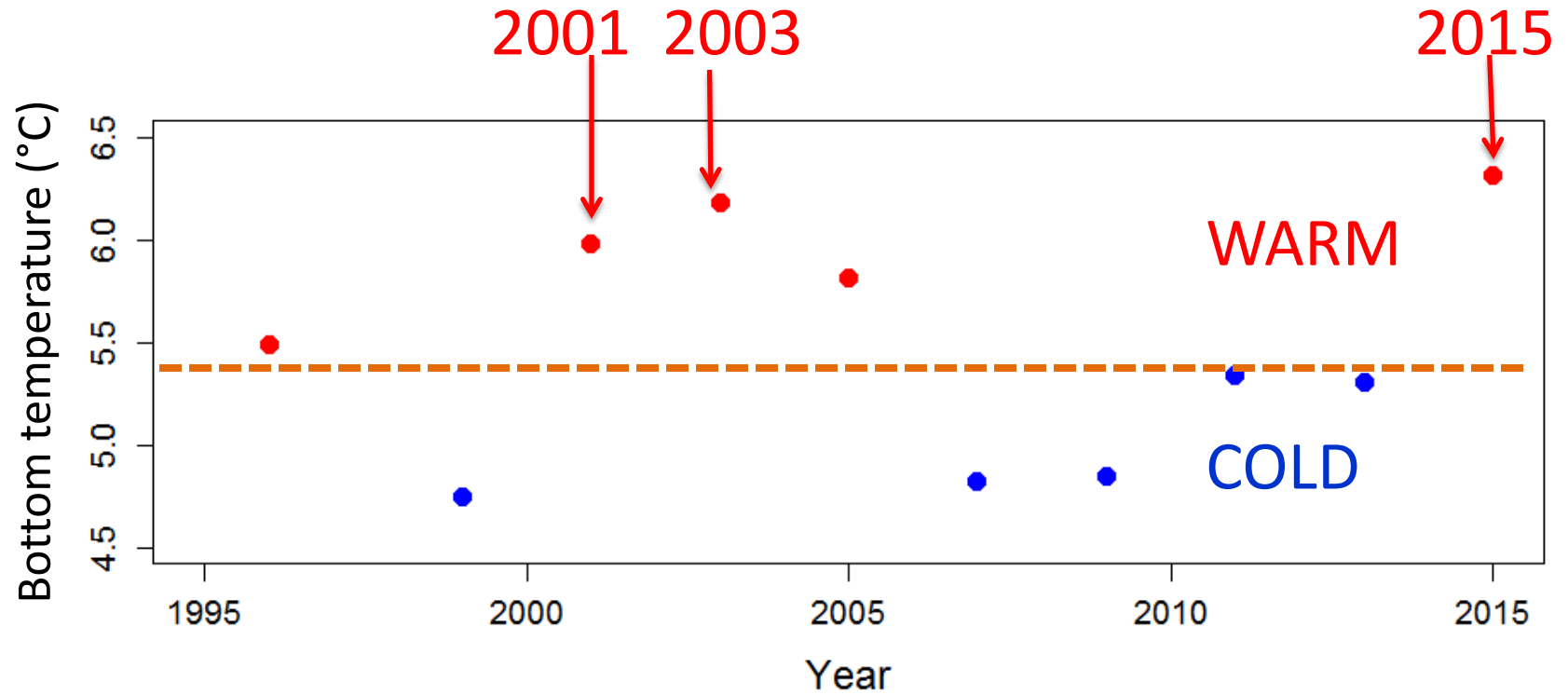
# The bottom trawl survey in the GOA



Selecting consistent data since 1996:

