

Assessment of the Kamchatka Flounder stock in the Bering Sea and Aleutian Islands

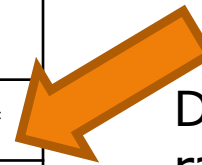
Thomas Wilderbuer, James Ianelli, Daniel Nichol and Robert Lauth

Summary of changes in assessment input

- 1) Estimate of catch for 2012-2014.
- 2) 2012 and 2013 fishery length composition.
- 3) 2013 and 2014 shelf survey length composition
- 4) 2013 and 2014 shelf survey biomass and standard error estimates.
- 5) 2014 Aleutian Islands survey biomass and standard error.
- 6) 2014 Aleutian Islands survey length composition.
- 7) 2012 slope survey age composition.

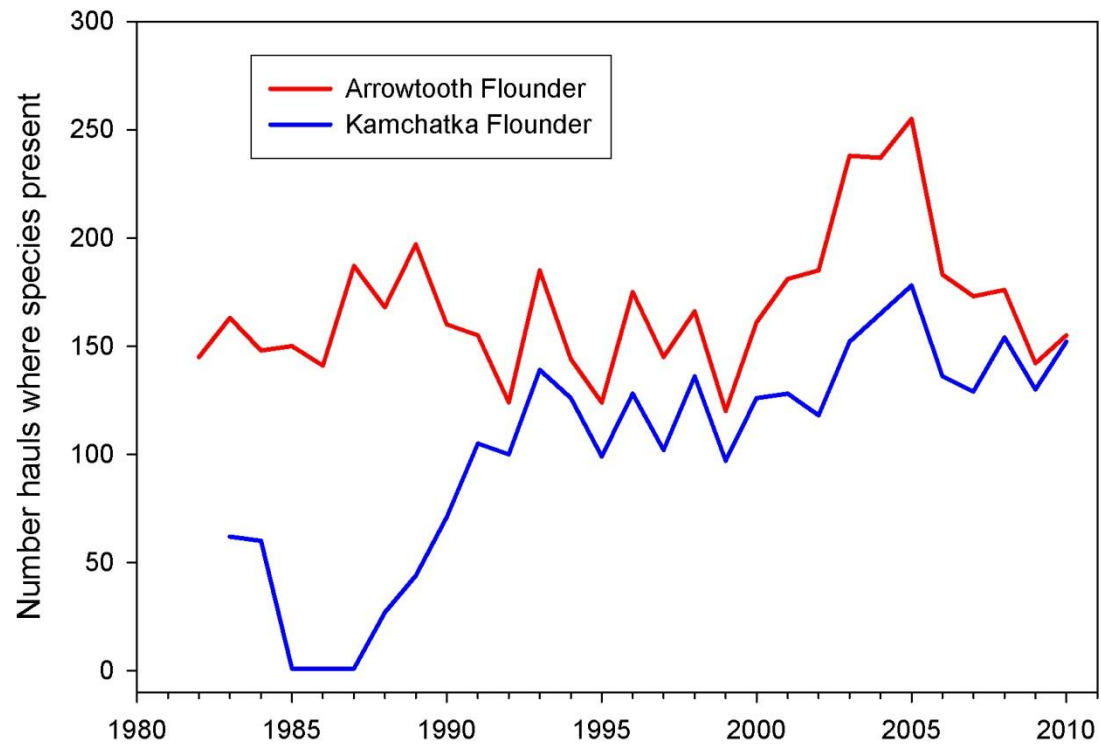
No changes were made to the assessment methodology.

