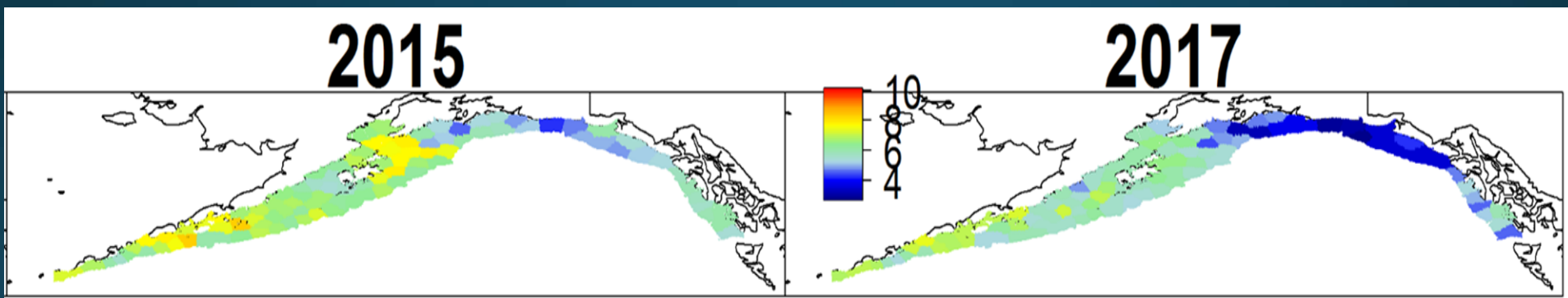




# Gulf of Alaska Pacific cod

Steven J. Barbeaux PhD.  
NPFMC SSC  
October 2, 2017



# 2017 Bottom trawl survey

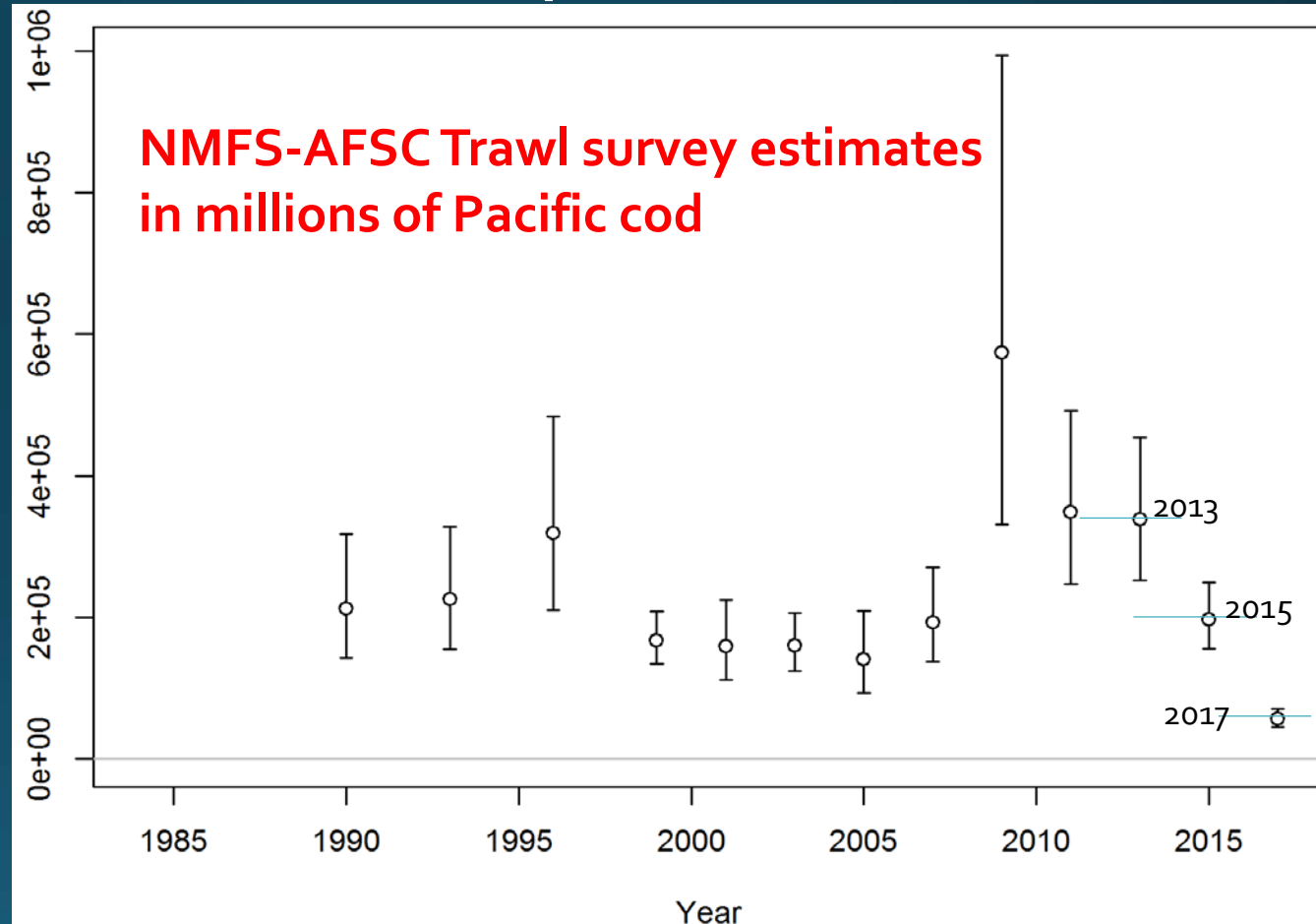
## Lowest estimate

- 196 million fish and 107,324 t
- Precise (12% CV)

## 71% drop from 2015 estimate

- 83% drop from 2013

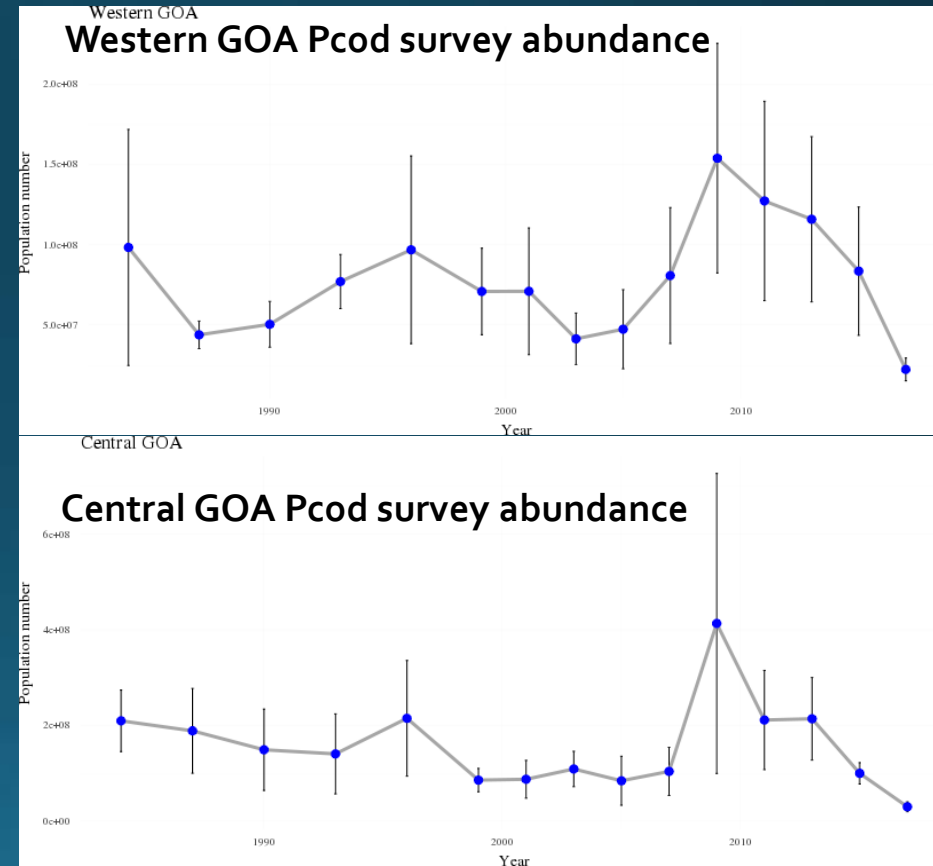
58% decline in biomass since 2015 (78% since 2013)



# 2017 Bottom trawl survey



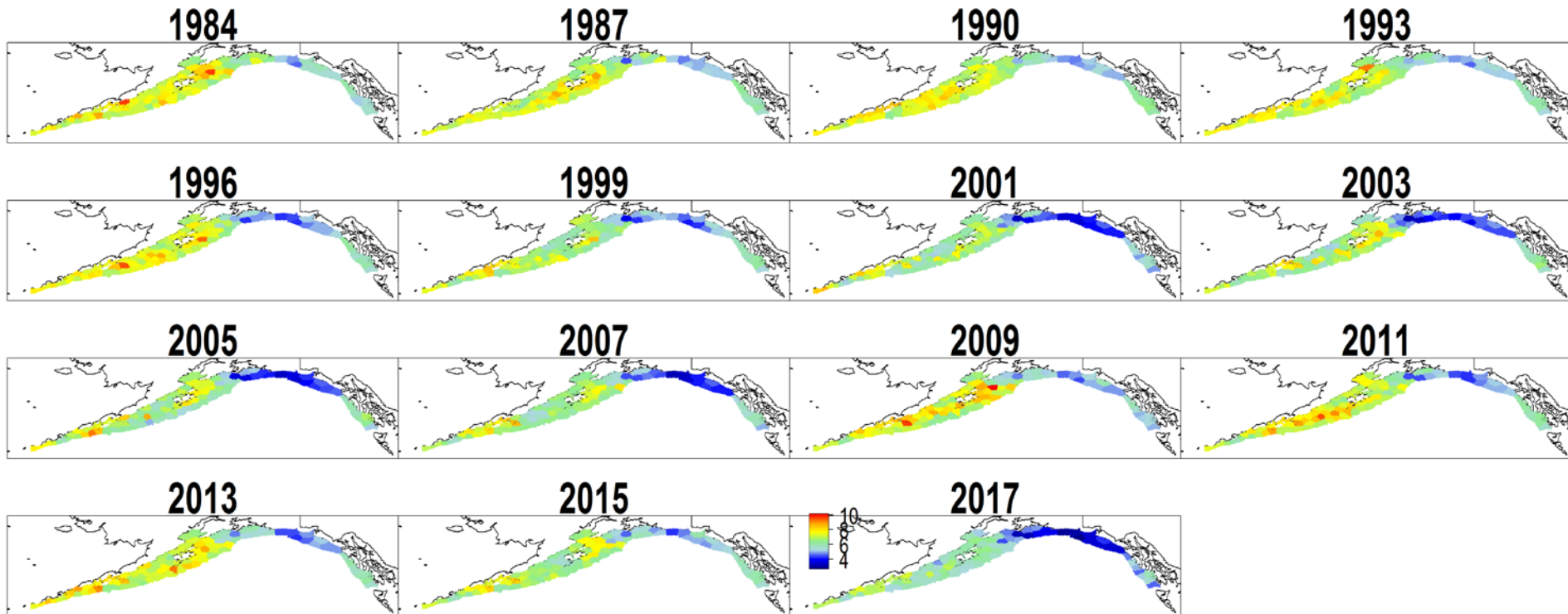
- Lowest estimate ever  
 $1.96 \times 10^8$  fish and 107,324 t
- Precise estimate (0.117 CV)
- 71% decline in abundance since 2015 (83% since 2013)
- 58% decline in biomass since 2015 (78% since 2013)



