Pacific ocean perch 2017 Assessment
Biology and Data

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STAR Panel
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Outline

Model Summary
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Biology
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Removals
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Indices of Abundance
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Composition Data
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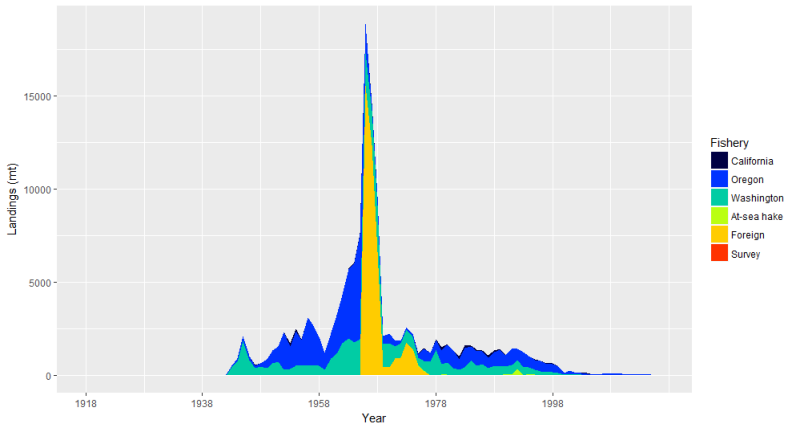
Landings

| Year	CA	OR	WA	At-sea hake	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

Approximately 70% of the landings are from Oregon.
Vast majority of landings are from bottom-trawl gear.
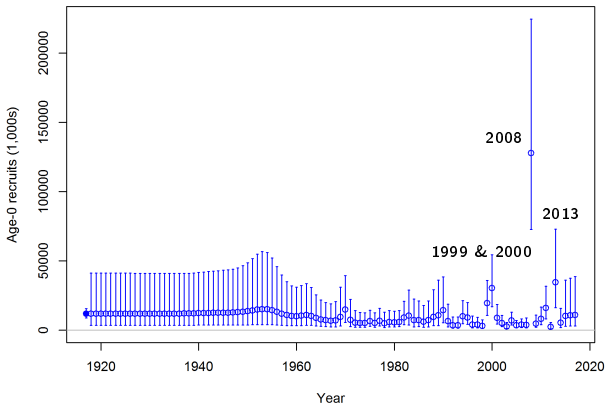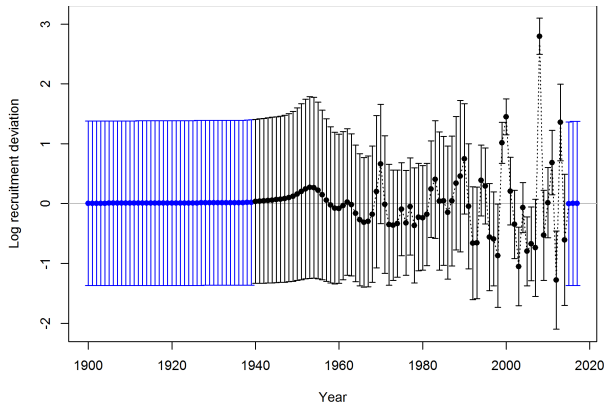
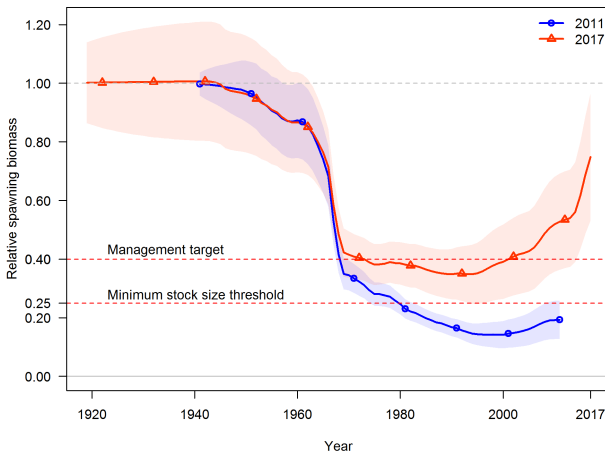# Spawning Output
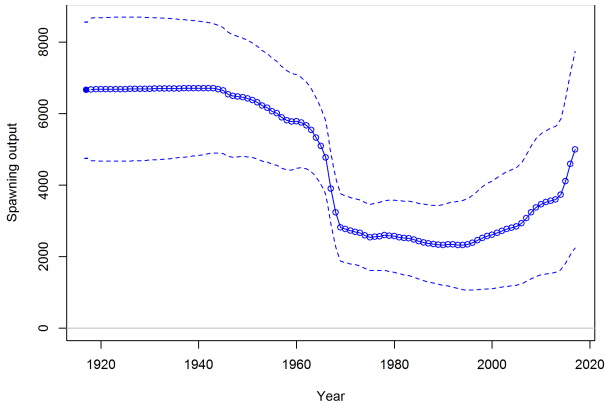
Relative Depletion
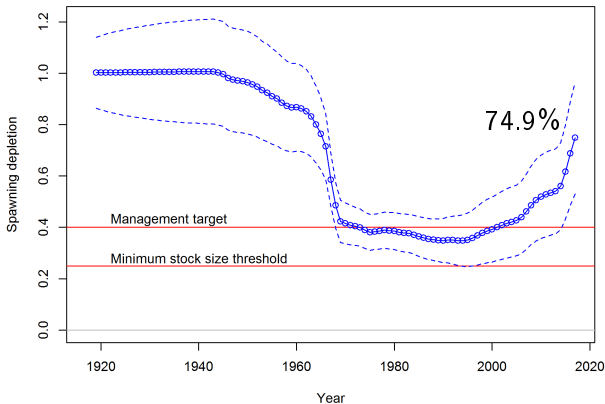
Estimated Annual Recruitment

