

# Pacific ocean perch



- Outline:
- Survey length composition analysis
- New maturity
- New growth
- Results from recommended model
  - Random effects apportionment
- Moving forward

# Survey length composition:

## Background

- In absence of most recent age composition, some assessments fit survey length composition
  - Results then reflect most recent demographic info
- Others do not use the most recent survey length comps
  - Potential benefits offset by greater variability and may induce retrospective patterns

# Survey length composition: Background

- Plan Team has had several requests on this:
- Nov 2011: *“The Team asks the [rockfish] authors to investigate whether the conversion matrix has changed over time. Additionally, the Team requests that the criteria for omitting data in stock assessment models be based upon the quality of the data (e.g. bias, sampling methods, information content, redundancy with other data, etc.) rather than the effect of the data on modeled quantities.”*
- Nov 2013: *“For the GOA age-structured rockfish assessments, if length composition data are withheld, the Team recommends exploratory model runs to test sensitivity. This should include any year of fishery or survey length composition data which could serve as a proxy for the age composition, not simply the most recent survey year.”*
- Nov 2013: *“The Team recommends additional analyses with the survey length data for 2014 to evaluate effects on the 2006 recruitment estimate. Other contributing factors to the large uncertainty estimate for 2006 recruitment could be related to sample size specified of age data (max at 100).”*

# Survey length composition: Background

- Presented some investigation at Sept meeting
- Showed that 2013 survey length composition was not consistent with recent 2009 & 2011 survey composition data (age & length)
- Showed length data can be influential on results depending on how it's treated (binning, length of time series)

# Survey length composition: Background

- Plan Team requested further analysis:
- *“The Plan Team recommends the following test to evaluate the value of information contained in the survey length data and the transition matrix. Consider model estimates of age structure obtained when survey age composition is included as a standard for comparison. For each survey year, conduct two additional model runs: 1) without either the age or length composition data for that survey year; and 2) with the length composition from that survey year. Finally, evaluate which of these two runs comes closest to producing the age composition estimates obtained when the survey age composition are used. Evaluating this comparison across multiple survey years should provide a more general view of the effect of including survey length data.”*

# Survey length composition:

## Methods

- Performed analyses recommended at Sept meeting
- From 2003 – 2013 compared following models:

Model case	Description
C0	Base case: all years of bottom trawl survey age composition are available and fitted by model
C1	Status quo: most recent bottom trawl survey age composition unavailable in the assessment year, survey length composition data excluded
C2	Alternative: most recent bottom trawl survey age composition unavailable in the assessment year, assessment year survey length composition <i>included</i>

# Survey length composition: Methods

- For case C2, looked at various input sample size cases:

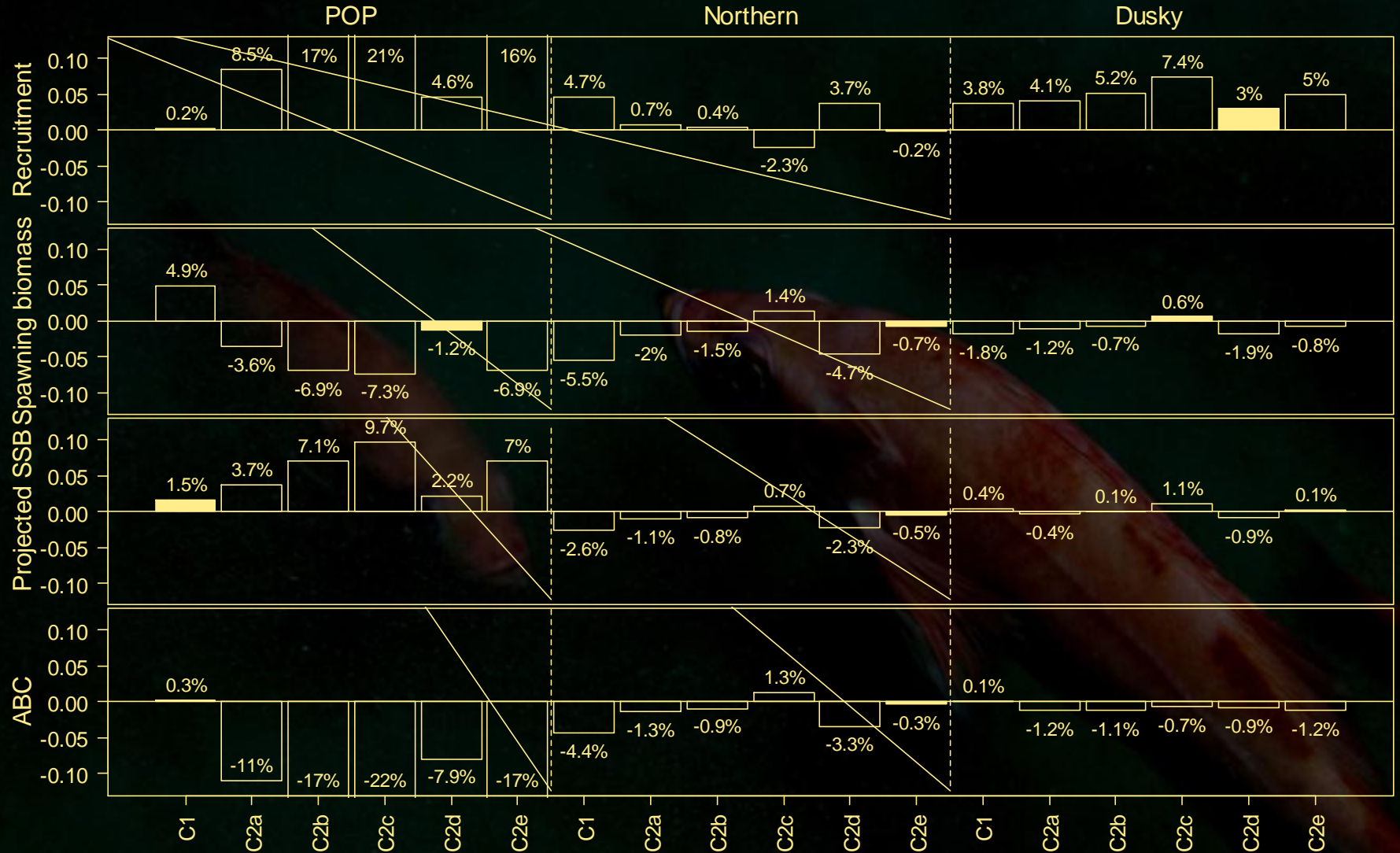
Model C2 sub-case	Description
C2a	Mean input sample size for bottom trawl survey age composition (square root of age sample size)
C2b	Square root of survey length sample size, scaled to 100
C2c	Square root of survey length sample size, scaled to 200
C2d	Square root of number of hauls from which survey lengths were sampled
C2e	Square root of survey length sample size * hauls, scaled to 100

# Survey length composition: Methods

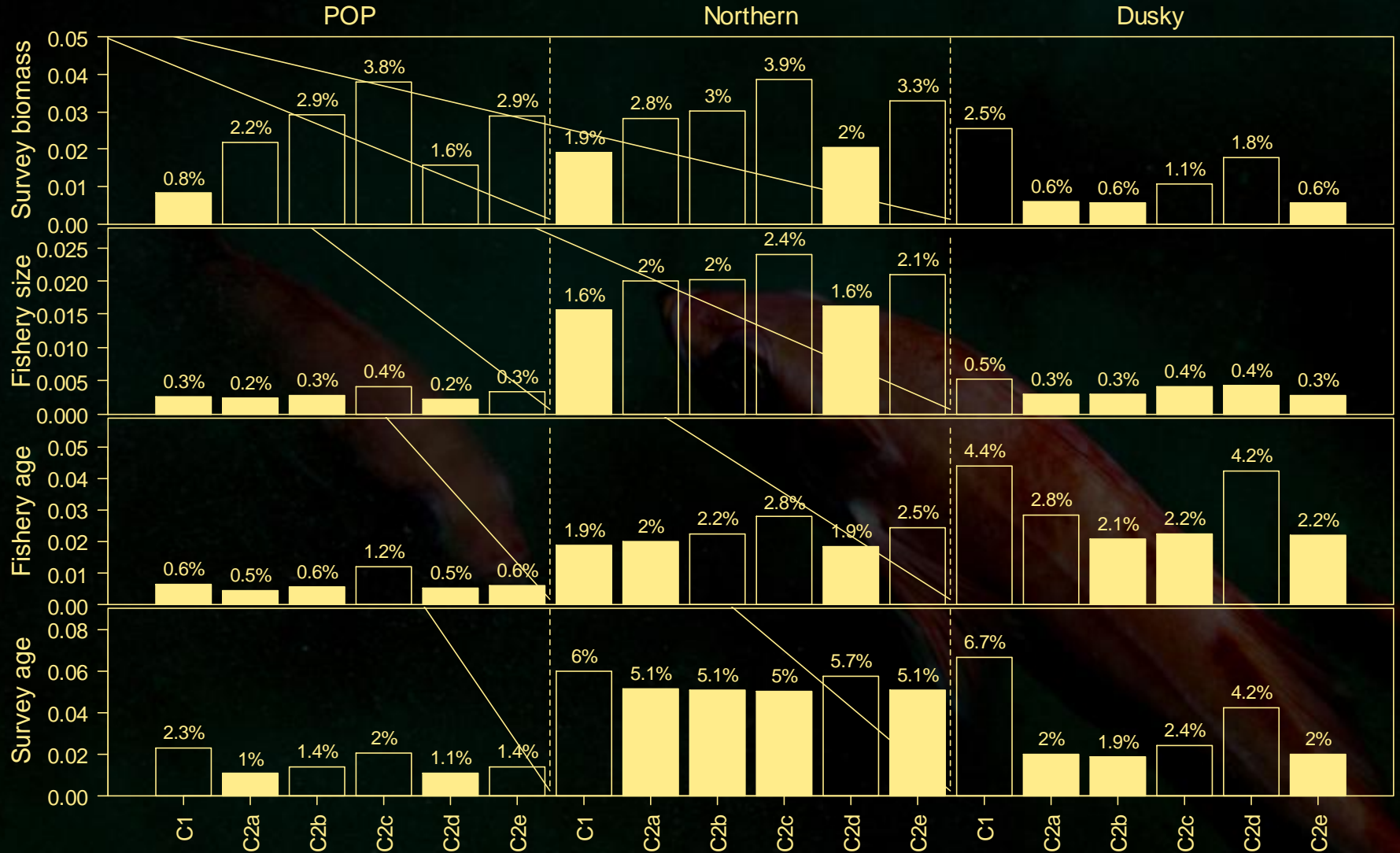
- Investigated for POP, northern, & dusky rockfish
- Statistics evaluated:
  - Mean % change in model estimates relative to C0: most recent 15 years of estimated recruitment & SSB, 15 year projected SSB, ABC
  - Mean % change in likelihoods/penalties relative to C0
  - Retrospective statistics for SSB



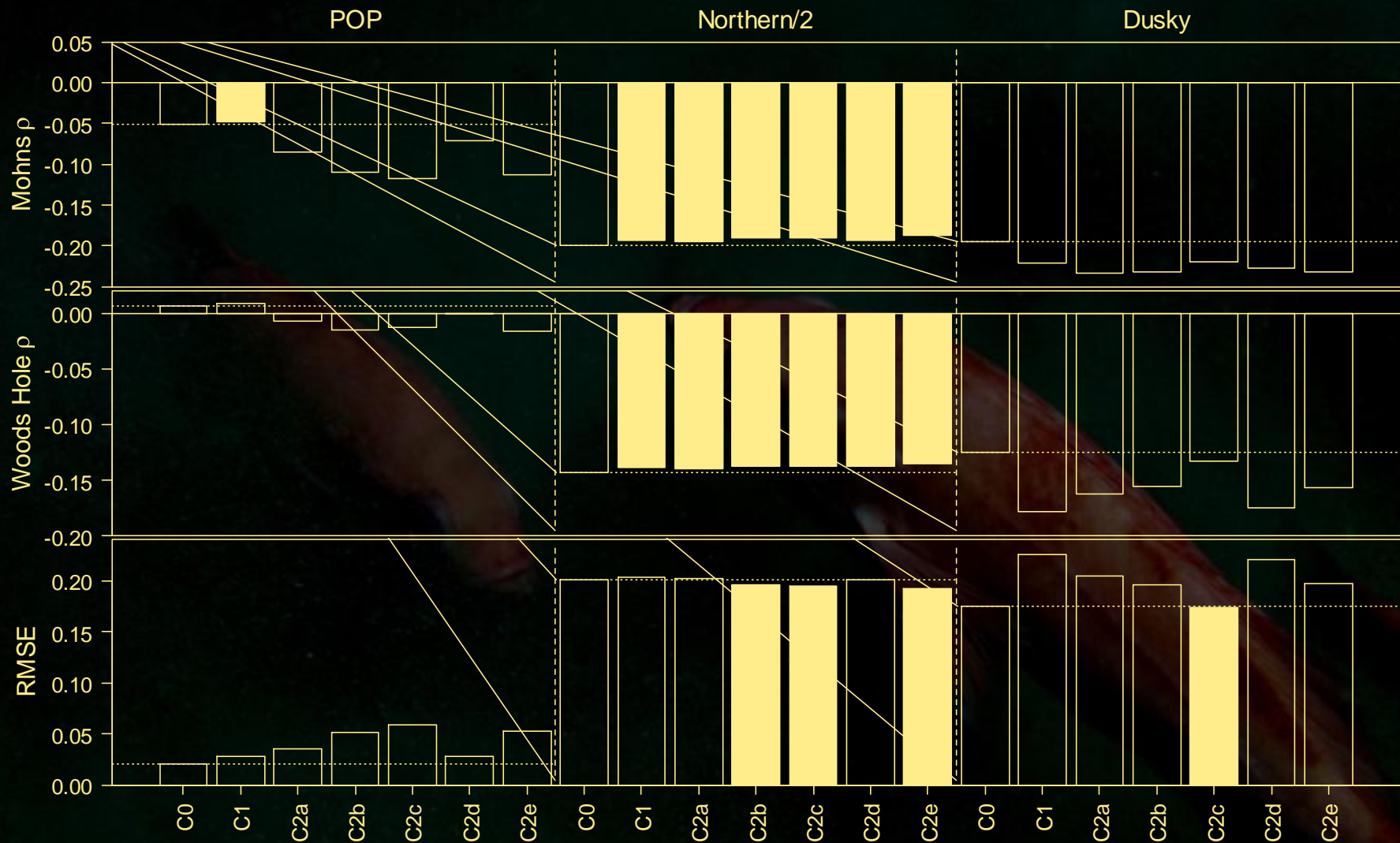
# Survey length composition: Model estimate results