# 2017 bottom trawl survey



- Biomass down Gulf-wide
- Highest densities in the Western GOA

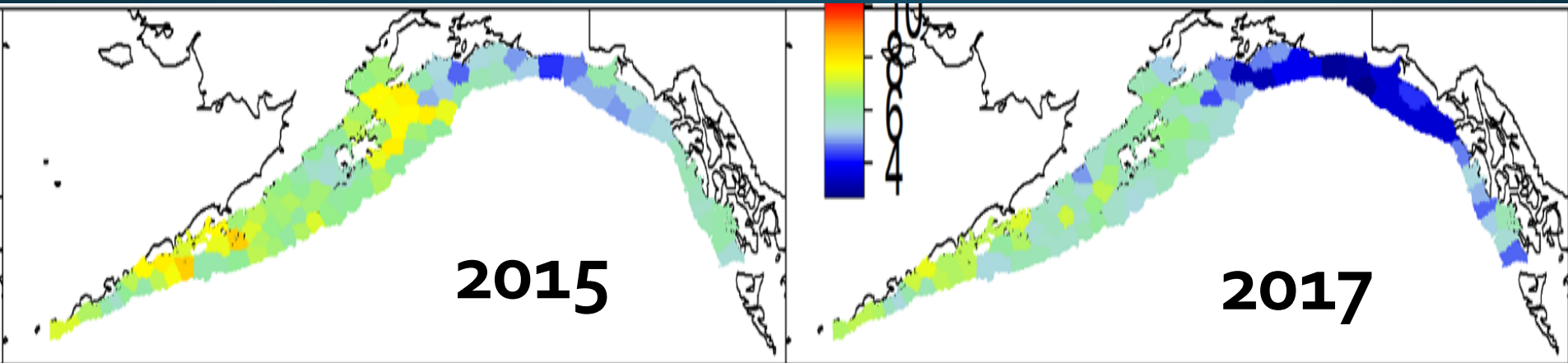


Eastings

# 2017 bottom trawl survey

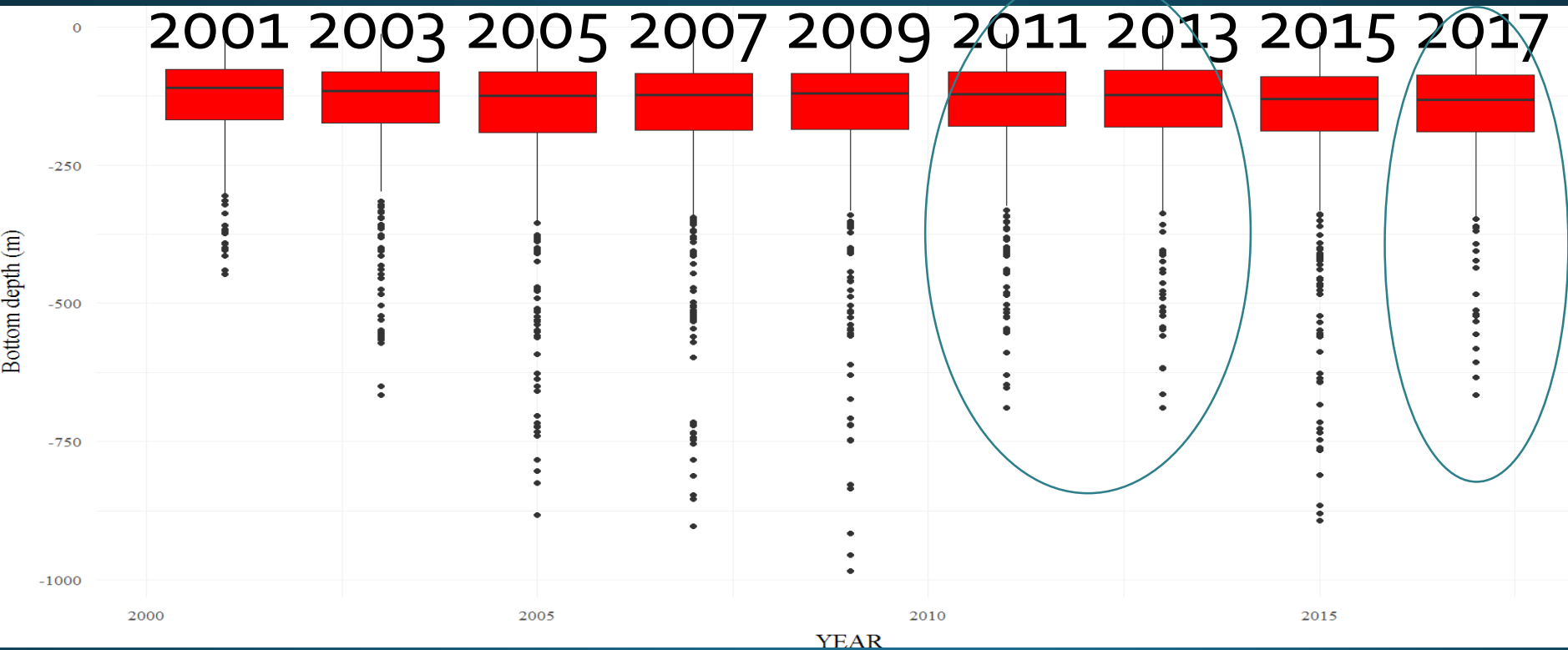


- Biomass down Gulf-wide
- Highest densities in the Western GOA



# 2017 bottom trawl survey depth coverage

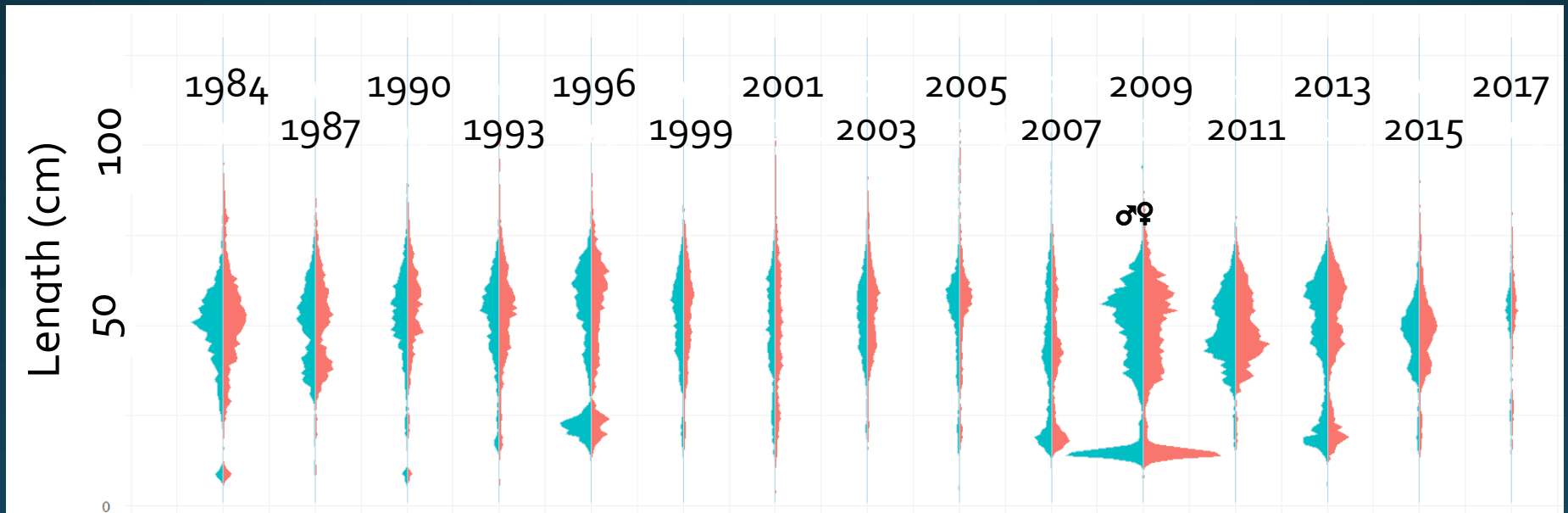
- Similar survey haul distribution
- Similar depths to 2011 and 2013