	Tier 3 assessment model			
	As estimated last year for		As estimated this year for	
Quantity	2014	2015	2015	2016
<i>M</i> (natural mortality rate)	0.11	0.11	0.11	0.11
Tier	3	3	3	3
Projected total (age 1+) biomass (t)	136,600	138,700	174,500	181,000
Projected female spawning biomass (t)				
Projected	50,400	50,100	60,100	61,200
<i>B</i> _{100%}	115,200	115,200	132,500	132,500
<i>B</i> _{40%}	46,100	46,100	53,000	53,000
<i>B</i> _{35%}	40,300	40,300	46,400	46,400
<i>F</i> _{OFL}	0.073	0.073	0.076	0.076
<i>maxF</i> _{ABC}	0.063	0.063	0.065	0.065
<i>F</i> _{ABC}	0.063	0.063	0.065	0.065
OFL (t)	8,270	8,500	10,500	11,000
maxABC (t)	7,100	7,300	9,000	9,500
ABC (t)	7,100	7,300	9,000	9,500
	As determined last year for:		As determined this year for:	
Status	2012	2013	2013	2014
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no
	Alternative Tier 5 model			
	As estimated or specified last year for:		As estimated or recommended this year for:	
Quantity	n/a	n/a	2015	2016
<i>M</i> (natural mortality rate)	n/a	n/a	0.11	0.11
Tier	n/a	n/a	5	5
Biomass (t)	n/a	n/a	136,000	136,000
<i>F</i> _{OFL}	n/a	n/a	0.11	0.11
<i>maxF</i> _{ABC}	n/a	n/a	0.0825	0.0825
<i>F</i> _{ABC}	n/a	n/a	0.0825	0.0825
OFL (t)	n/a	n/a	14,200	14,200
maxABC (t)	n/a	n/a	10,700	14,200
ABC (t)	n/a	n/a	10,700	10,700
	As determined last year for:		As determined this year for:	
Status	2013	2014	2014	2015
Overfishing	n/a	n/a	n/a	n/a



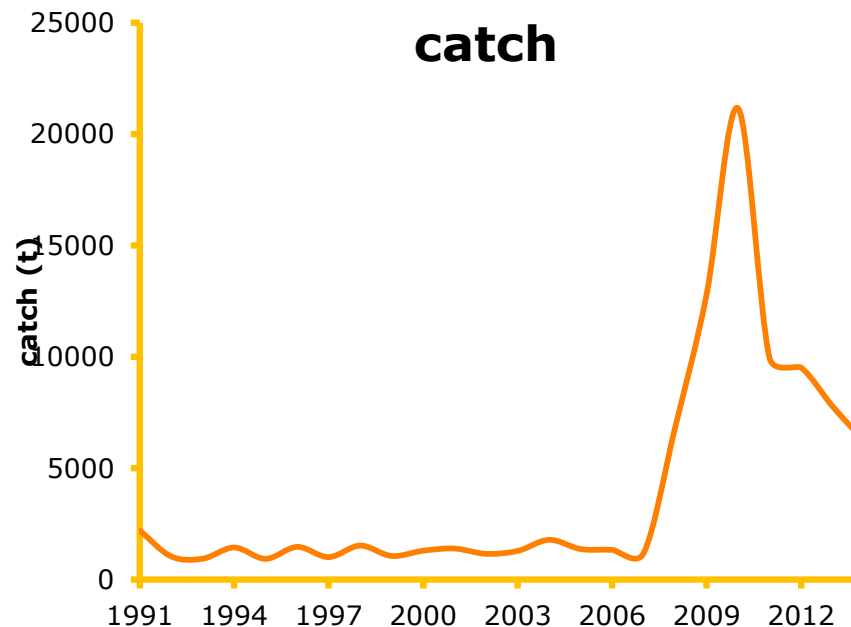
Derived from random effects model, different from draft SAFE provided to Plan Team members.