Estimated Annual Recruitment Deviations

## Comparison between 2011 and 2017

Major Changes Between the Previous and Current Assessment
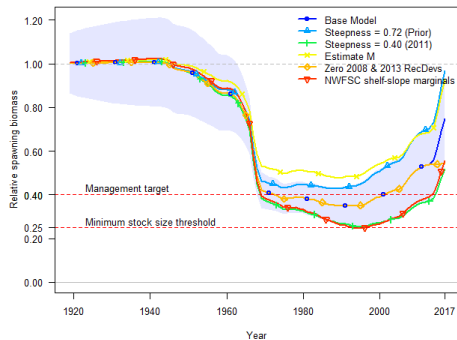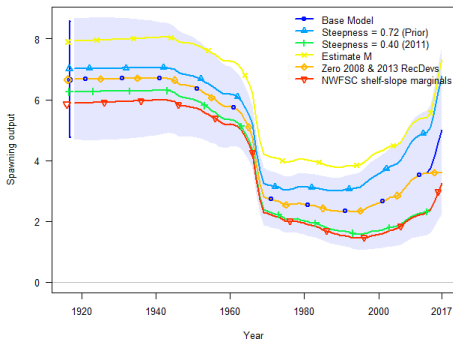
- Steepness
- Natural Mortality
- Landing History
- Maturity and Fecundity
- Fleet and Survey Selectivities

2011 Model Data "Update"

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

Model Summary
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Indices of Abundance
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Composition Data
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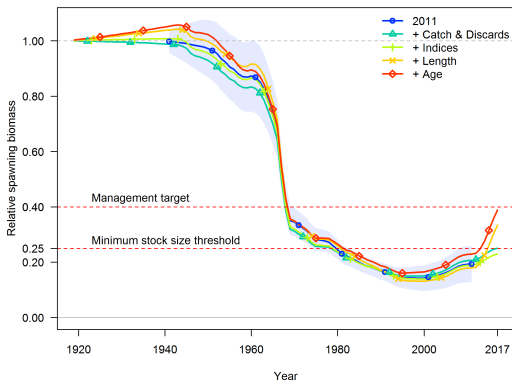
2017 Base Model Sensitivities

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.