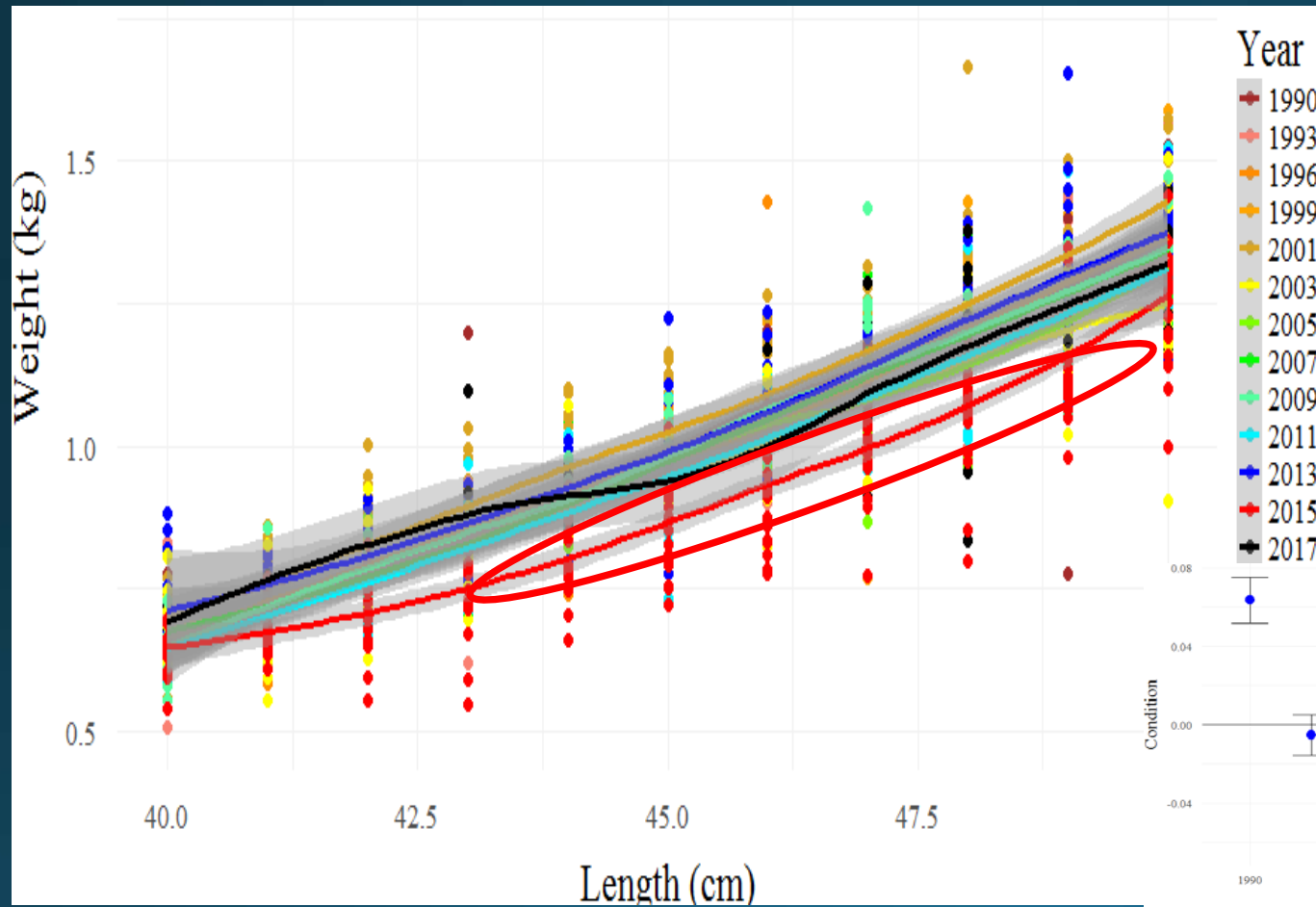
# 2017 bottom trawl survey



## Length frequency from surveys

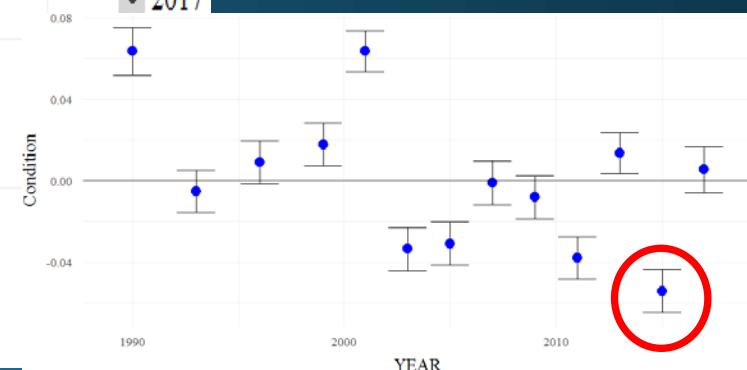


# 2015 Bottom trawl survey - Condition - Length-Weight



Condition was lowest on record in 2015

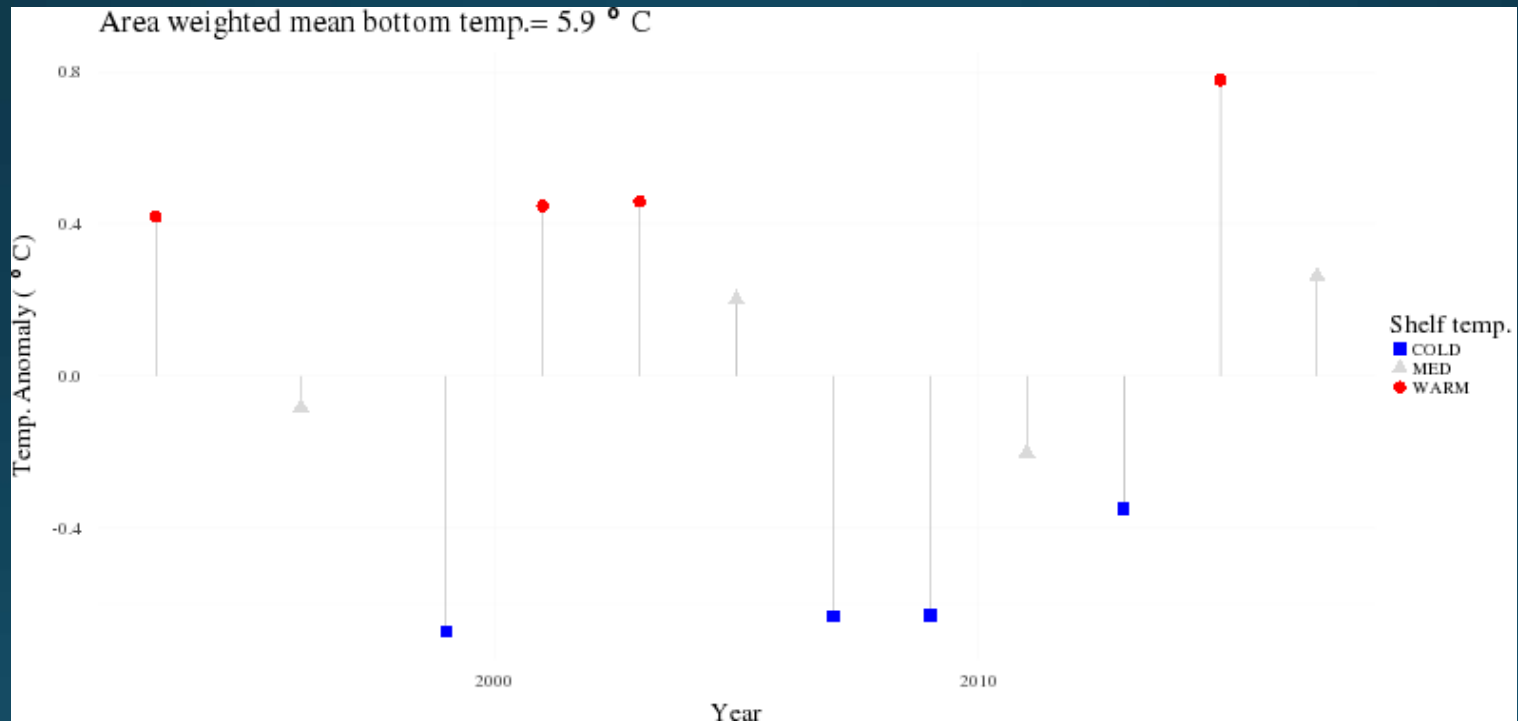
- Primarily due to lengths 40-50cm (3-year olds)





# 2017 bottom trawl survey - Temperature

- 2015 record high temperatures
  - 2017 temperatures were warm, but near the 1996-2017 average
- Central GOA