# Survey length composition: Likelihood results



# Survey length composition: Retrospective results

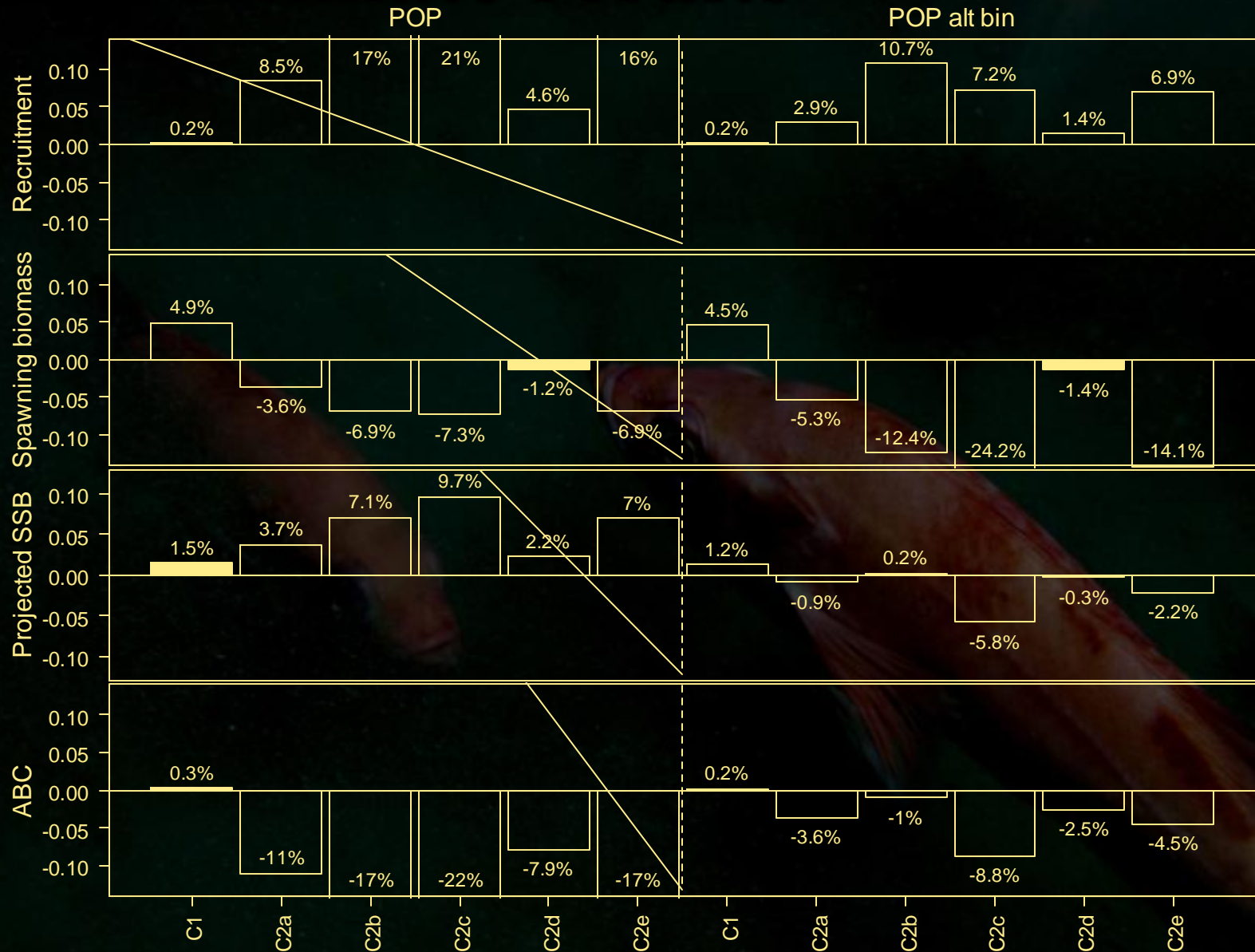


# Survey length composition: Additional

- POP has some aggregated binning (12-15,35-38)
- Performed same analysis with 1 cm bins for comparison



# Survey length composition: Model estimate results



# Survey length composition:

## Discussion

- Overall, wasn't a single case that was consistently preferred
- Whether or not including most recent survey length comp improved model was case-dependent
  - POP, including didn't seem to provide improvement, for some model estimates had large differences with optimal
  - Northern/Duskys, including in some cases seemed to improve model over status quo
- Due to lack of improvement, was not included in current POP assessment

# Survey length composition:

## Moving forward

- Simulation analysis may not get the answer we're looking for
  - Would be dependent on age-length variability, precision of comp data
  - We tend to see bias in 'real' data, wouldn't/shouldn't see that in a simulation setting
- Will also be sensitive to treatment of ageing error and input sample size (planned for next assessment)

# POP – Maturity

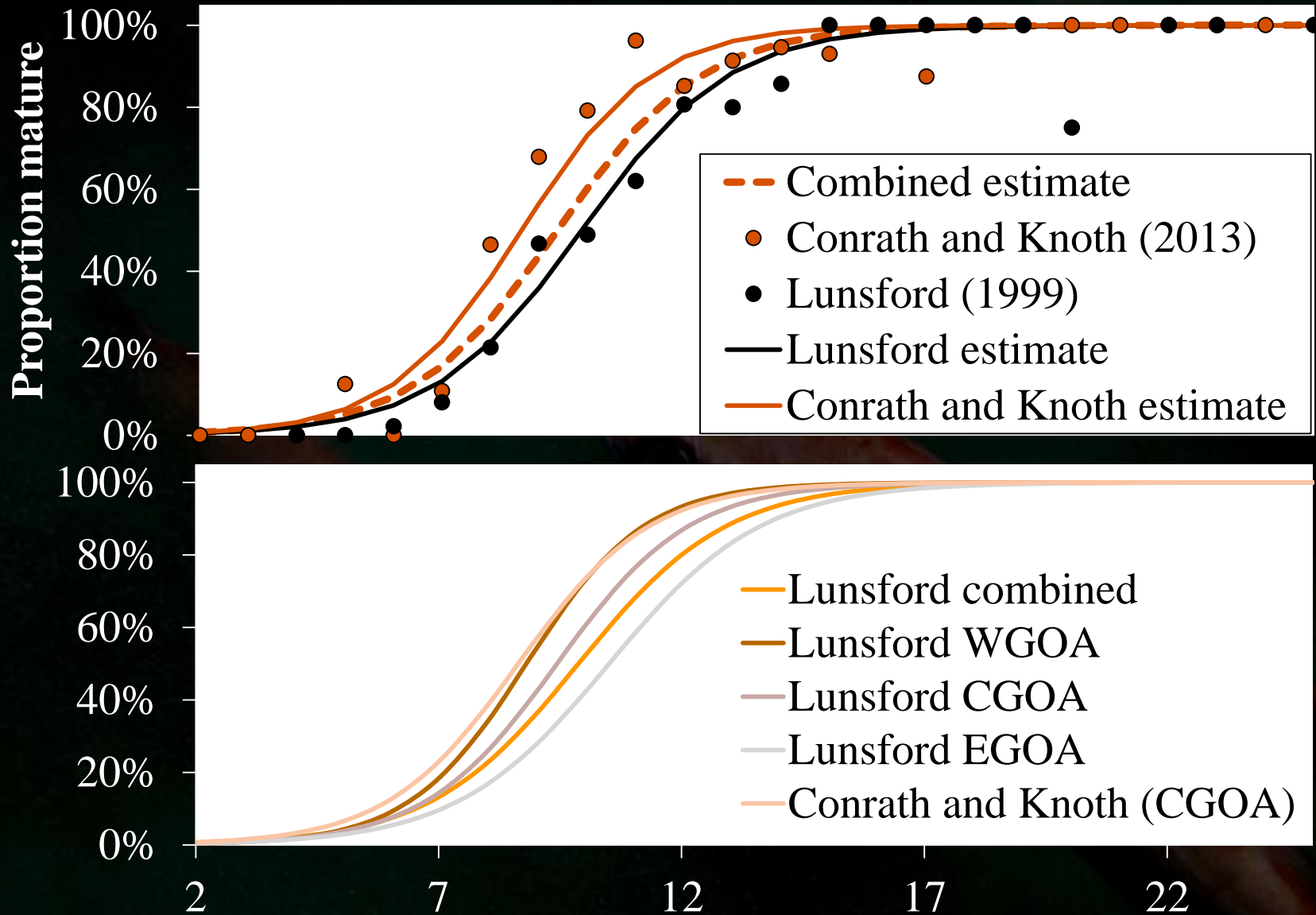
- Previously, maturity for POP from Lunsford (1999)
  - Collected GOA wide,  $n = 722$  (W = 95, C = 297, E = 410)
- Conrath and Knoth (2013) provided new maturity observations
  - Collected in the CGOA,  $n = 473$
- Plan Team and SSC requested that new maturity information be included in a full assessment for 2014



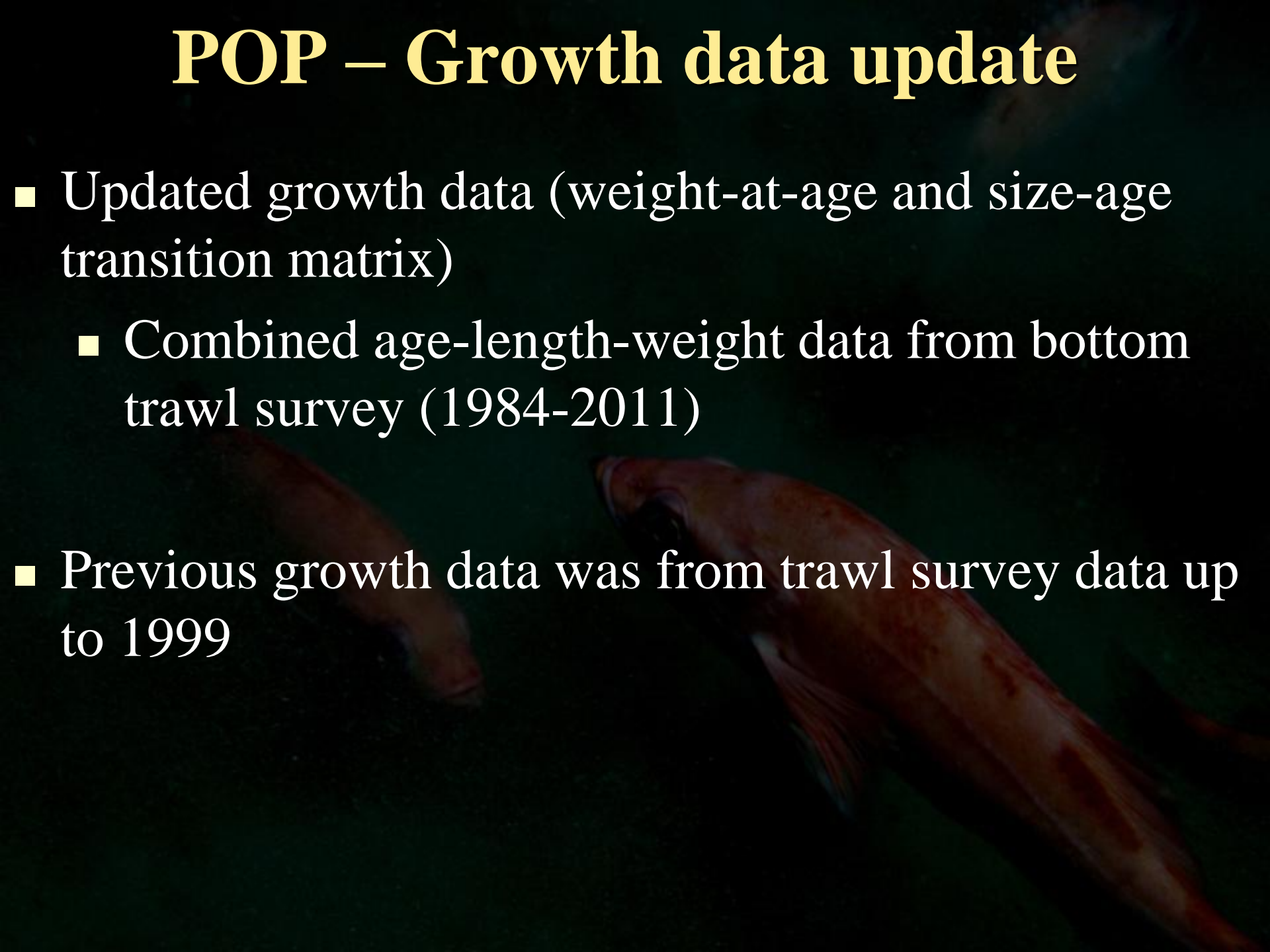
# POP – Maturity

- Followed method in Hulson et al. (2011)
  - Fit each study with a single logistic model using the binomial likelihood within assessment
  - Links uncertainty in maturity parameters with uncertainty in other model estimates

