Pacific ocean perch 2017 Assessment
Biology and Data

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STAR Panel
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Outline
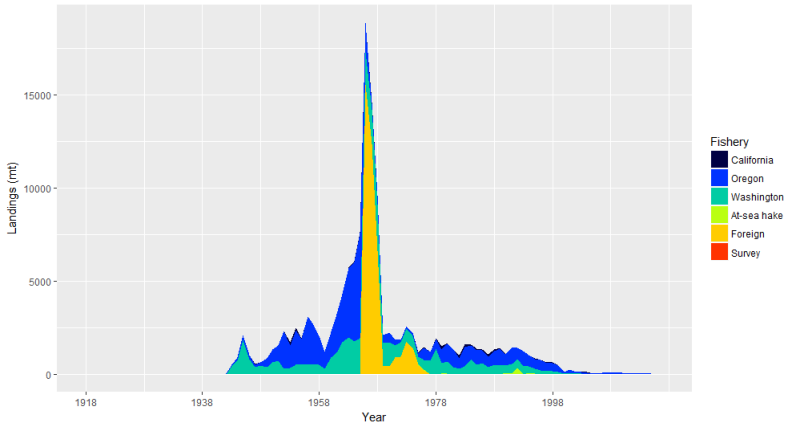
Landings

| 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
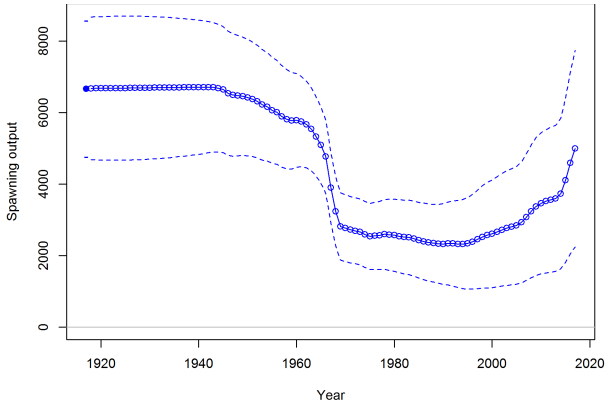
Relative Biomass
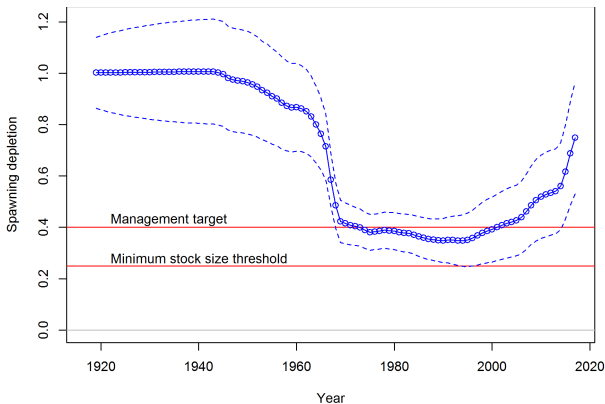
Estimated Annual Recruitment
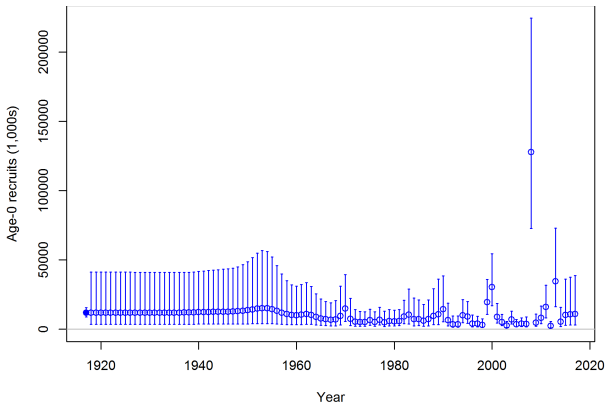
Estimated Annual Recruitment Deviations
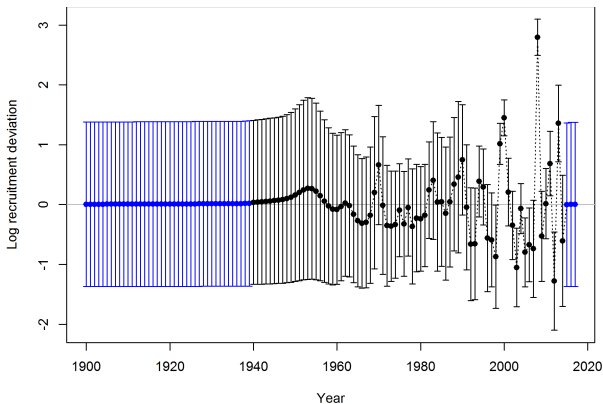
- Steepness - fixed at 0.50 within the base model. Likelihood profile over steepness indicates no information in data concerning steepness. Fixing the value at the steepness prior value of 0.718 results in stock status 97% of unfished.