# Anomalously warm waters 2014-2016



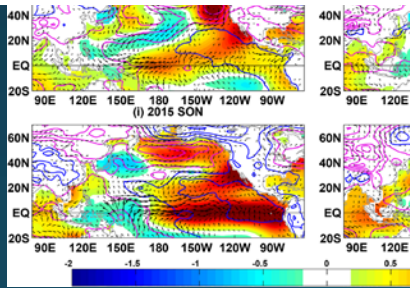
Alaska Dispatch News

Anchorage 55°F

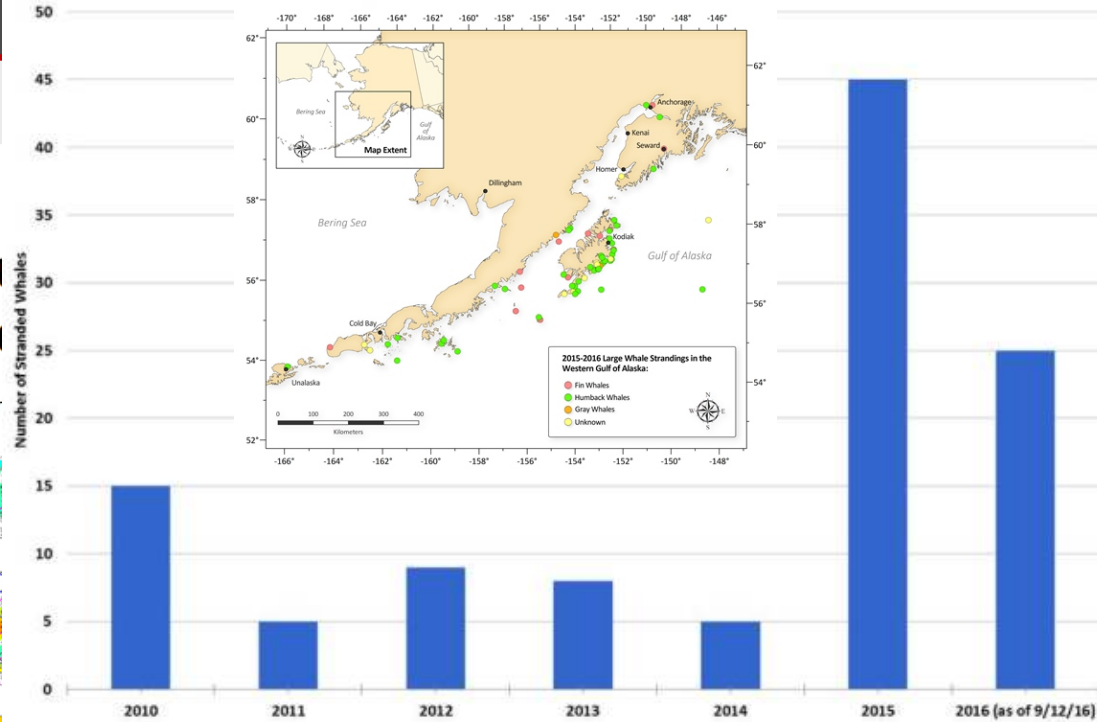
Science

## Scientists think Gulf of Alaska has biggest ever record

Author: Yereh Rosen Updated: September



Annual Large Whale Strandings in Western Gulf of Alaska



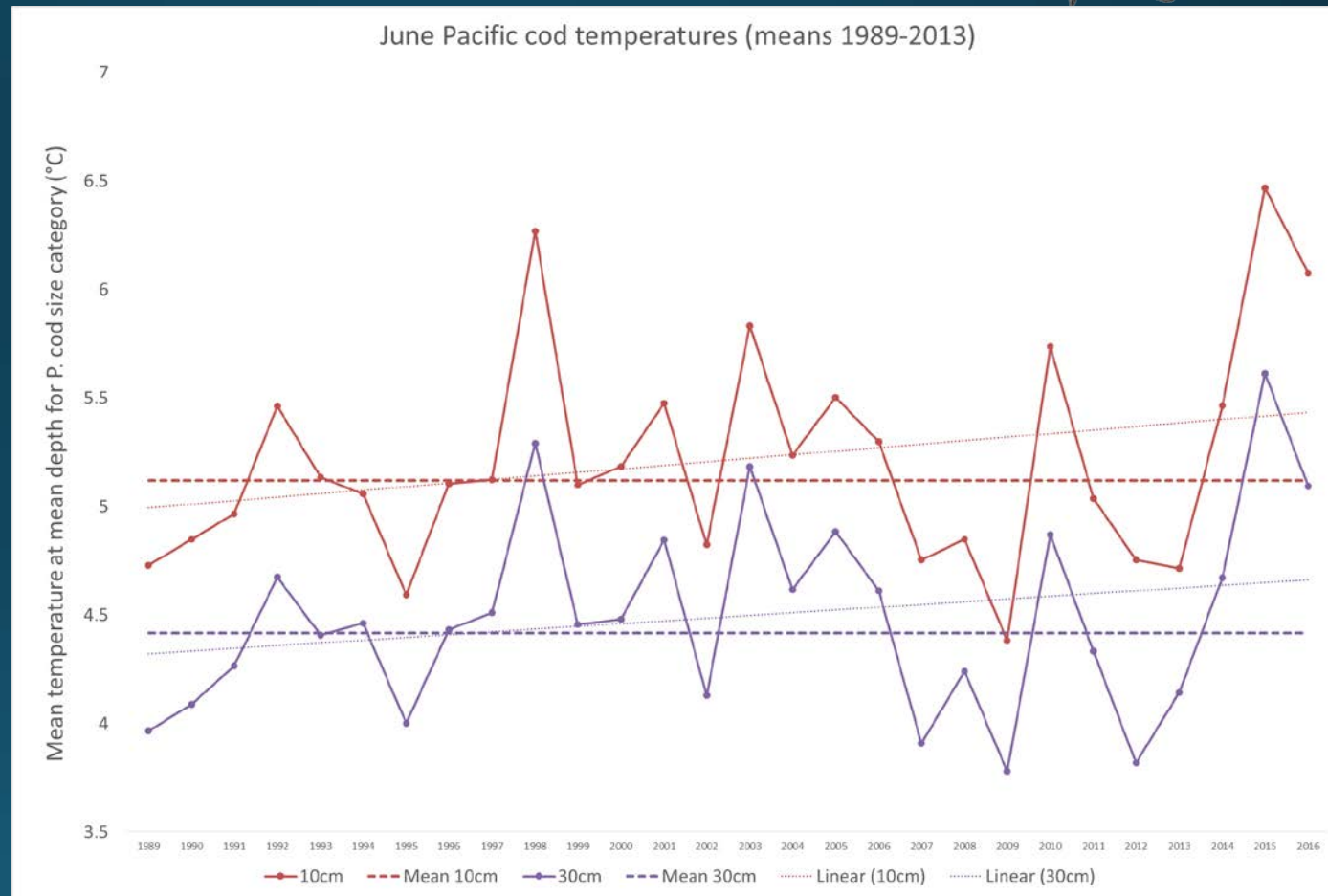
17

JAN 2017

# Anomalously warm waters for Pacific cod



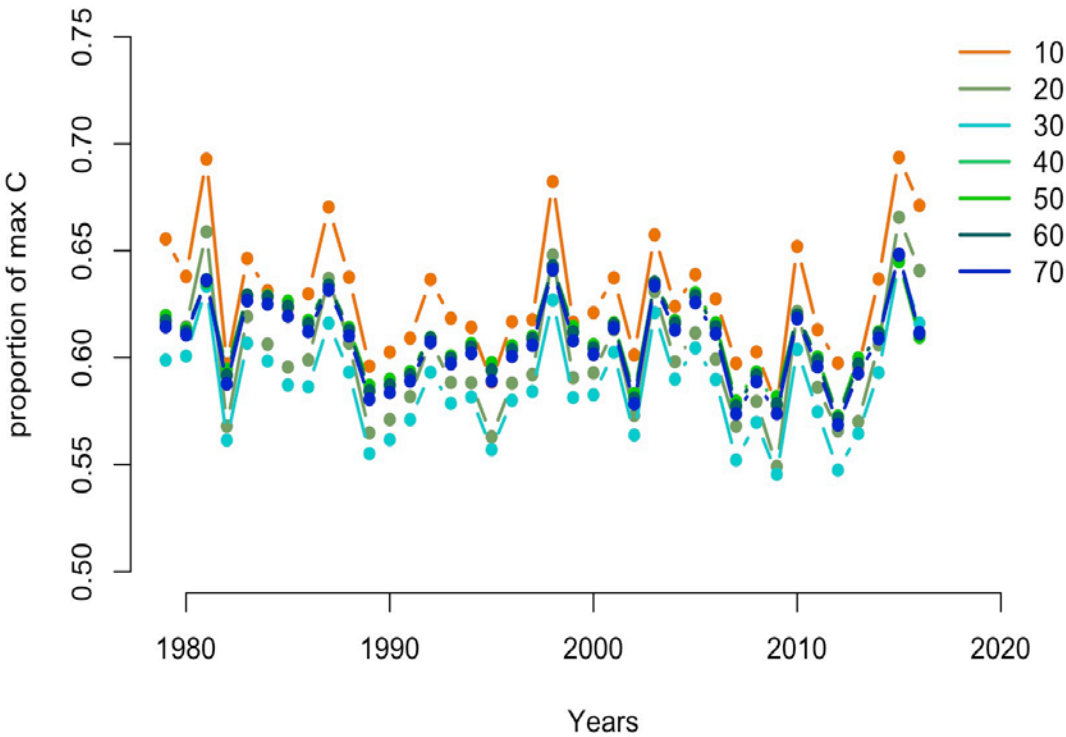
2014-2016  
different in  
that  
temperatures  
were higher for  
entire year



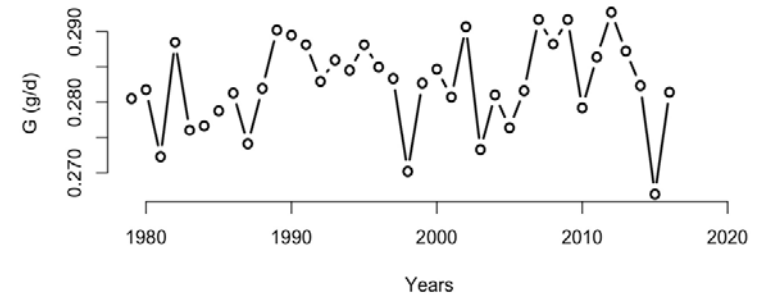
# Pacific cod bioenergetics



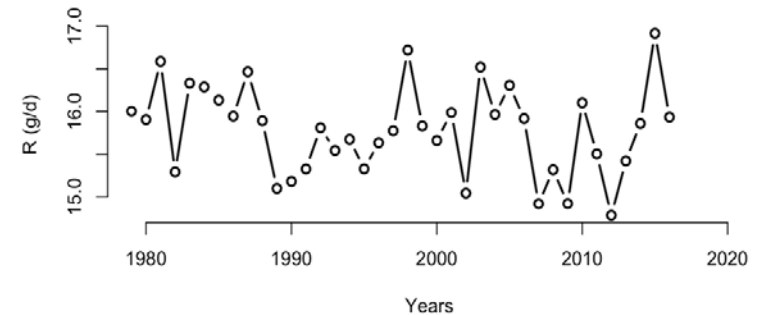
Relative energetic demand



Daily growth (based on mean foraging rate)



Daily metabolic demand

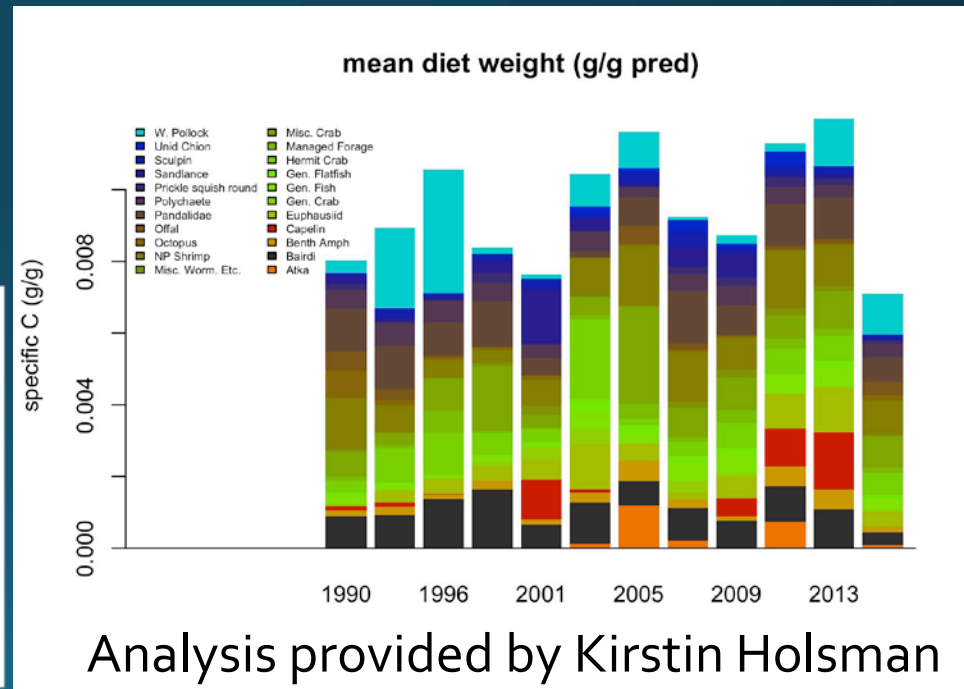
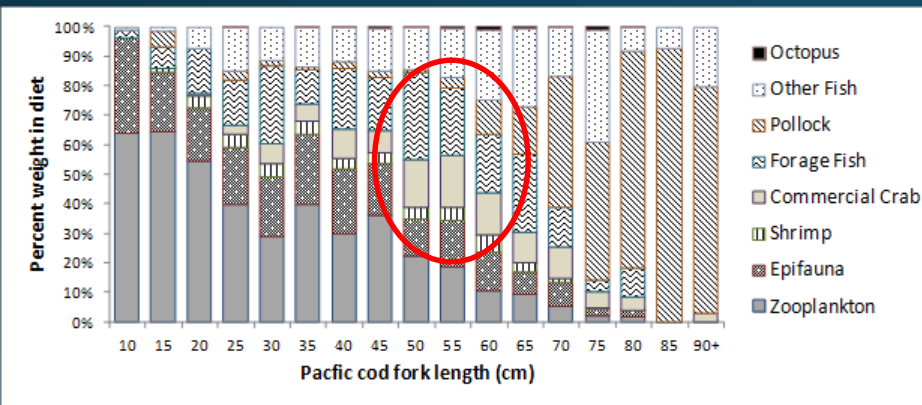


Curtesy Kirstin Holsman

# Pacific cod bioenergetics – Available forage



- Overall prey weight down to lowest measured in Pacific cod stomachs in 2015



Analysis provided by Kirstin Holsman

# Pacific cod bio-energetics - Summary



- Warmer temperatures were throughout the year and water column
- Higher metabolism in warmer temps lead to higher forage requirements
- Indications of lower forage amounts in 2015-2016
- Combination could have lead to higher natural mortality for these years for the 2012 year class.

