Pacific ocean perch 2017 Assessment

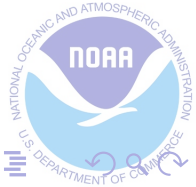
Biology and Data

Chantel Wetzel[1]
Lee Cronin-Fine[2]

Northwest Fisheries Science Center[1]
University of Washington[2]

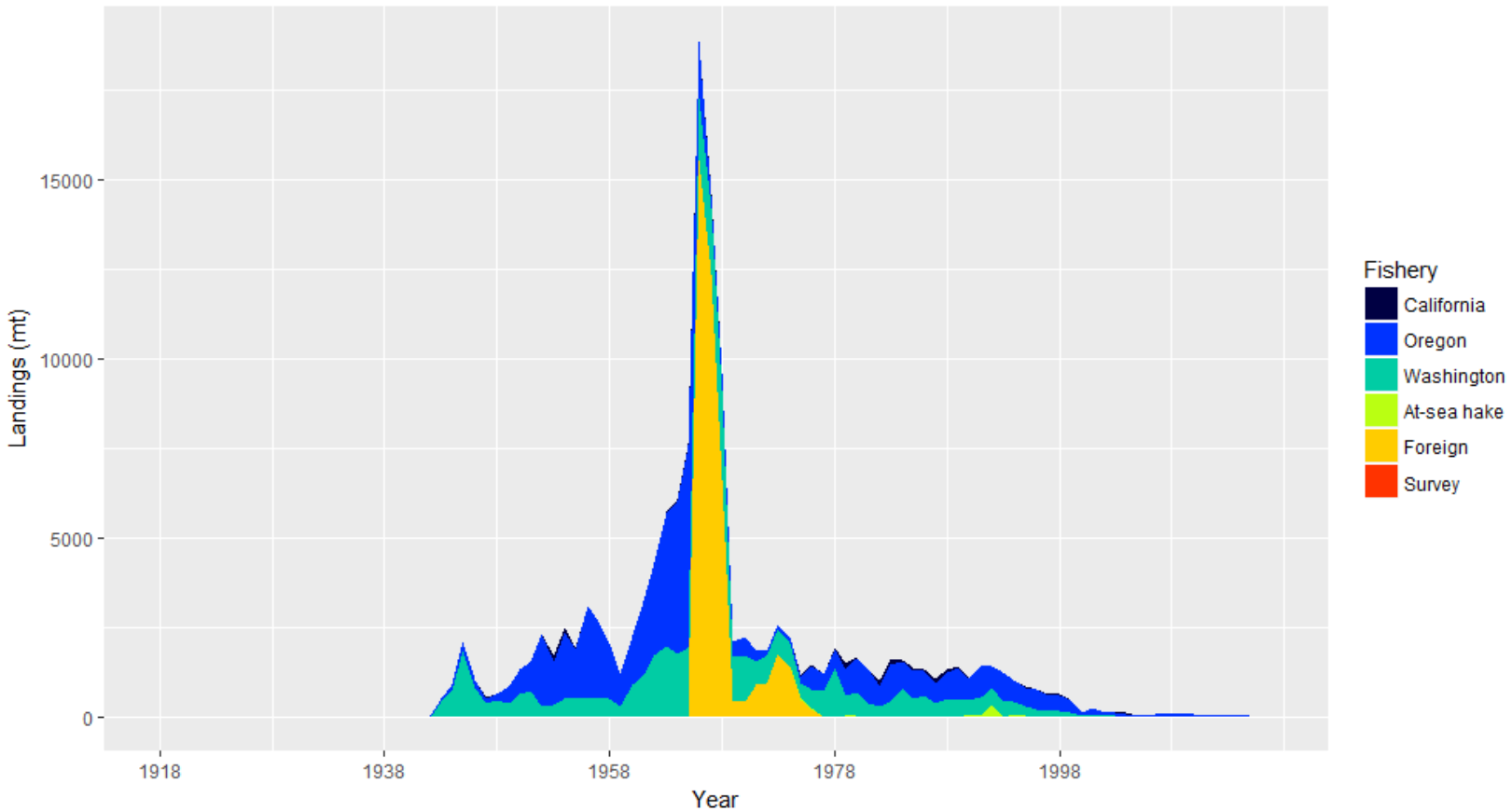
STAR Panel

June 26-30, 2017



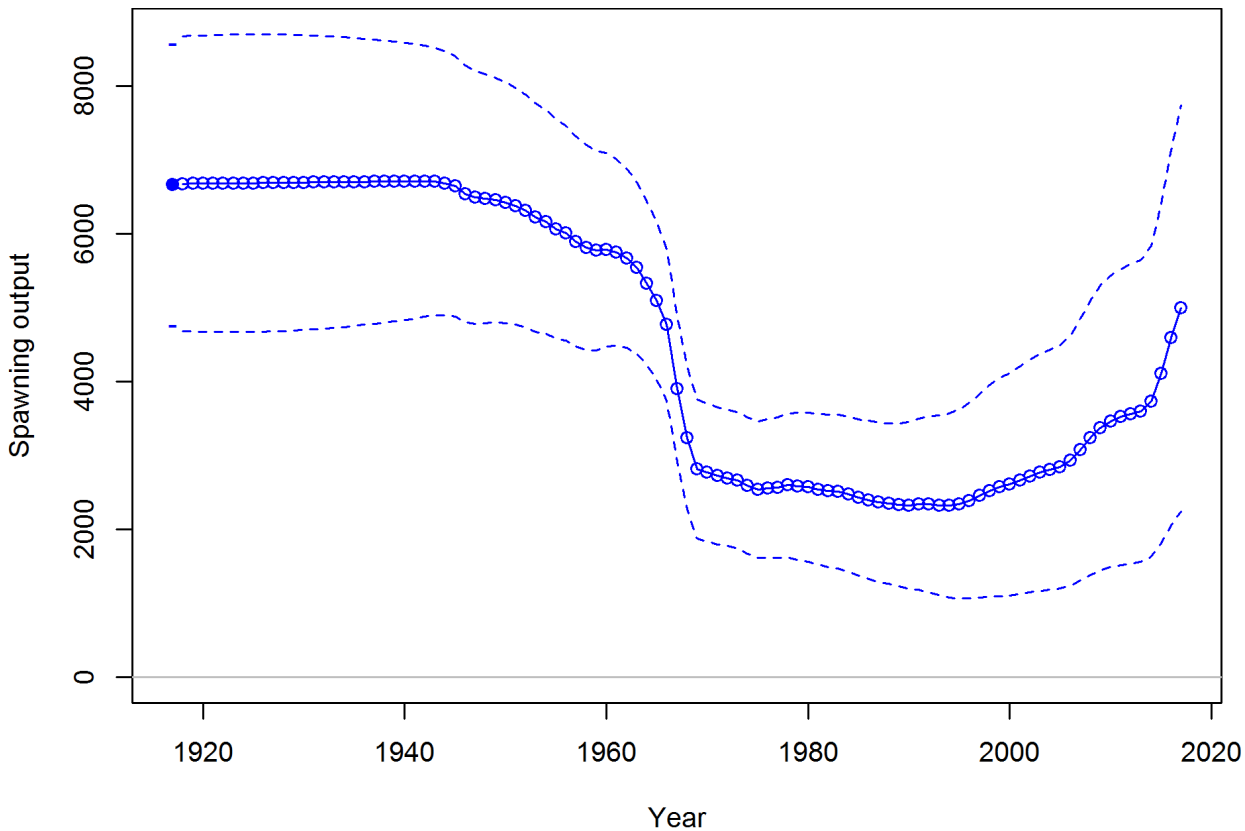
Outline

Landings

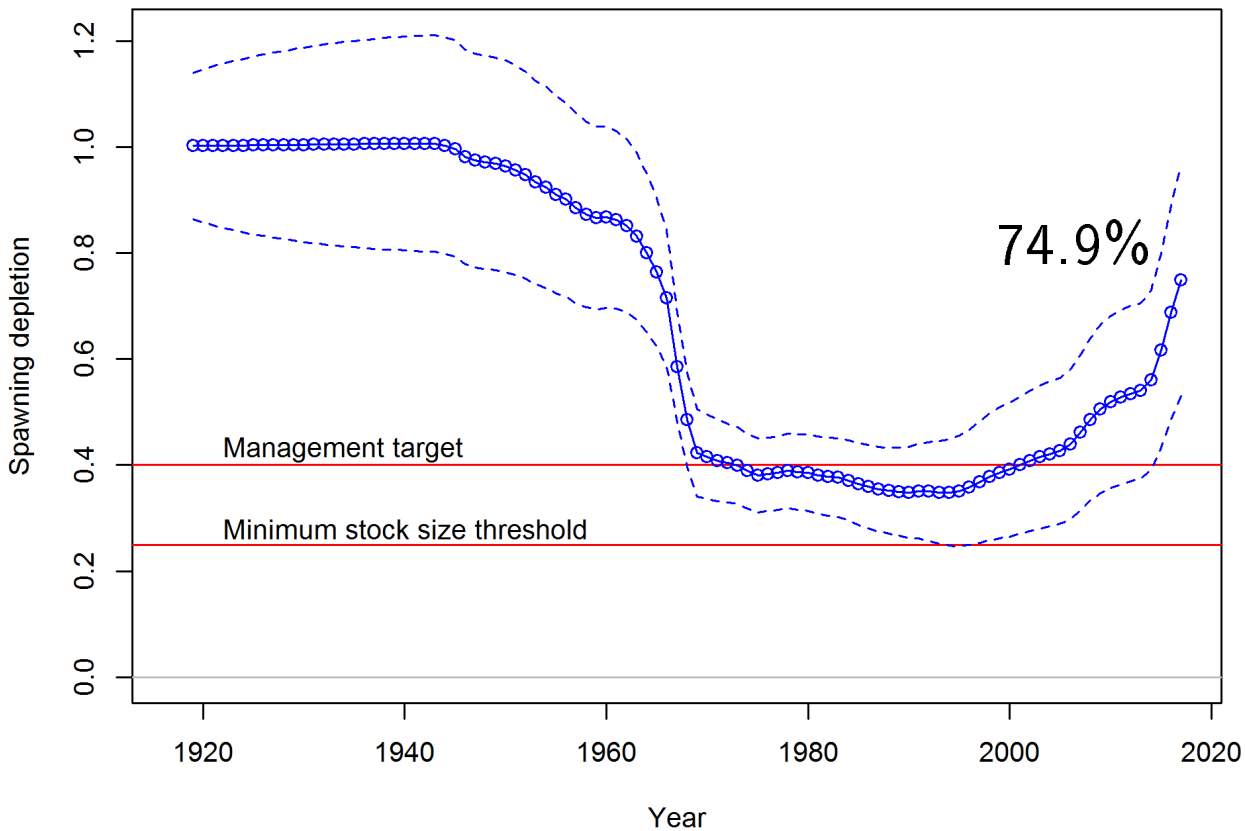

Landings (mt)
15000
10000
5000
0
1918
1938
1958
1978
1998
Year
Fishery
California
Oregon
Washington
At-sea hake
Foreign
Survey

Year	CA	OR	WA	At-sea	Survey	Total Landings
2007	0.15	83.65	45.12	4.05	0.58	133.55
2008	0.39	58.64	16.61	15.93	0.80	92.36
2009	0.92	58.74	33.22	1.56	2.72	97.17
2010	0.14	58.00	22.29	16.87	1.68	98.98
2011	0.12	30.26	19.66	9.17	1.94	61.14
2012	0.18	30.41	21.79	4.52	1.62	58.51
2013	0.08	34.86	14.83	5.41	1.71	56.89
2014	0.18	33.91	15.82	3.92	0.57	54.40
2015	0.12	38.05	11.41	8.71	1.59	59.88
2016	0.23	40.81	13.12	10.30	3.10	67.56