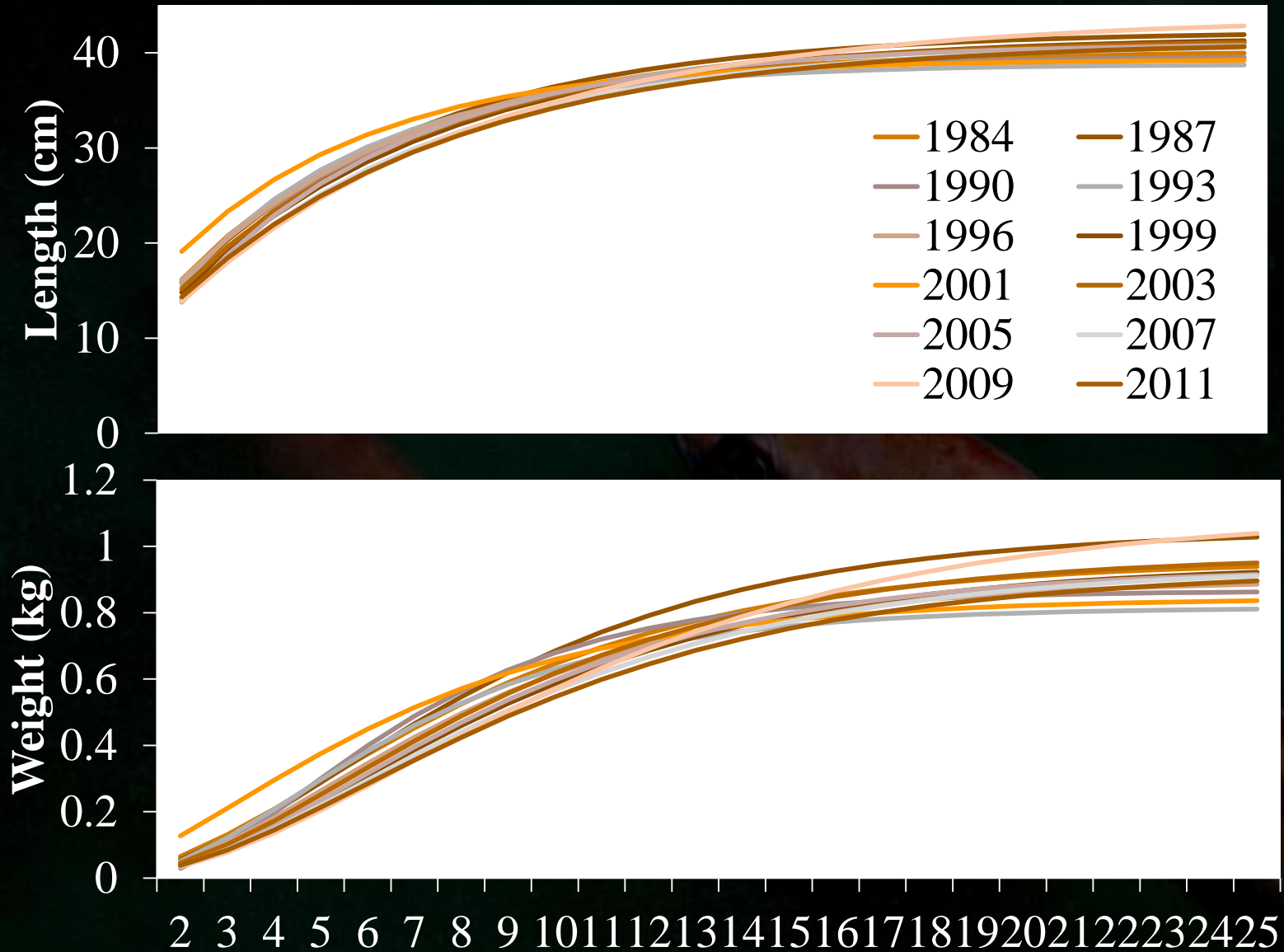
# POP – Maturity



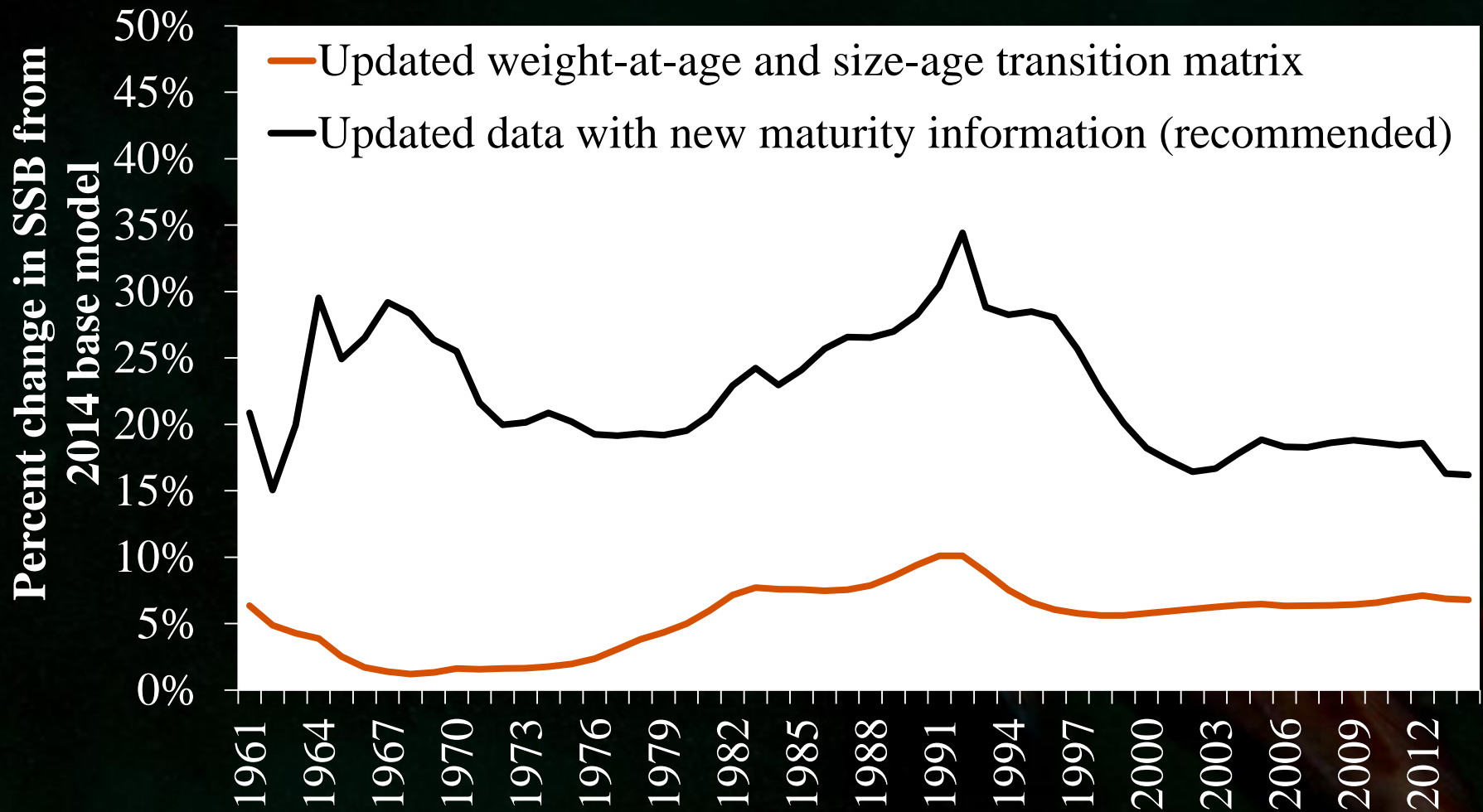
# POP – Growth data update

- Updated growth data (weight-at-age and size-age transition matrix)
    - Combined age-length-weight data from bottom trawl survey (1984-2011)
  - Previous growth data was from trawl survey data up to 1999
- 
- The background of the slide features a dark, underwater scene with two fish swimming. One fish is in the foreground, slightly out of focus, while another is further back, also out of focus. The lighting is dim, creating a moody atmosphere.

# POP – Growth data update



# POP – Maturity & Growth data update





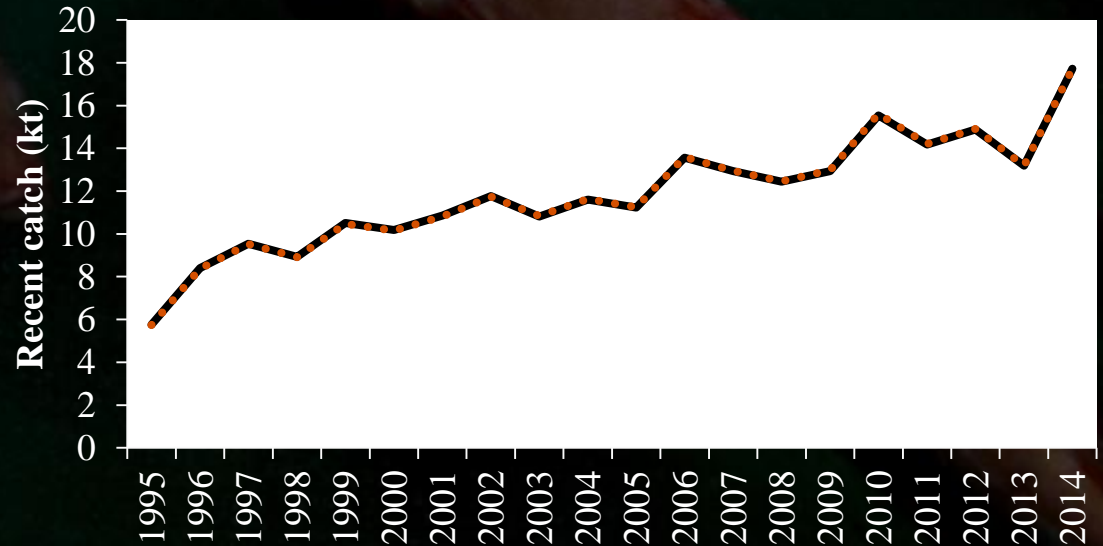
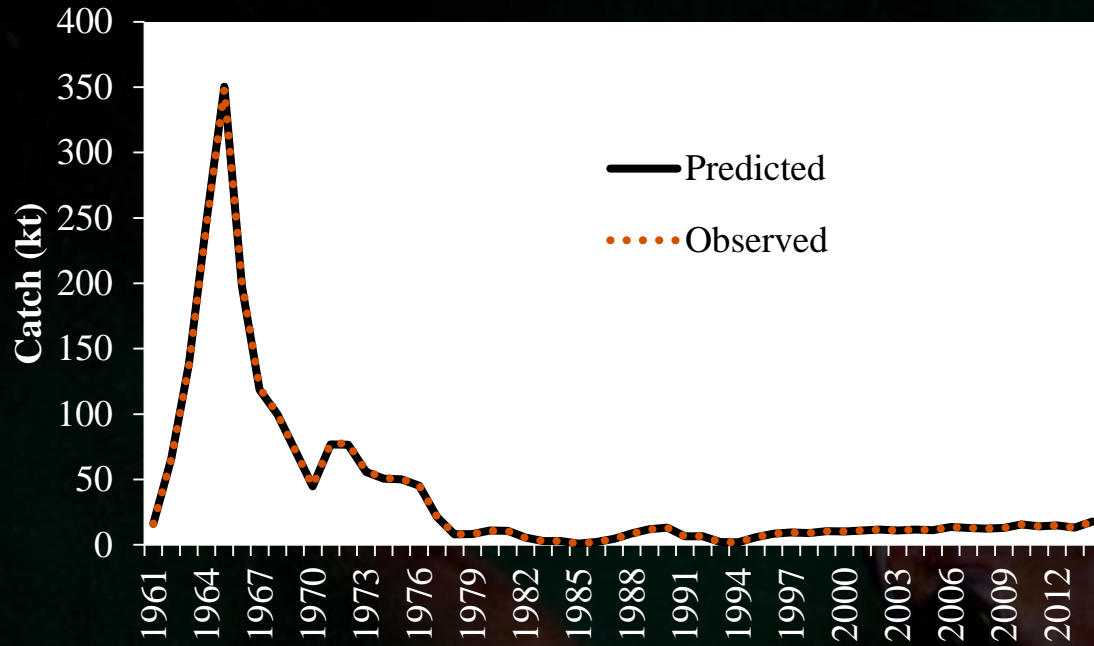
# **Recommended Model Results**