- 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 in 2008 and 2013 - The 2008 data point is relatively certain within the model but an order of magnitude higher than any other year. Early indications of a strong 2013 recruitment (model is currently underfitting).

Model Summary
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Biology
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Removals
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Indices of Abundance
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Length Compositions
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Age Compositions
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figures

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 celss
- 50% maturity is at larger lengths vs. biological maturity
- functional 50% = 32.1 cm vs. biological 50% = 30.1 cm
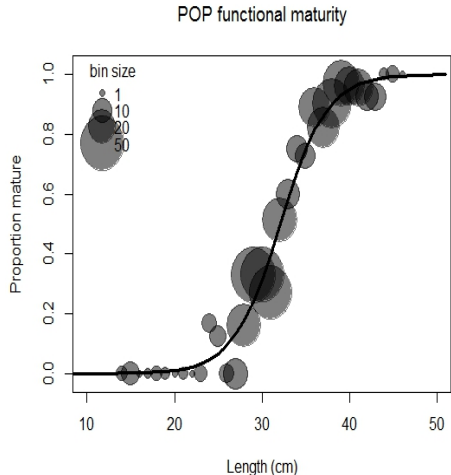
POP functional maturity

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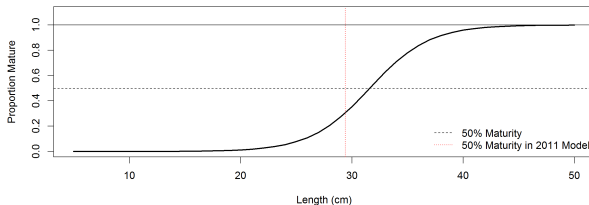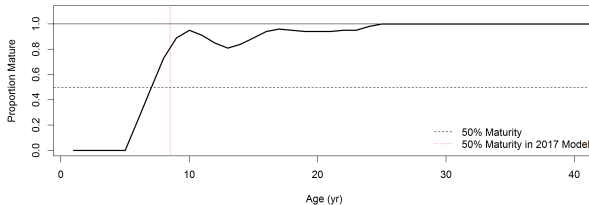
*Sensitivity assumed maturity shown to not have a large impact on results