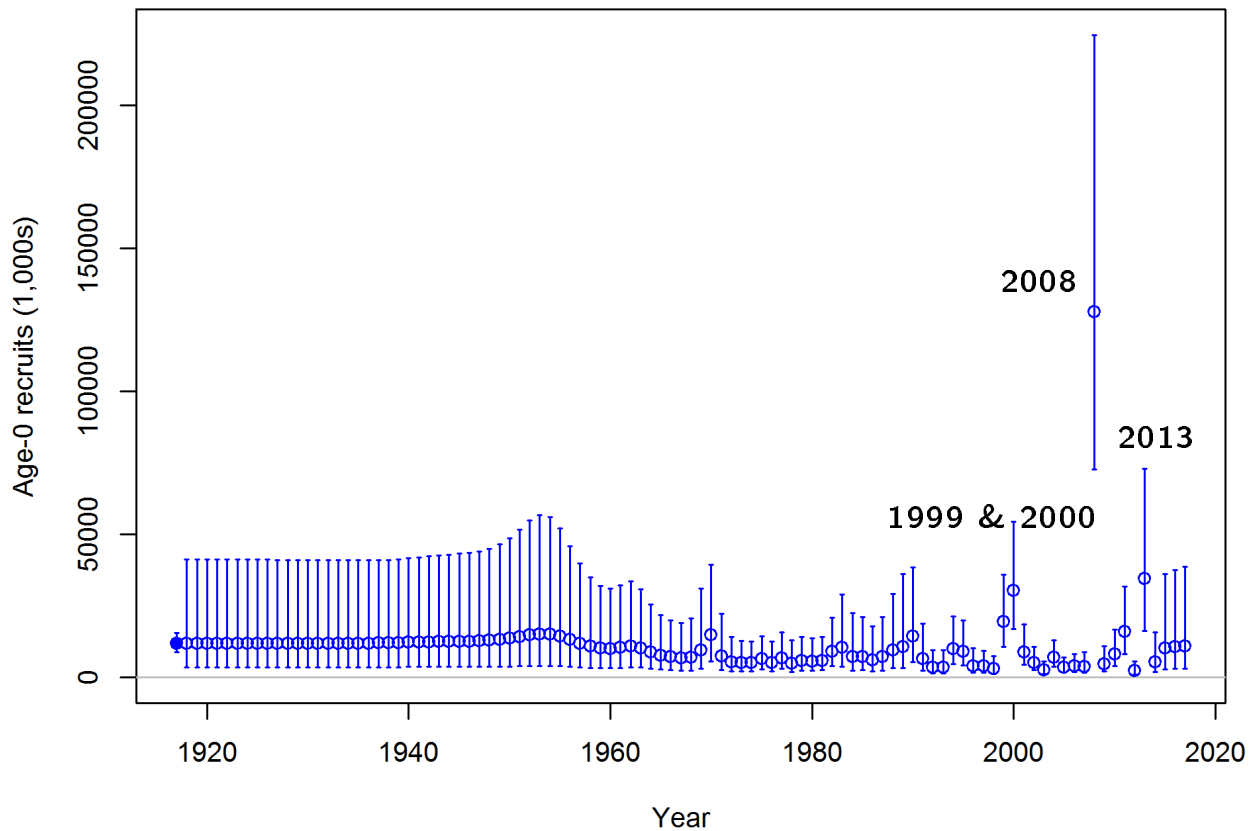
Spawning Output



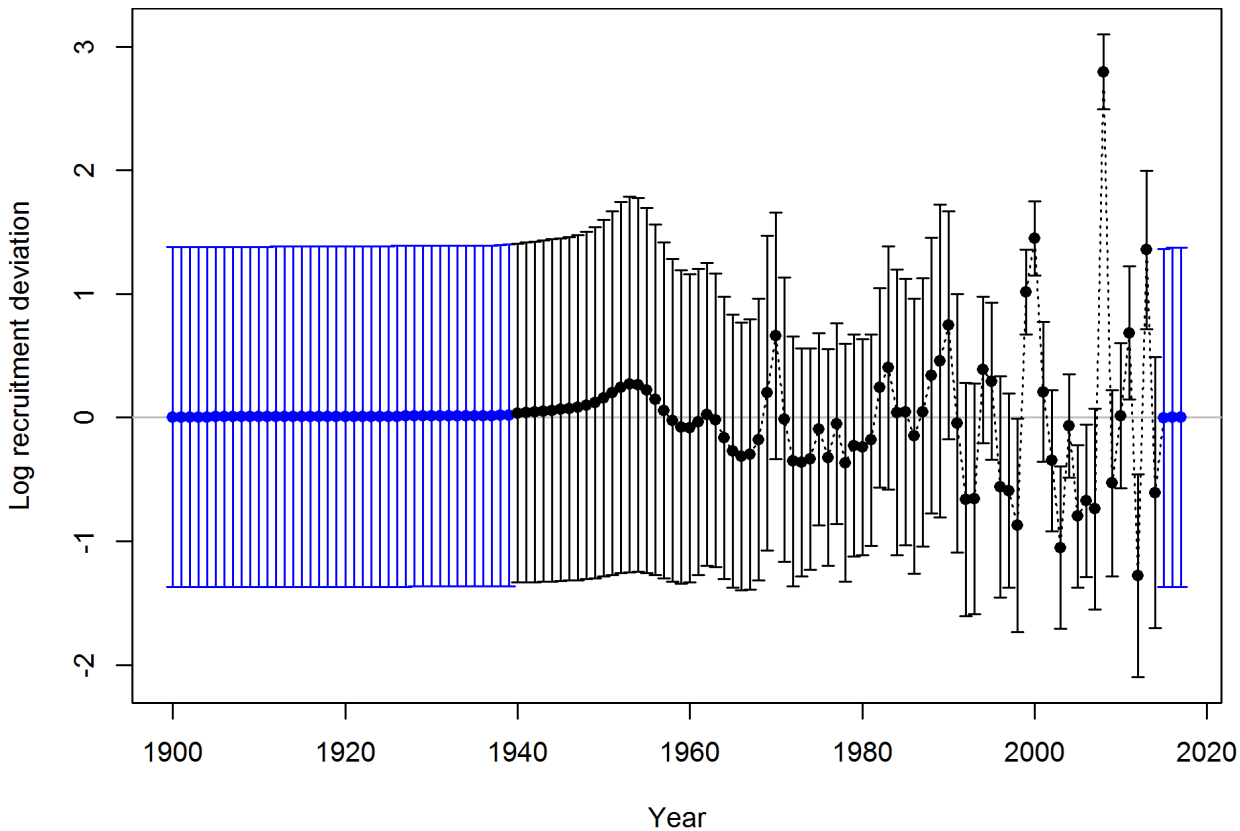
Relative Depletion



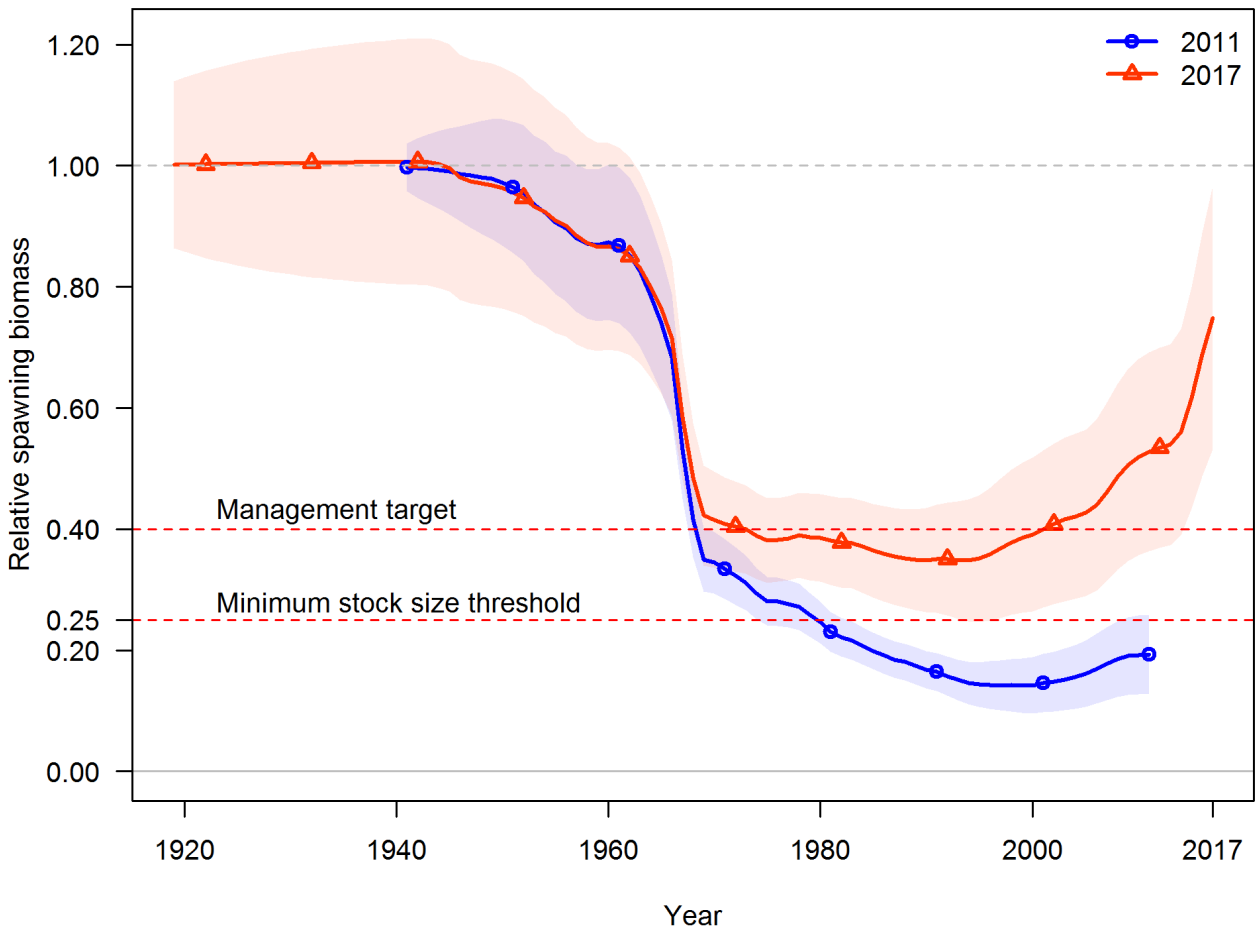
Estimated Annual Recruitment



Estimated Annual Recruitment Deviations



Comparison between 2011 and 2017

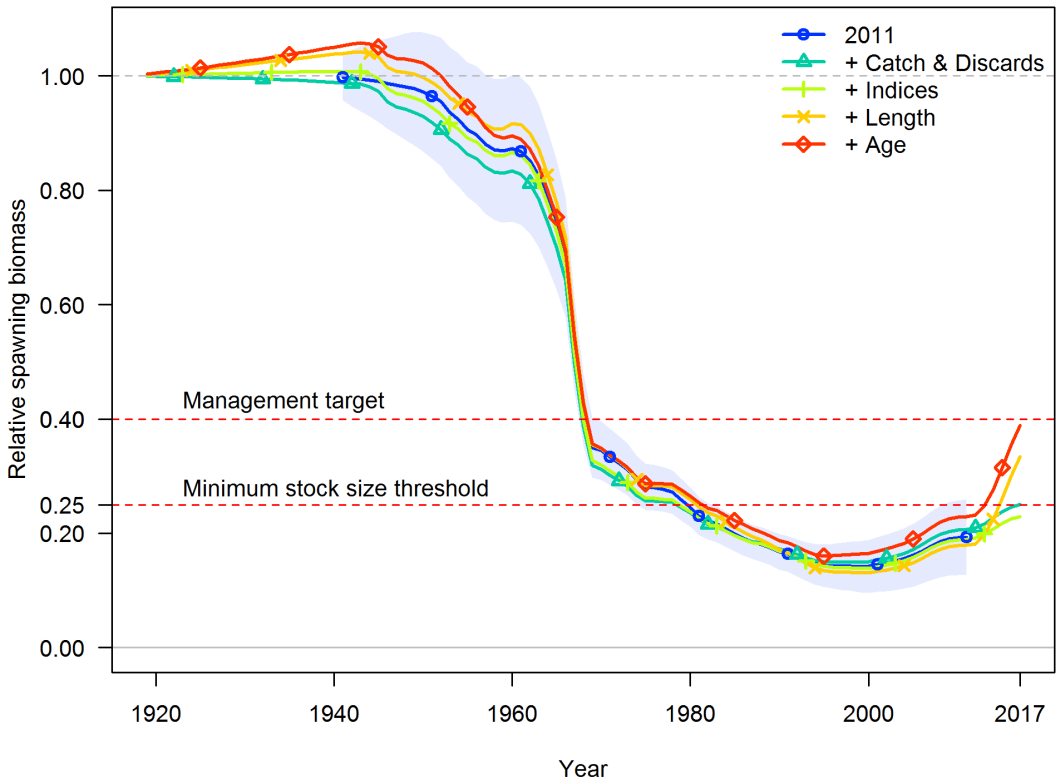


Major Changes Between the Previous and Current Assessment

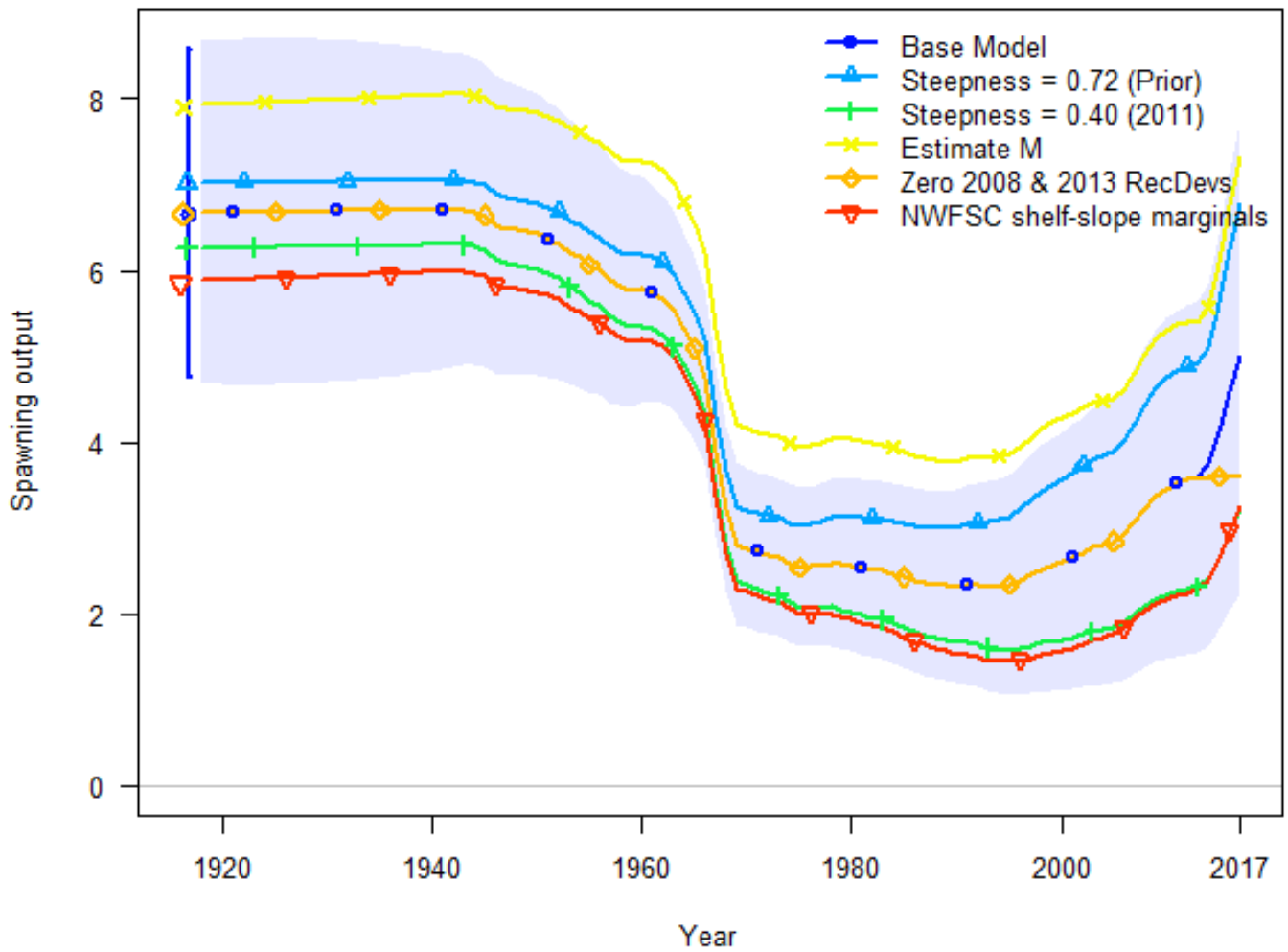
- Steepness
- Natural Mortality
- Maturity and Fecundity
- Fleet and Survey Selectivities

2011 Model Data "Update"

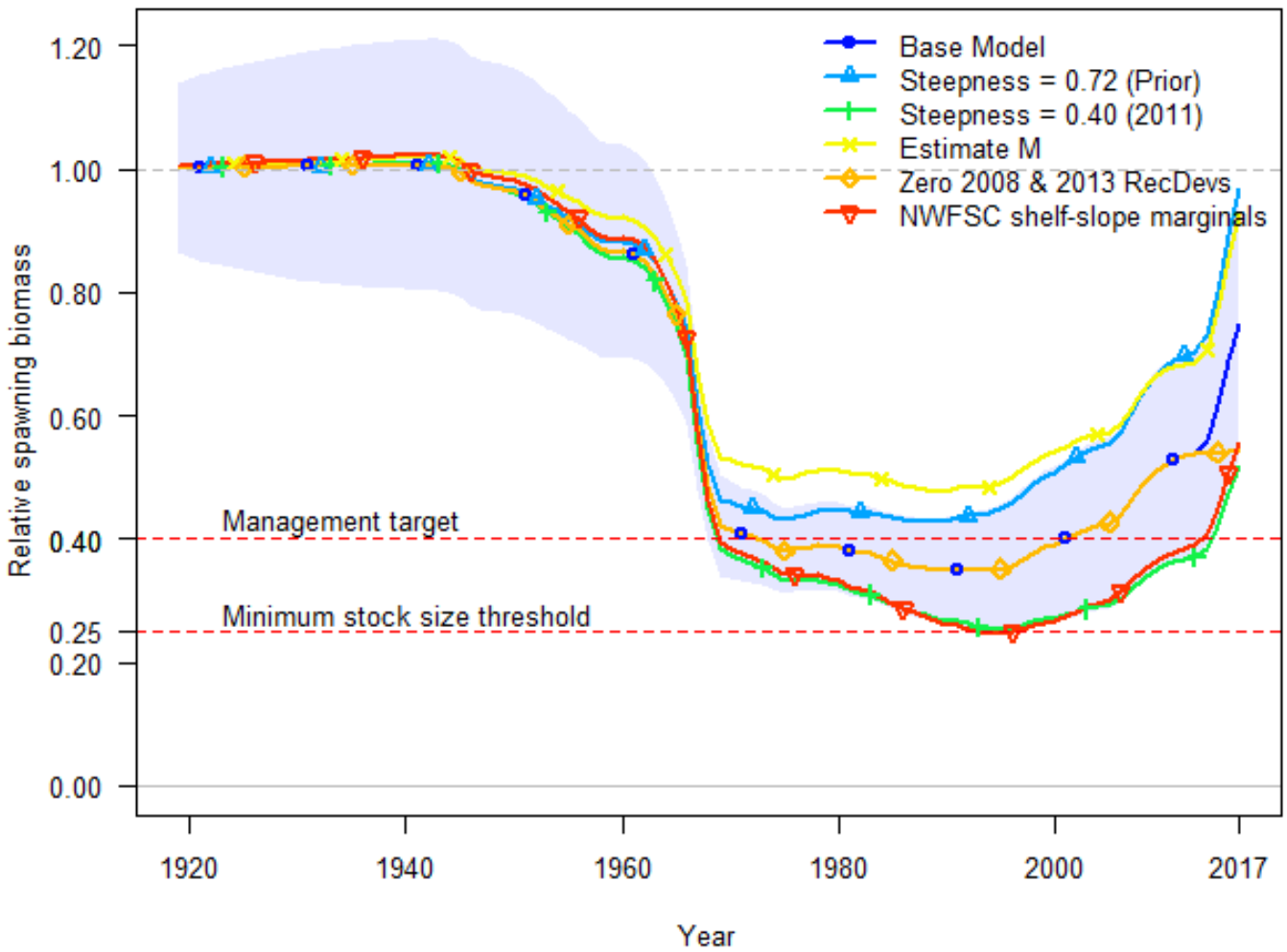
- Added layers of new data cumulatively to while retaining 2011 modeling assumptions



Model Sensitivities - Scale



Model Sensitivities - Relative



Key Sources of Uncertainty

- Steepness
  - Fixed at 0.50 within the base model. Likelihood profile over steepness indicates no information in data concerning steepness. Fixing the value at the steepness prior value of 0.72 results in stock status 97% of unfished.
- Natural Mortality
  - Fixed at 0.054 for males and females, the mean of the prior when maximum age is 100. Likelihood profile relatively flat around the prior.
- Recruitment
  - Estimated large recruitments in 2008 and 2013.
  - Setting these recruitments equal to the stock-recruitment curve results in a decline in stock status to 54%.
- NWFSC shelf-slope age data
  - Treating these data as either conditional age-at-length or as marginals results in differing estimates of R_0 and final stock status.
  - Marginal ages are essentially weighted out of the model using Francis weighting.

Outline

Pacific ocean perch (*Sebastes alutus*)

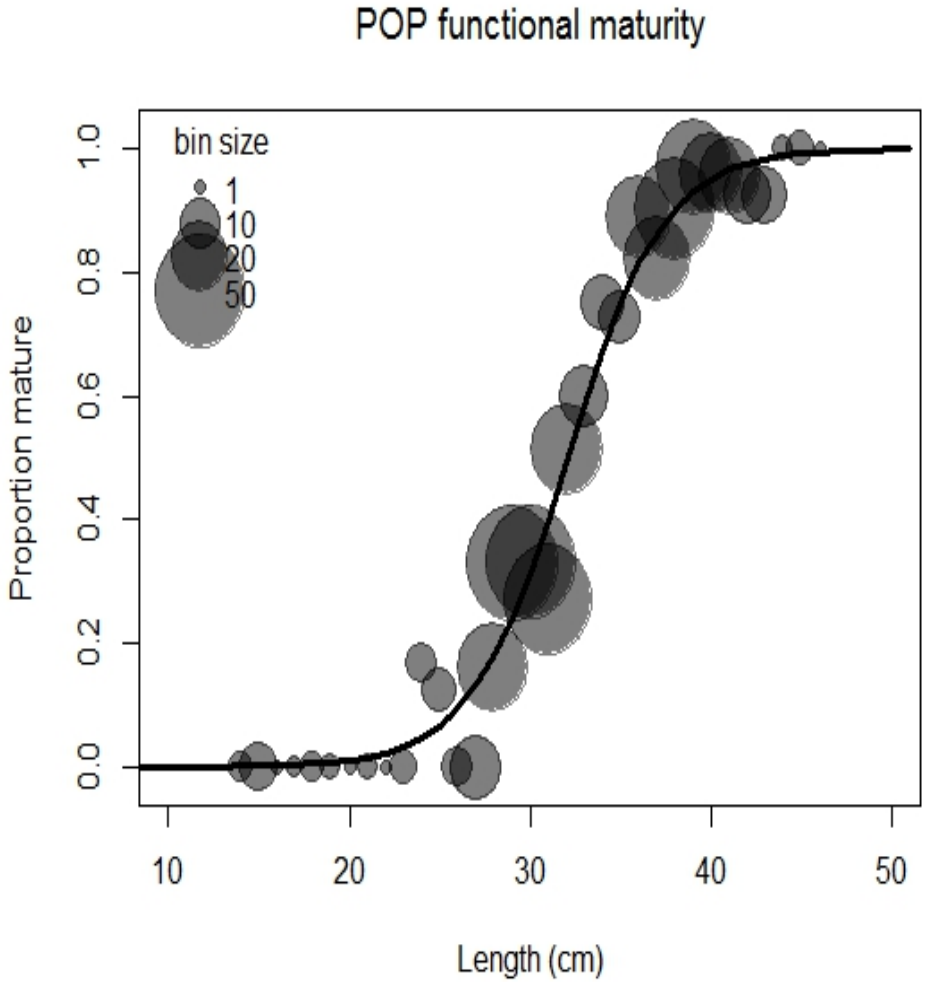
- Distributed from Alaska Aleutian Islands to Northern California
- Typically 200 - 400 meters during summer months
- Semi-demersal and can be pelagic
- Both sexes move to deeper water with age

- Female move to deeper waters post-spawning during winter months and return inshore in spring.