Outline

Pacific ocean perch (*Sebastes alutus*)

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

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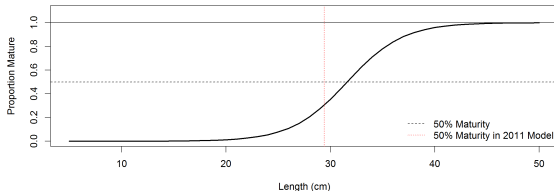
Maturity

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
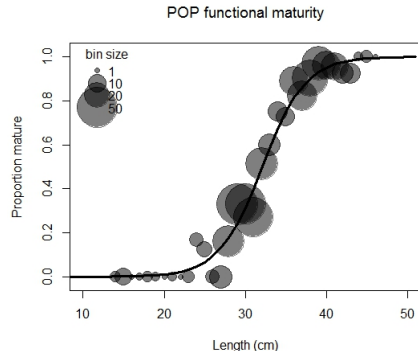
POP functional maturity

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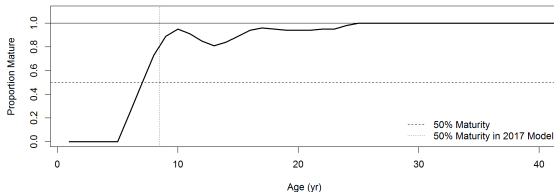
*Sensitivity to assumed maturity shown to not have a large impact on results

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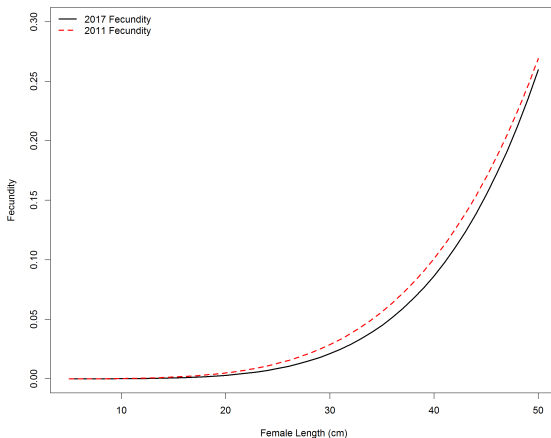
*Sensitivity to assumed fecundity shown to not have a large impact on results

Weight-at-length
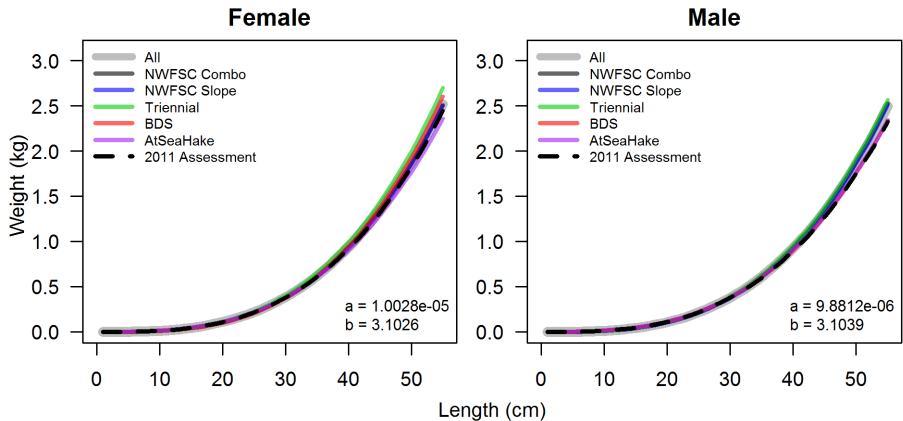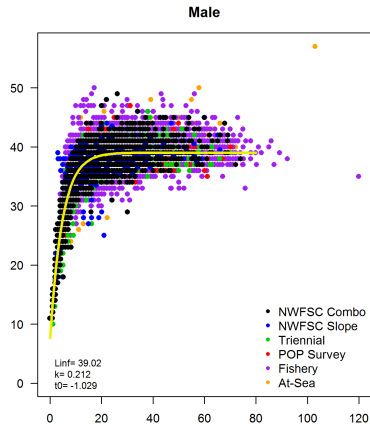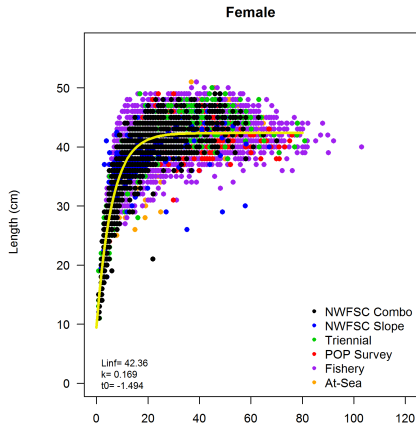
Length-at-age