Comparison of species identified during the EBS survey



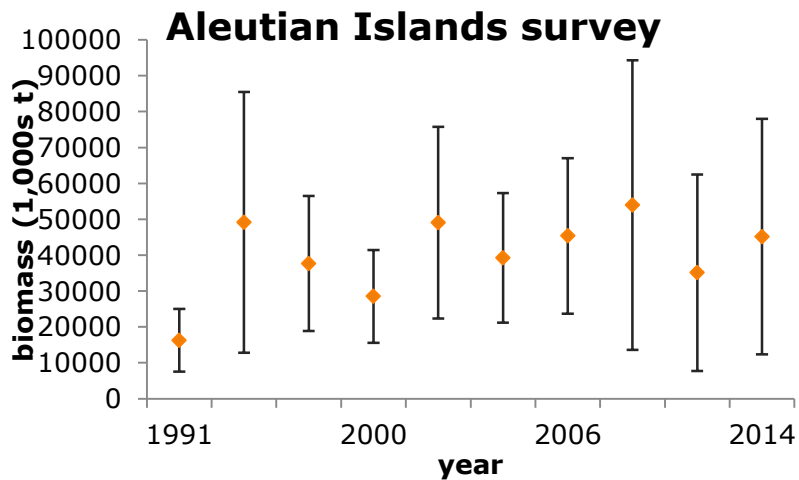
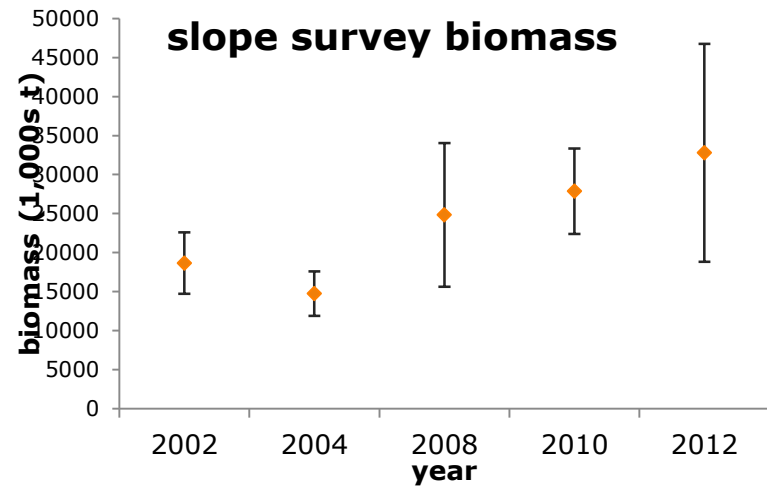
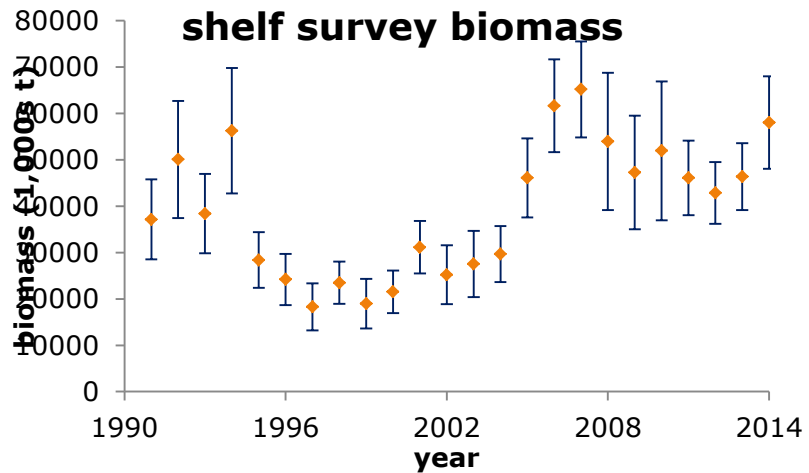
Fishery catch

Fishery catch from 2007-2014 were included in the model from direct identification of Kamchatka flounder. Catches from 1991-2006, years when Kamchatka and arrowtooth flounder were not identified to species, were calculated by assuming that Kamchatka flounder comprised 10% of the catch during that time period.