Fecundity
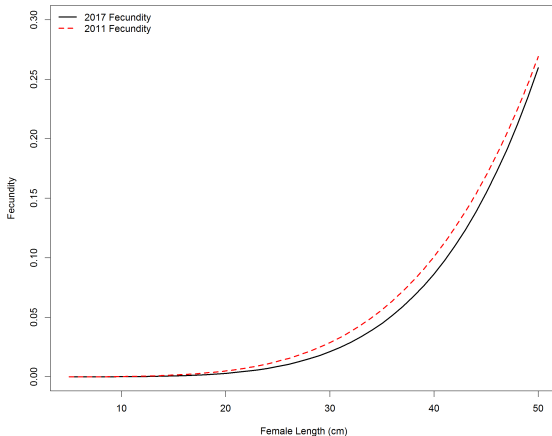
*Sensitivity to assumed fecundity shown to not have a large impact on results
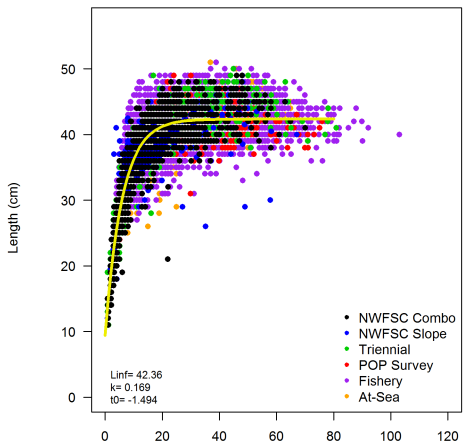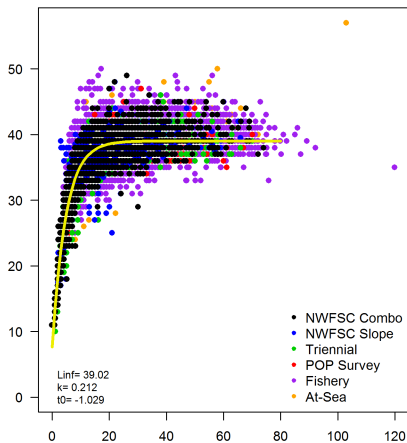
Weight-at-length
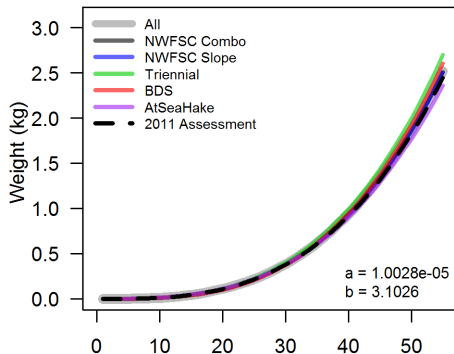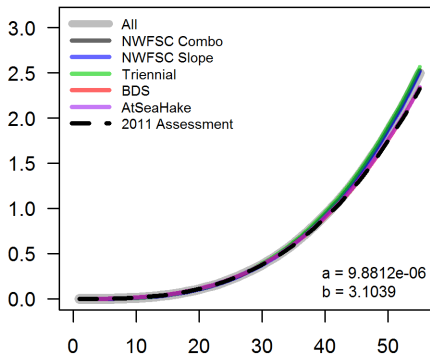
Length-at-age
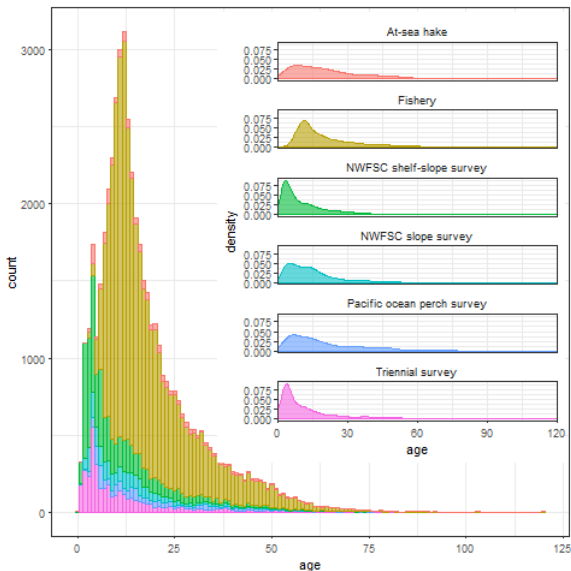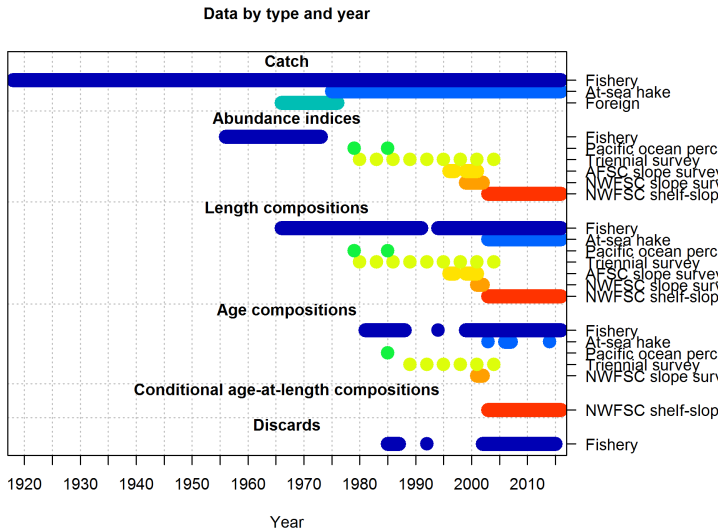
Observed Ages