Observed Ages

- Oldest age: 120 by the fishery (2007)
- Next oldest fish range from 90-103 collected by the fishery or the at-sea hake fishery between 1981-2010
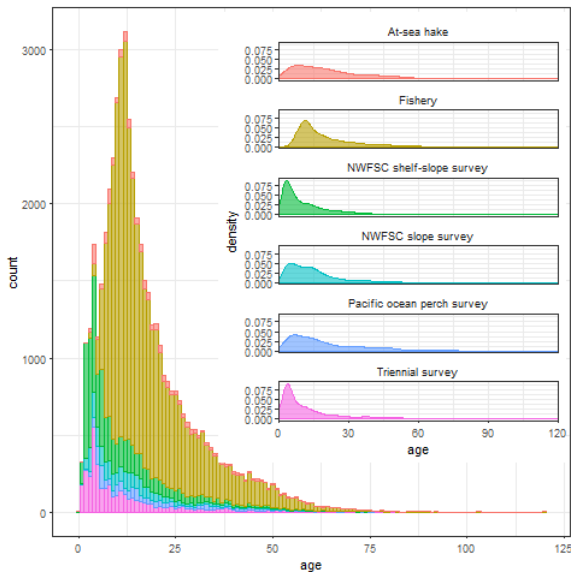
Data Summary Used in the 2017 Assessment