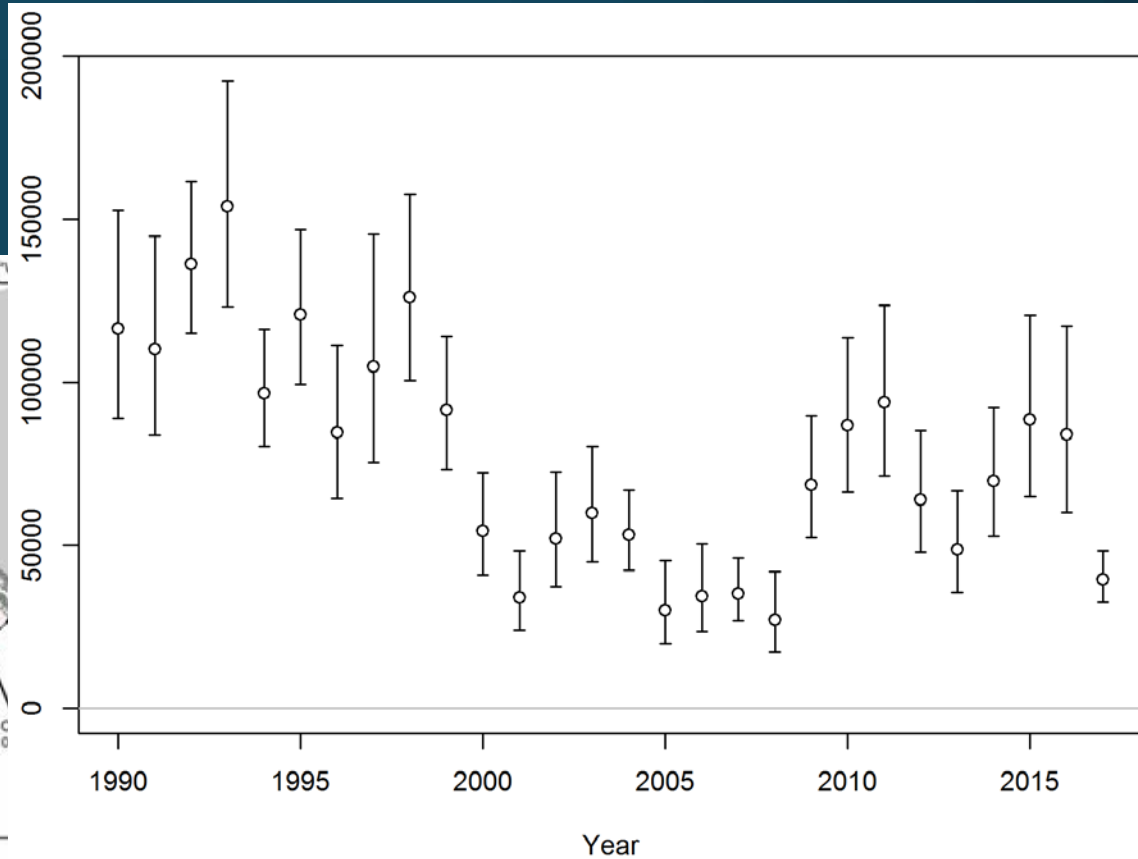
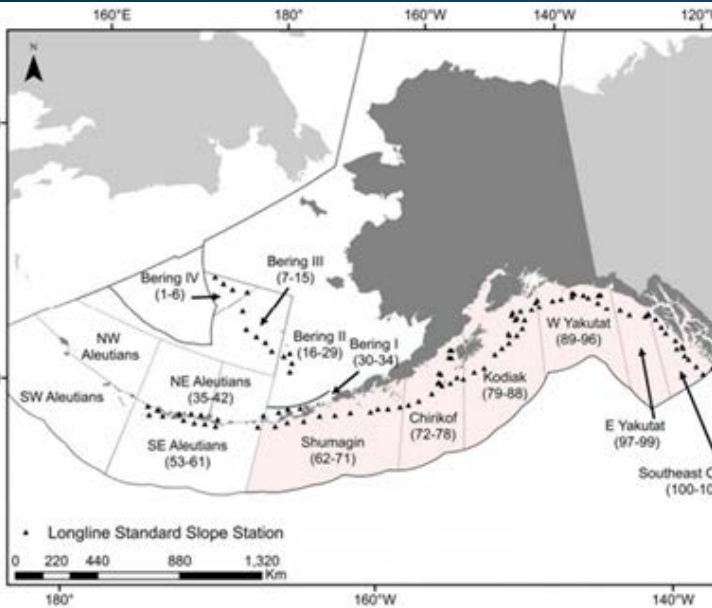
# Other surveys and abundance information