- 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

Data by type and year

Outline

Discarding practices

Model Summary

Indices of Abundance

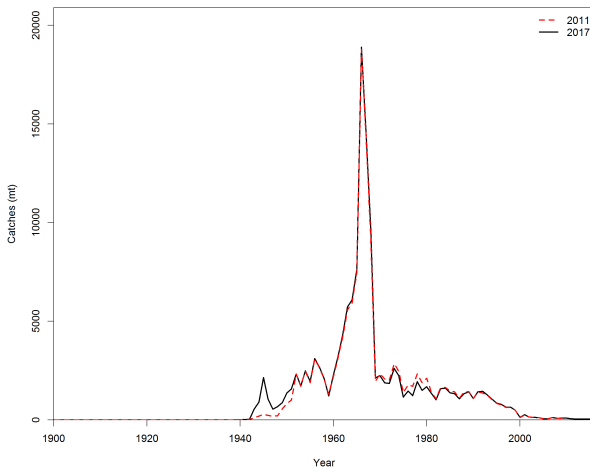Biology

Length Compositions

Removals
  Landing history by state

Age Compositions

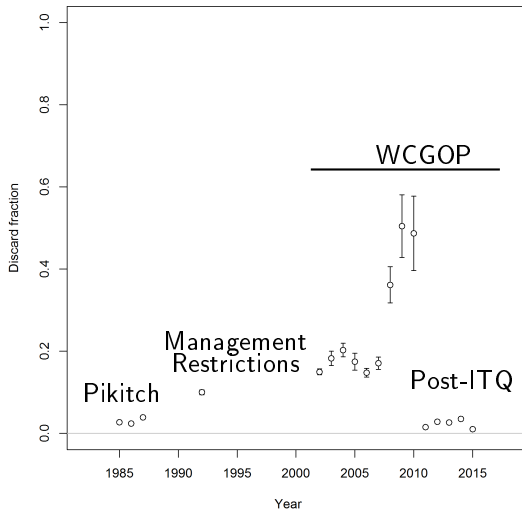# Landings Data: 2017 vs. 2011
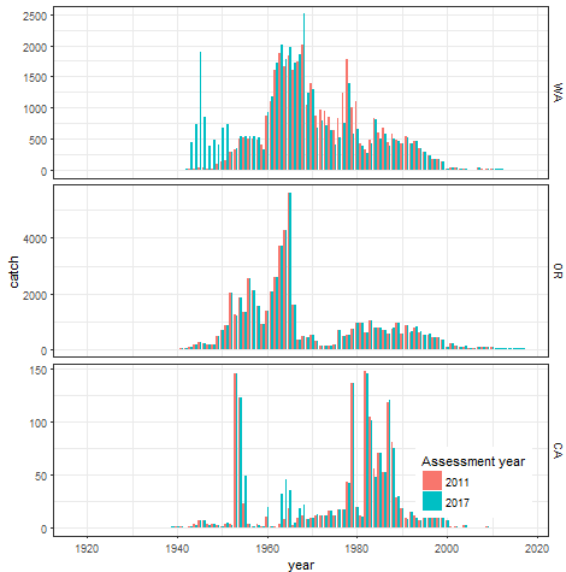
Cummalative catch difference

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

Fishery Discard Data

Outline

Model Summary

Biology

Removals

Indices of Abundance
  Fishery CPUE
  Survey Indices

Length Compositions

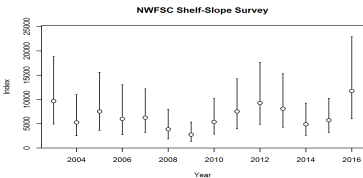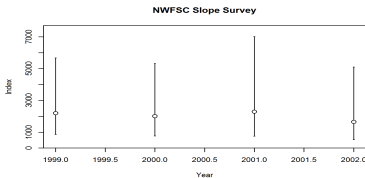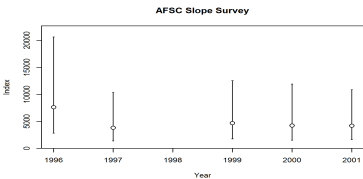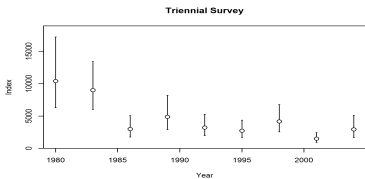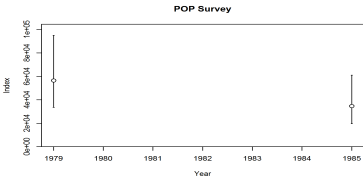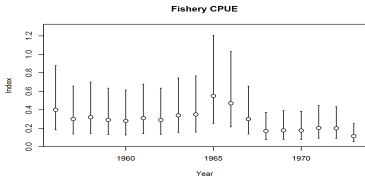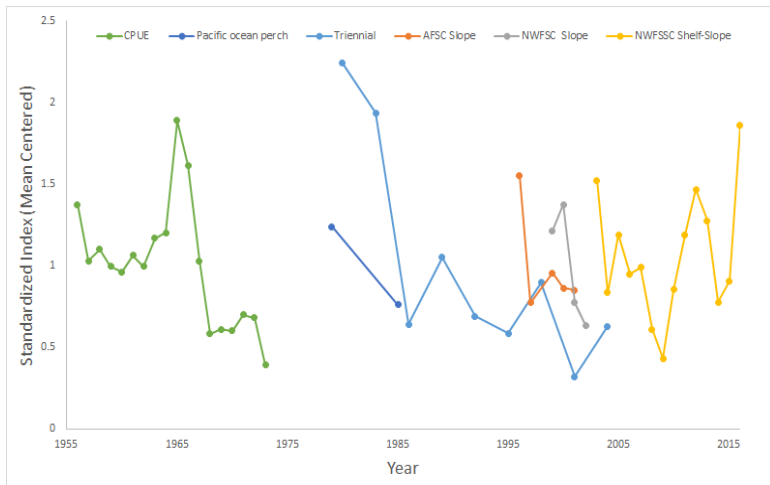Age Compositions