Data by type and year
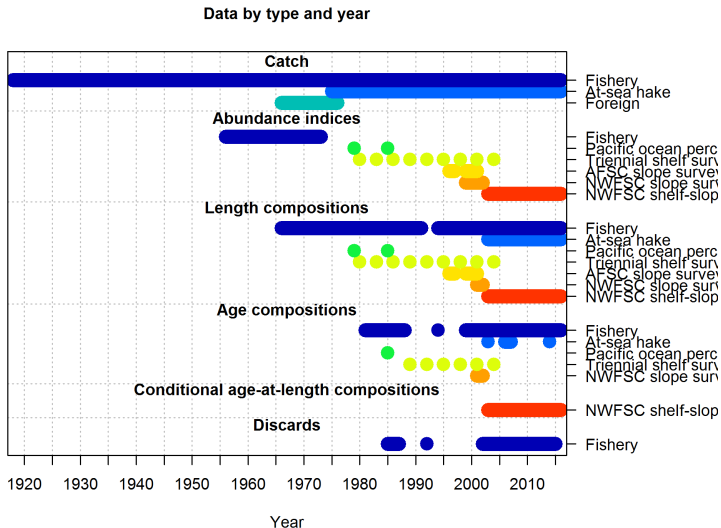
Outline

Model Summary

Biology

Removals

Landing history by state
Discarding practices

Indices of Abundance

Composition Data

Landings Data: 2017 vs. 2011

Model Summary
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Biology
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Removals
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Indices of Abundance
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Composition Data
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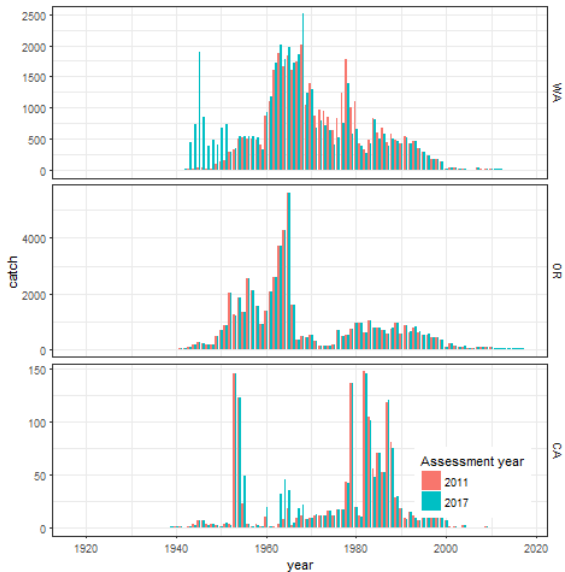
Cummalative catch difference
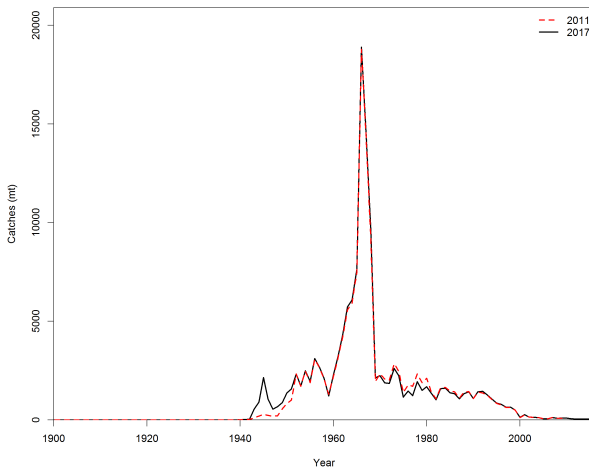
*Resulted in $< 1\%$ change in $R0$

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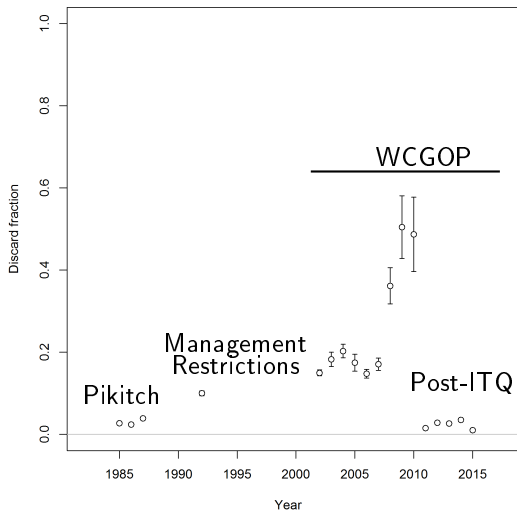
* Sensitivities done on the 1992 data point (high vs. low) results $\pm$ 0.5% in status.

Outline

CPUE

Index Fishery

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

Survey Indices

All: standardized

Outline

Fishery Length and Age 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
  - Ages: 1981-1988, 1994, 1999-2016
- At-sea hake fishery
  - All (Retained and Discarded) Lengths: 2003-2016
  - Ages: 2003, 2006, 2007, 2014