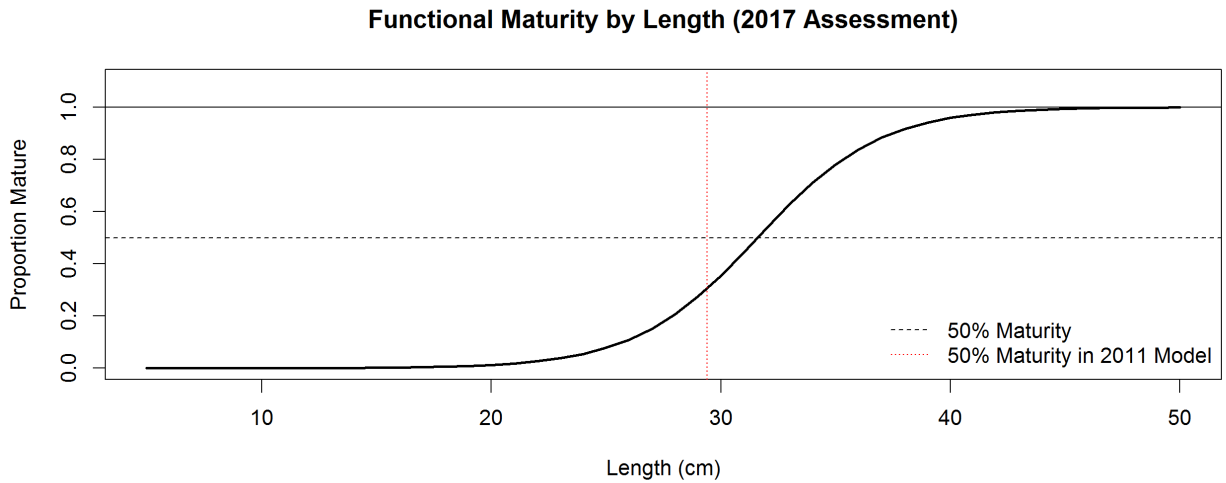
Maturity

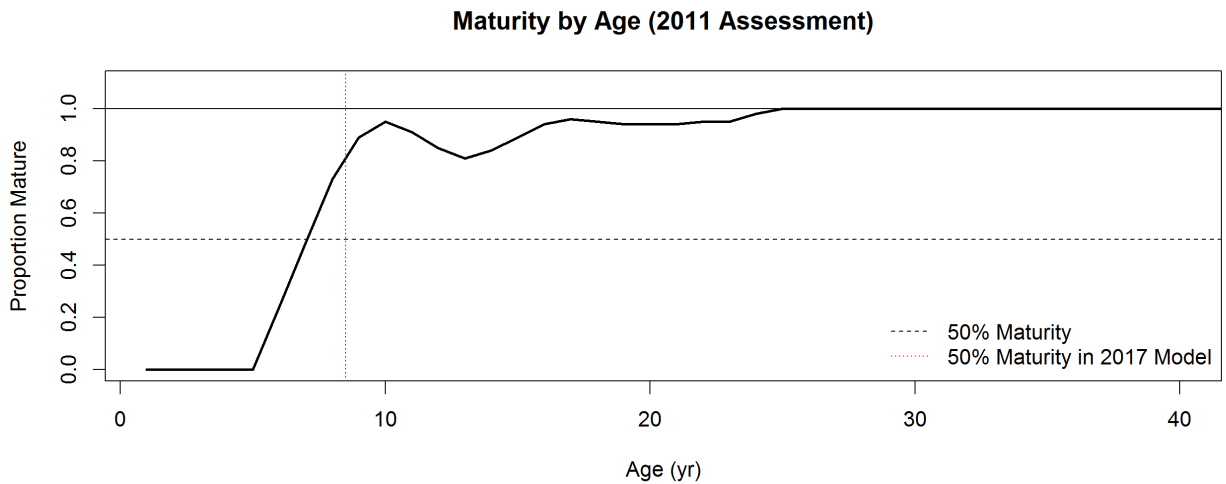
Functional maturity-at-length

- Categorized mature and immature fish based on the proportion of vitellogenin in the cytoplasm and atretic cells
- 50% maturity is at larger lengths vs. biological maturity
- functional 50% = 32.1 cm vs. biological 50% = 30.1 cm



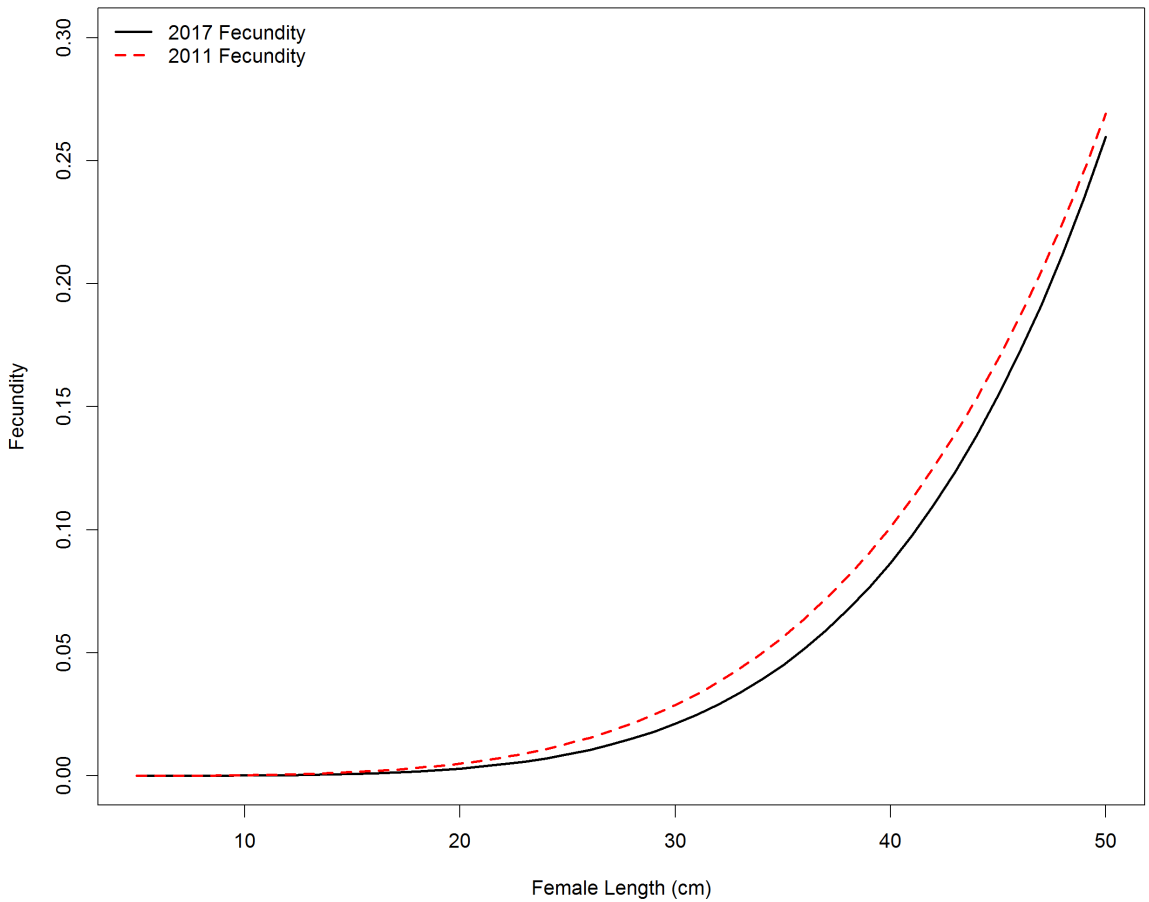
Maturity Comparison





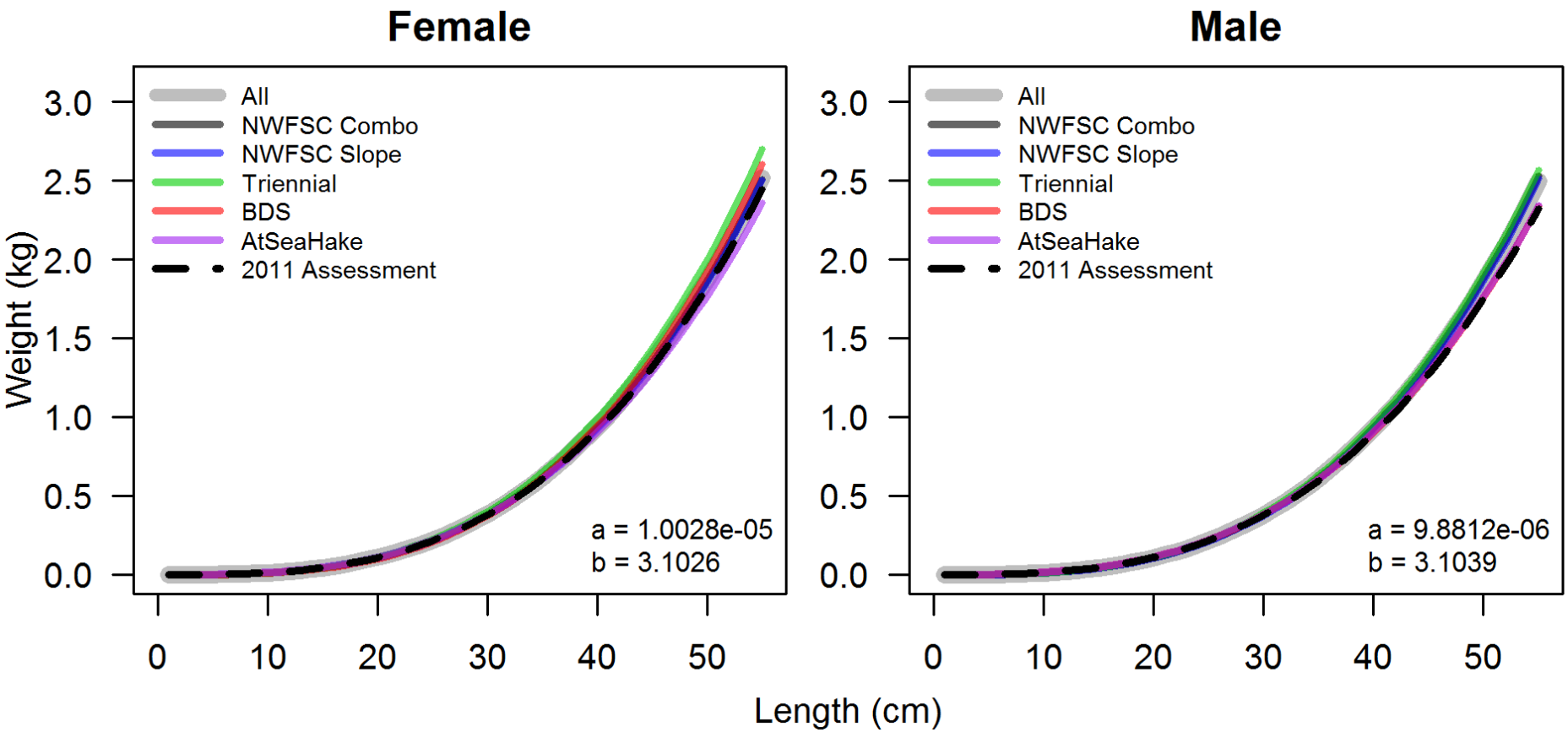
*Sensitivity assumed maturity shown to not have a large impact on results