- The western GOA (wGOA)
- Strata with depth  $\leq 500\text{m}$

# Sea bottom temperature





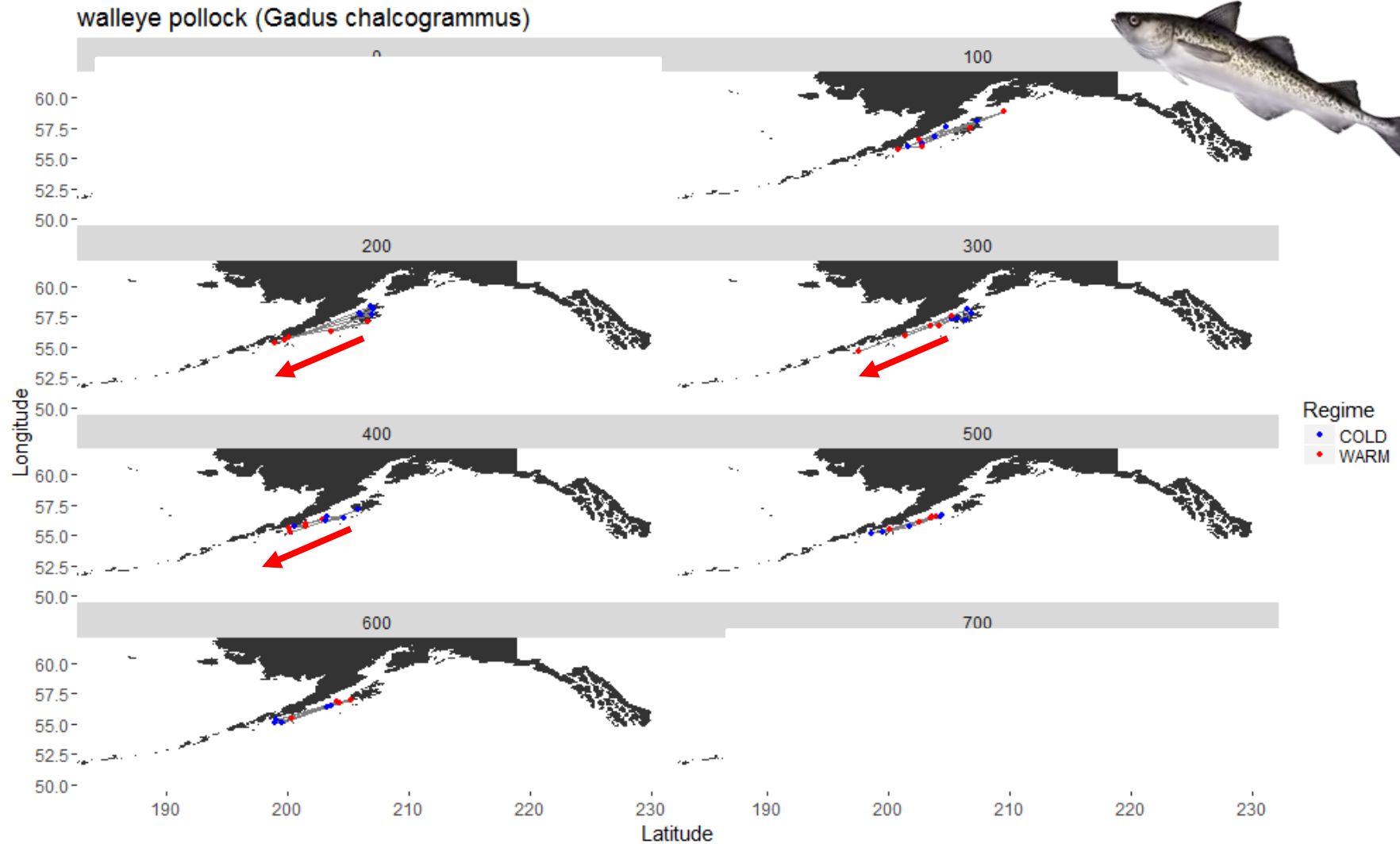