# Pacific ocean perch



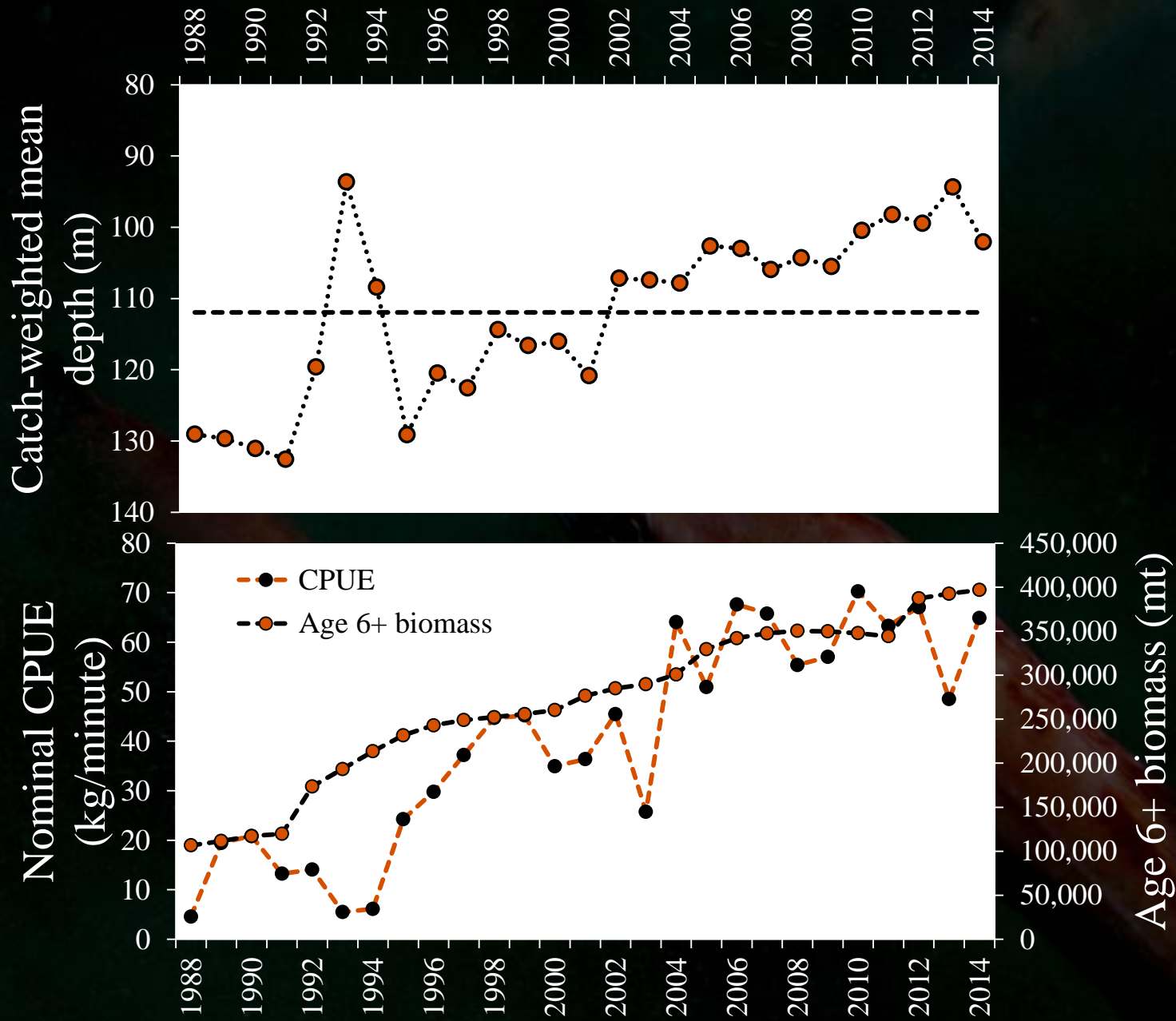
- Tier 3a
  - Changes in input data:
    - updated catch 2013, preliminary catch 2014 (+2000 t in WGOA), updated weight and size-age transition matrix
  - Changes to model: incorporate new maturity information – estimated internally
- Results, recommended model
  - 9% increase in ABC from 2014, 6% increase in ABC from projected 2015 value