Fecundity

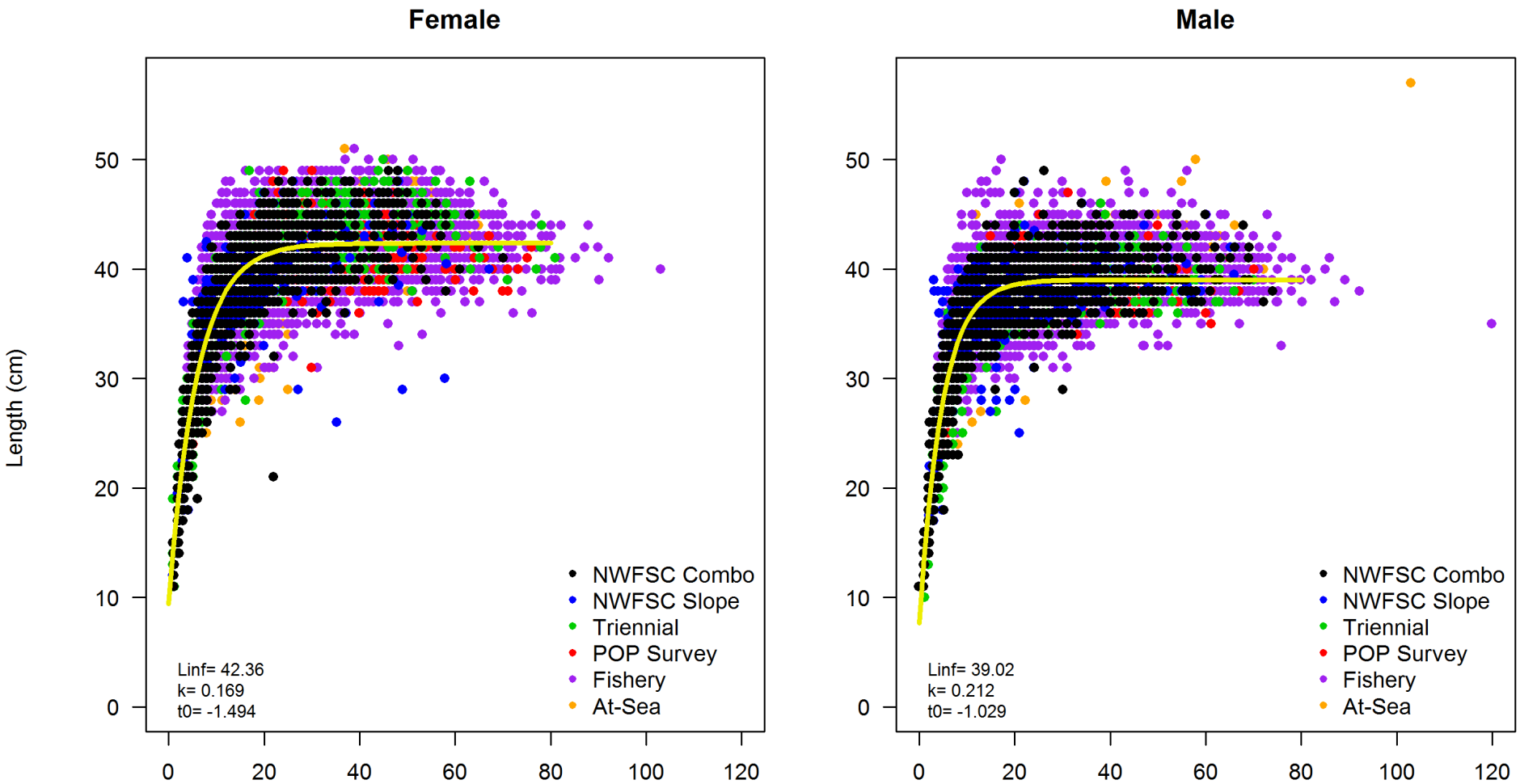


*Sensitivity to assumed fecundity shown to not have a large impact on results

Weight-at-length

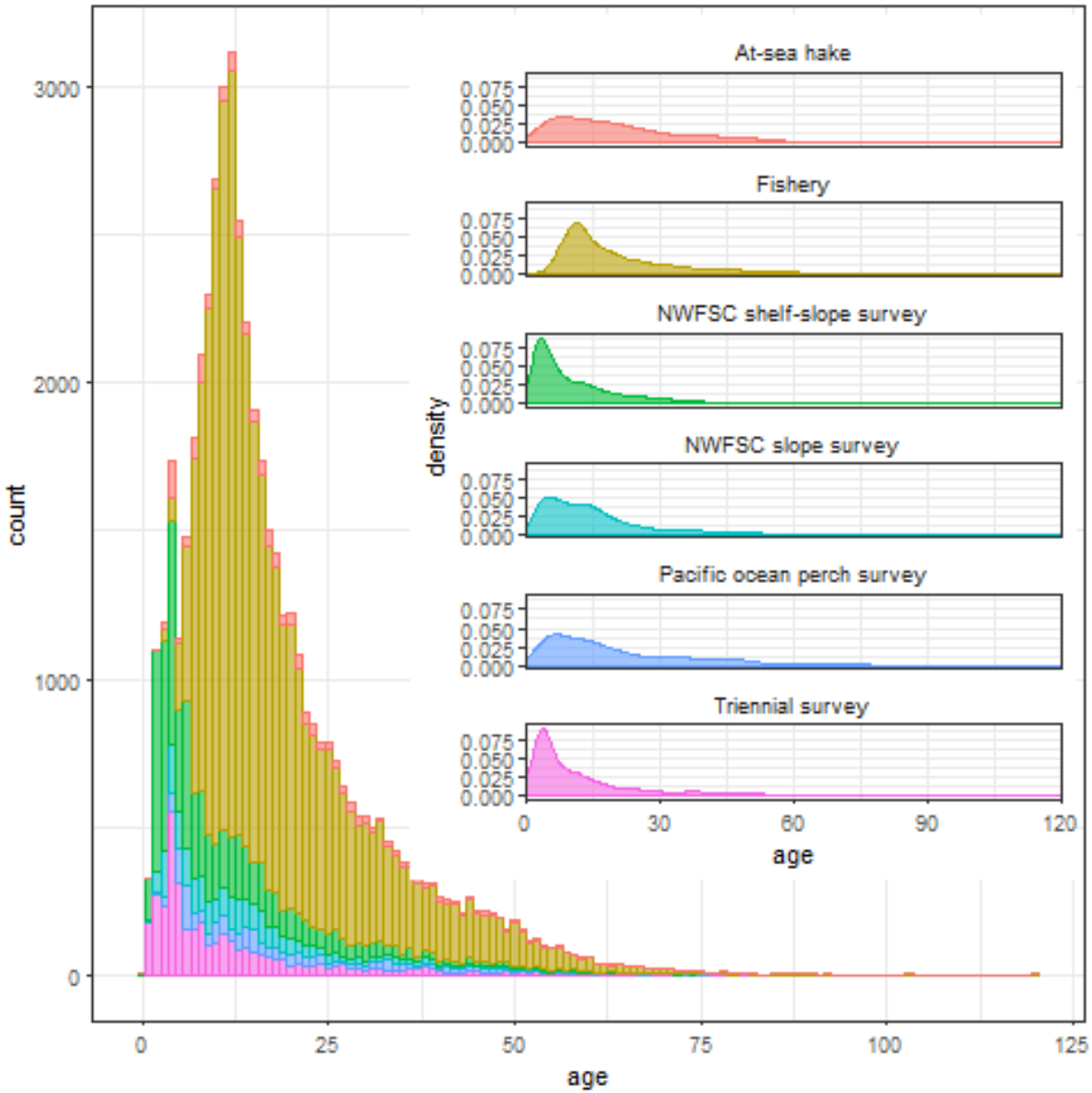


Length-at-age

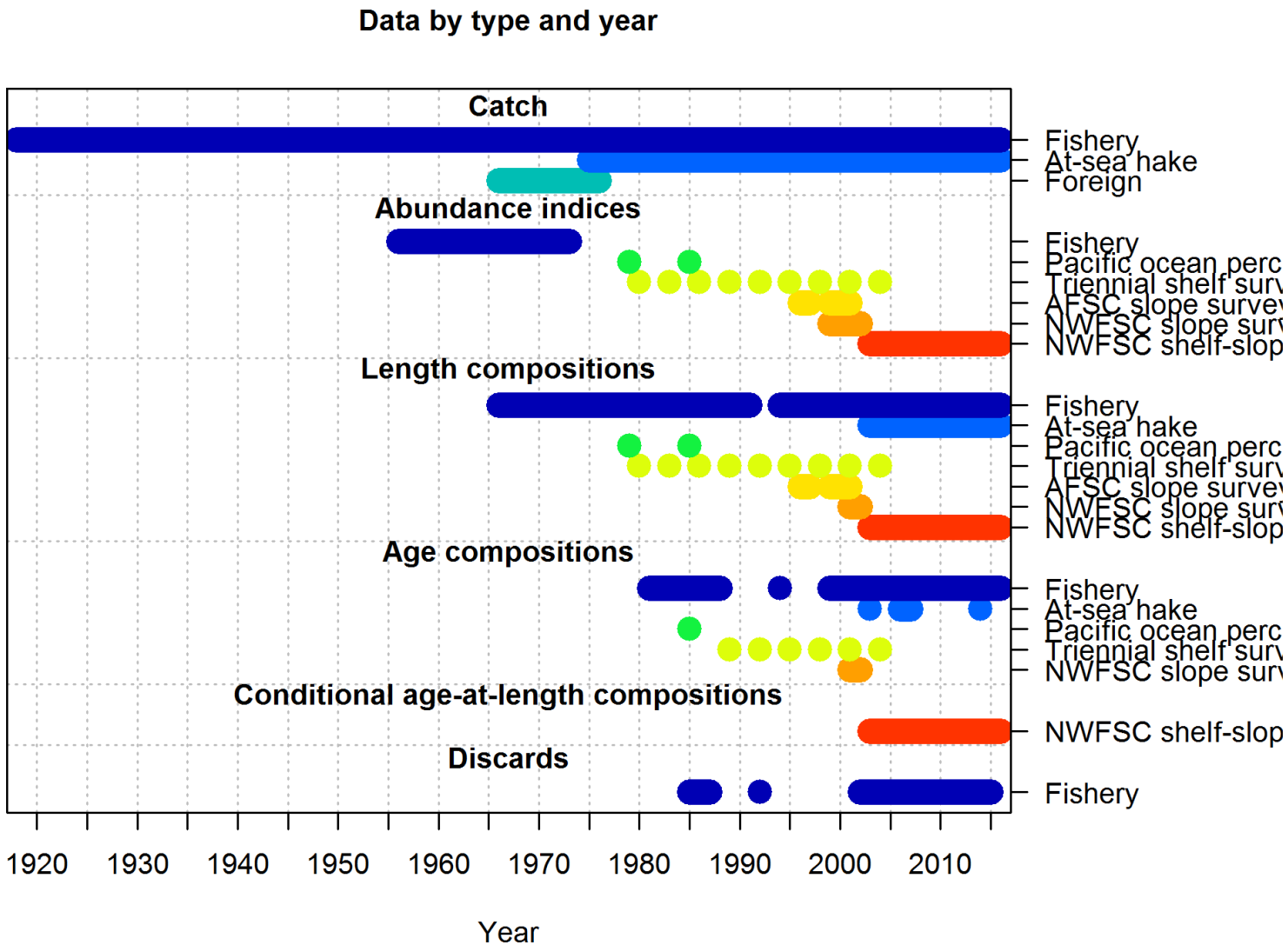


Observed Ages

- Oldest age: 120 by the fishery (2007)
- Next oldest fish range from 90-103 collected by fishery and At-sea hake between 1981-2010

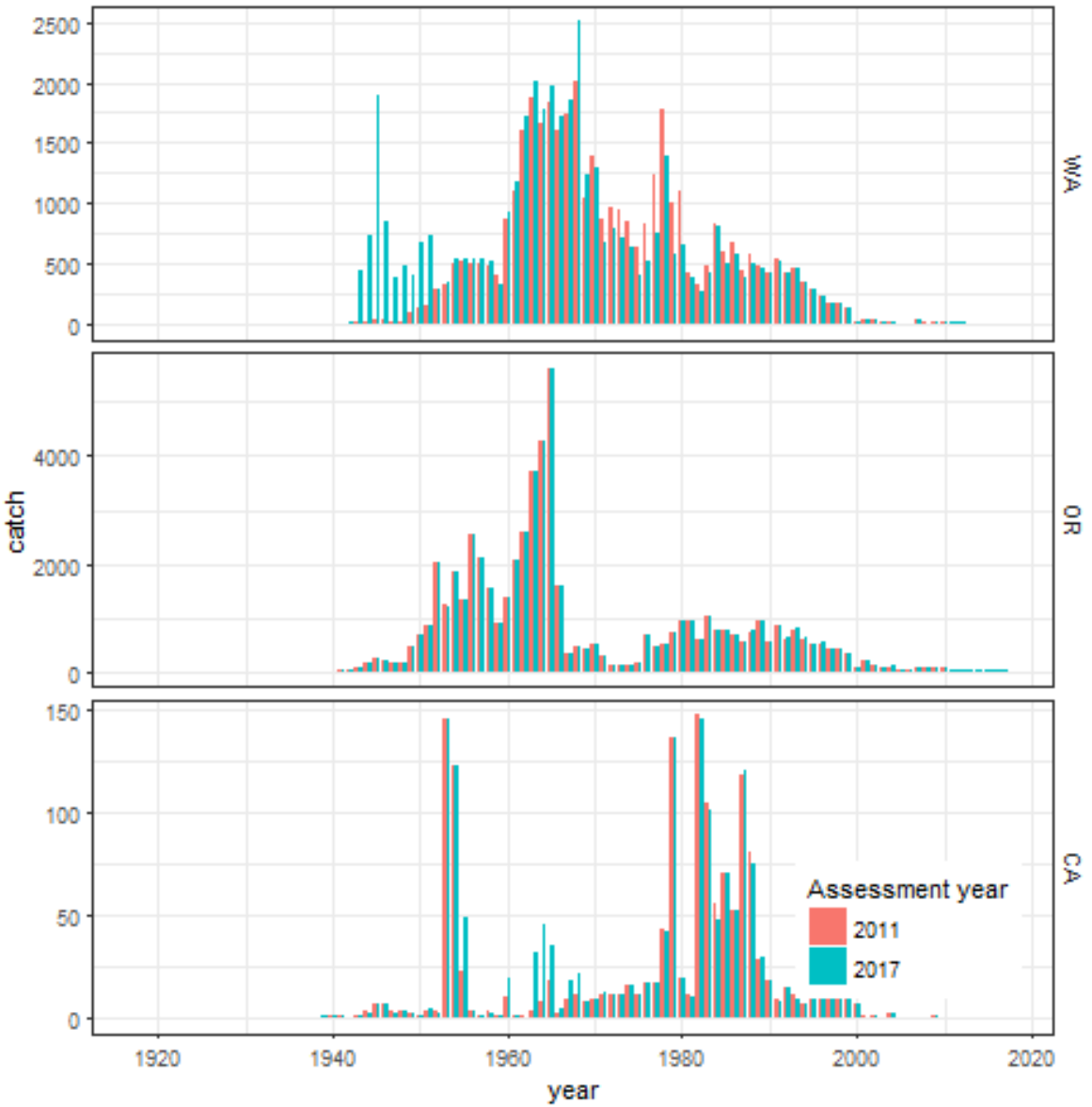


Data Summary Used in the 2017 Assessment

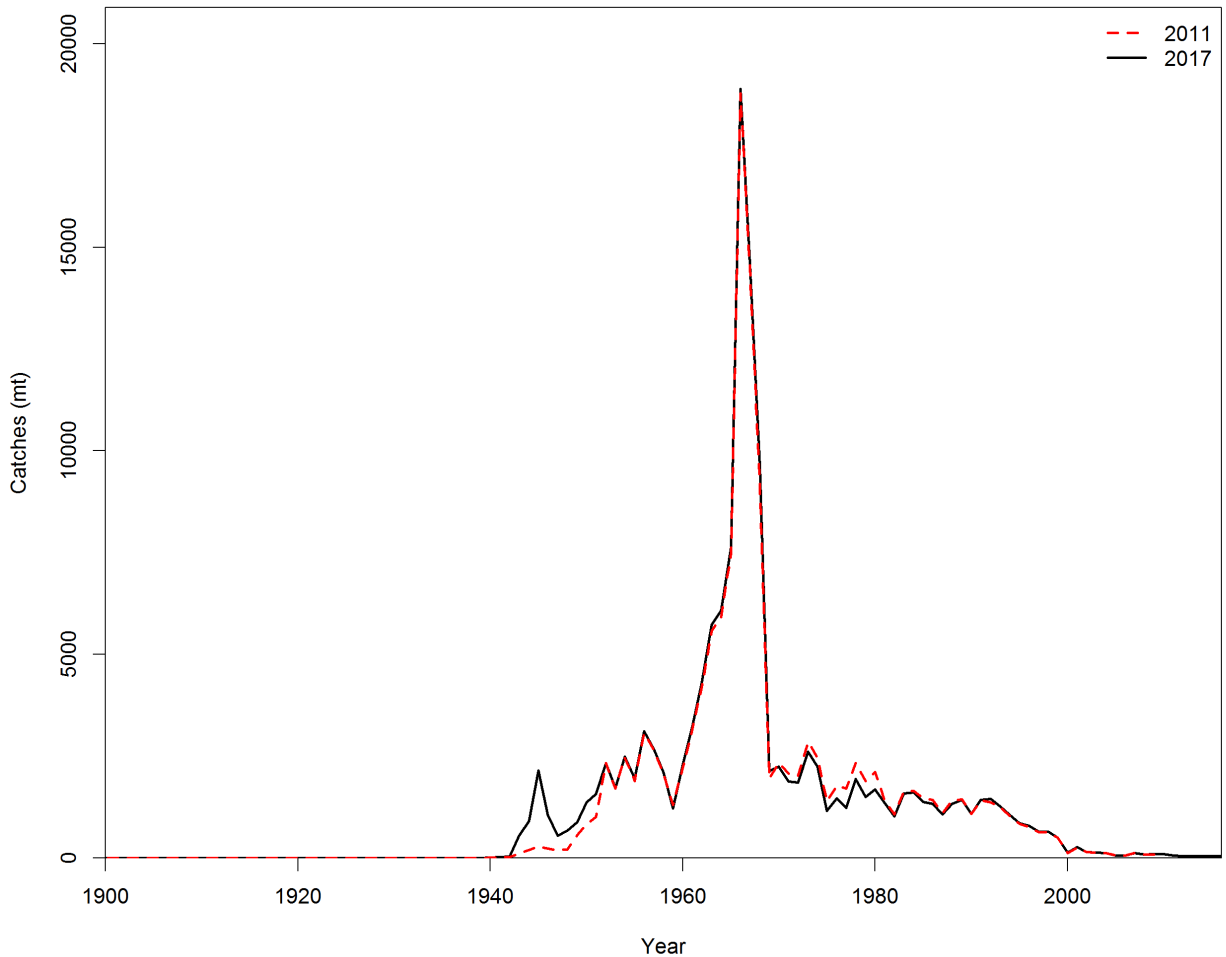


Outline

Landings Data: 2017 vs. 2011

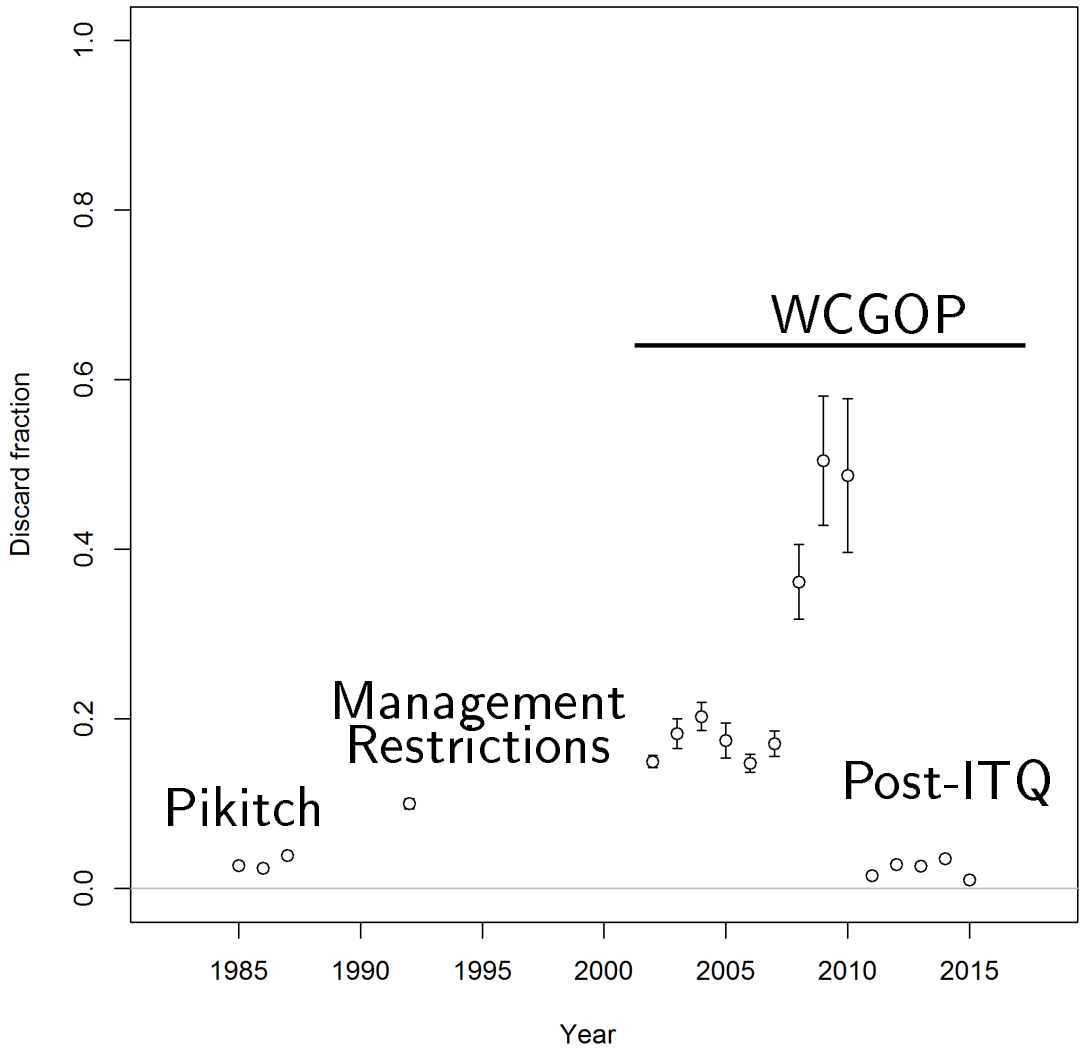


Cummalative catch difference



*Resulted in $< 1\%$ change in $R0$

Fishery Discard Data



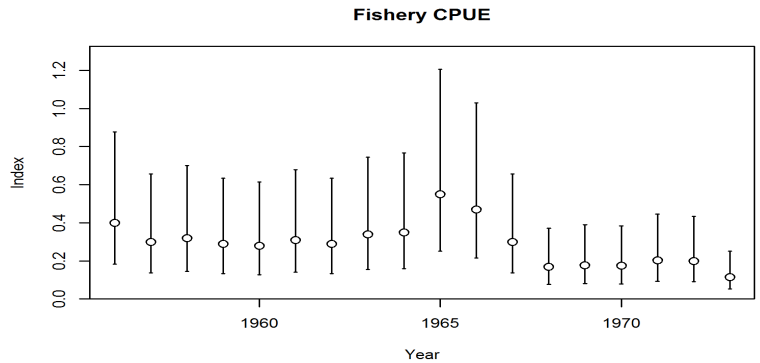
* Sensitivities done on the 1992 data point (high vs. low) results $\pm$ 0.5% in status.

