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

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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 ≤ 500m
Sea bottom temperature

Bottom temperature (°C)

Year


2001 2003

WARM

COLD

5.0 5.5 6.0 6.5

4.5
Walleye pollock in the wGOA
Westward movement: 200, 300 & 400 mm size bins

walleye pollock (Gadus chalcogrammus)
Centroid depth vs centroid temperature
Centroid depth vs centroid temperature

Depth preference

Temperature preference
Pollock centroid depth vs sea bottom temperature

Pollock ≥ 300 mm

Centroid depth (m)

Sea bottom temperature (°C)
NCEP GODAS data

http://www.cpc.ncep.noaa.gov/
Temperature anomalies in July

[Graph showing temperature anomalies over different years and depths.]
Arrowtooth flounder in the wGOA
Arrowtooth flounder in the wGOA

Regime

COLD
WARM

Latitude
Longitude
Arrowtooth flounder in the wGOA
Arrowtooth flounder in the wGOA

Depth preference

Temperature preference
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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