# Walleye pollock in the wGOA







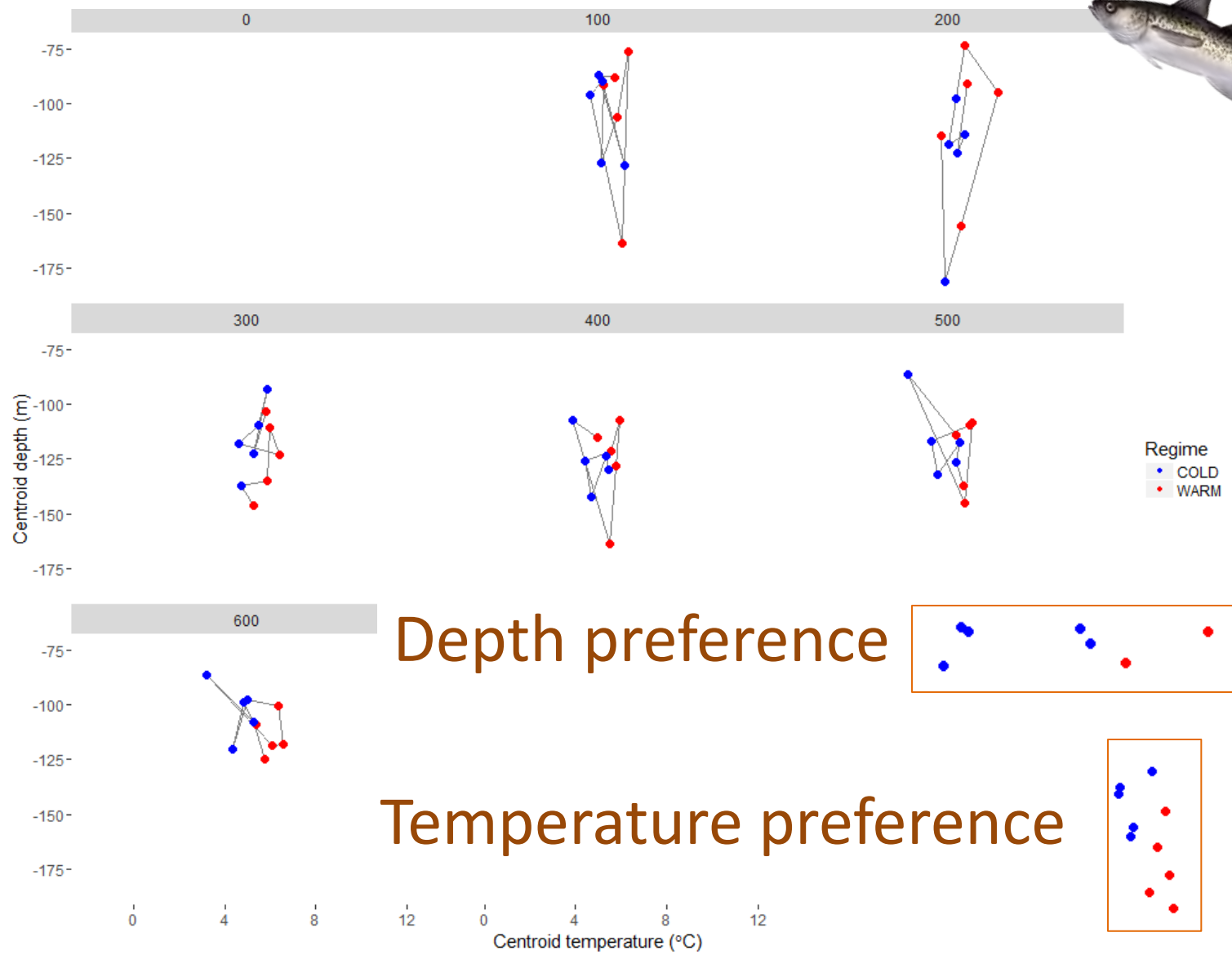
# Westward movement: 200, 300 & 400 mm size bins