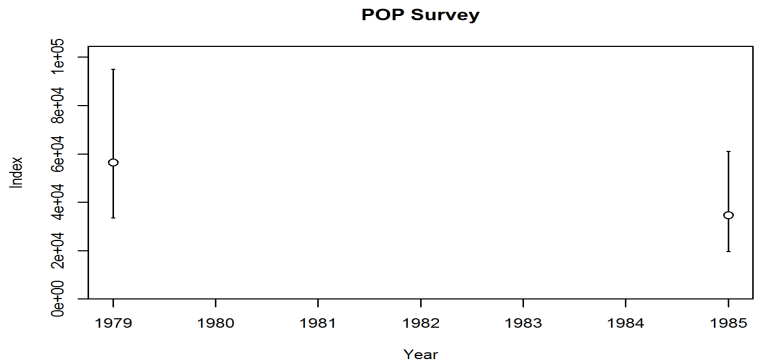
Outline

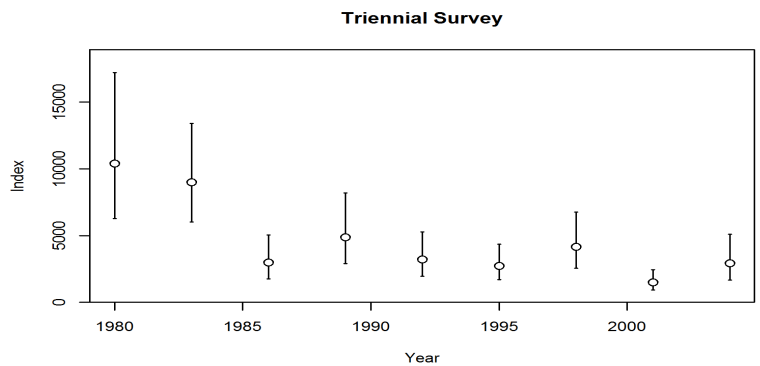
CPUE

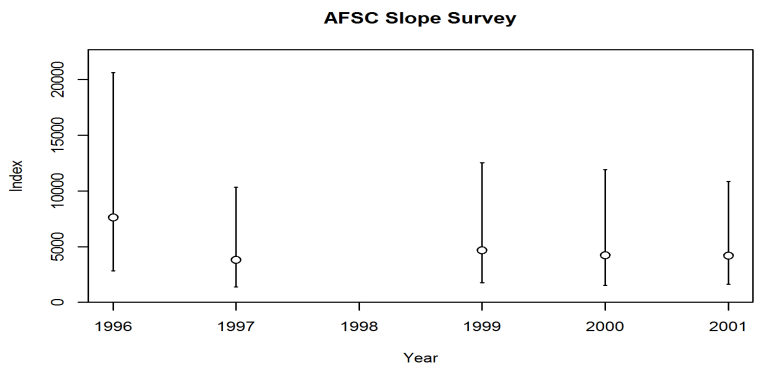
Gunderson (1977) CPUE from the INPFC Columbia area
*Sensitivity shows little effect on model results when removed.

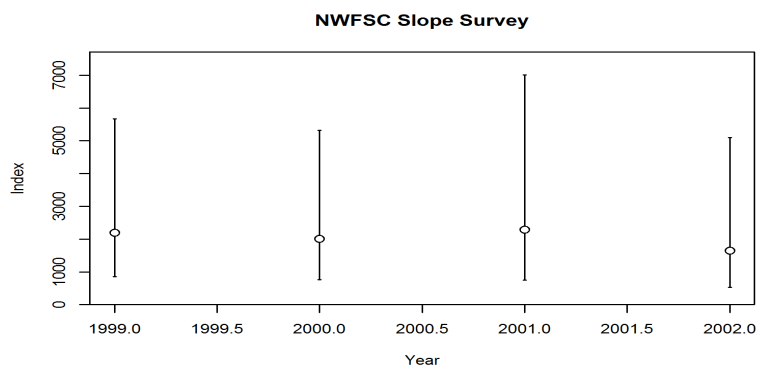
Survey Indices

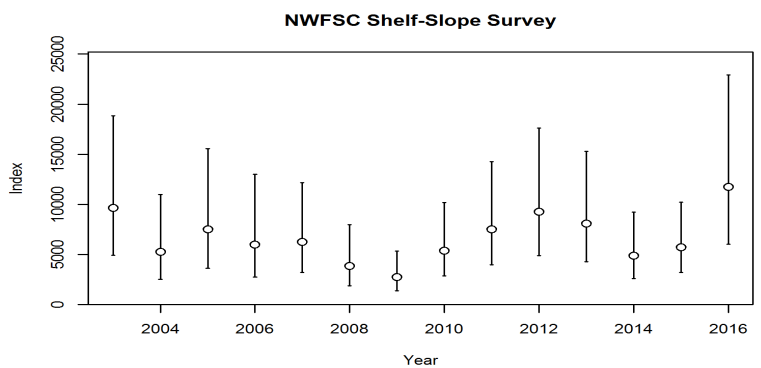




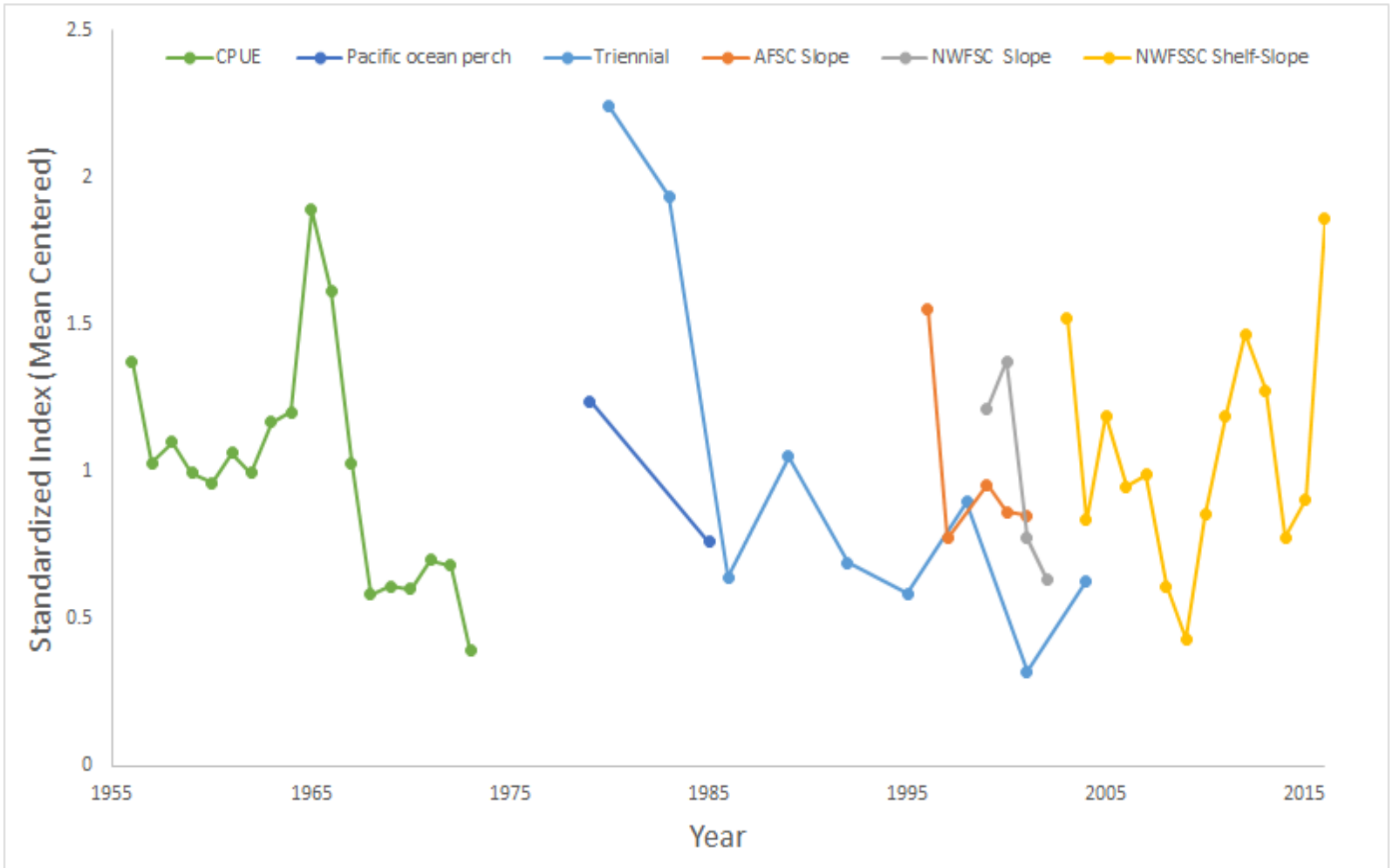








All: standardized



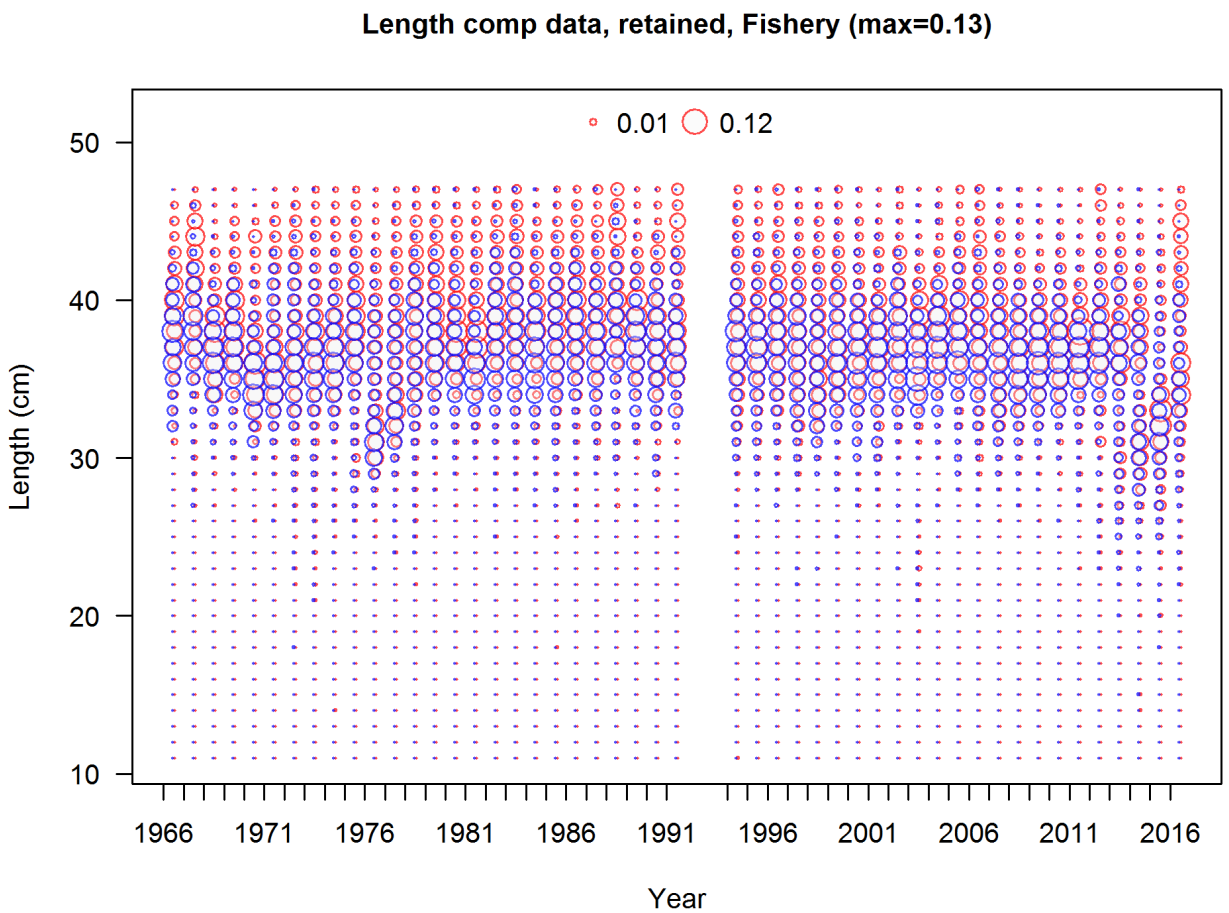
Outline

Fishery Length Data

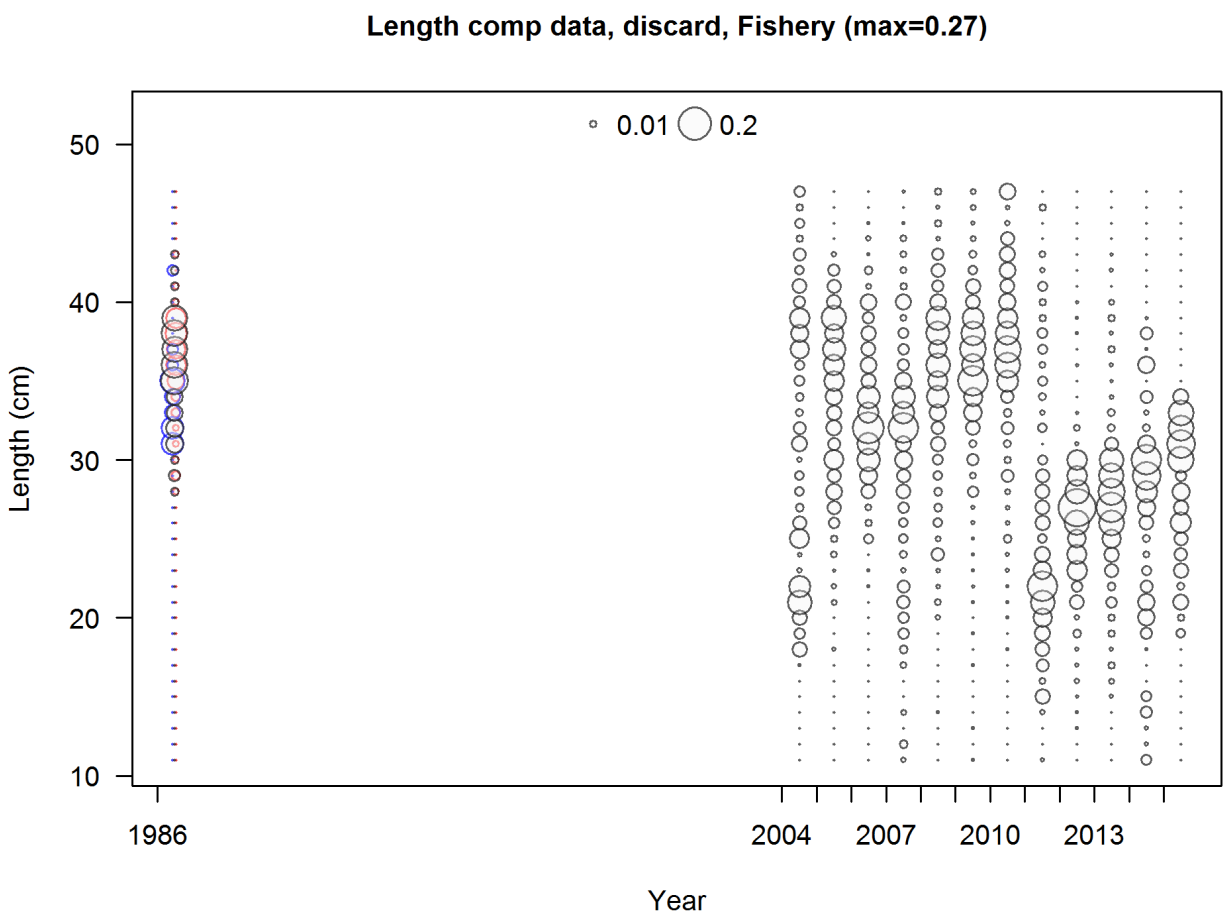
Fishery length data used in the 2017 assessment:

- Fishery: bottom trawl, mid-water trawl, fixed gear
  - Retained Lengths 1966-2016
  - Discarded Lengths 1986 (Pikitch), 2004-2015
- At-sea hake fishery
  - All (Retained and Discarded) Lengths 2003-2016