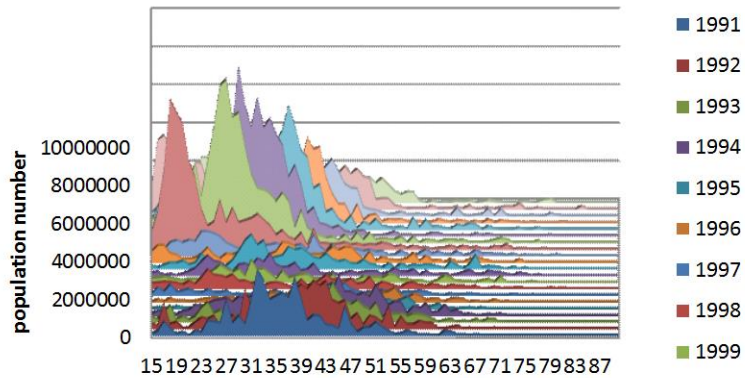


**2014 catch is
90% of the
ABC of 7,100 t**

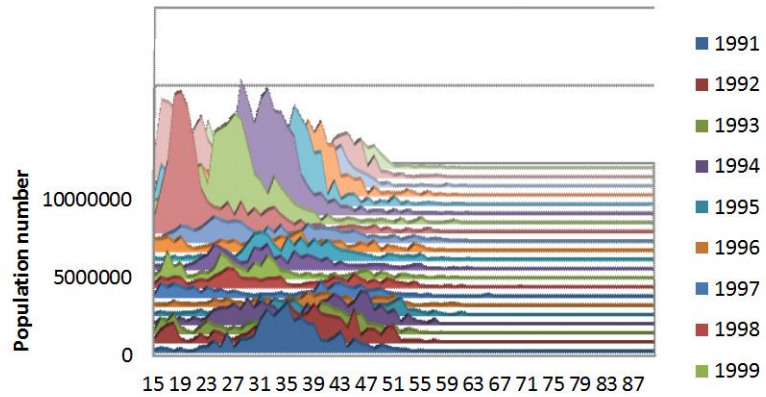
surveys



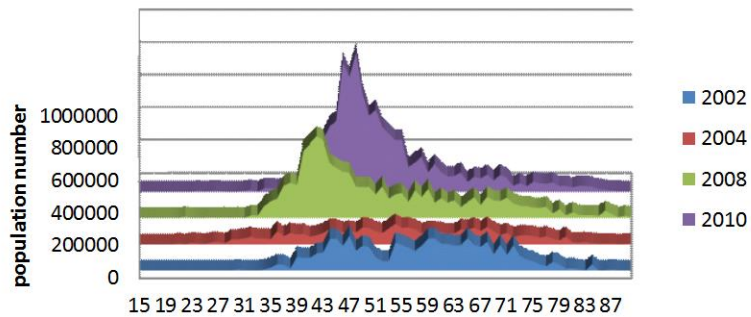
shelf survey female length composition



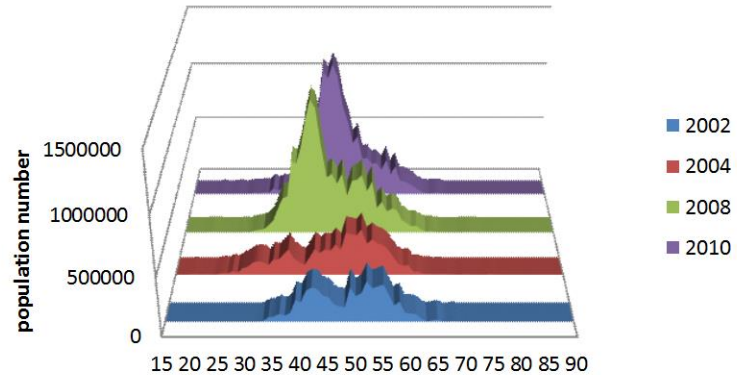