# Centroid depth vs centroid temperature



Depth preference

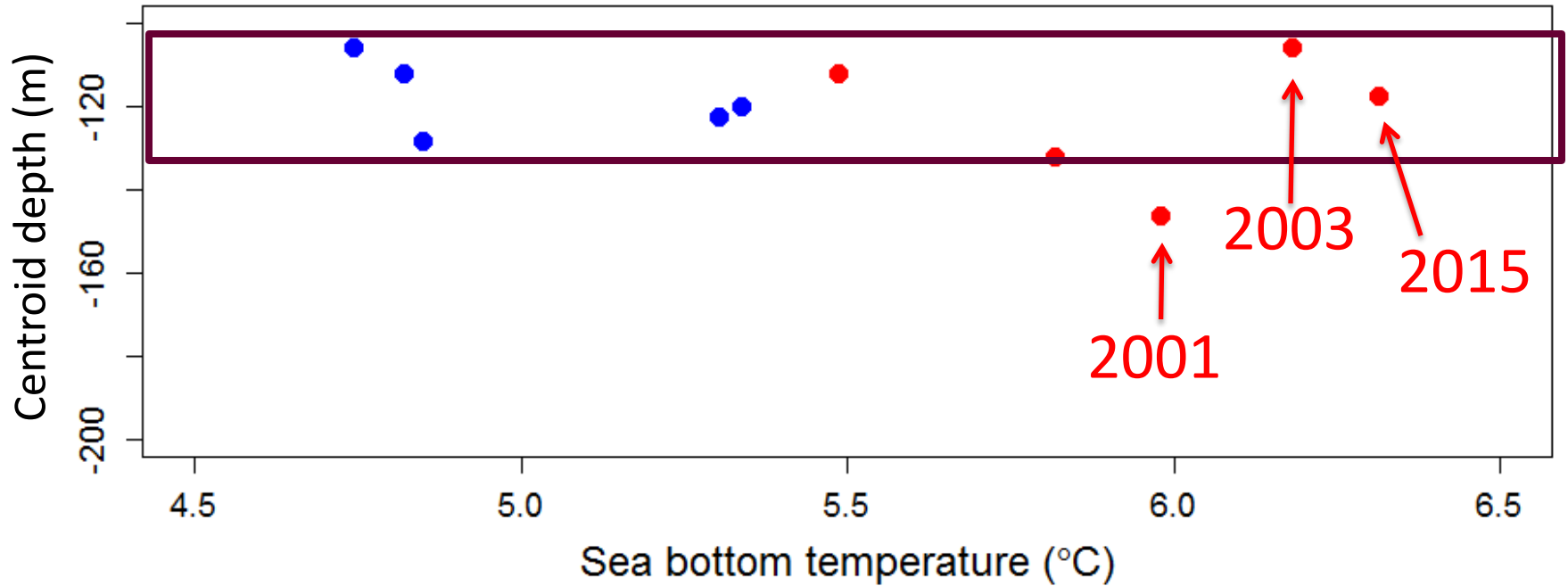
Temperature preference



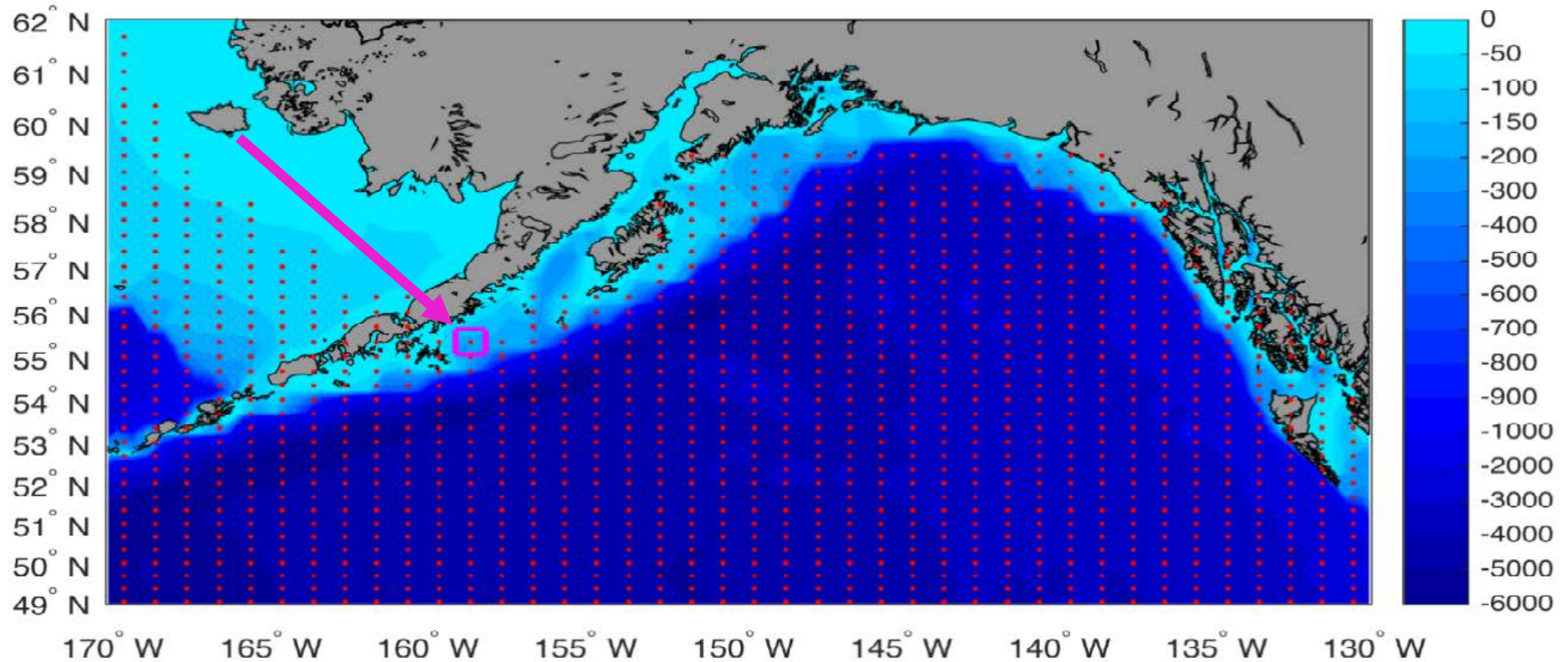
# Pollock centroid depth vs sea bottom temperature