# POP – Catch

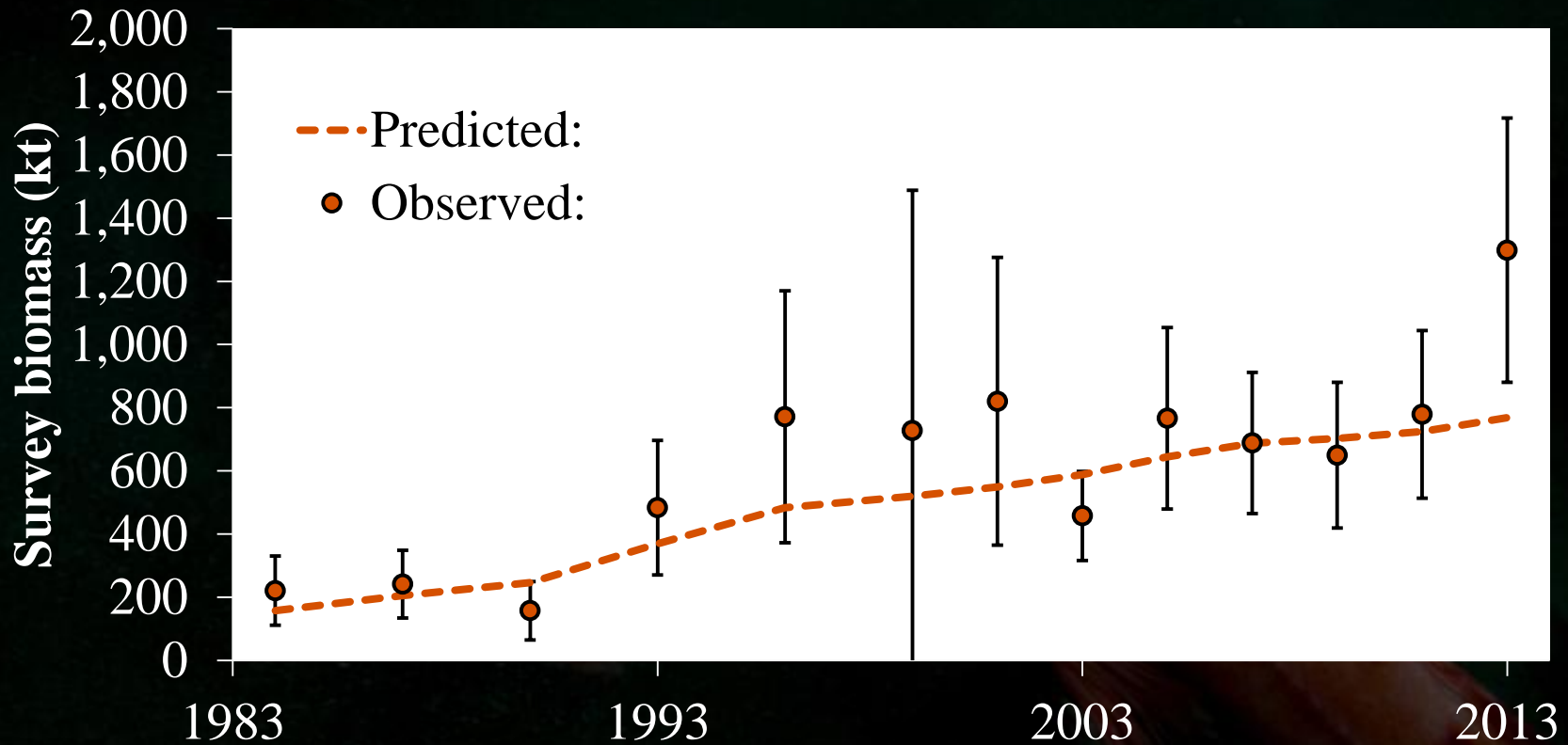




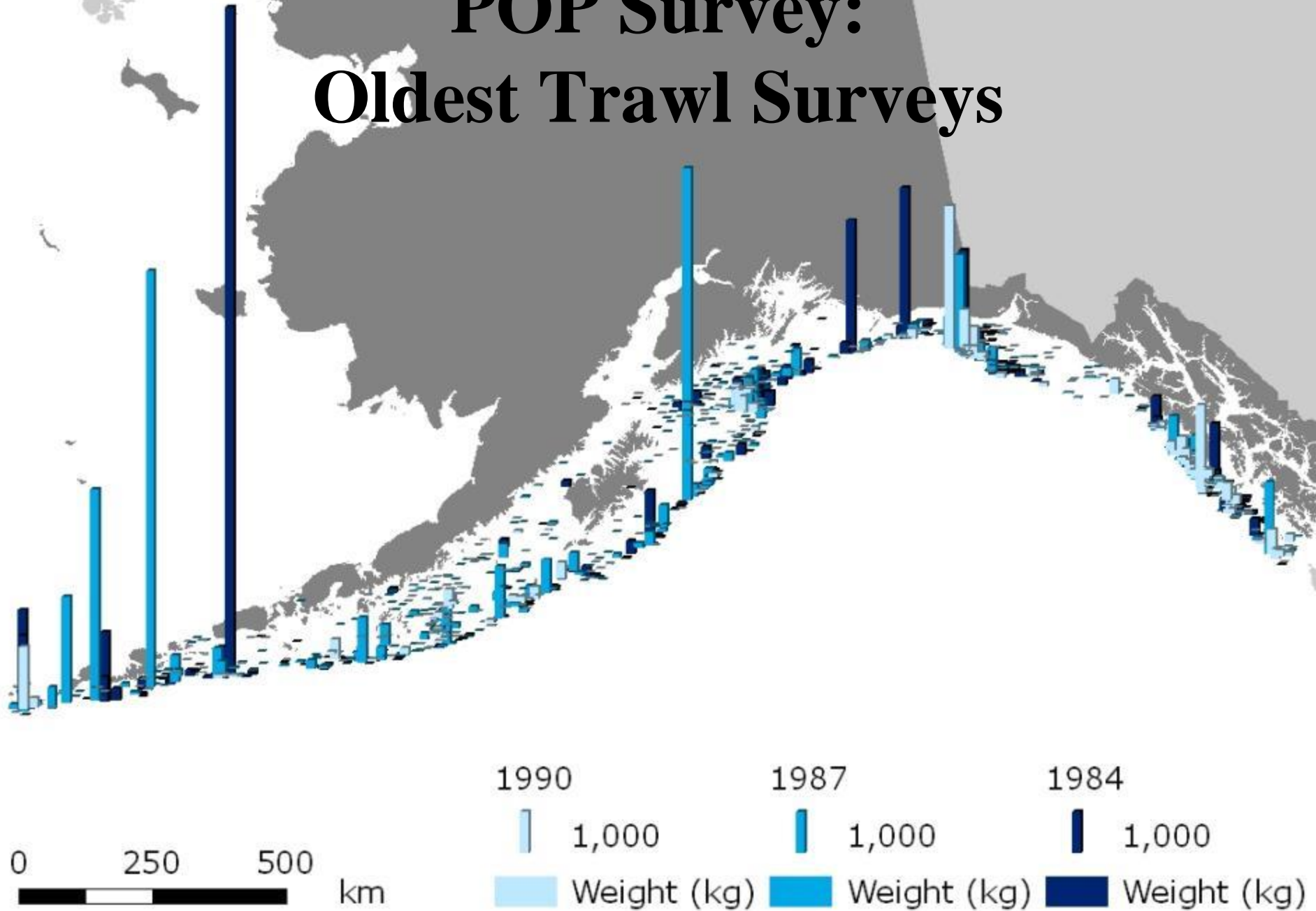
# POP – CPUE



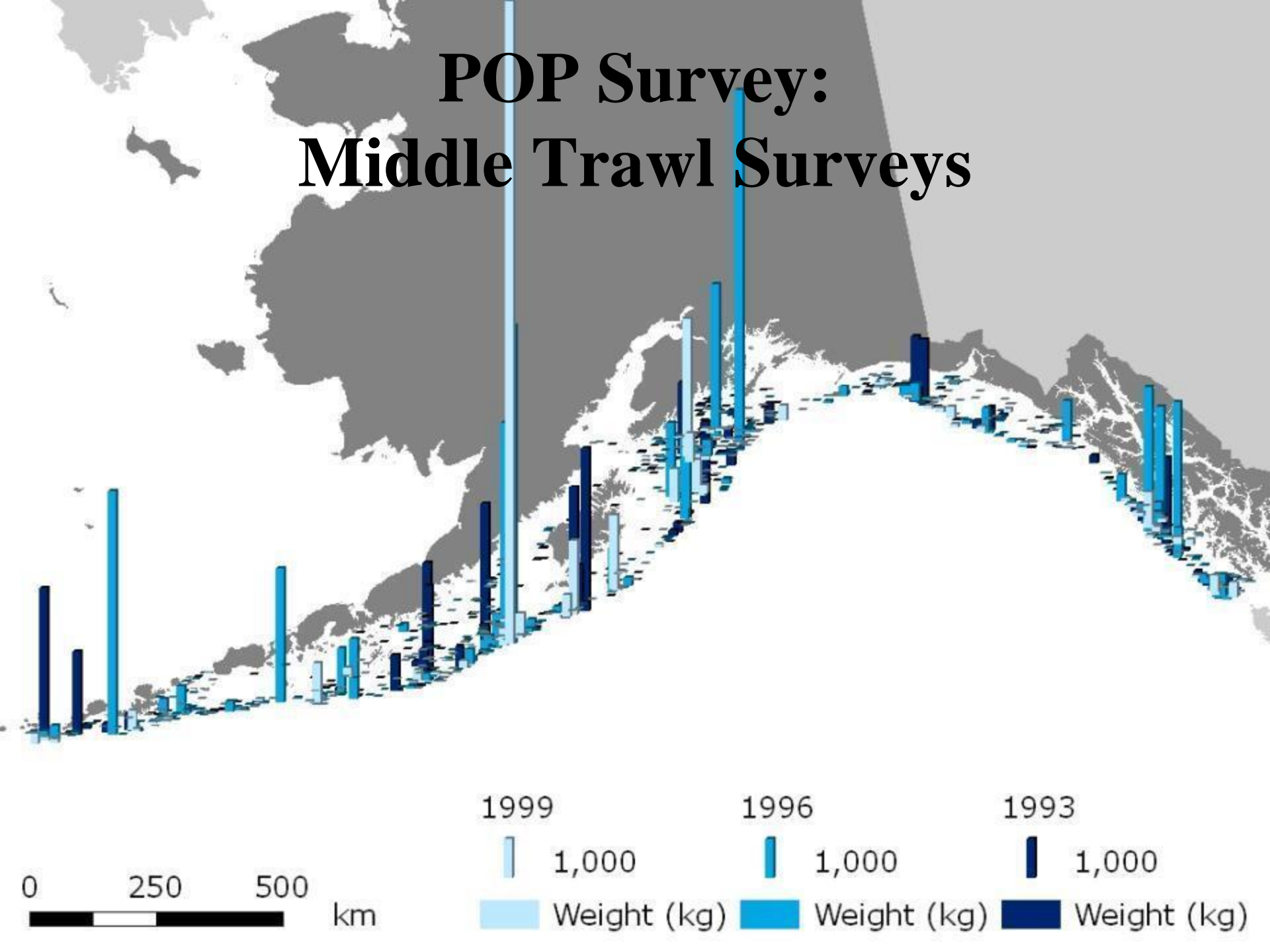
# POP – Survey Biomass



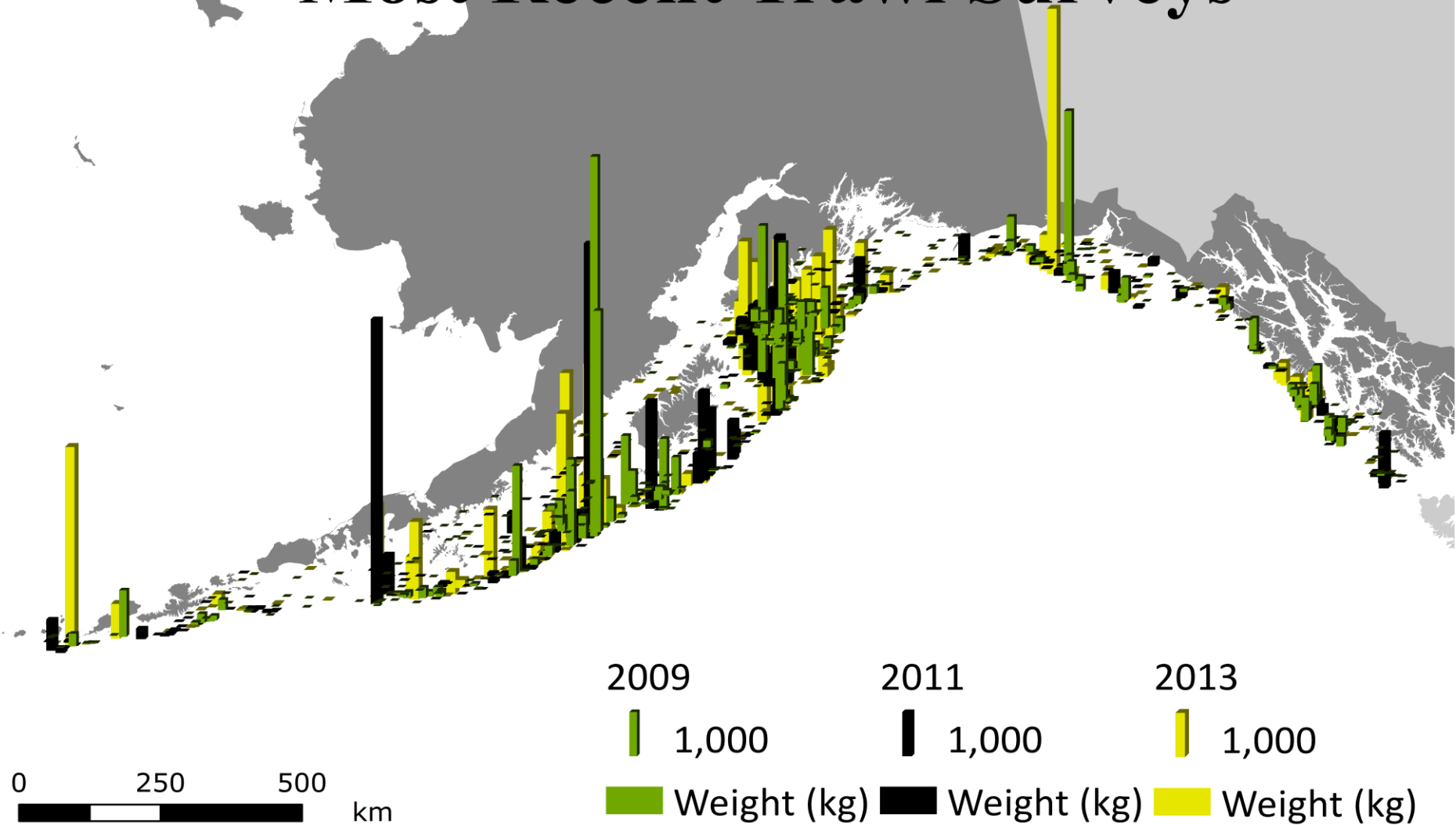
# POP Survey: Oldest Trawl Surveys



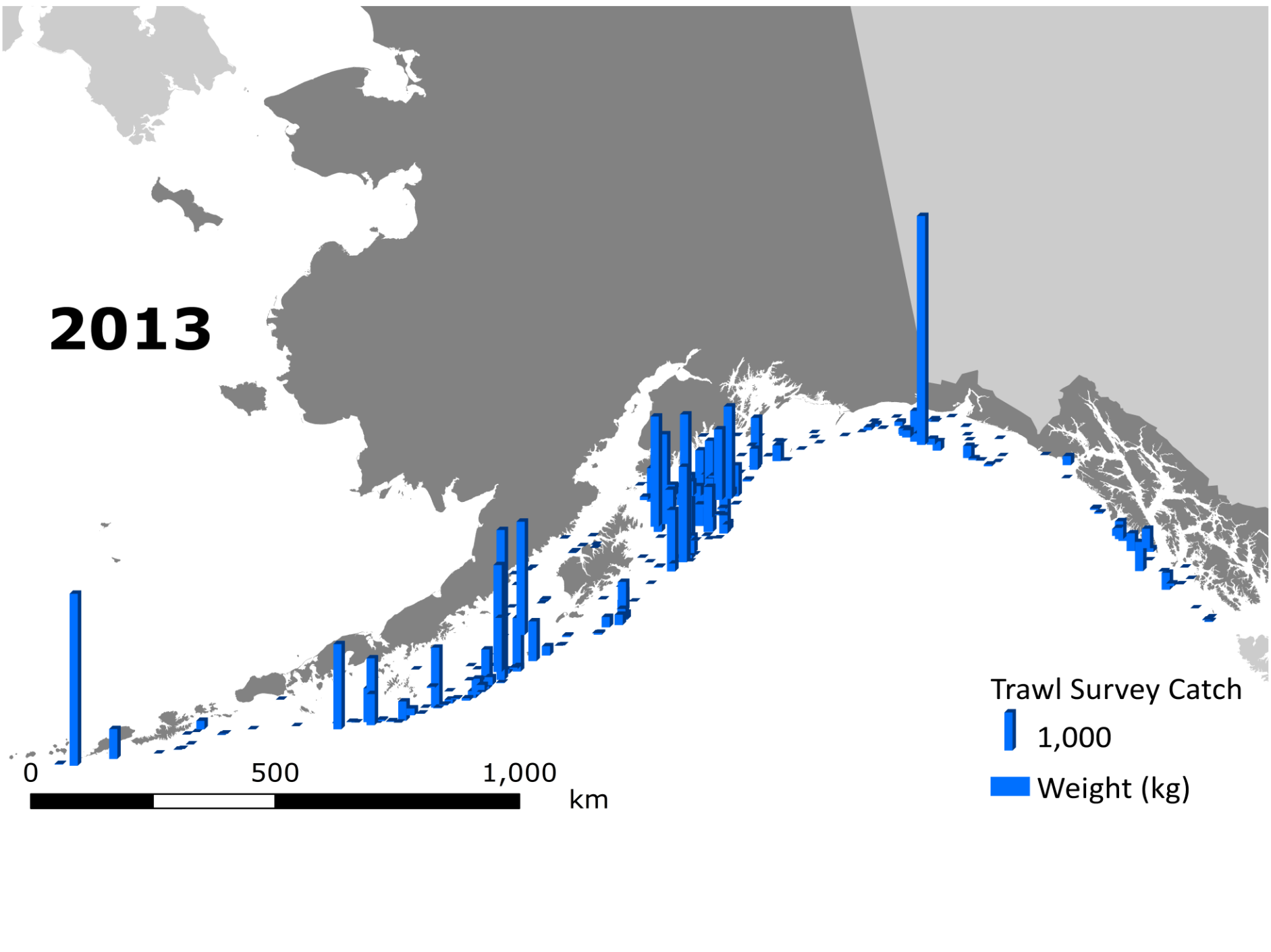
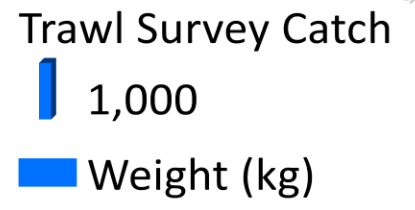
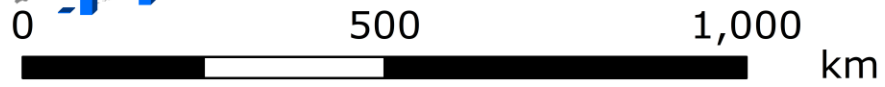
# POP Survey: Middle Trawl Surveys