shelf survey male length composition



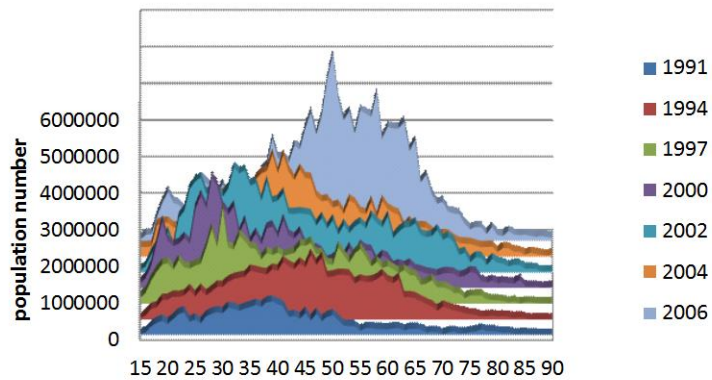
slope survey female length composition



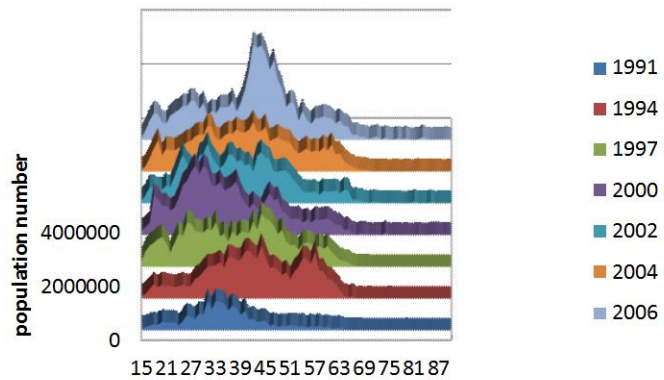
slope survey male length composition



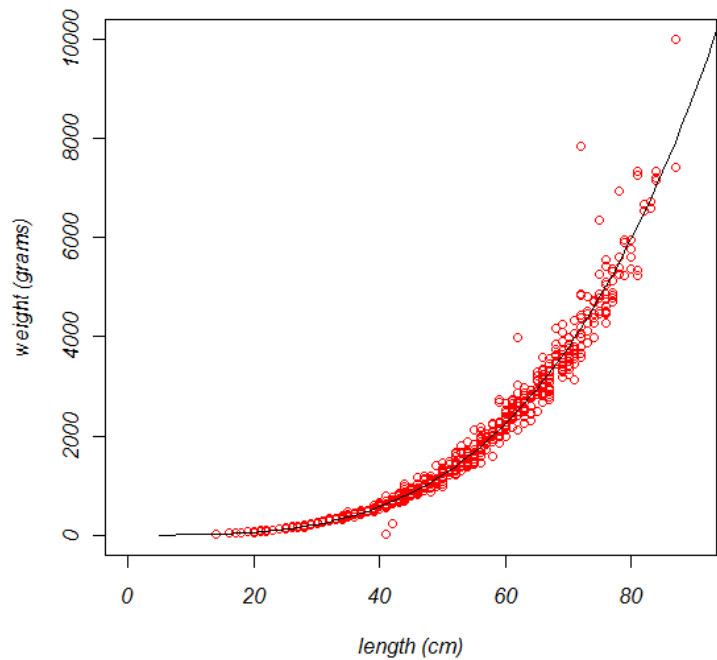
Aleutian survey female length compositions