CPUE

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

Survey Indices
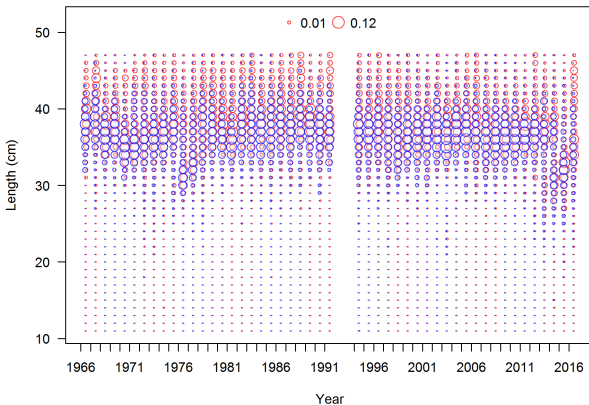
All: standardized

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
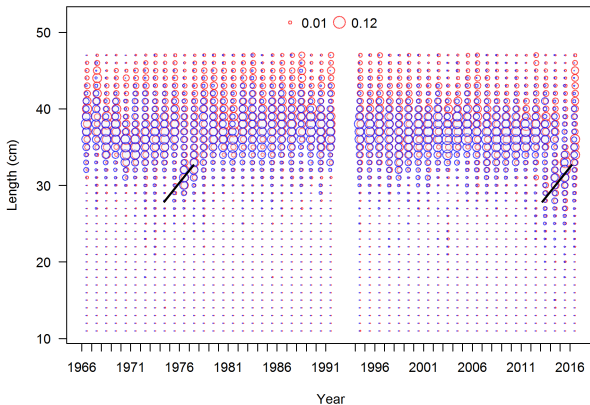 - All (Retained and Discarded) Lengths 2003-2016

Fishery Lengths: Retained
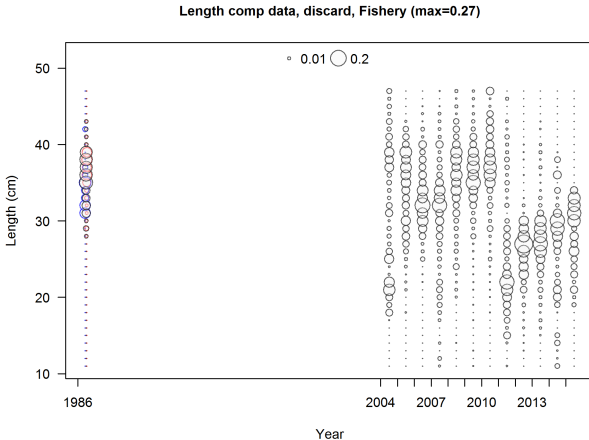

Length comp data, retained, Fishery (max=0.13)

Fishery Lengths: Retained
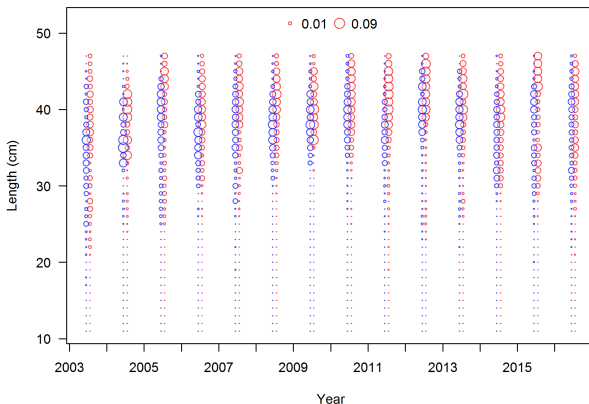

Length comp data, retained, Fishery (max=0.13)

Fishery Lengths: Discarded

Length comp data, discard, Fishery (max=0.27)