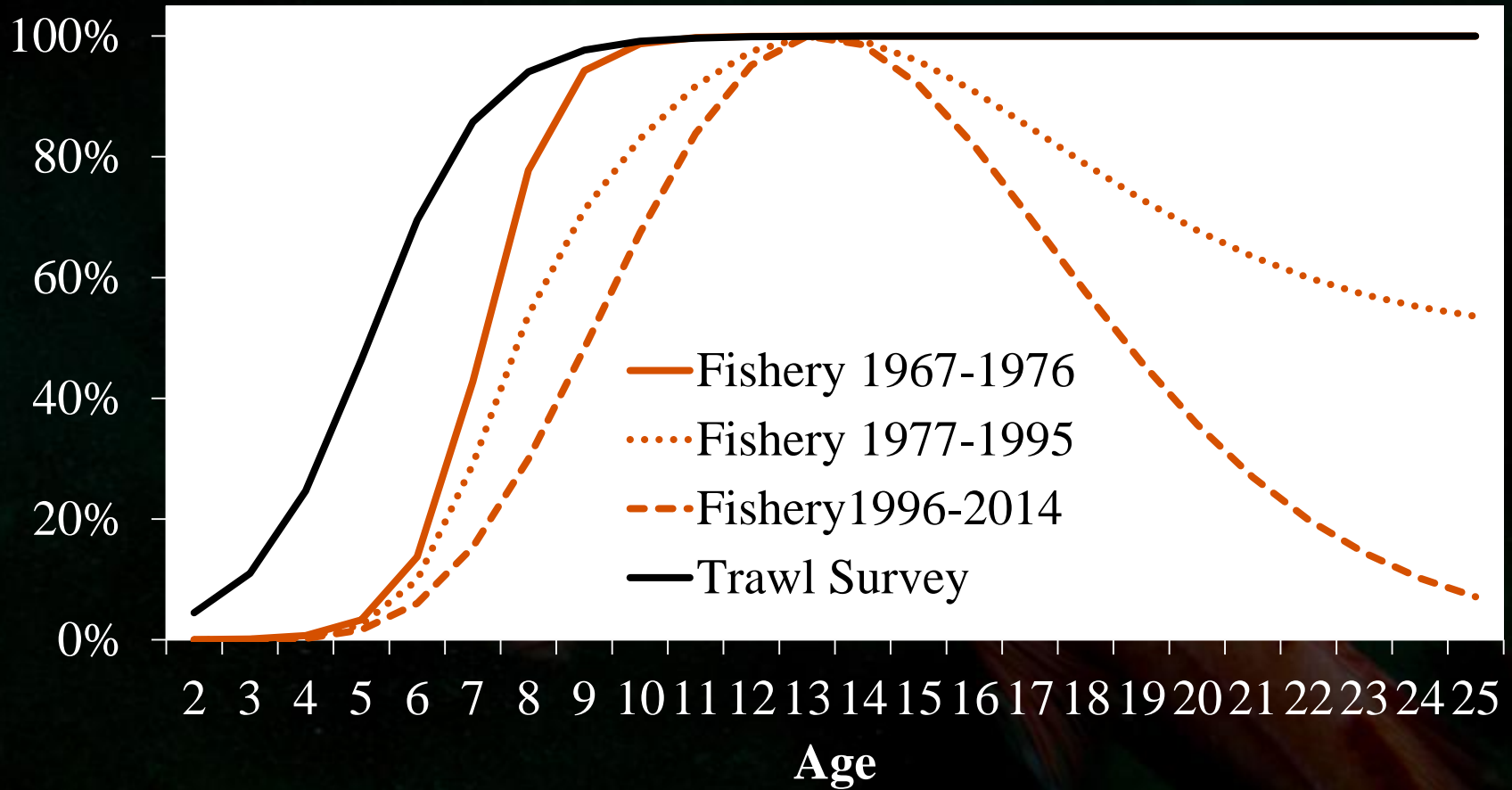
# POP Survey: Most Recent Trawl Surveys



**2013**



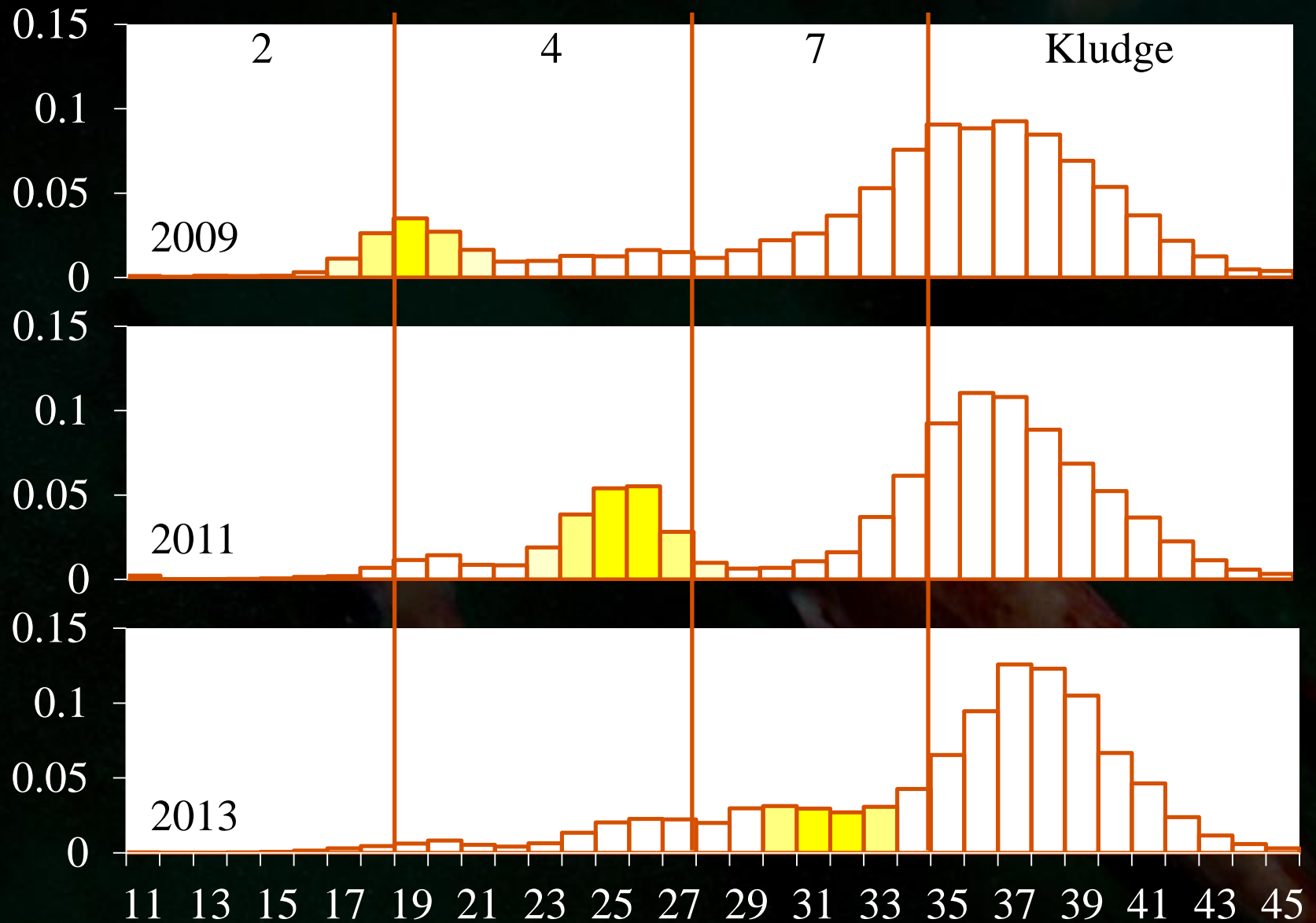
# POP – Selectivity



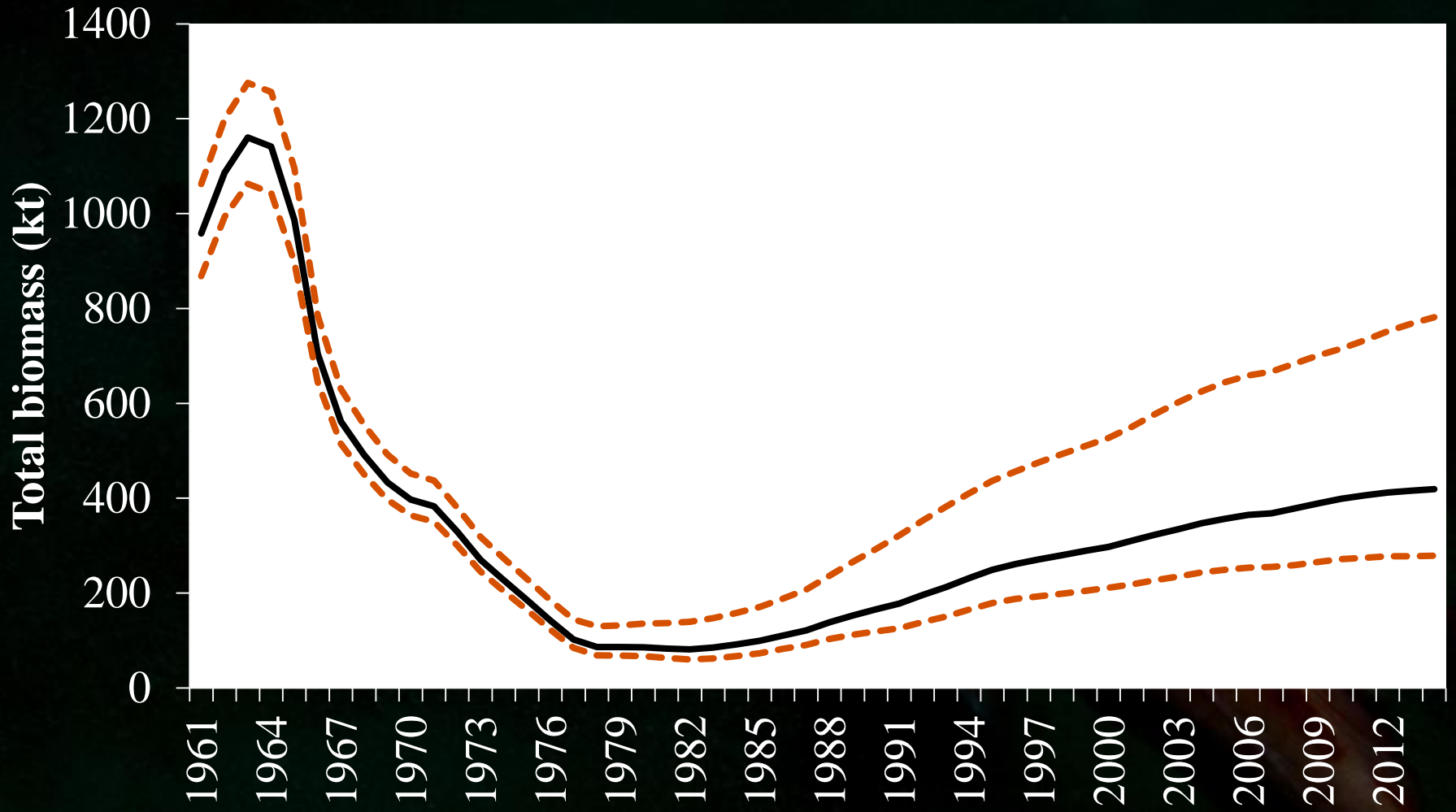




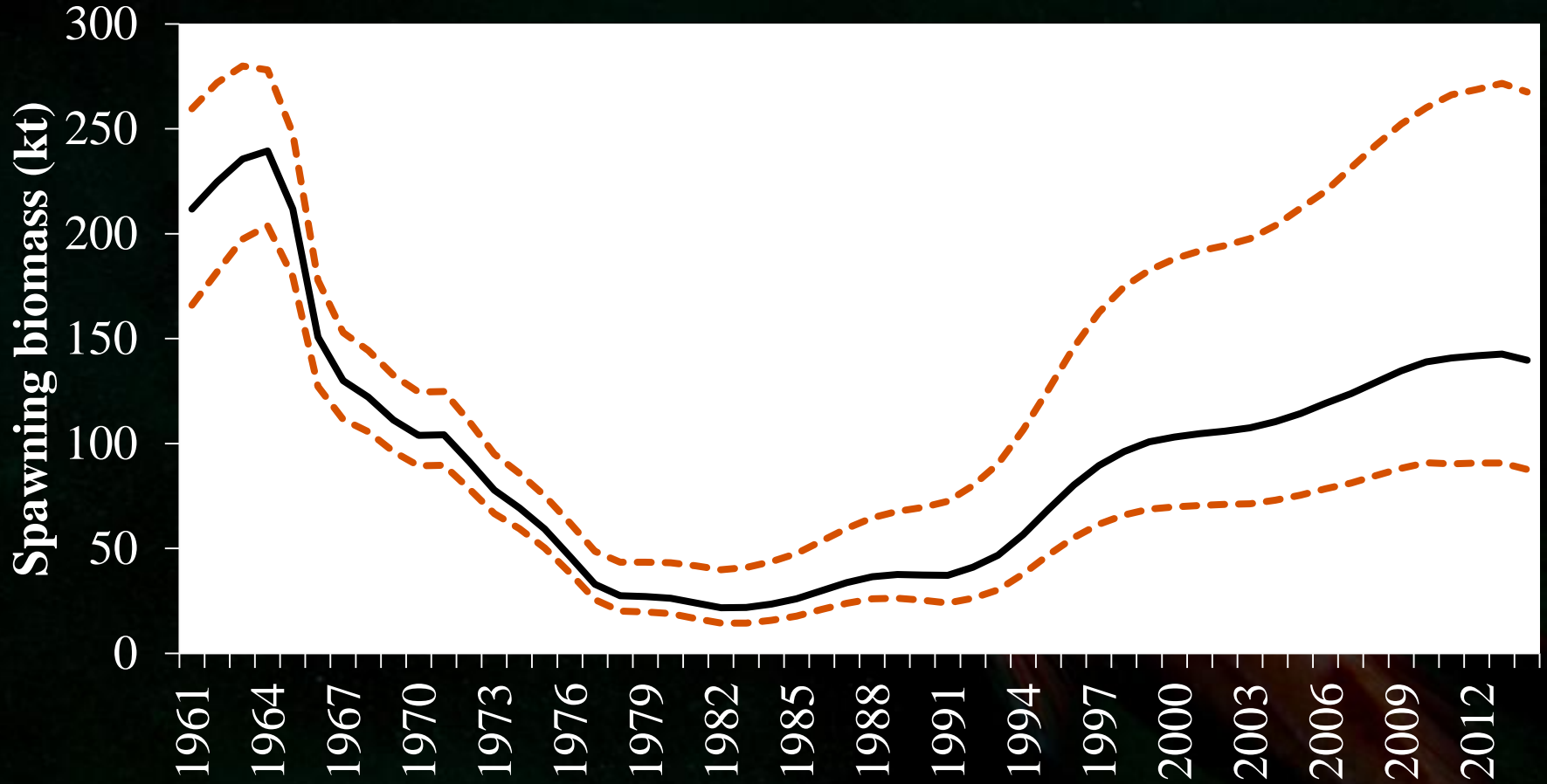
# POP – Survey length comps



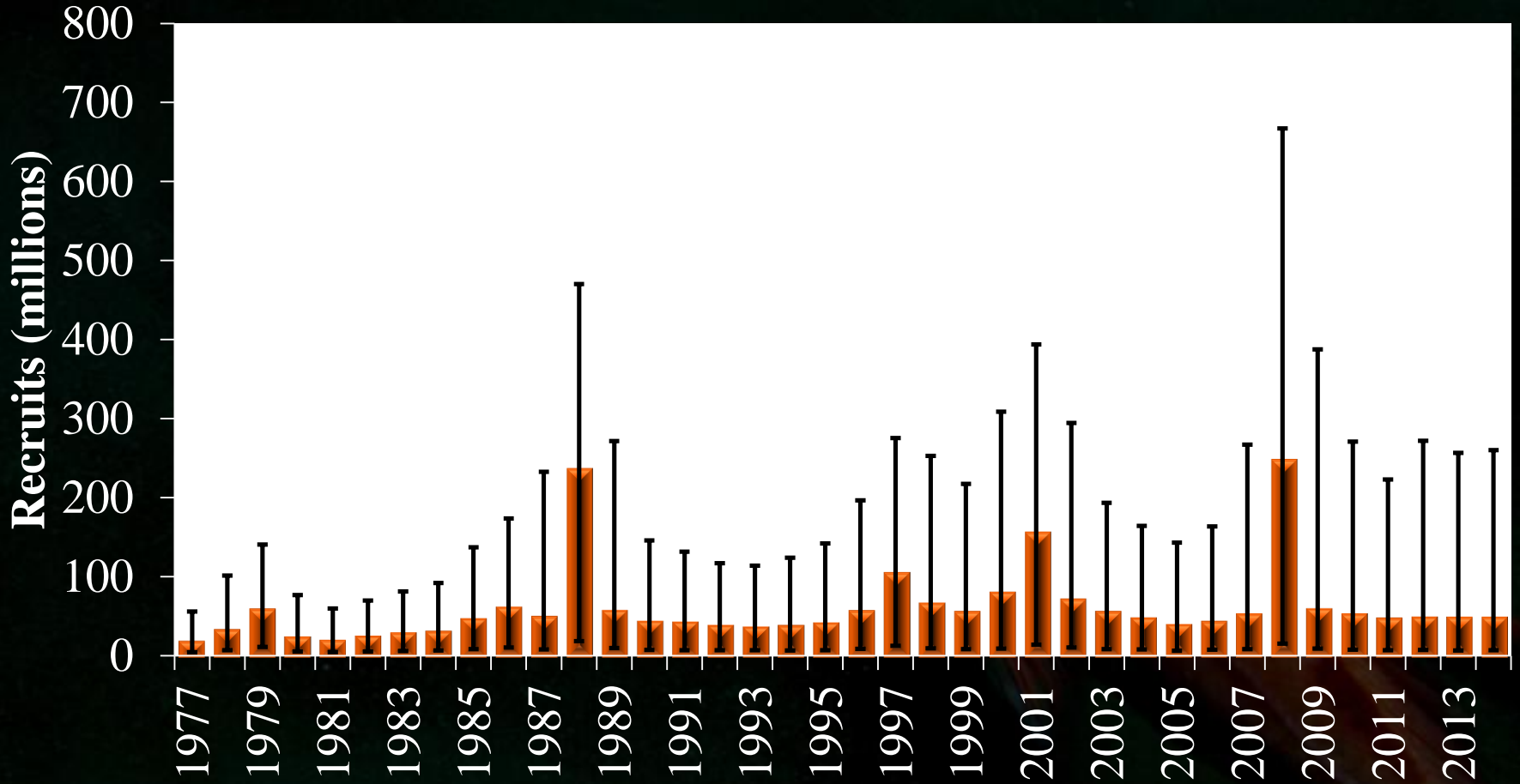
# POP – Total Biomass



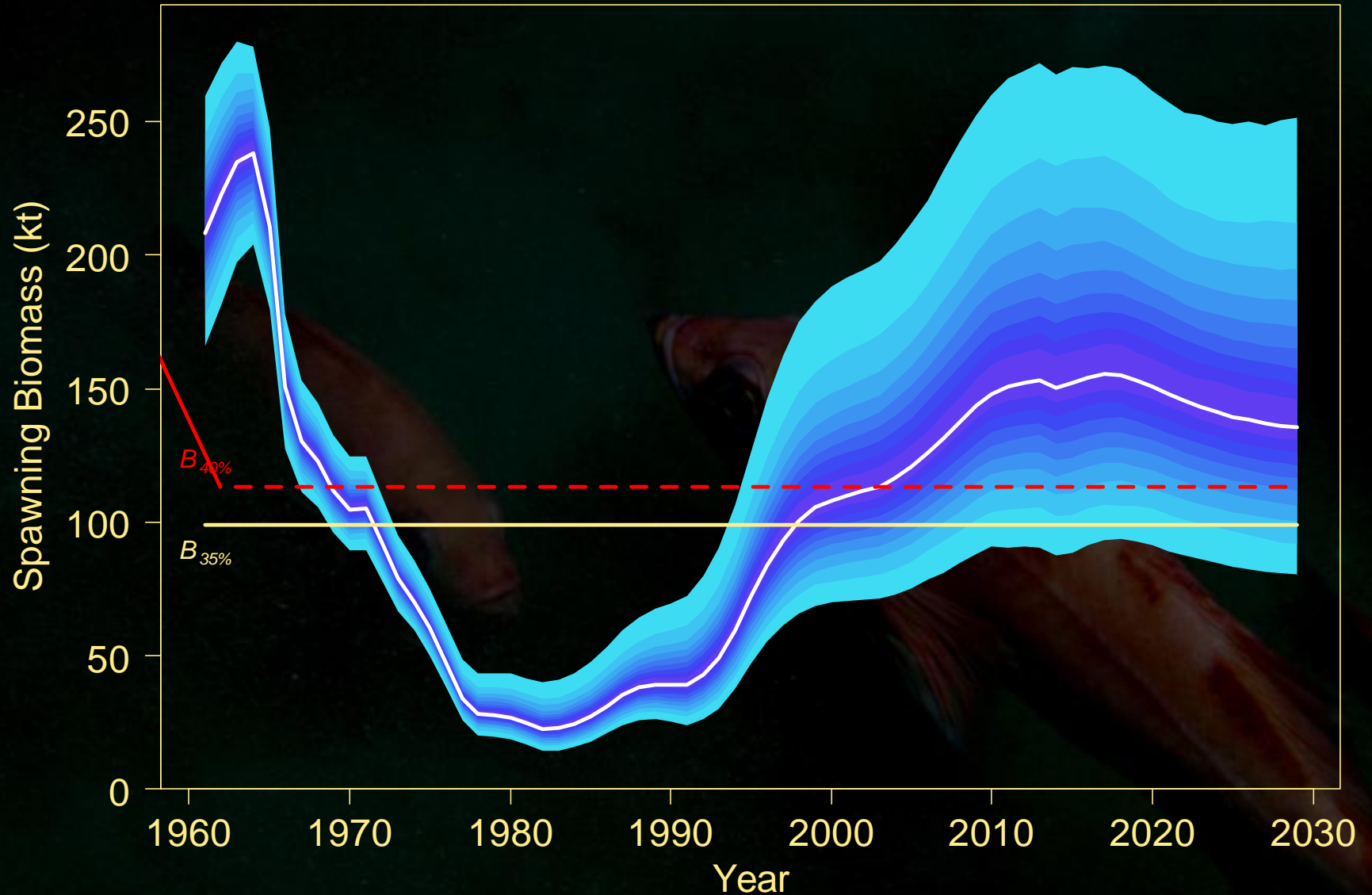
# POP – Spawning Biomass



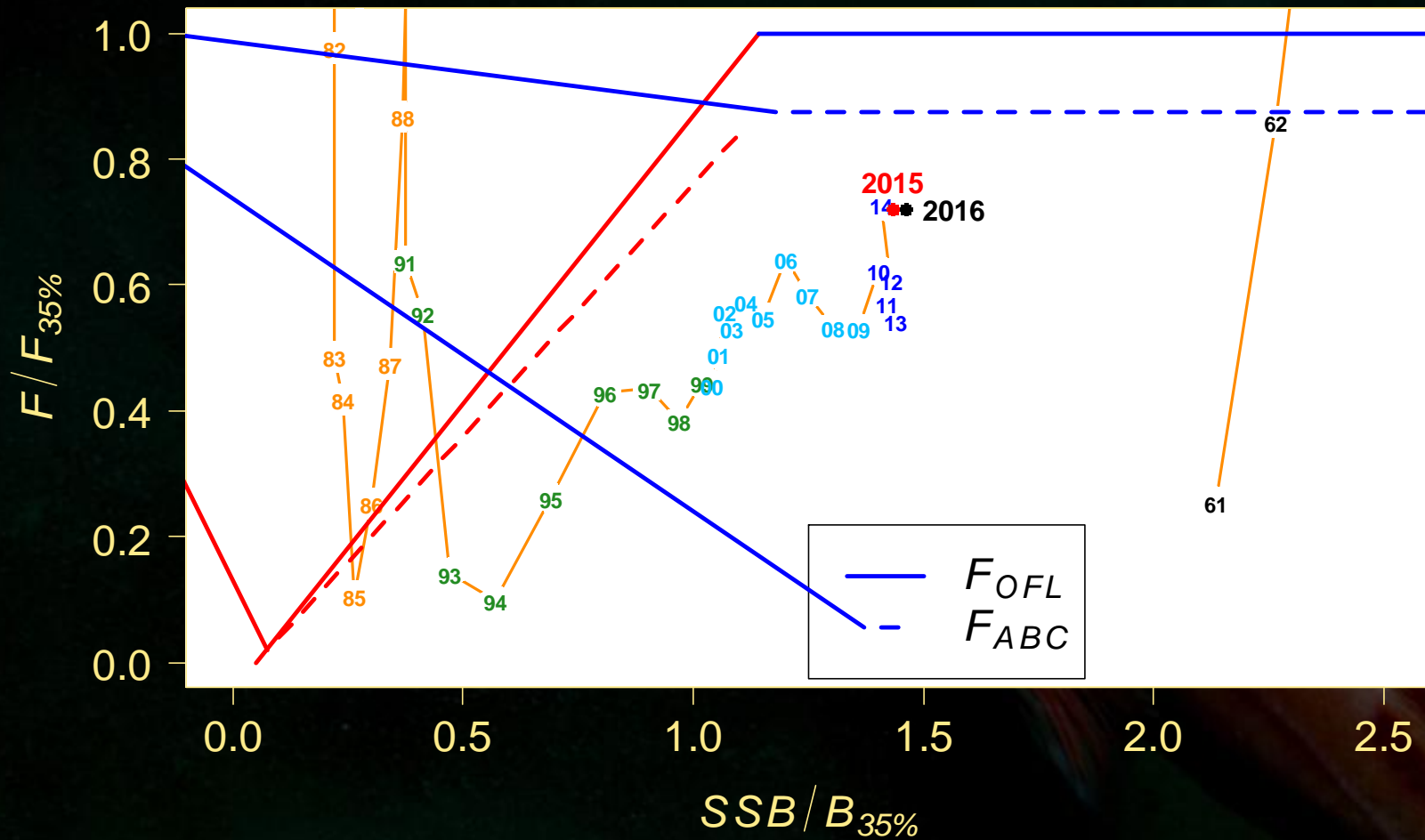
# POP – Recruitment



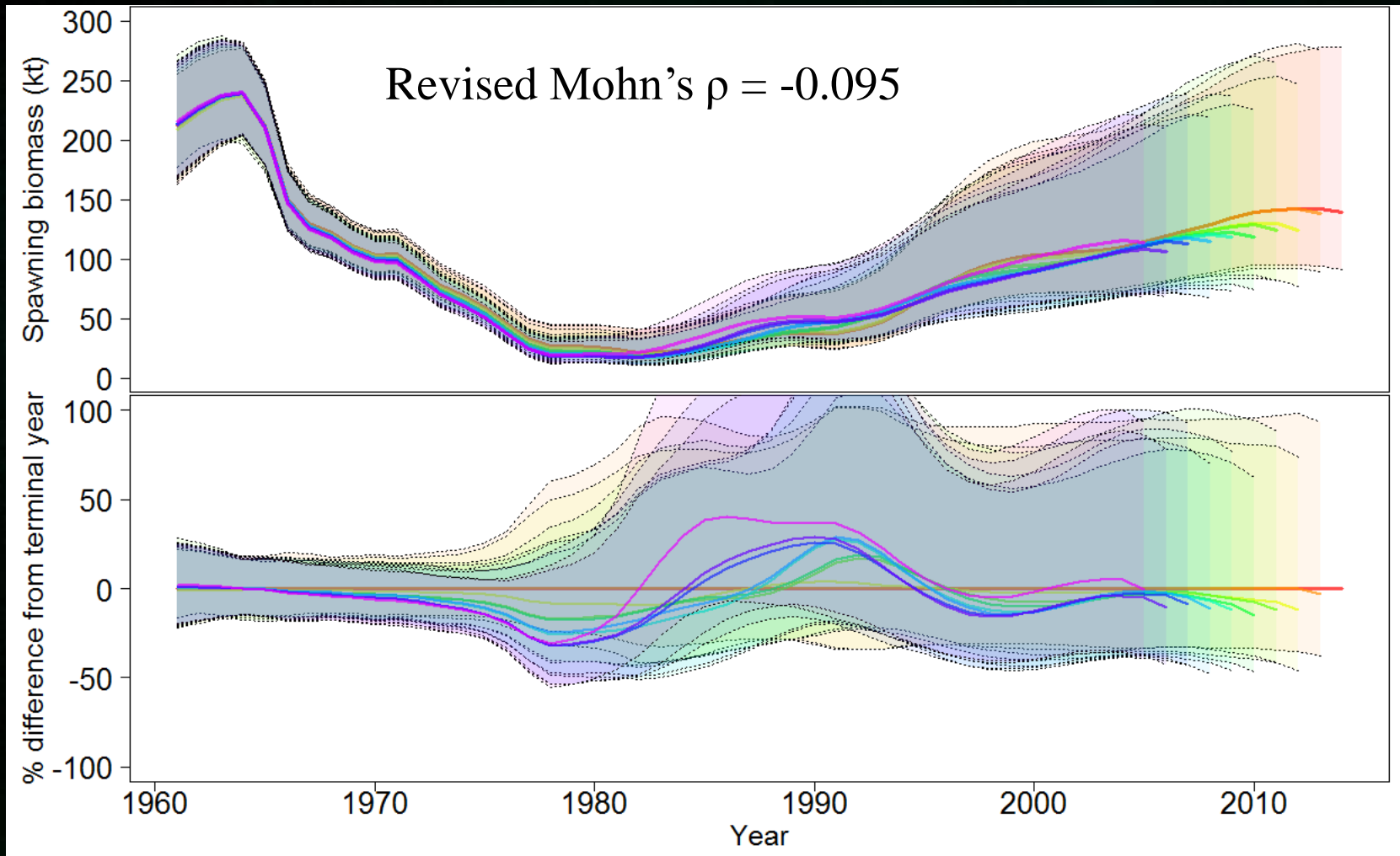
# POP – Projection



# POP – Phase-plane

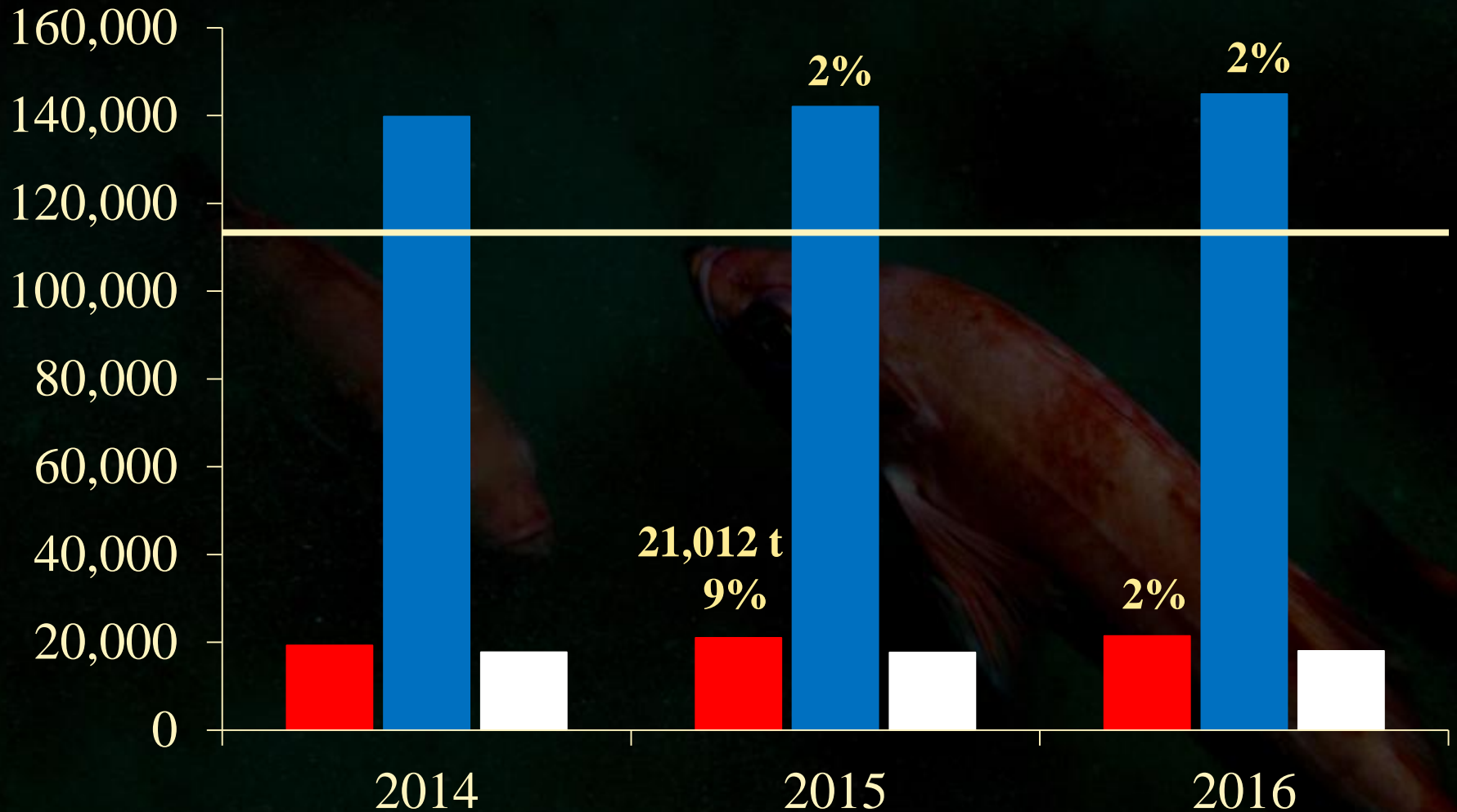


# POP – Retrospective



# Pacific ocean perch

■ ABC ■ Female Spawning Biomass ■ Catch — B\_40%

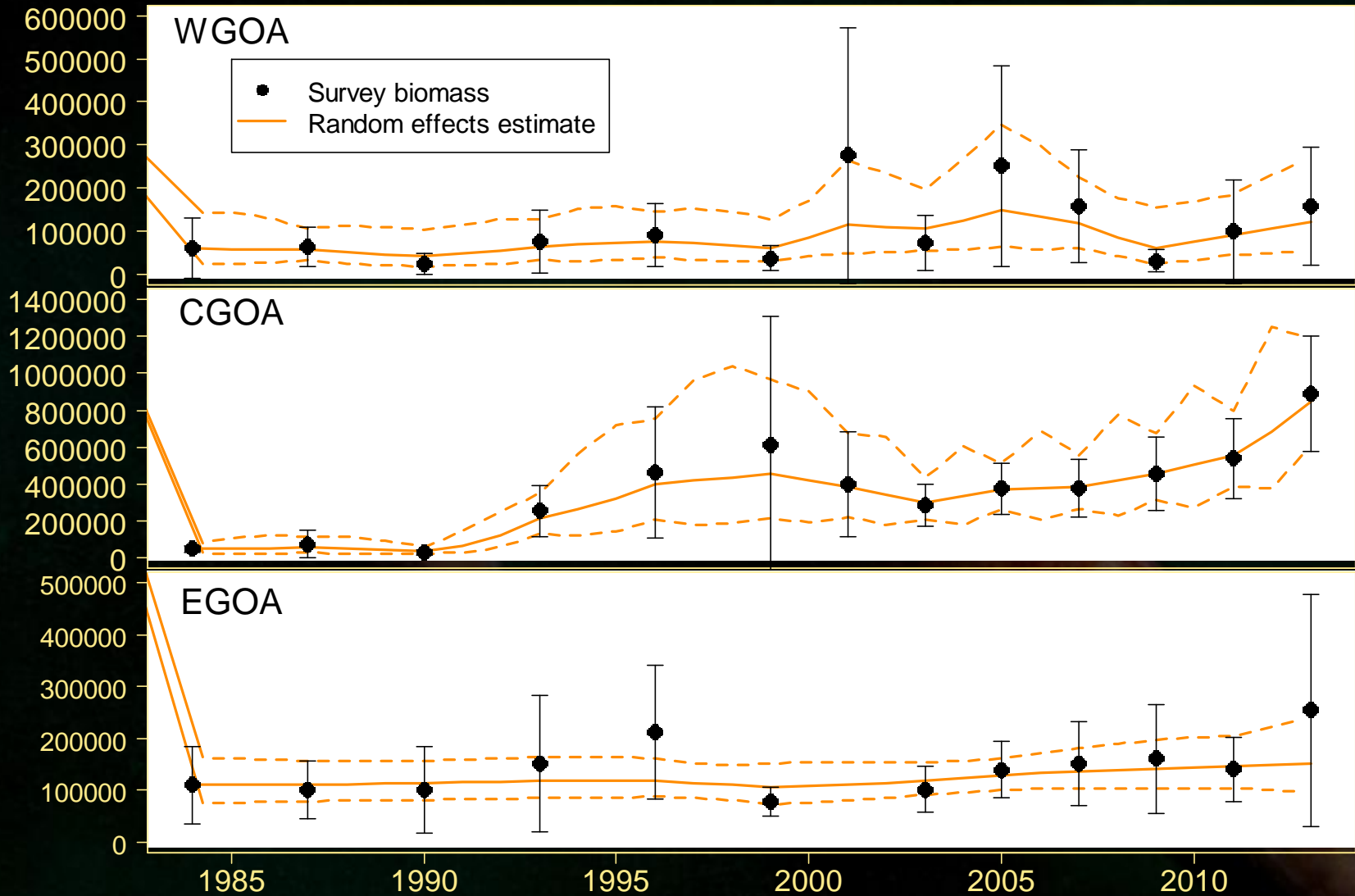




# Apportionment

- In Dec 2013 SSC rejected apportionment from 2013 survey, used apportionment from 2011
- Both Plan Team and SSC requested that random effects model be used for apportionment
- This year random effects model fit to W/C/EGOA survey biomass for use in apportionment