# 2017 Longline survey



- Also declined
  - 53% from 2015



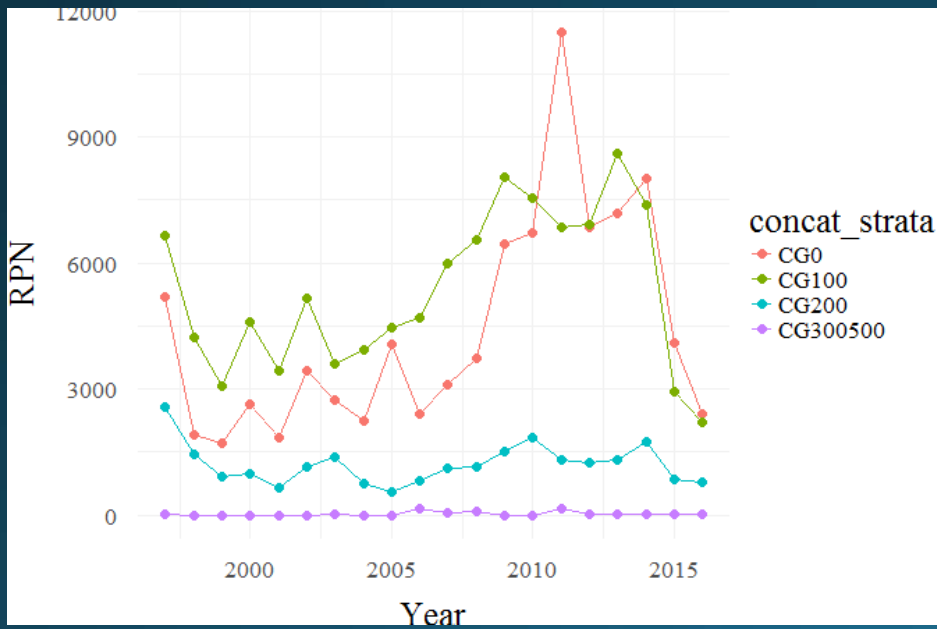


# IPHC longline survey

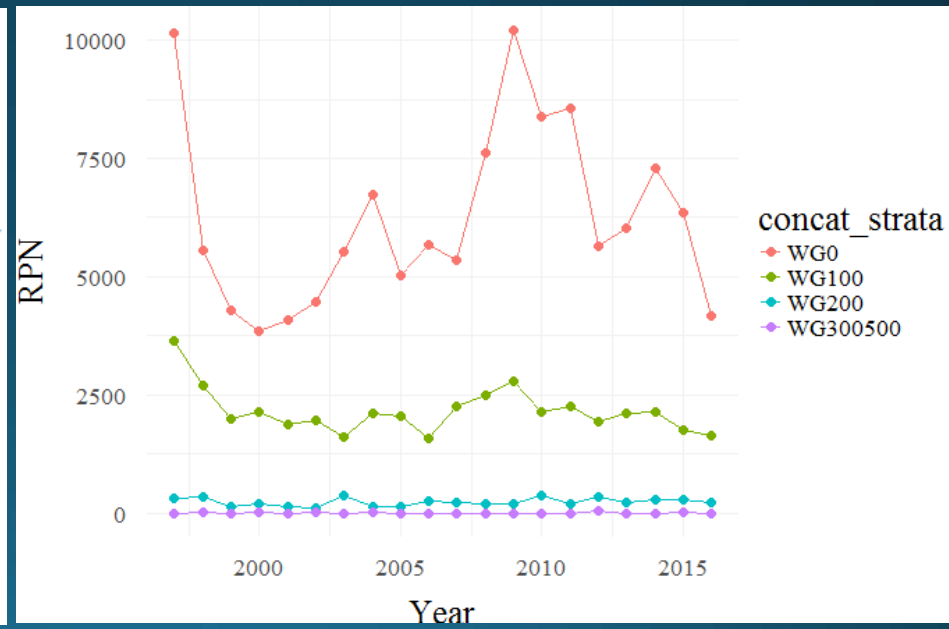


- Through 2016 only

Central GOA



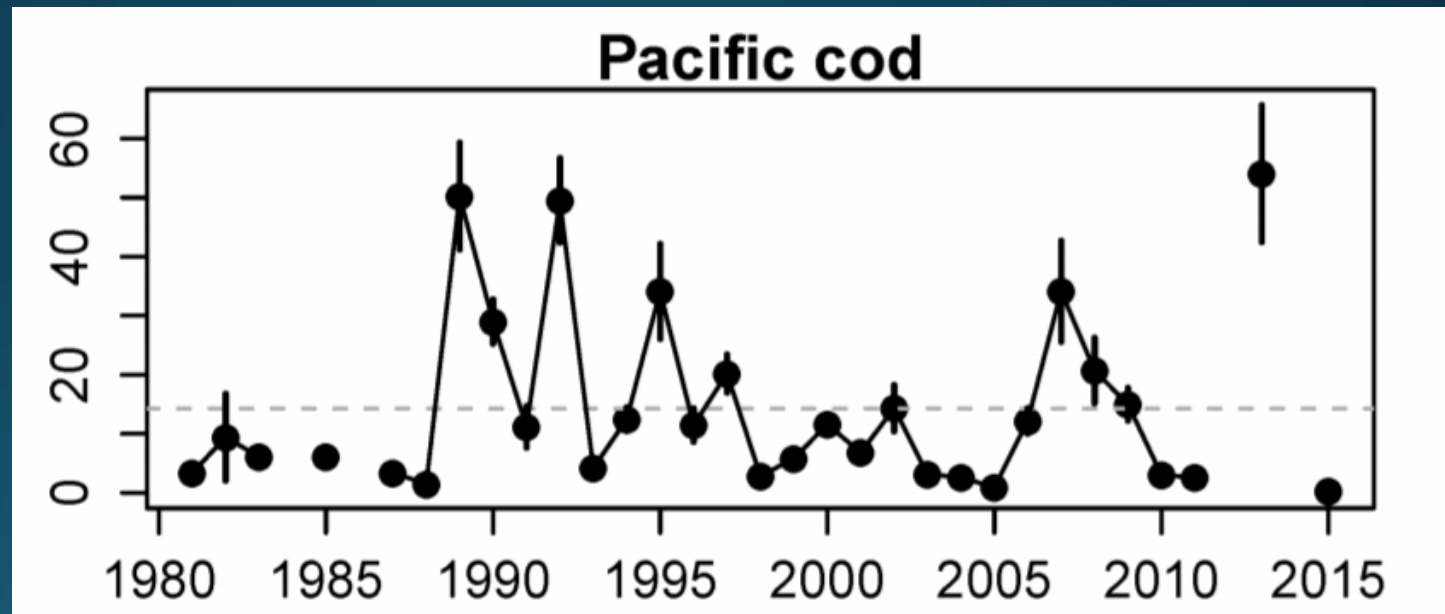
Western GOA



# Pacific cod larval abundance



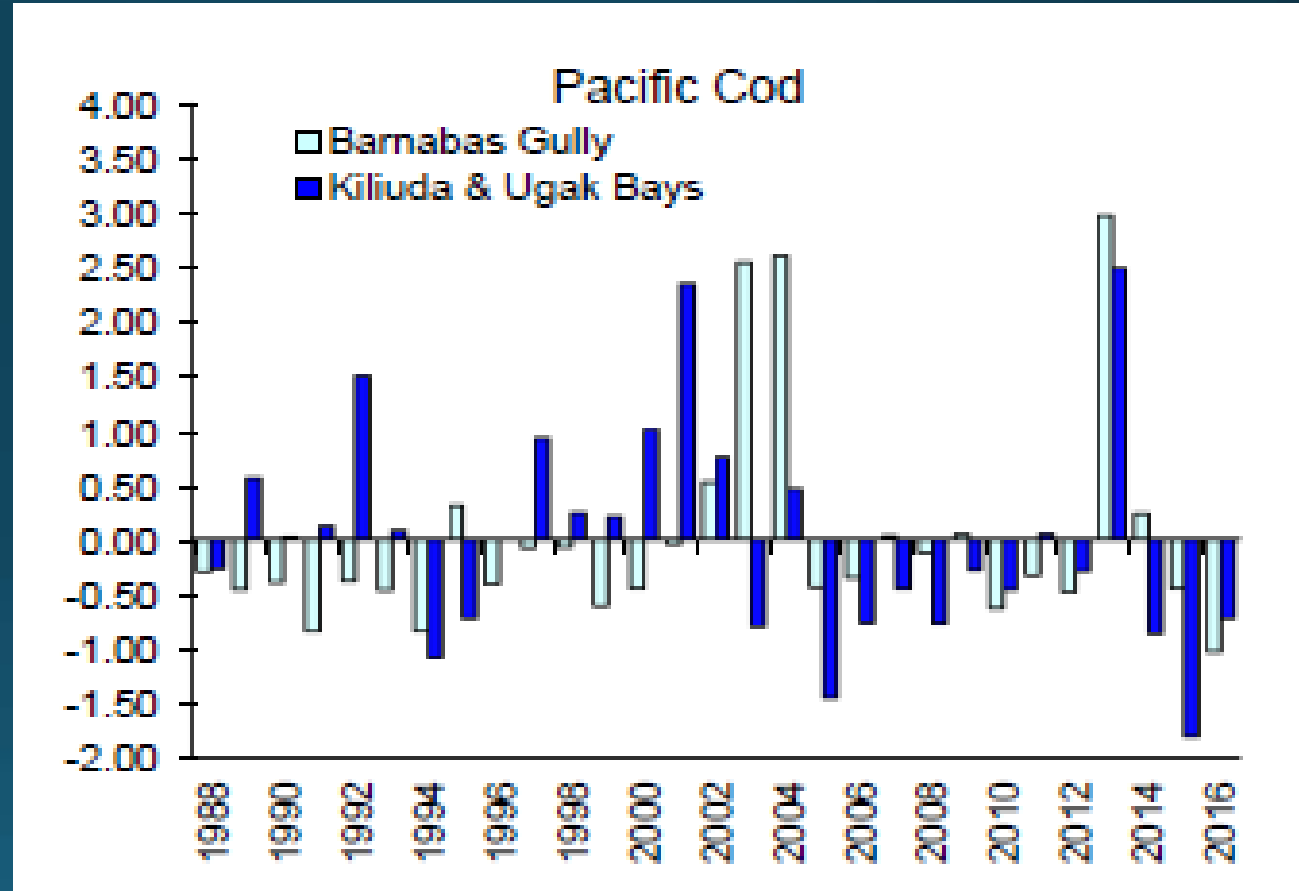
- Low value in 2015
- Apparent high 2013 larval abundance didn't materialize...



# ADF&G large-mesh trawl survey

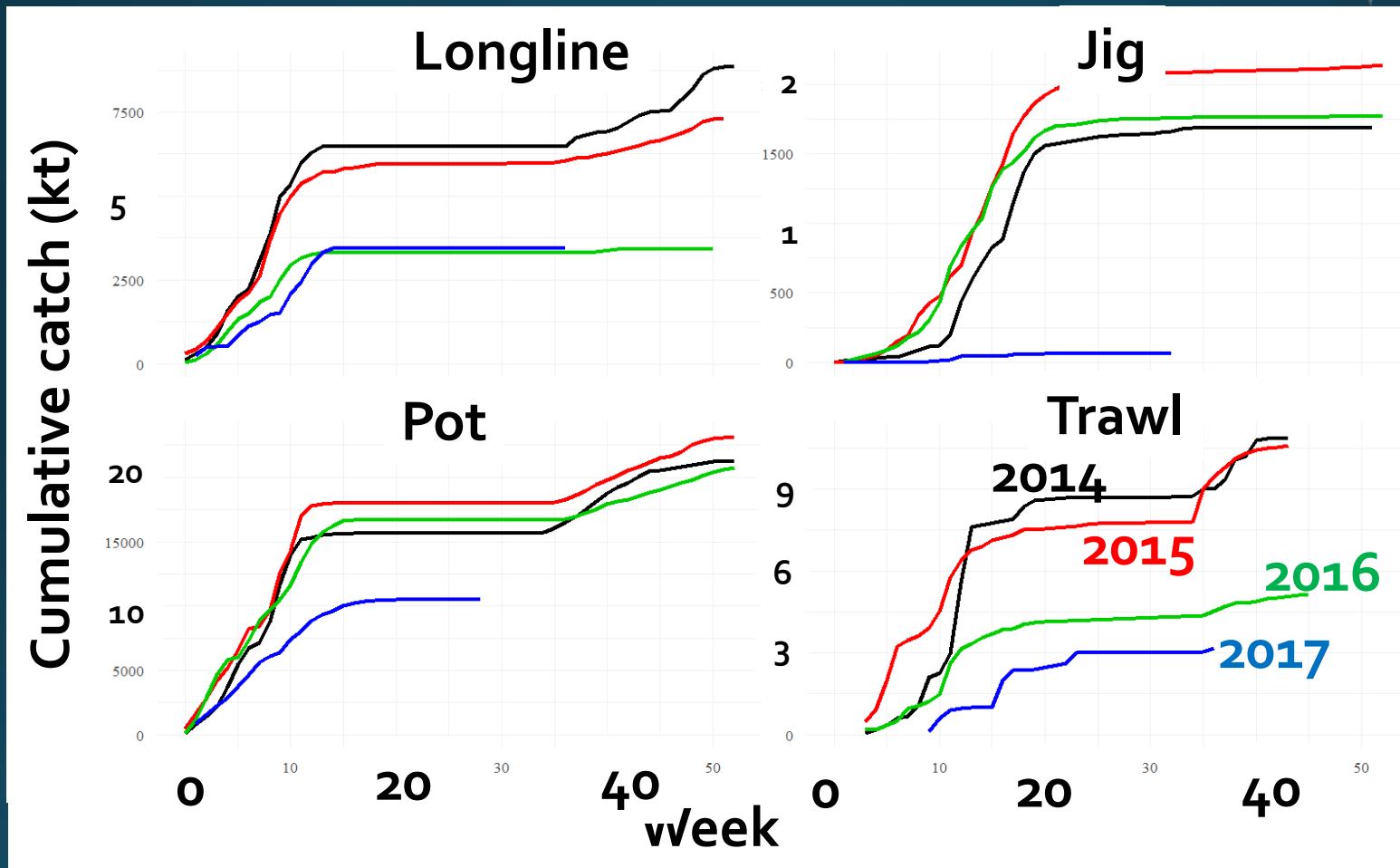


- 2015 and 2016 below average



# Fishery data

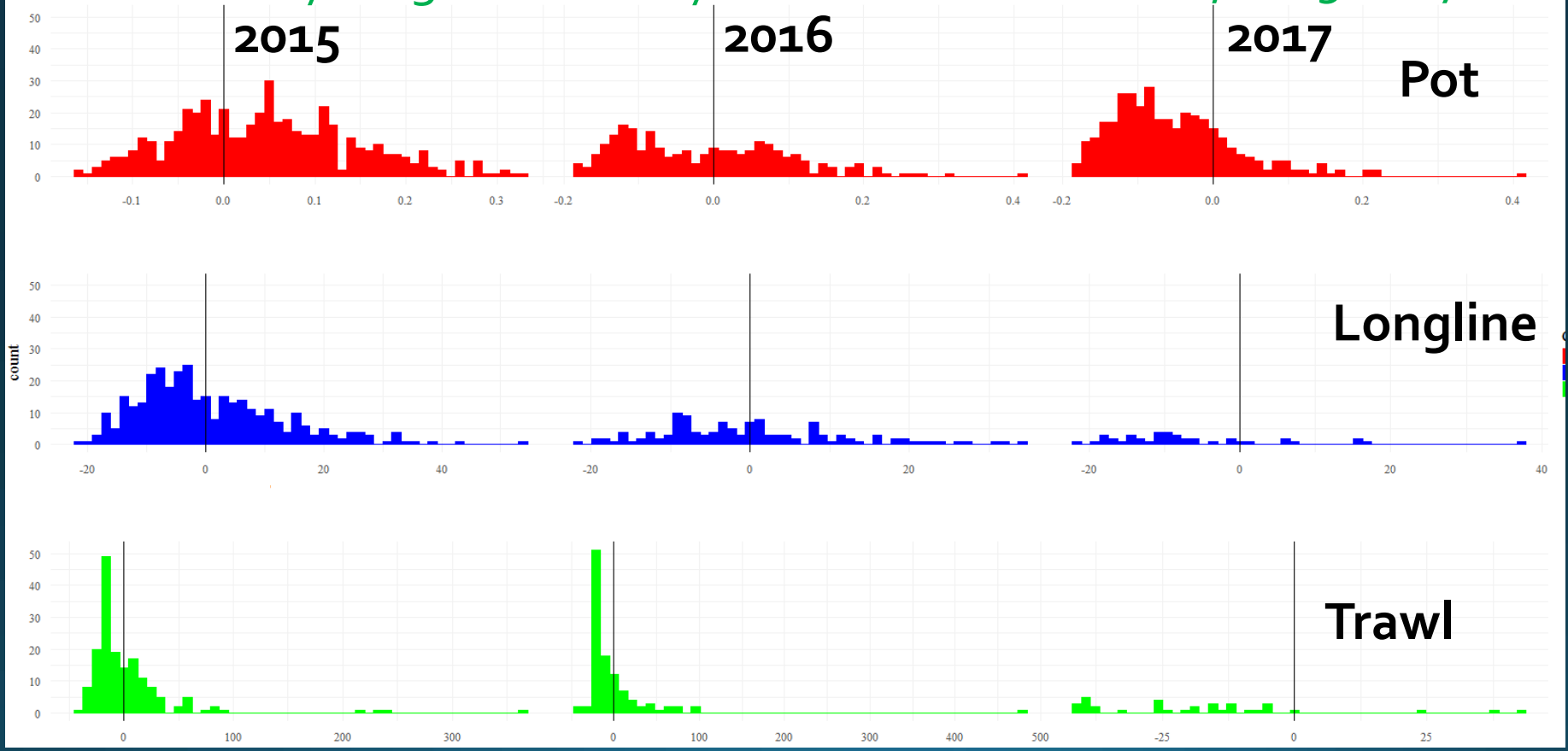
# Central GOA Pacific cod fishery



# Central GOA Pacific cod fishery



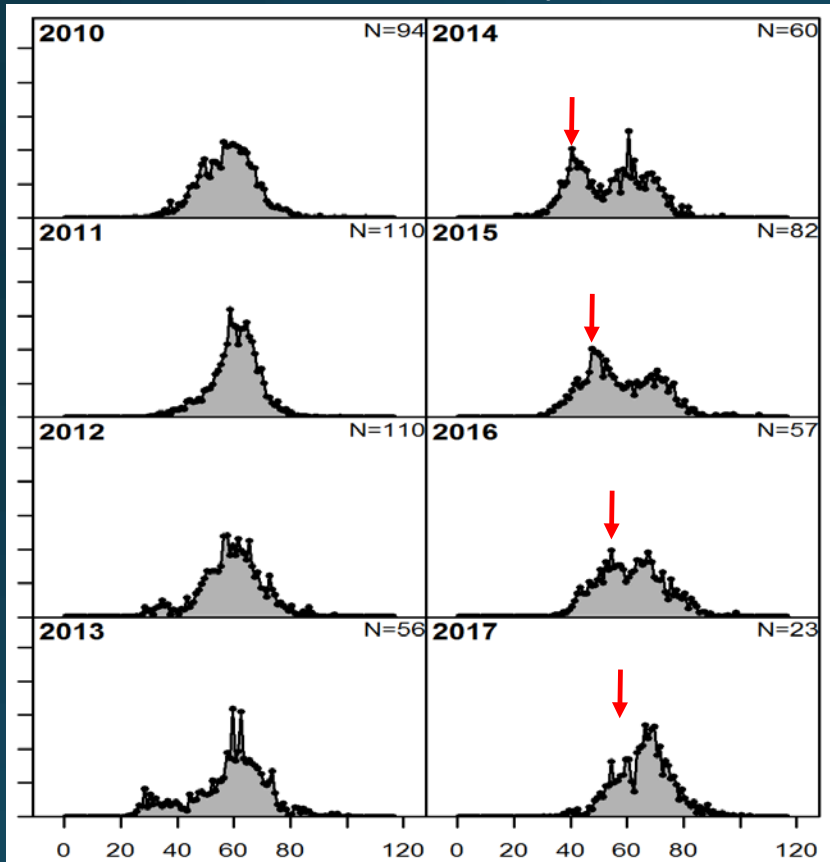
January-August CPUE by number of Pacific cod, 2015-2017