Fishery Lengths: Retained



Fishery Lengths: Discarded



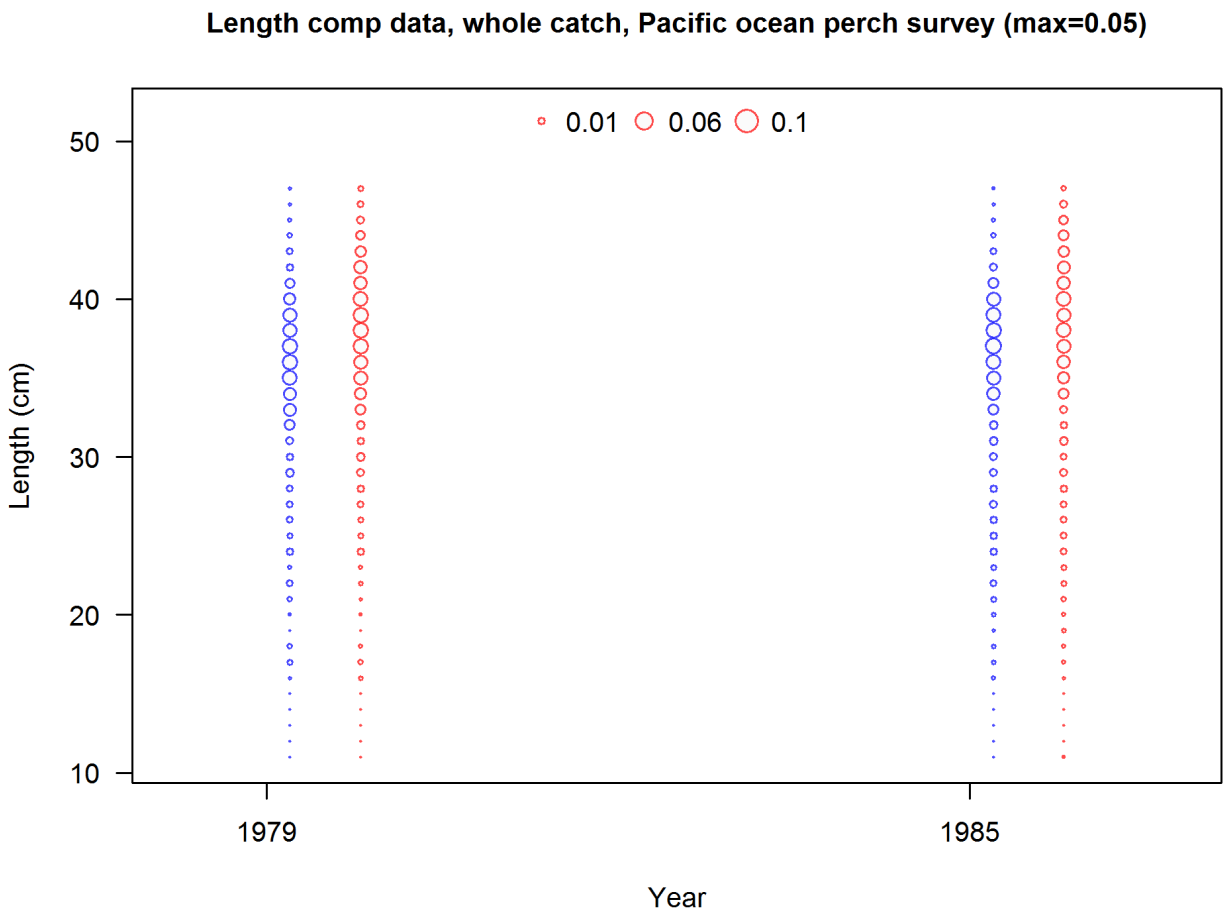
At-sea hake lengths

Survey Length Data

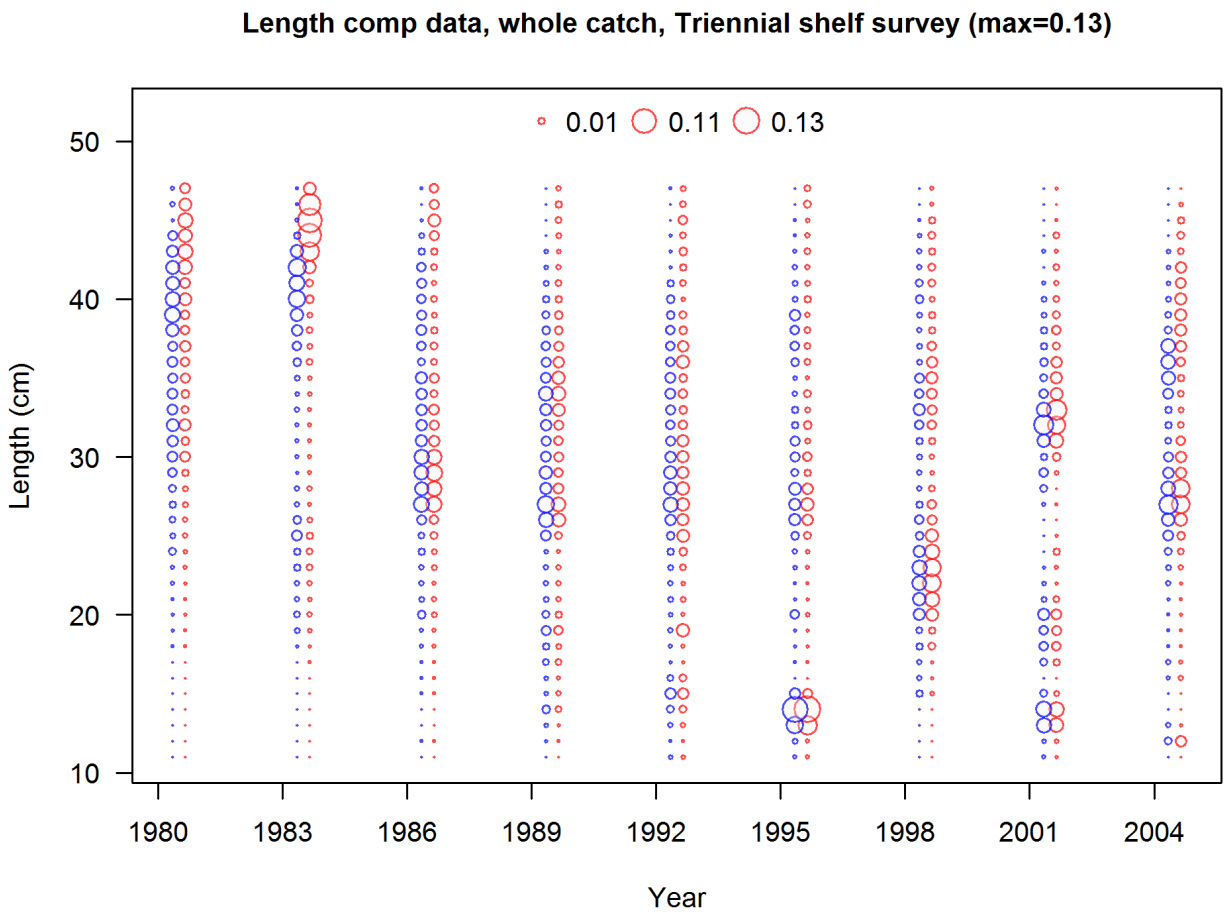
Survey length data used in the 2017 assessment:

- Pacific ocean perch survey
  - 1979 and 1985
- Triennial shelf survey
  - 1980, 1983, 1986, 1989, 1992, 1995, 1998, 2001, 2004
- AFSC slope survey
  - 1996, 1997, 1999-2001
- NWFSC slope survey
  - 2001 and 2002
- NWFSC shelf-slope survey
  - 2003-2016