At-sea hake lengths

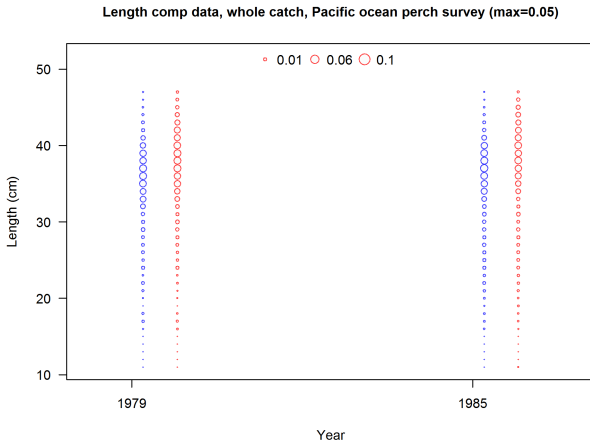Length comp data, whole catch, At-sea hake (max=0.08)

Survey Length Data

Survey length data used in the 2017 assessment:

- Pacific ocean perch survey
  - 1979 and 1985
- Triennial survey
  - 1980, 1983, 1896, 1989, 1992, 1995, 1998, 2001, 2004
- AFSC slope survey
  - 1996, 1997, 1999-2001
- NWFSC slope survey
  - 2001 and 2002
- NWFSC shelf-slope survey
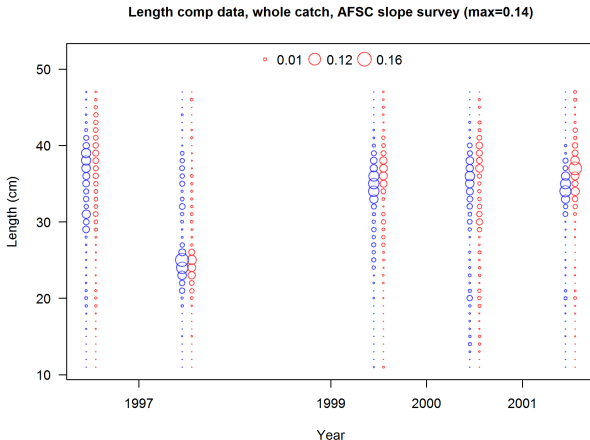 - 2003-2016

Pacific ocean perch survey lengths

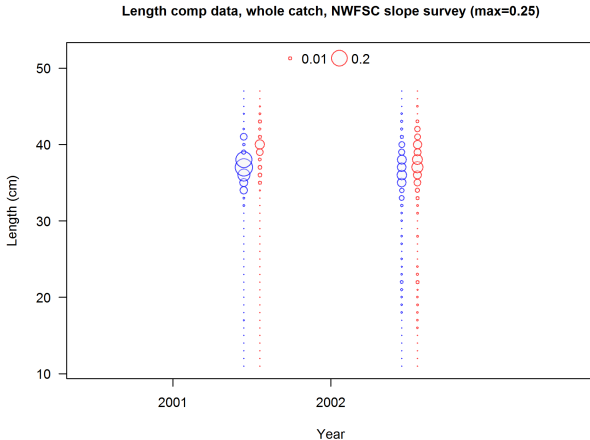Length comp data, whole catch, Pacific ocean perch survey (max=0.05)

Triennial survey lengths

Length comp data, whole catch, Triennial survey (max=0.13)

AFSC slope survey lengths

Length comp data, whole catch, AFSC slope survey (max=0.14)

NWFSC slope survey lengths
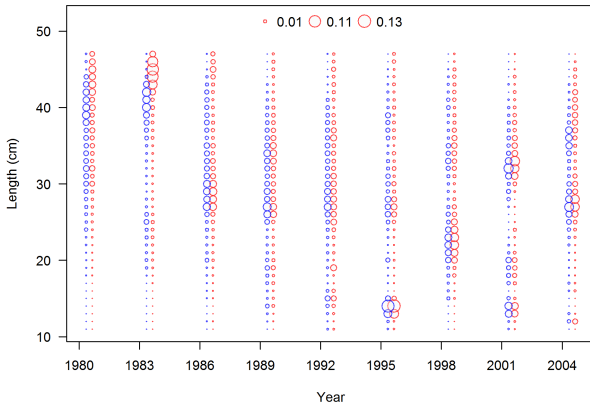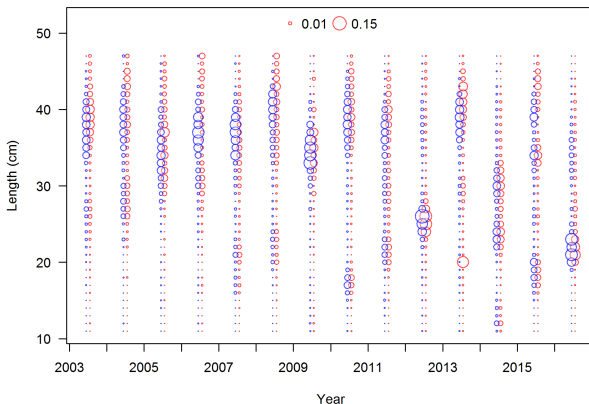