# Apportionment



# Apportionment

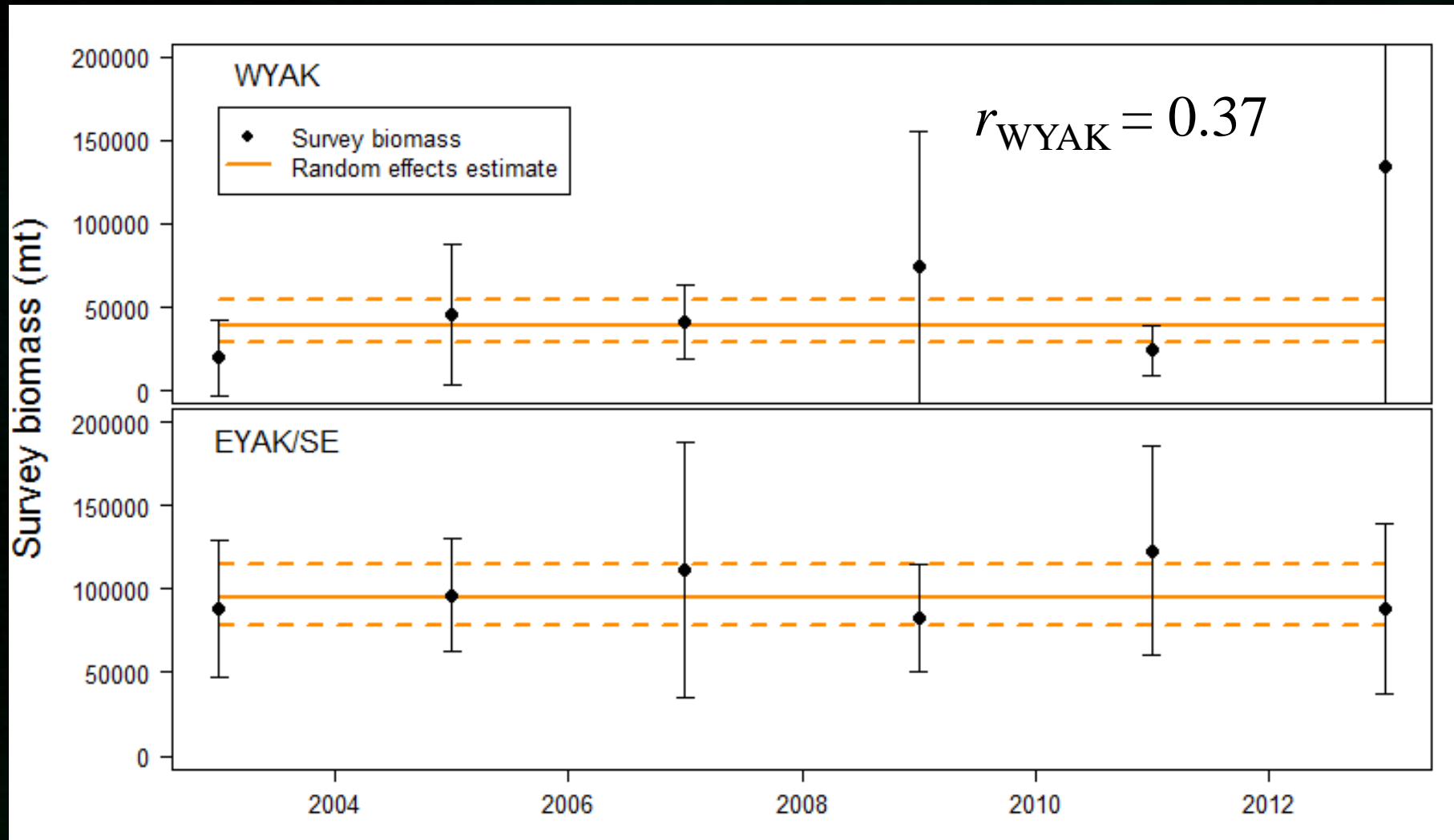
	Western	Central	Eastern	Total
Status quo	11%	69%	20%	100%
RE	<b>11%</b>	<b>75.5%</b>	<b>13.5%</b>	<b>100%</b>

# Apportionment

- Additional issue: WYAK/EYAK-SE split
- Current method uses weighting of upper 95% CI of the ratio of biomass between two areas
  - Didn't have variance estimates, unclear how to use random effects in this case
- Continued with status quo for WYAK/EYAK-SE split
  - Would appreciate Plan Team guidance

# Apportionment-Hot off the press

- But, got variance estimates yesterday...



# Apportionment – ABC

	Western	Central	Eastern	Total
2014 ABC	2,399	12,855	4,055	19,309
2015 ABC	<b>2,302</b>	<b>15,873</b>	<b>2,837</b>	<b>21,012</b>

	WYAK (71%)	EYAK/SE (29%)	Total
2014 ABC	1,931	2,124	4,055
2015 ABC	<b>2,014</b>	<b>823</b>	<b>2,873</b>

# Apportionment – ABC (RE)

	Western	Central	Eastern	Total
2014 ABC	2,399	12,855	4,055	19,309
2015 ABC	<b>2,302</b>	<b>15,873</b>	<b>2,837</b>	<b>21,012</b>

	WYAK (37%)	EYAK/SE (63%)	Total
2015 ABC	<b>1,063</b>	<b>1,810</b>	<b>2,873</b>

# Apportionment - OFL

	W/C/WYAK	EYAK/SE	Total
2014 OFL	21,016	1,303	22,319
<b>2015 OFL</b>	<b>23,406</b>	<b>954</b>	<b>24,360</b>

Using RE	W/C/WYAK	EYAK/SE	Total
<b>2015 OFL</b>	<b>22,288</b>	<b>2,072</b>	<b>24,360</b>



# POP – Summary

- Future looks stable
  - Projections indicate increasing abundance
- To do for next full assessment:
  - Address CIE suggestions
  - Address remaining Plan Team comments (influence of relative weighting...)
  - Perform tasks mentioned for other GOA rockfish stocks (including internal estimation of growth)

# Research Priorities

- Investigate catchability
  - What is it sensitive to, are there auxiliary data to inform priors
- Investigate spatial patterns, and it's relationship with selectivity
  - Potential relationship between depth and dome-shapedness of fishery select
- Investigate fishery CPUE as alternative index