Pollock  $\geq 300$  mm



# NCEP GODAS data







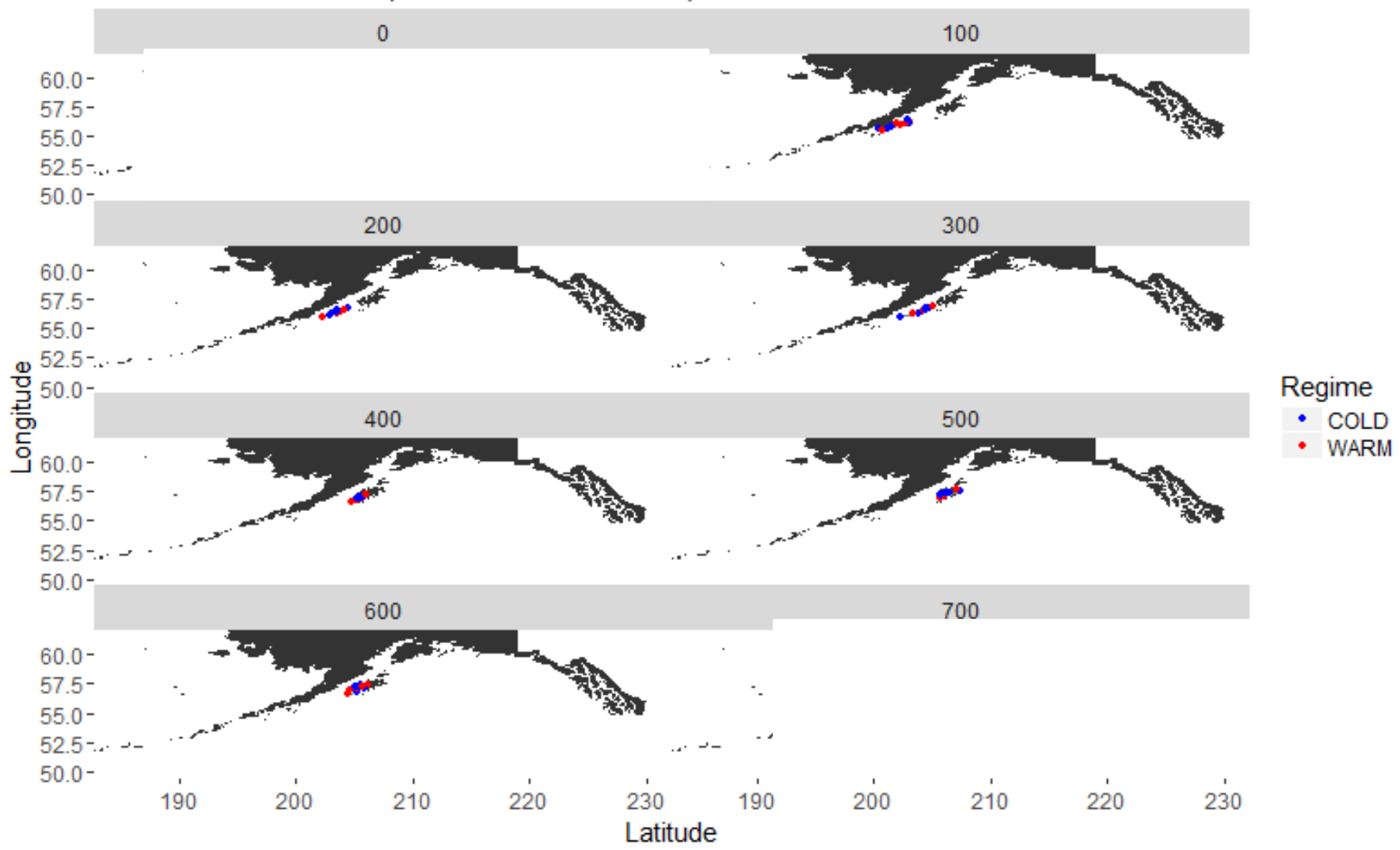


# Arrowtooth flounder in the wGOA



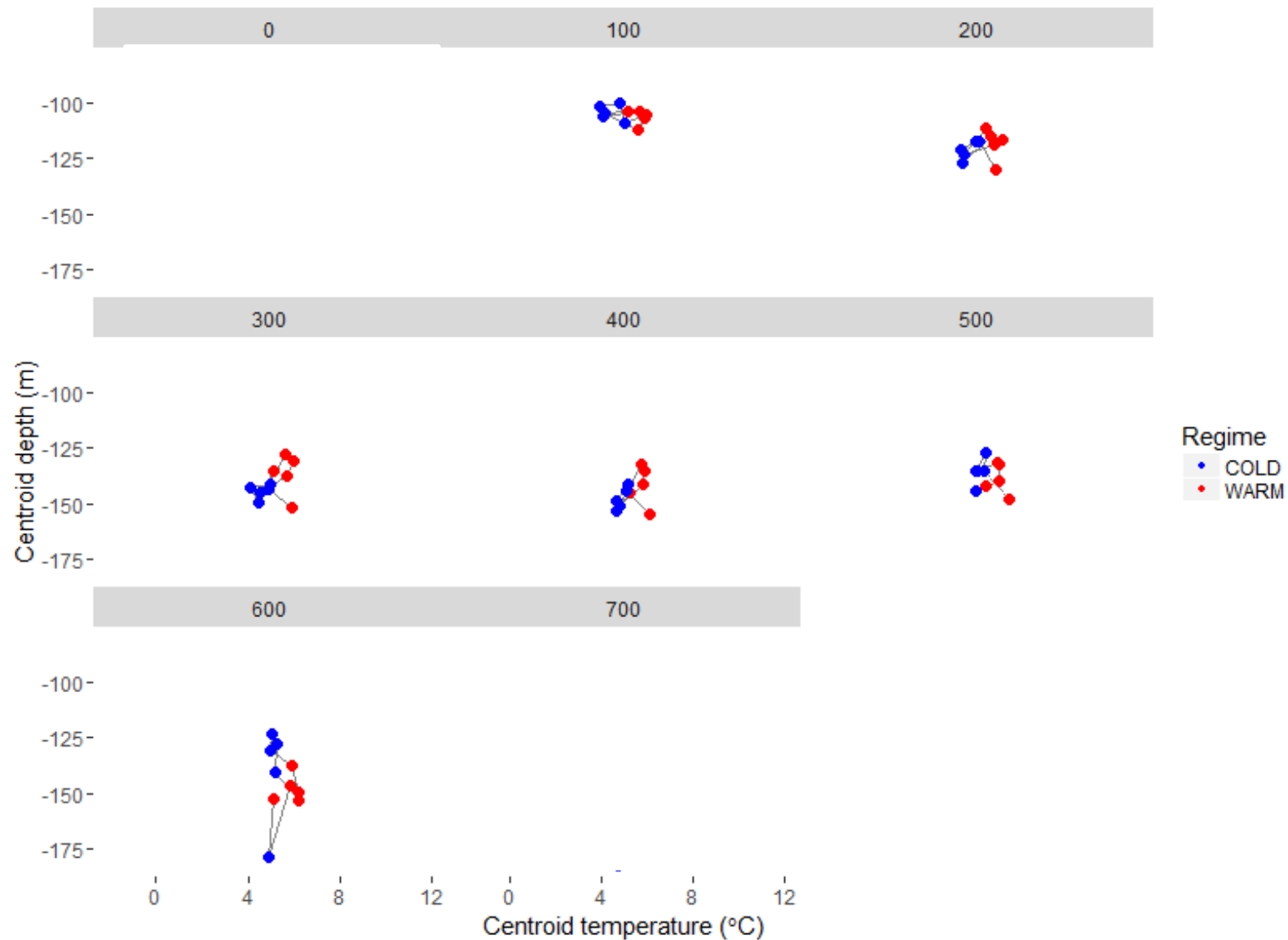


# Arrowtooth flounder in the wGOA