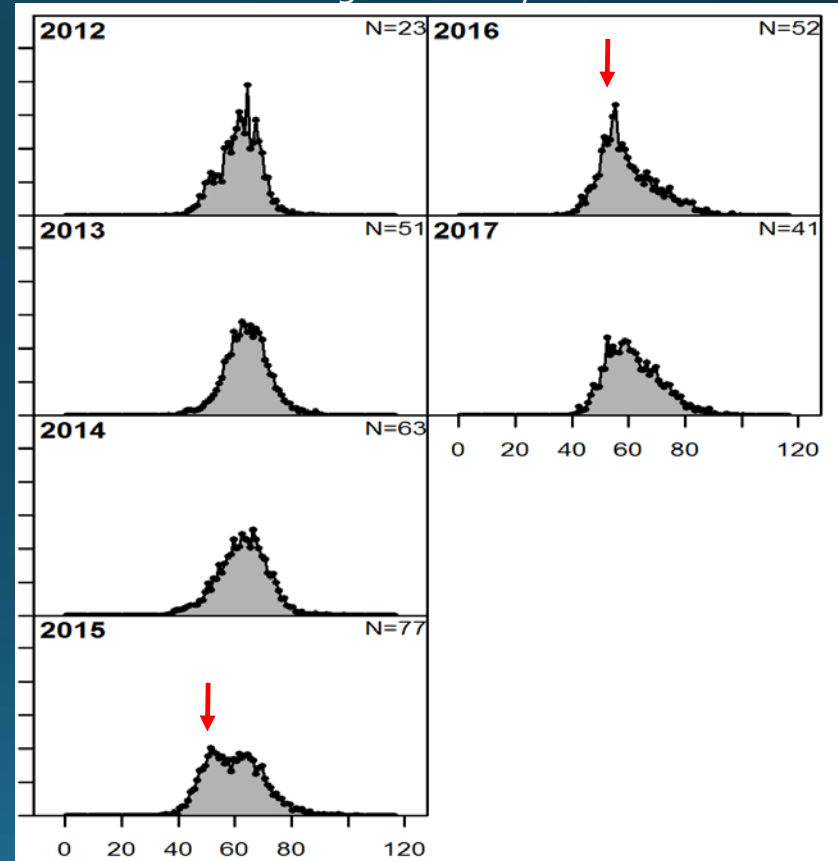
# Pacific cod fishery length data



Trawl fishery



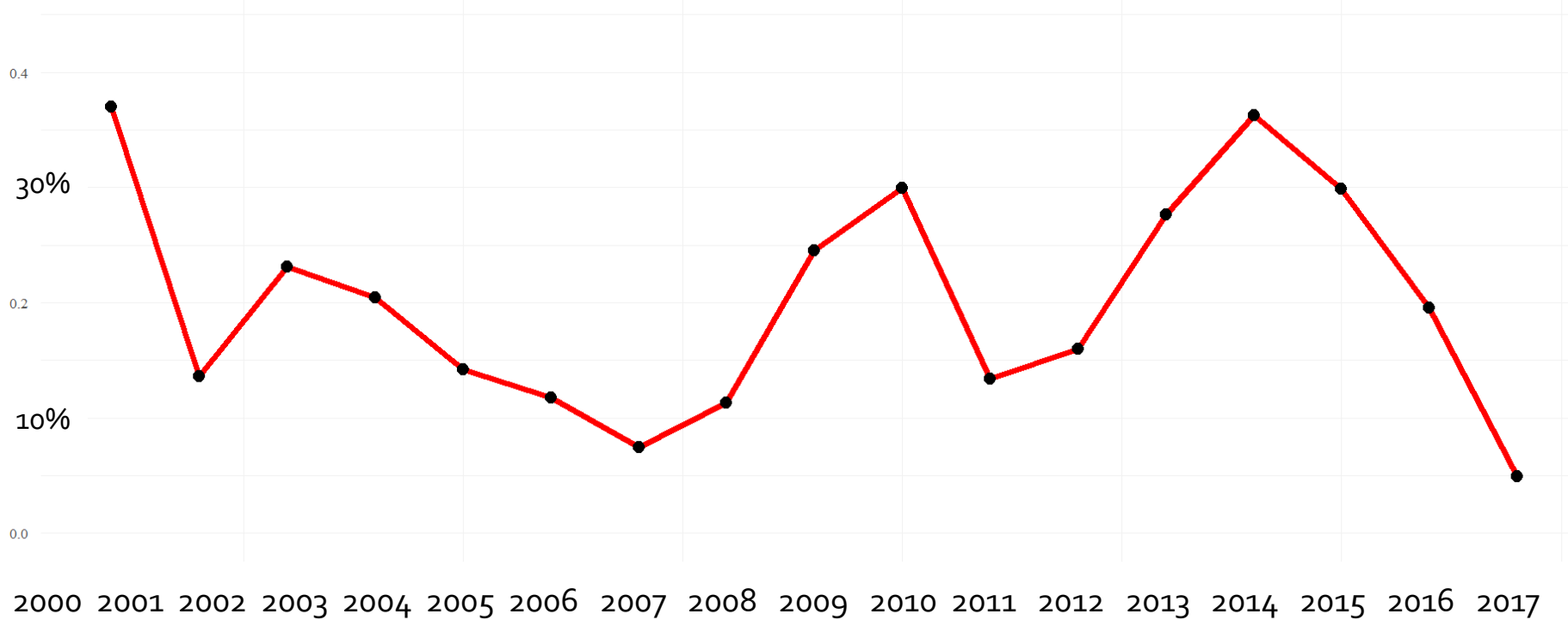
Longline fishery



# Pacific cod in pollock fishery



50% Proportion of pelagic pollock trawl hauls with Pacific cod (Jan-Aug)