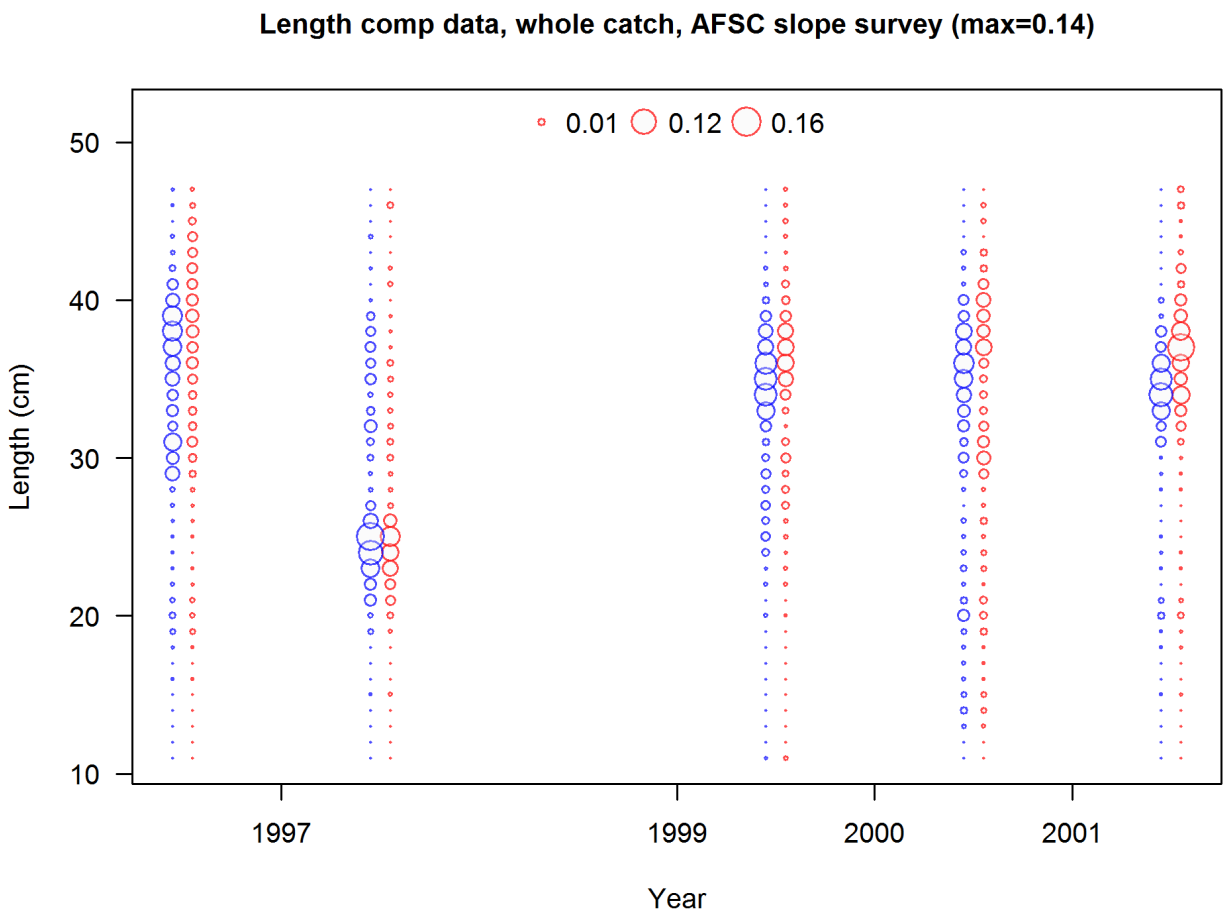
Pacific ocean perch survey lengths



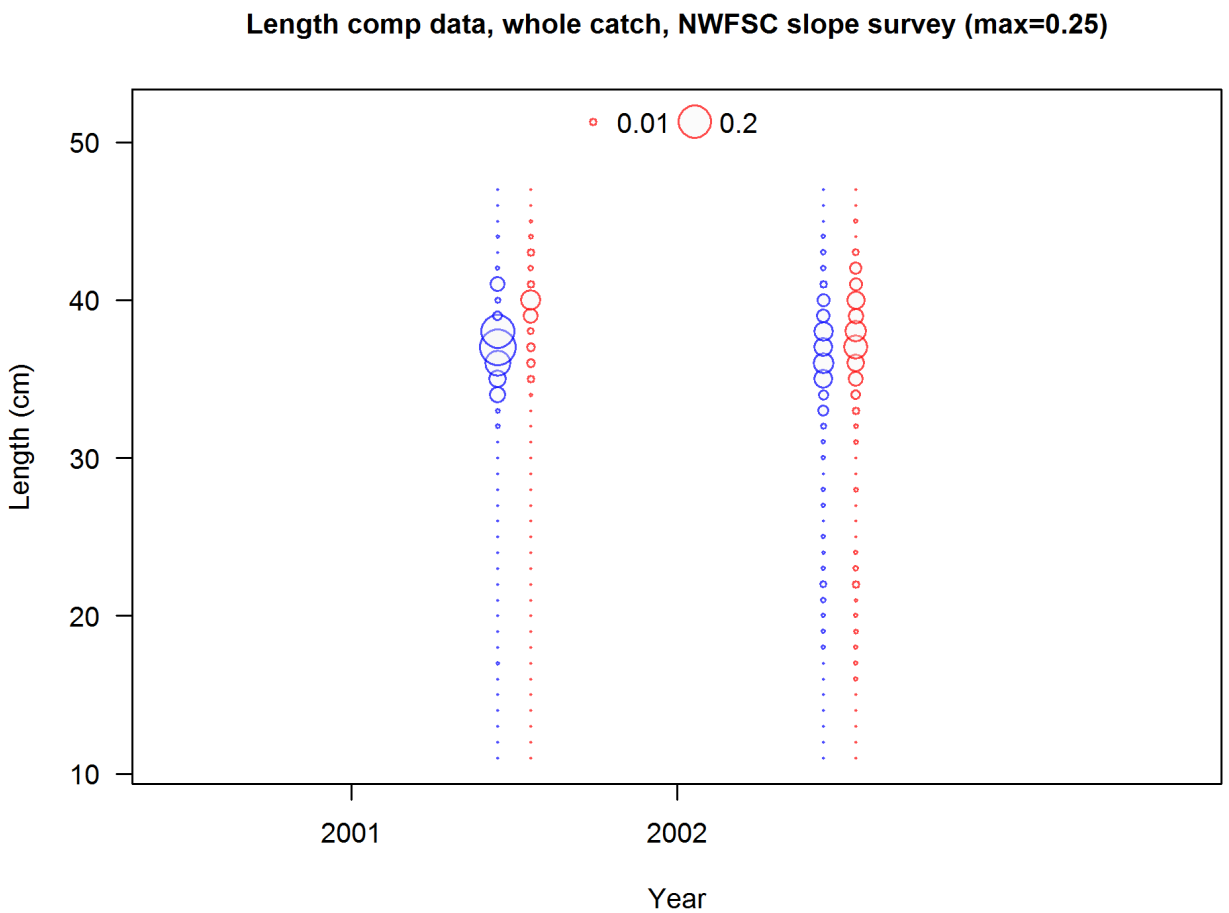
Triennial shelf survey lengths



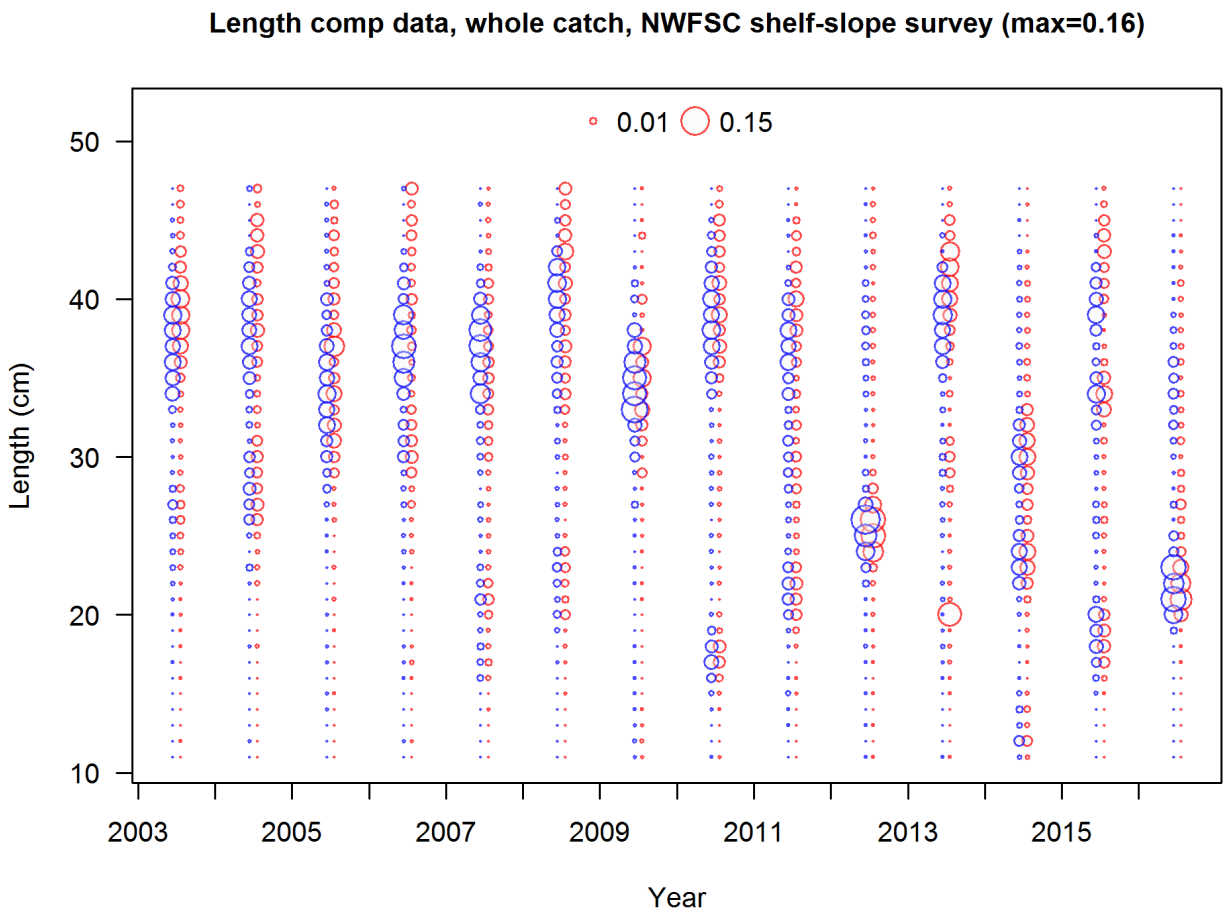
AFSC slope survey lengths



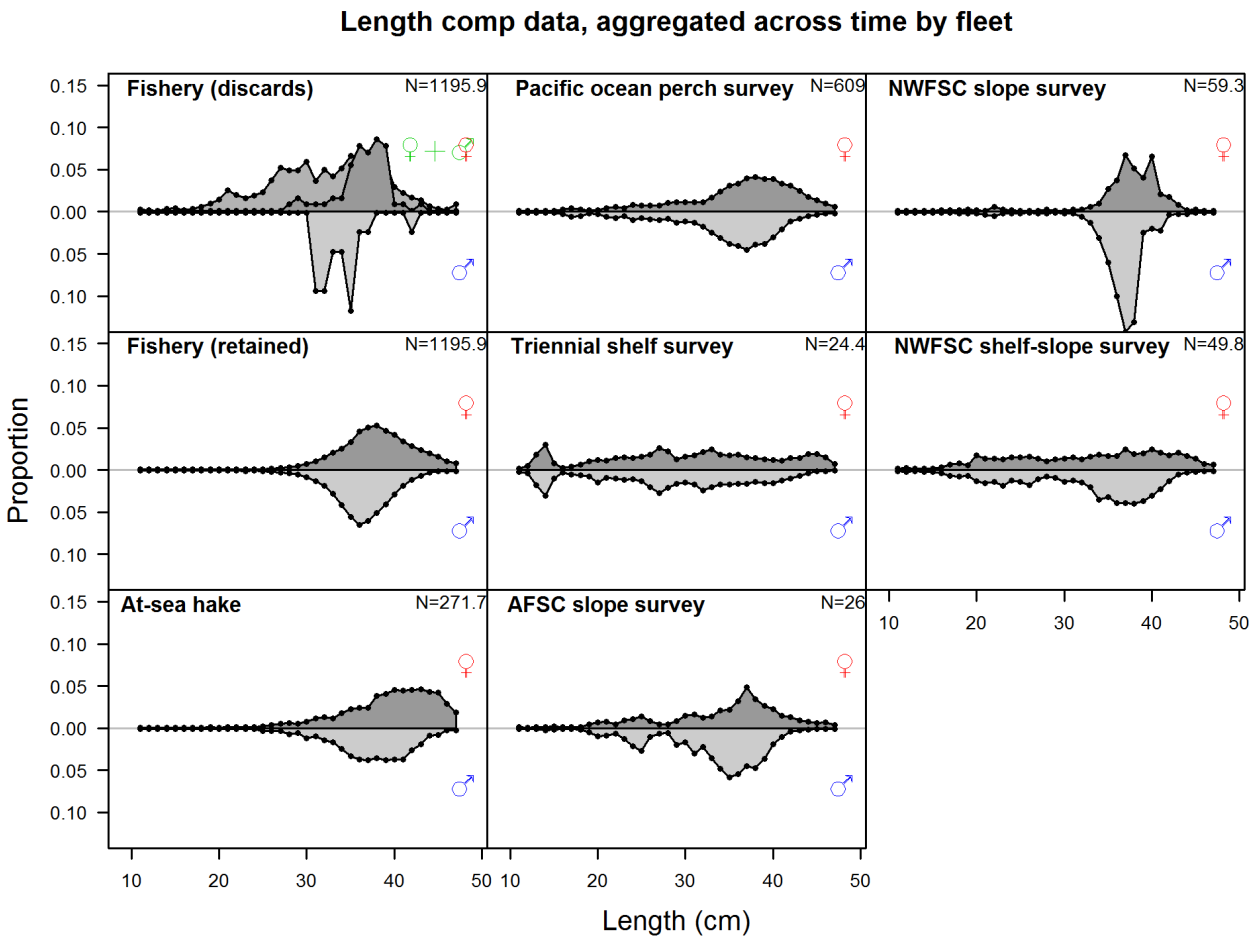
NWFSC slope survey lengths



NWFSC shelf-slope survey lengths



Aggregated lengths by source



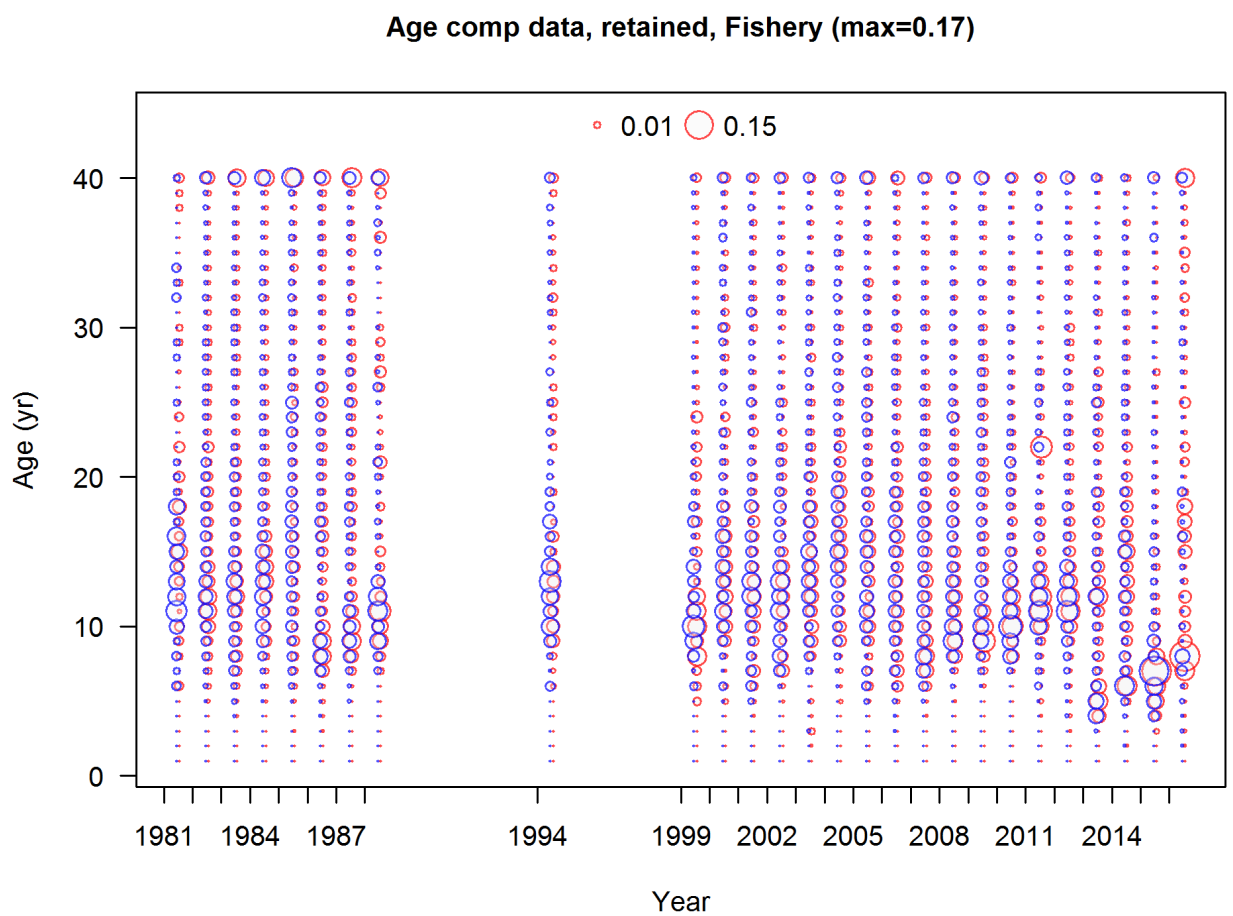
Outline

Fishery Age Data

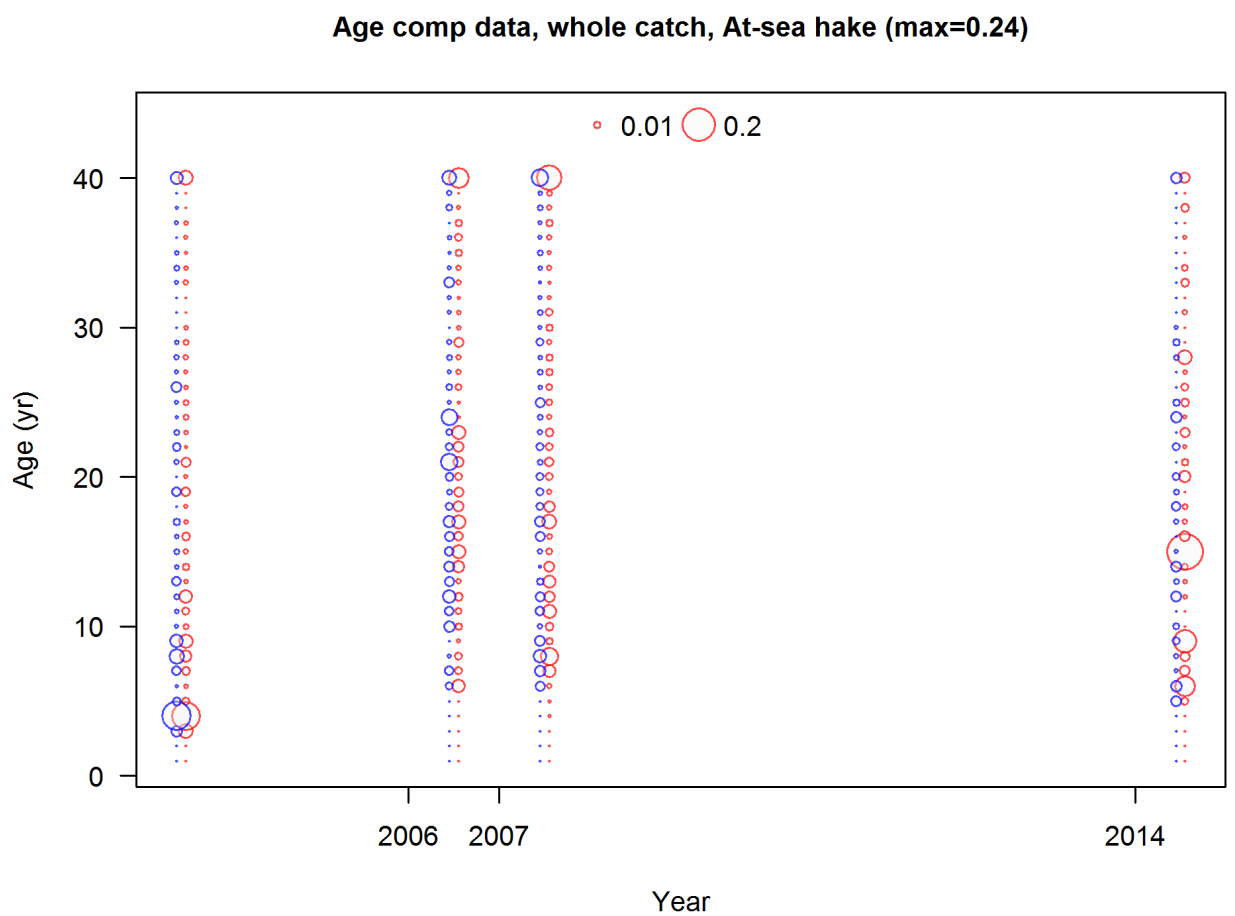
Fishery age data used in the 2017 assessment:

- Fishery: bottom trawl, mid-water trawl, fixed gear
  - 1981-1988, 1994, 1999-2016
- At-sea hake fishery
  - 2003, 2006, 2007, 2014

Fishery Ages



At-sea hake Ages

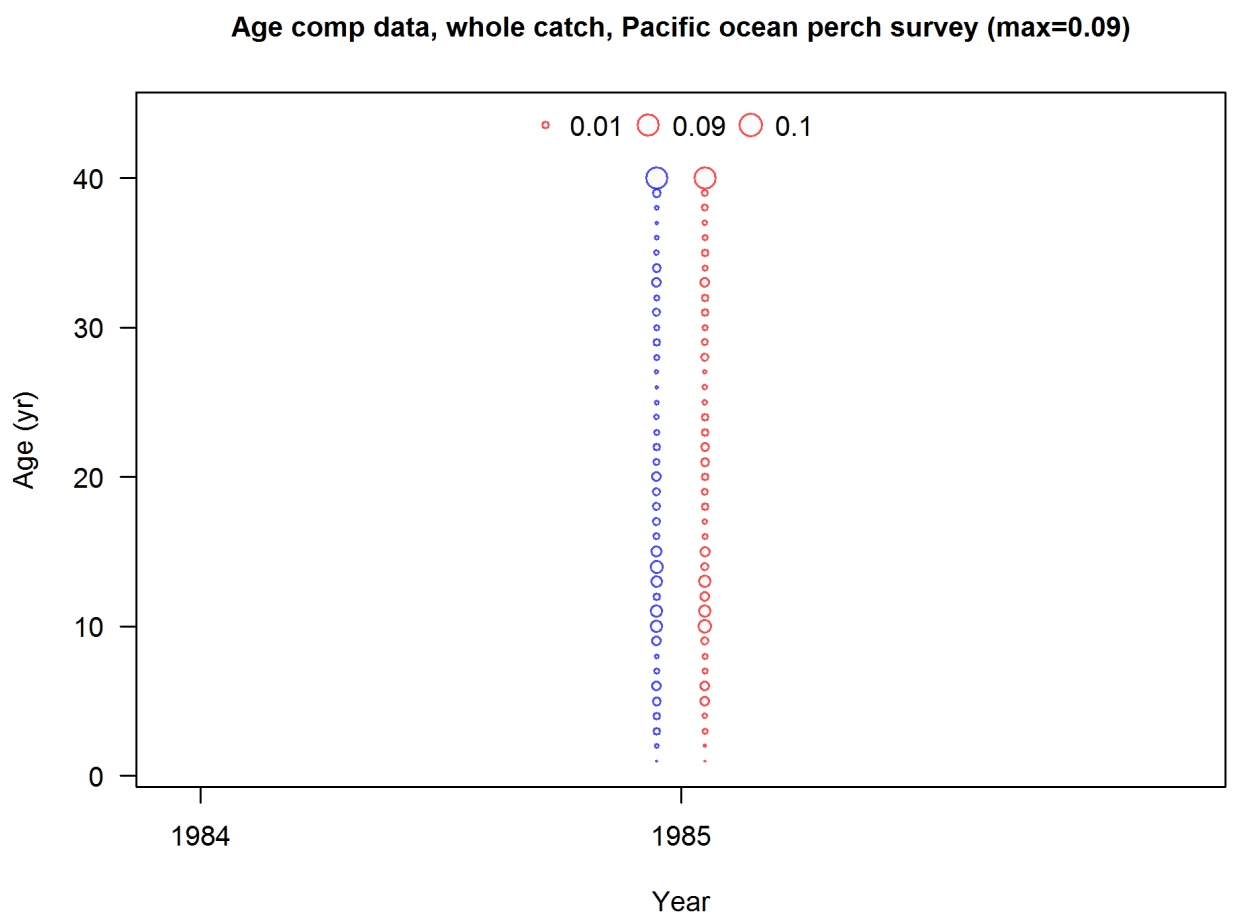


Survey Age Data

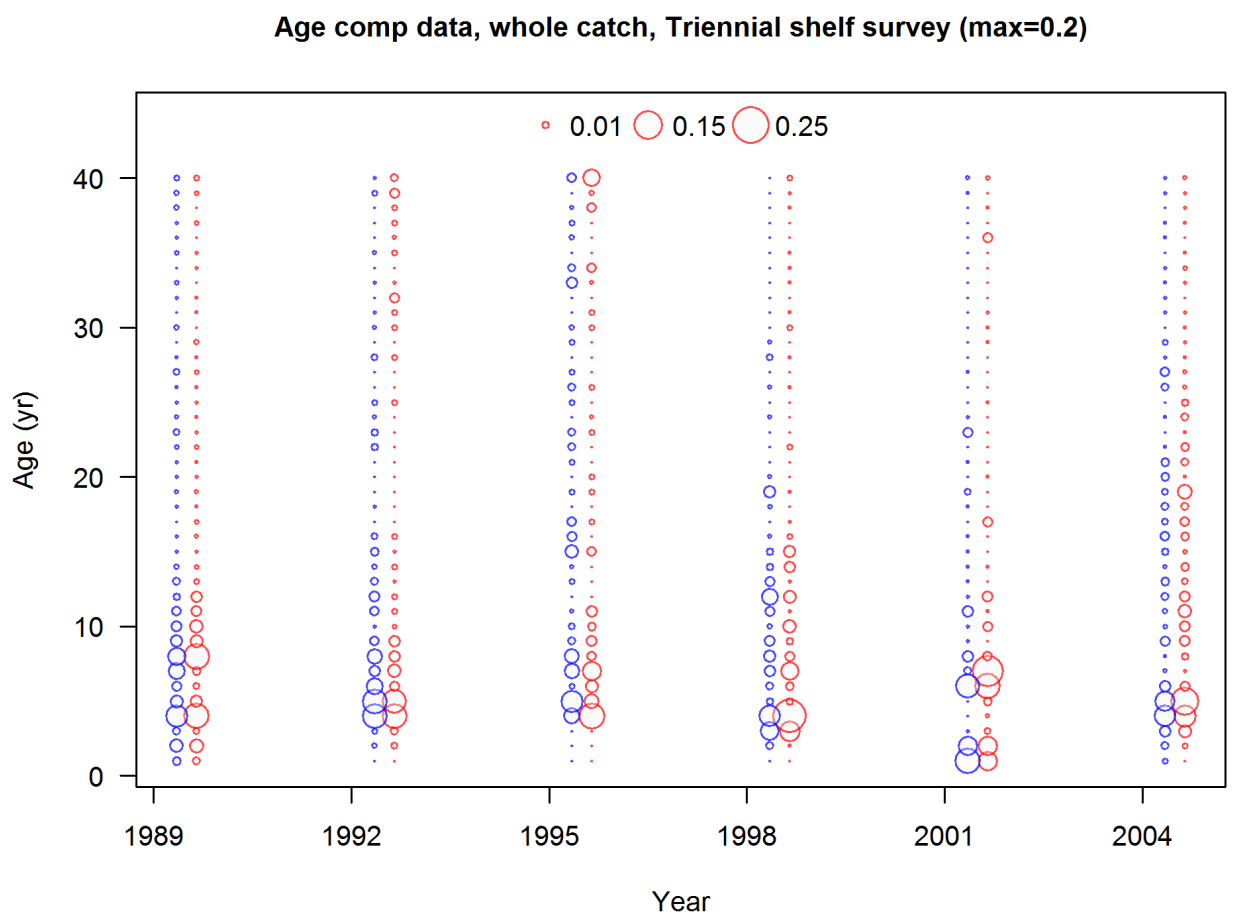
Survey age data used in the 2017 assessment:

- Pacific ocean perch survey
  - 1985
- Triennial shelf survey
  - 1989, 1992, 1995, 1998, 2001, 2004
- NWFSC slope survey
  - 2001 and 2002
- NWFSC shelf-slope survey
  - 2003-2016