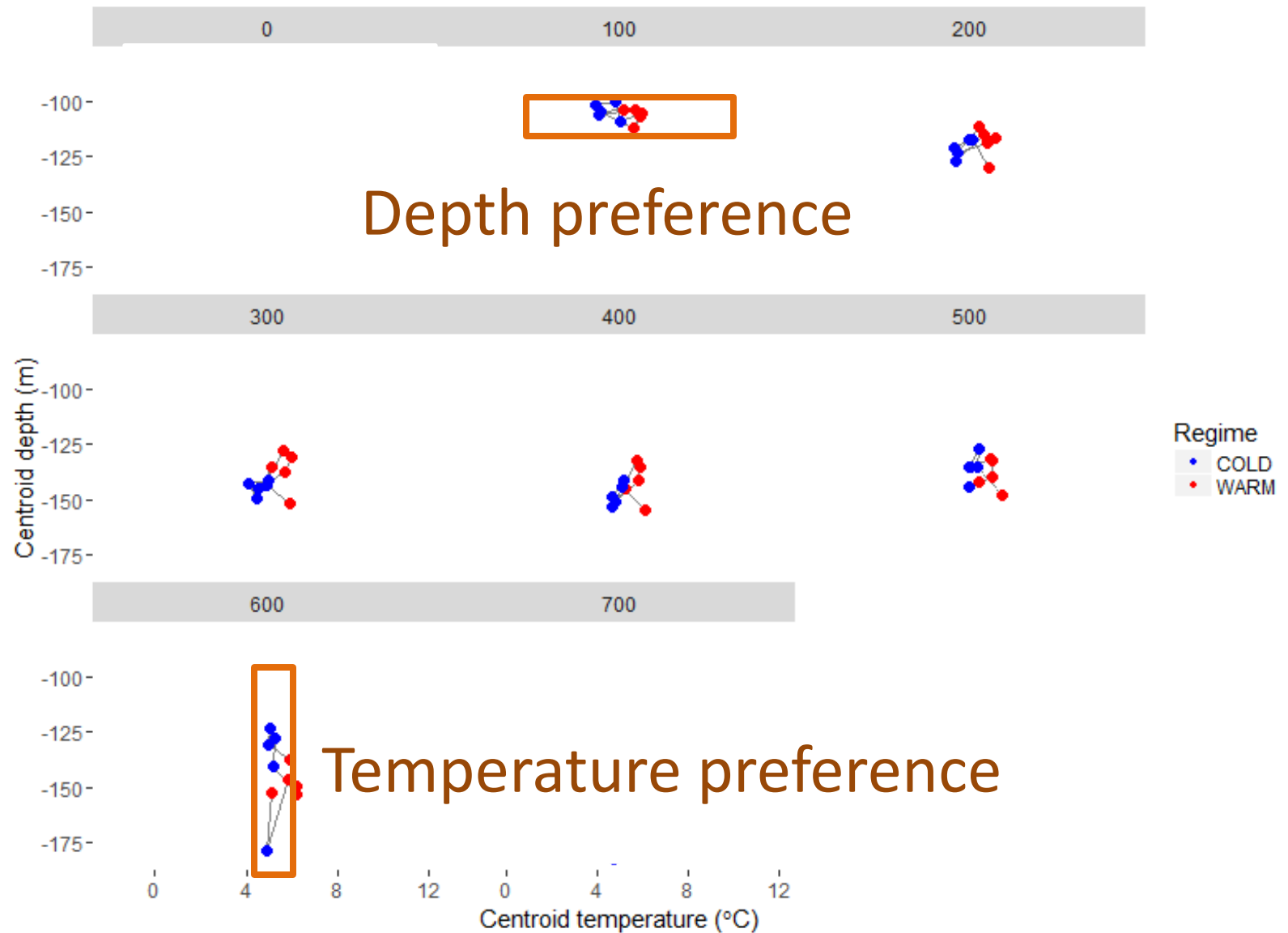


# Arrowtooth flounder in the wGOA





# Arrowtooth flounder in the wGOA





# Conclusions and discussions

- Different responses to temperature changes by size by species
- The warm water depth range appears to influence the vertical distribution of fish
- Standardizing temperature
- Next steps: spatial-temporal modelling

**THANK YOU VERY MUCH !!**



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