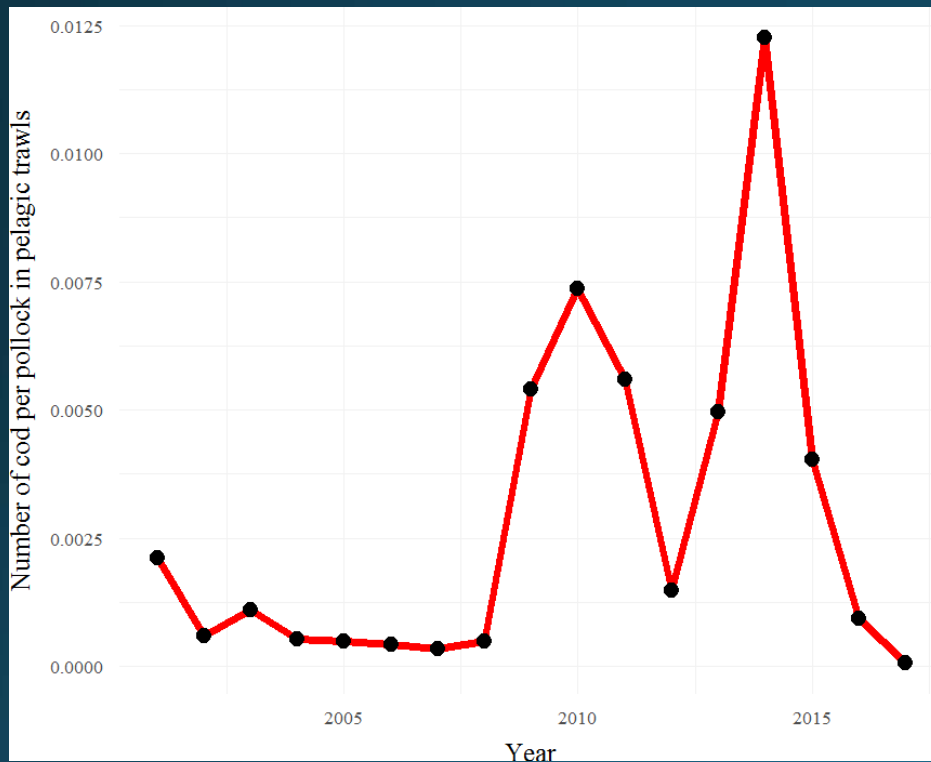




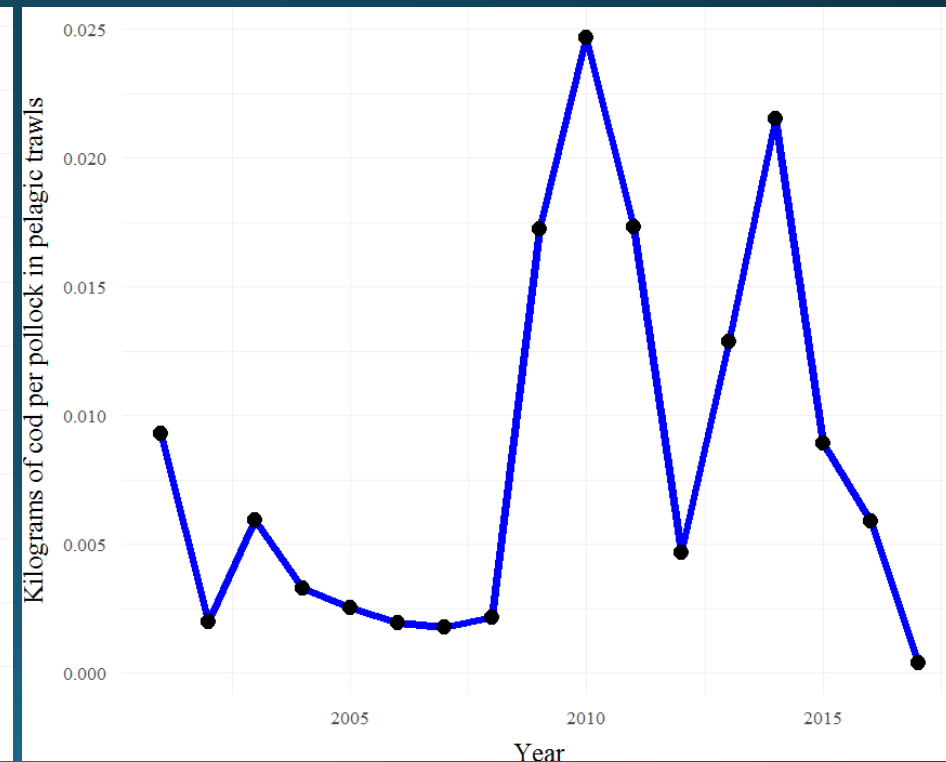
# Pacific cod in pollock fishery



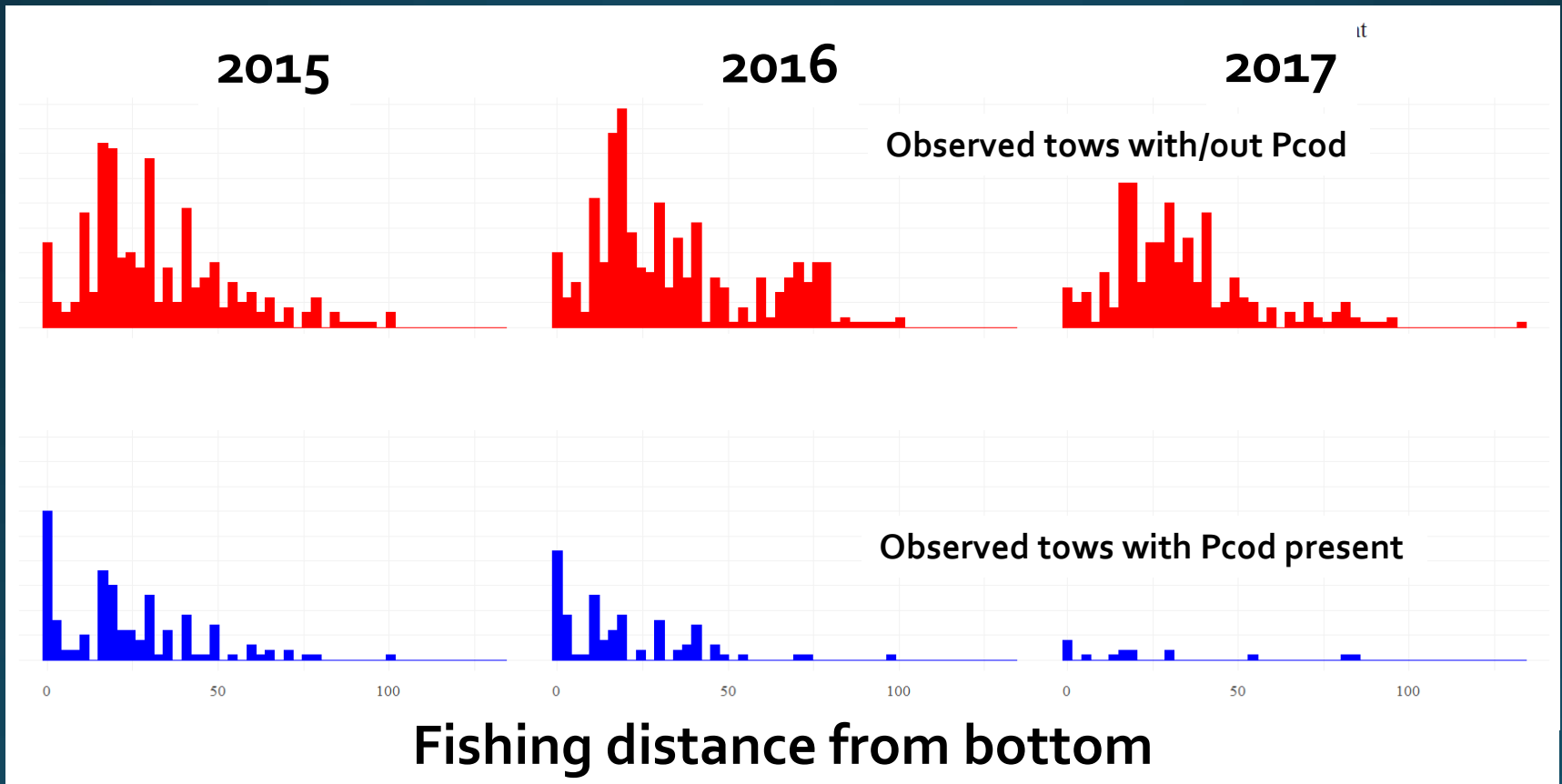
Number of cod per pollock



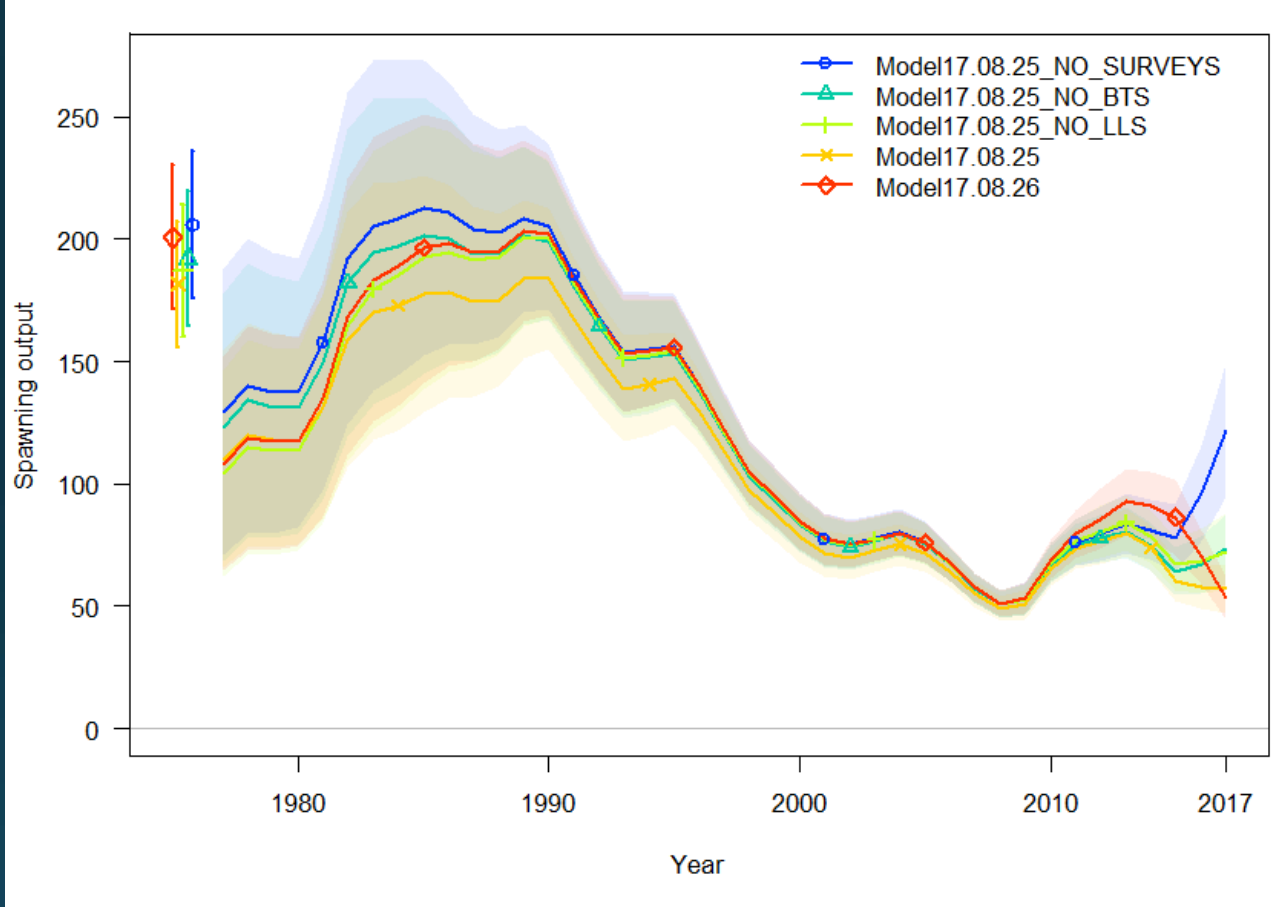
KG of cod per KG of pollock



# Pacific cod in pollock fishery Off bottom?



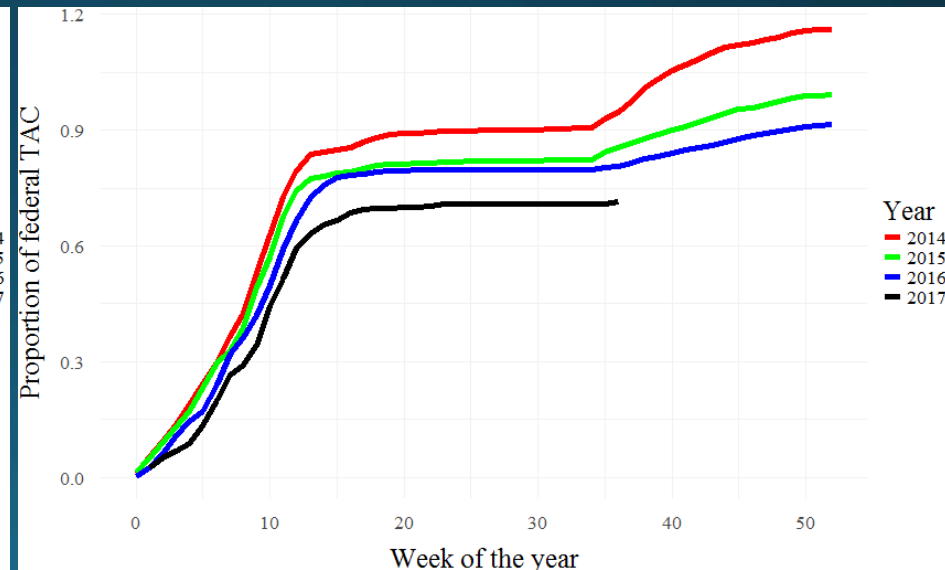
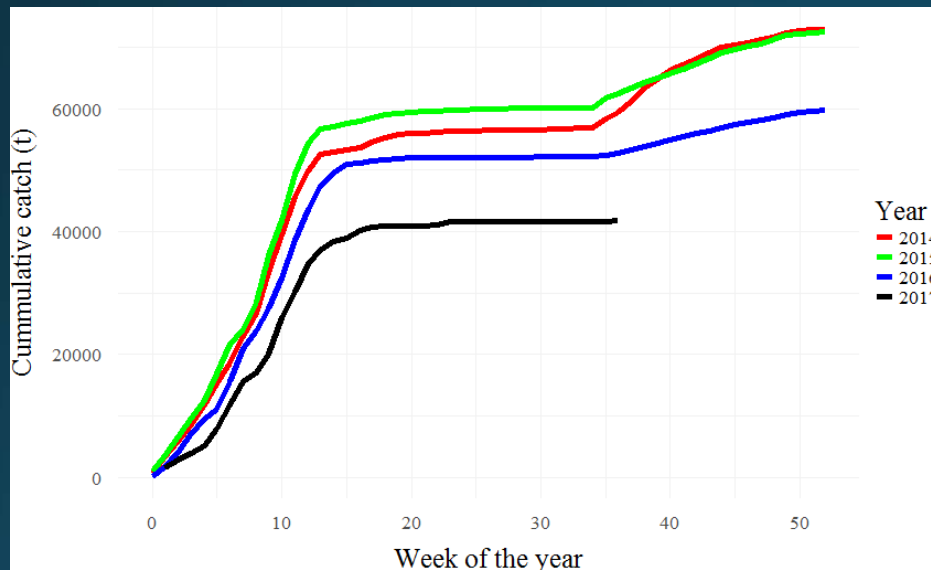
# Preliminary model runs for 2018



- Blue same as 2016
- Red same fit with natural mortality pulse in 2015-16
- Others with new survey data added

# Preliminary specs for 2018

- ~45-60% of Federal TAC caught by week 10 in directed fishery



Thanks