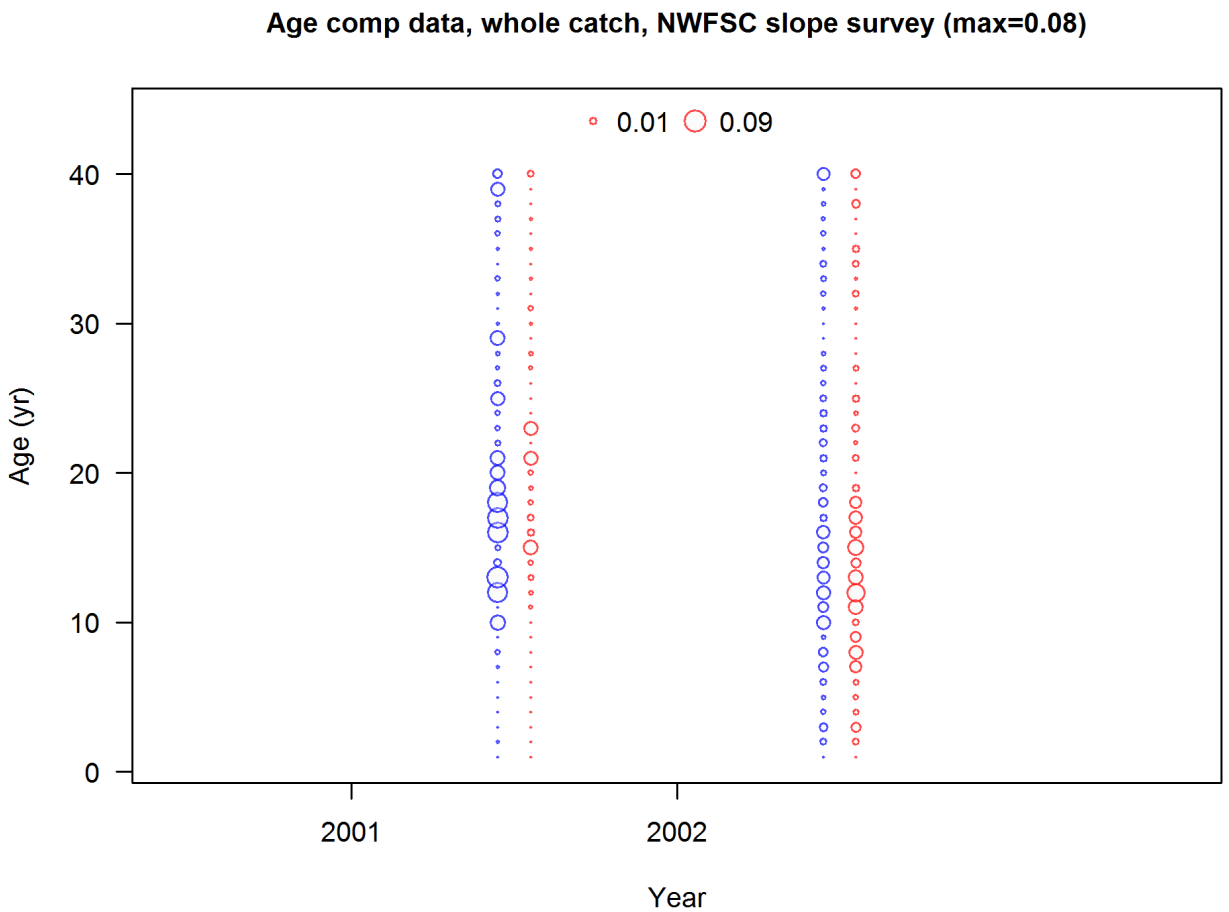
Pacific ocean perch ages



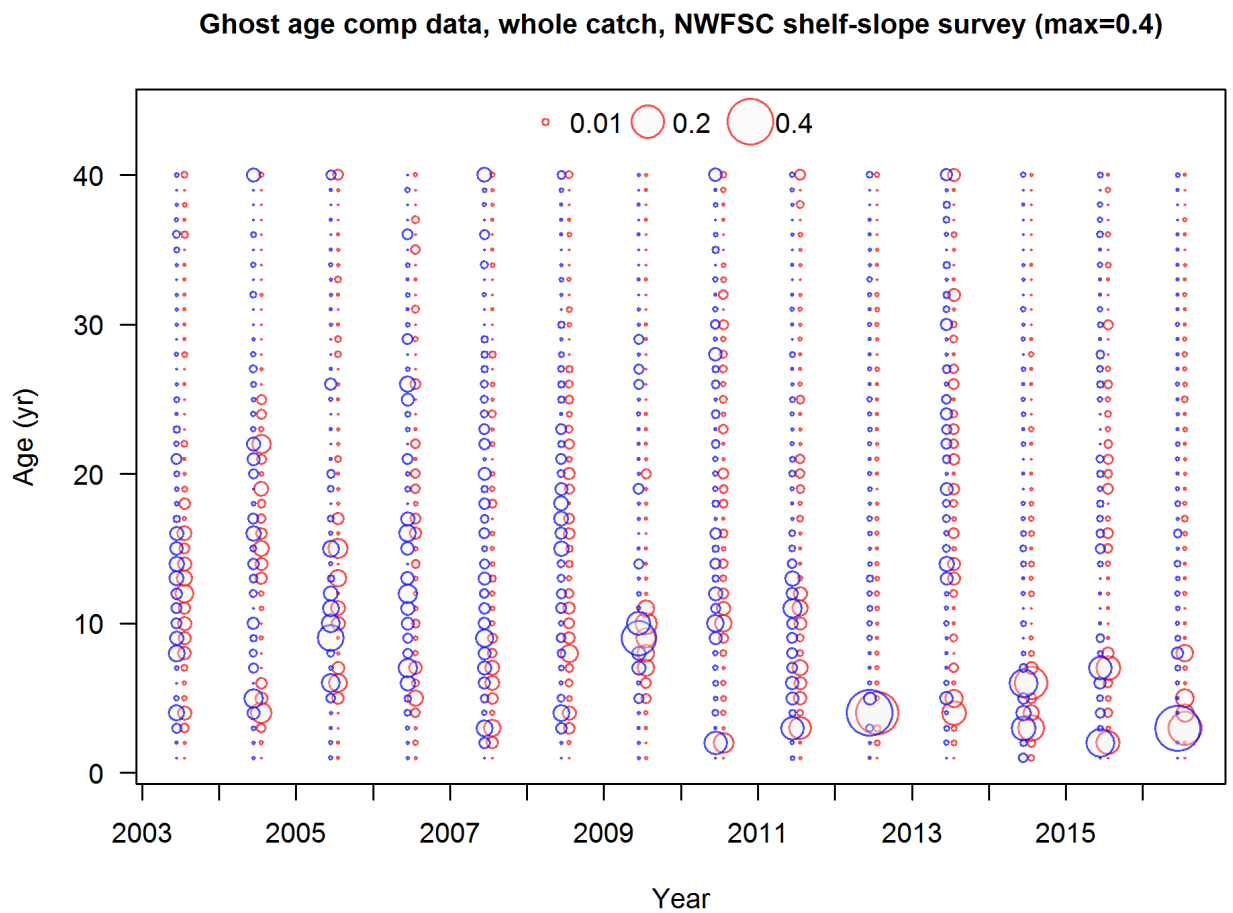
Triennial shelf survey ages



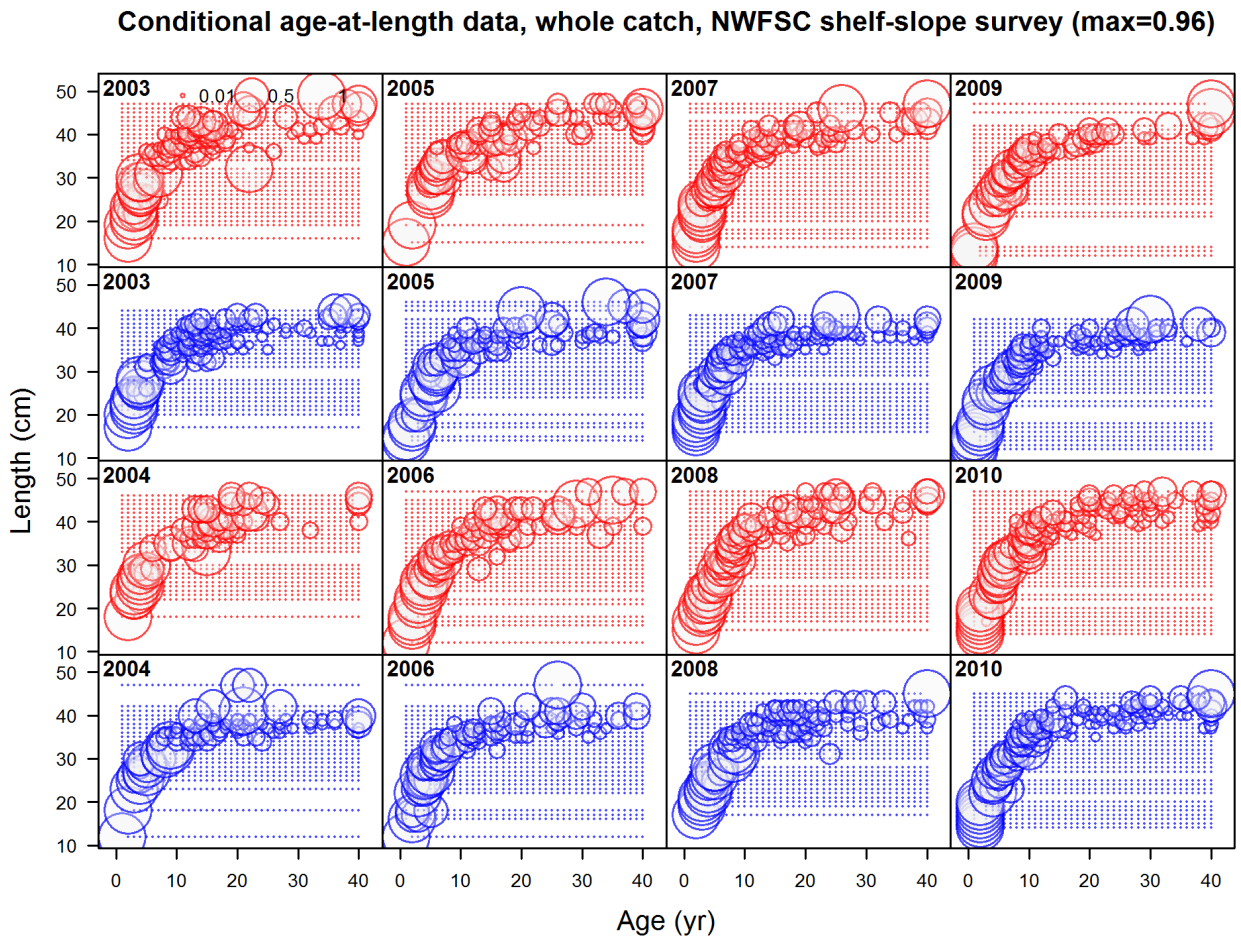
NWFSC slope ages



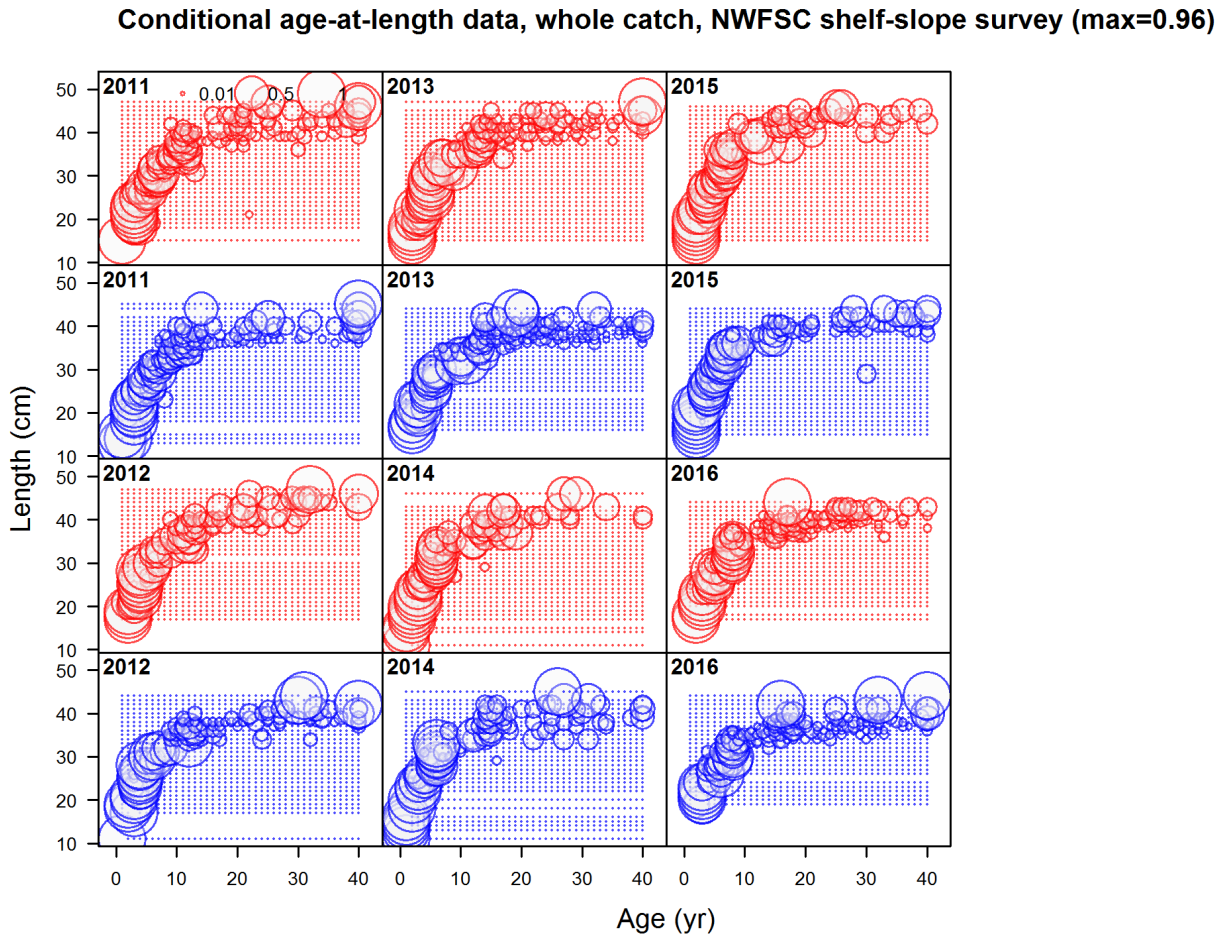
NWFSC shelf-slope ages - marginal view



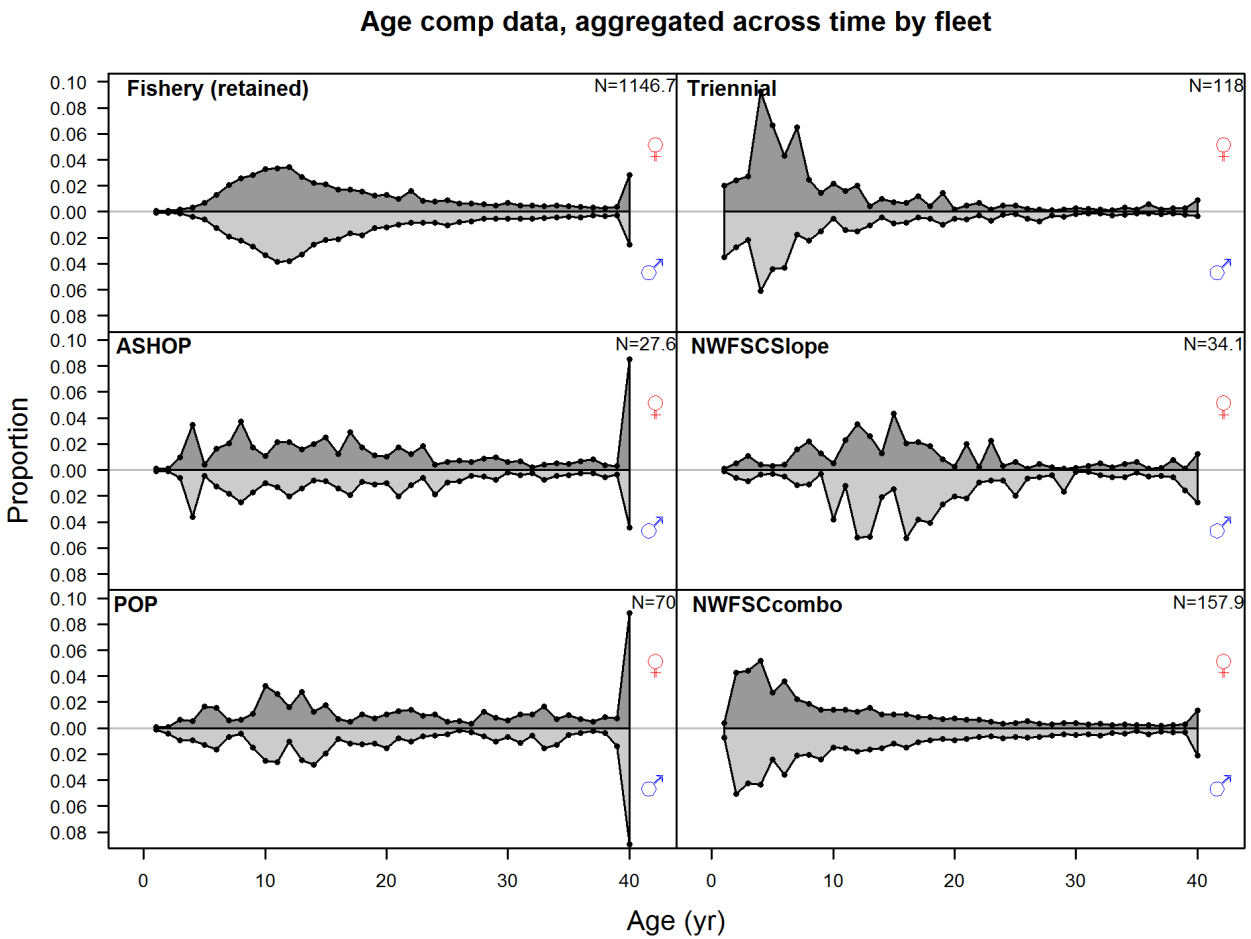
NWFSC shelf-slope conditional age-at-length



NWFSC shelf-slope conditional age-at-length



Aggregated Ages by Source



Estimated Ageing Error: Curvilinear without bias