Fishery Lengths: Discarded

Length comp data, discard, Fishery (max=0.27)
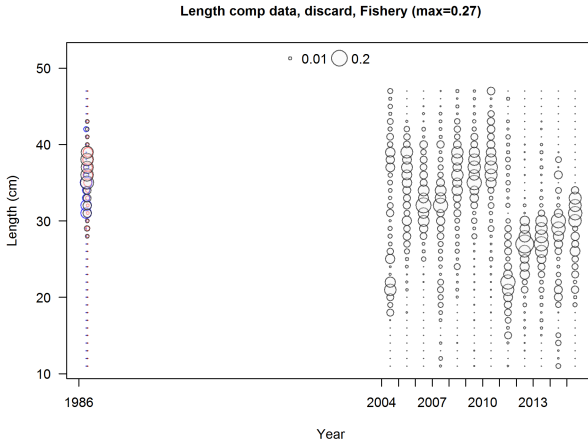
Fishery Lengths and Ages: Retained
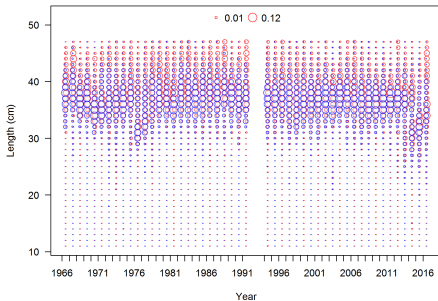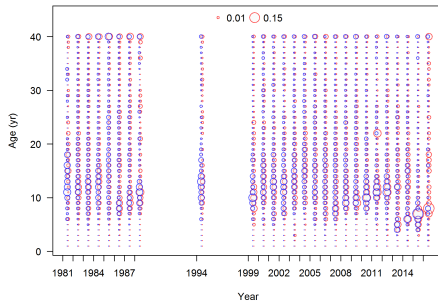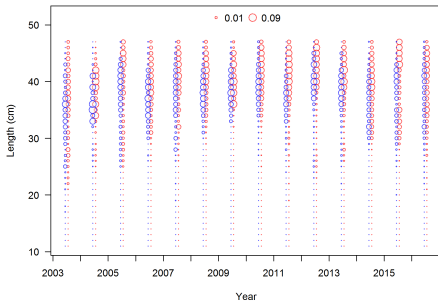
At-sea hake
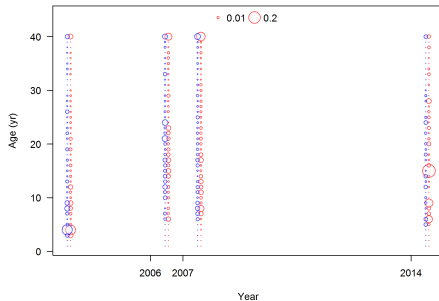
Survey Length Data

Survey length data used in the 2017 assessment:

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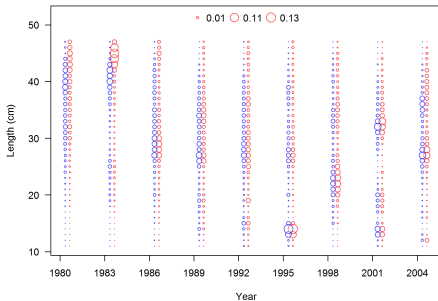
Pacific ocean perch survey lengths