Length comp data, whole catch, NWFSC slope survey (max=0.25)

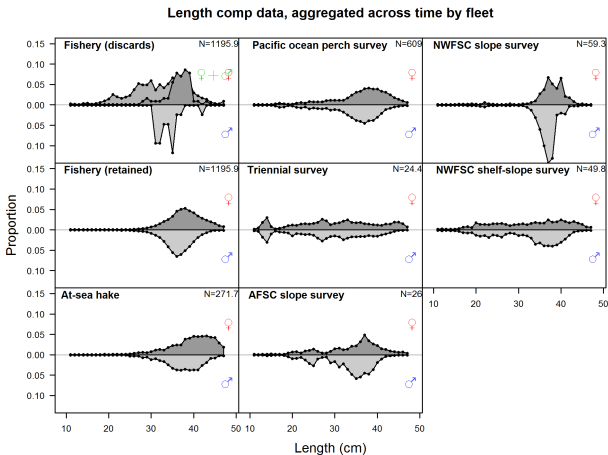# NWFSC shelf-slope survey lengths

Length comp data, whole catch, NWFSC shelf-slope survey (max=0.16)

Aggregated lengths by source


Length comp data, aggregated across time by fleet

Outline

Fishery Age Data
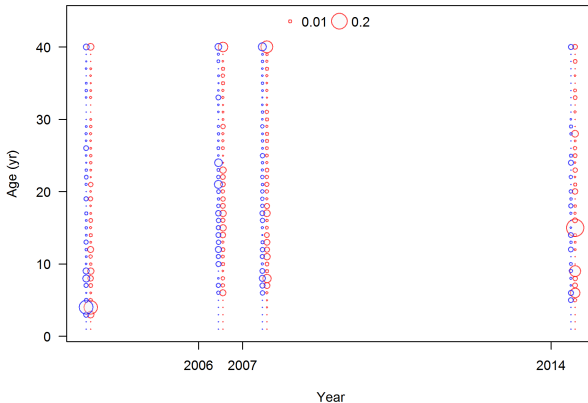
Fishery age data used in the 2017 assessment:

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

Fishery Ages

Age comp data, retained, Fishery (max=0.17)

Model Summary
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Removals
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Indices of Abundance
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Length Compositions
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Age Compositions
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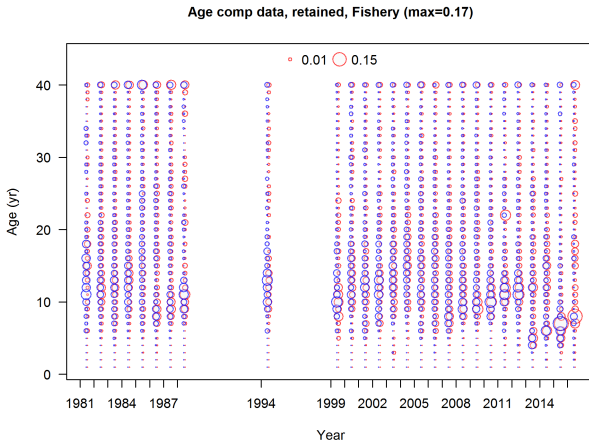
At-sea hake Ages

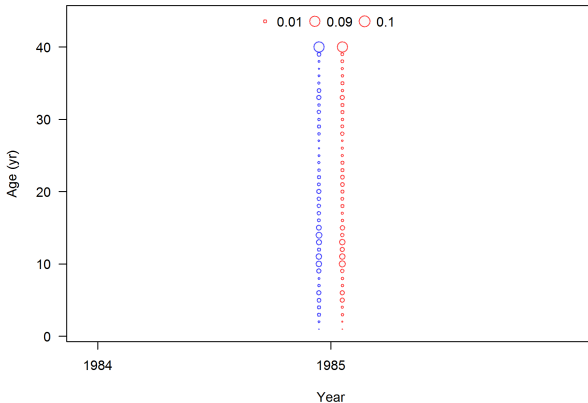Age comp data, whole catch, At-sea hake (max=0.24)

Survey Age Data

Survey age data used in the 2017 assessment:

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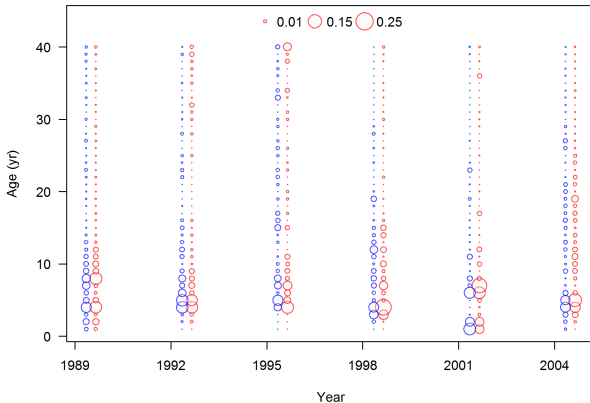- NWFSC shelf-slope survey
  - 2003-2016

Pacific ocean perch ages

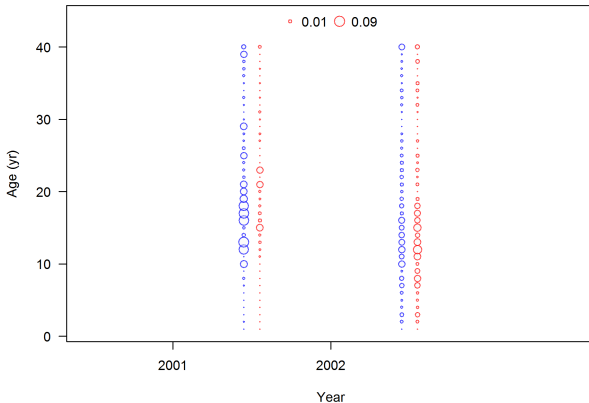Age comp data, whole catch, Pacific ocean perch survey (max=0.09)

Triennial survey ages

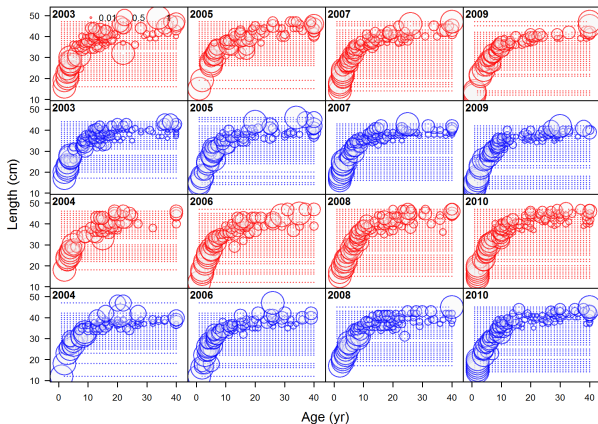Age comp data, whole catch, Triennial survey (max=0.2)

NWFSC slope ages

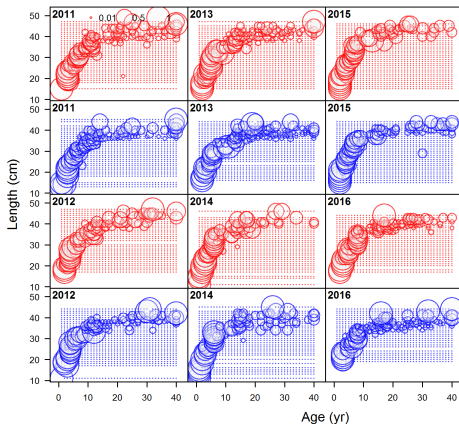Age comp data, whole catch, NWFSC slope survey (max=0.08)

NWFSC shelf-slope conditional age-at-length

Conditional age-at-length data, whole catch, NWFSC shelf-slope survey (max=0.96)
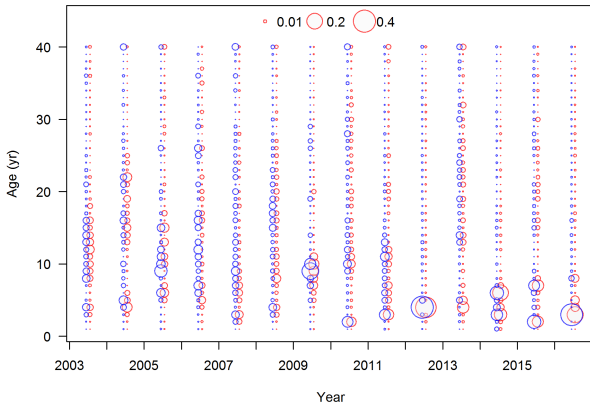
NWFSC shelf-slope conditional age-at-length

Conditional age-at-length data, whole catch, NWFSC shelf-slope survey (max=0.96)

NWFSC shelf-slope ages - marginal view

Ghost age comp data, whole catch, NWFSC shelf-slope survey (max=0.4)

Estimated Ageing Error: Curvilinear without bias

Ageing imprecision