Triennial shelf survey
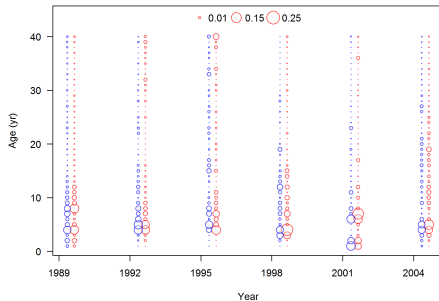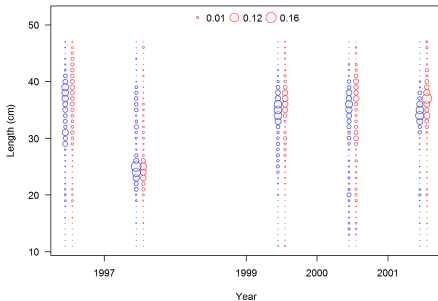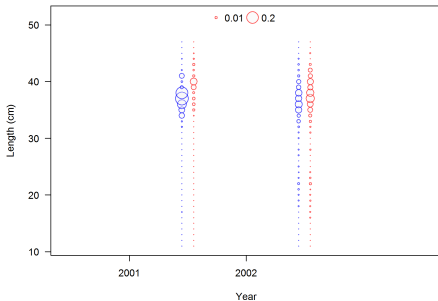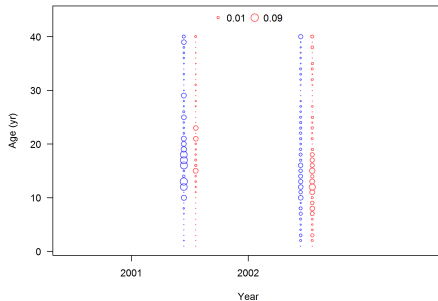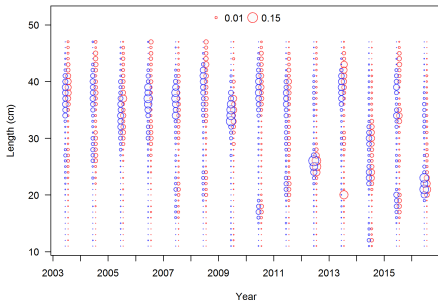
AFSC slope survey

NWFSC slope survey

NWFSC shelf-slope survey
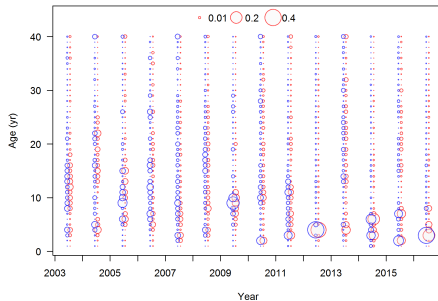
NWFSC shelf-slope conditional age-at-length
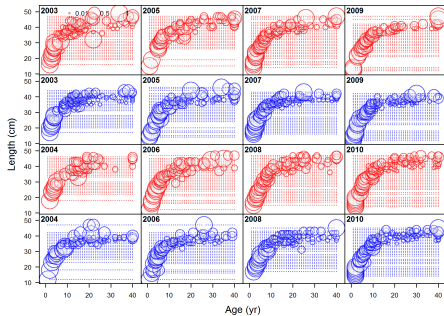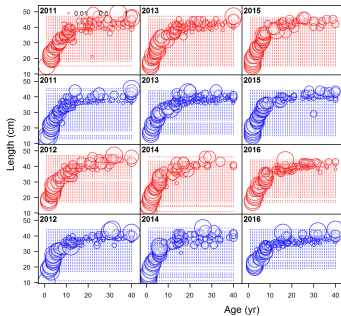
Aggregated data by source
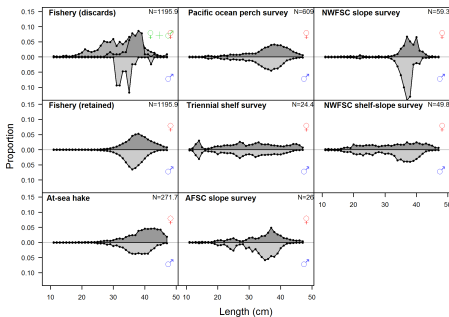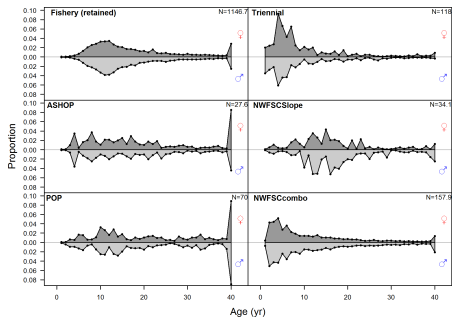
Estimated Ageing Error: Curvilinear without bias