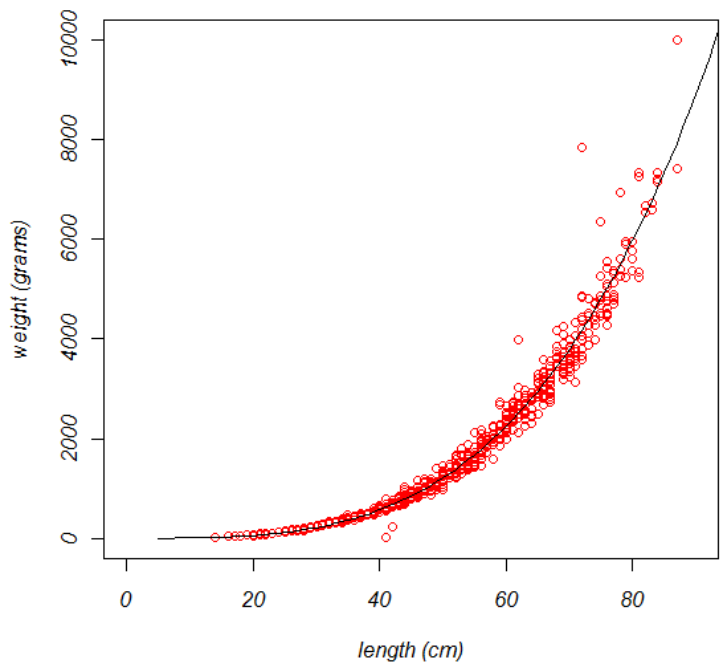
Aleutian survey male length composition

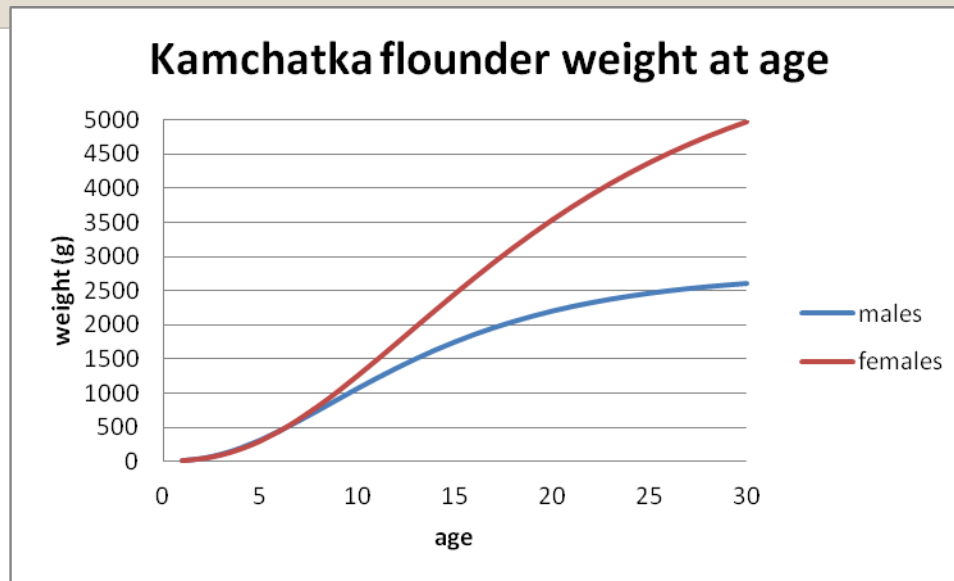


Kamchatka flounder male length-weight data

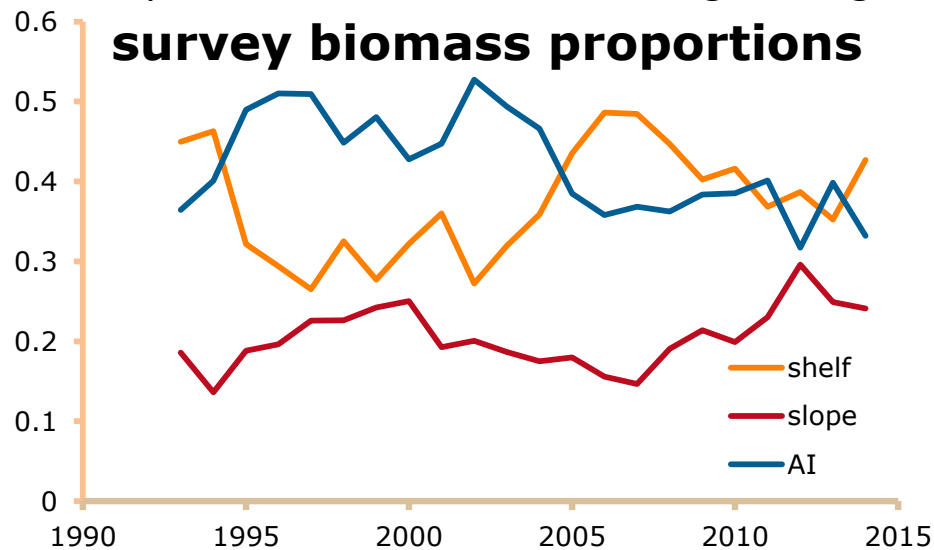


Kamchatka flounder female length-weight data



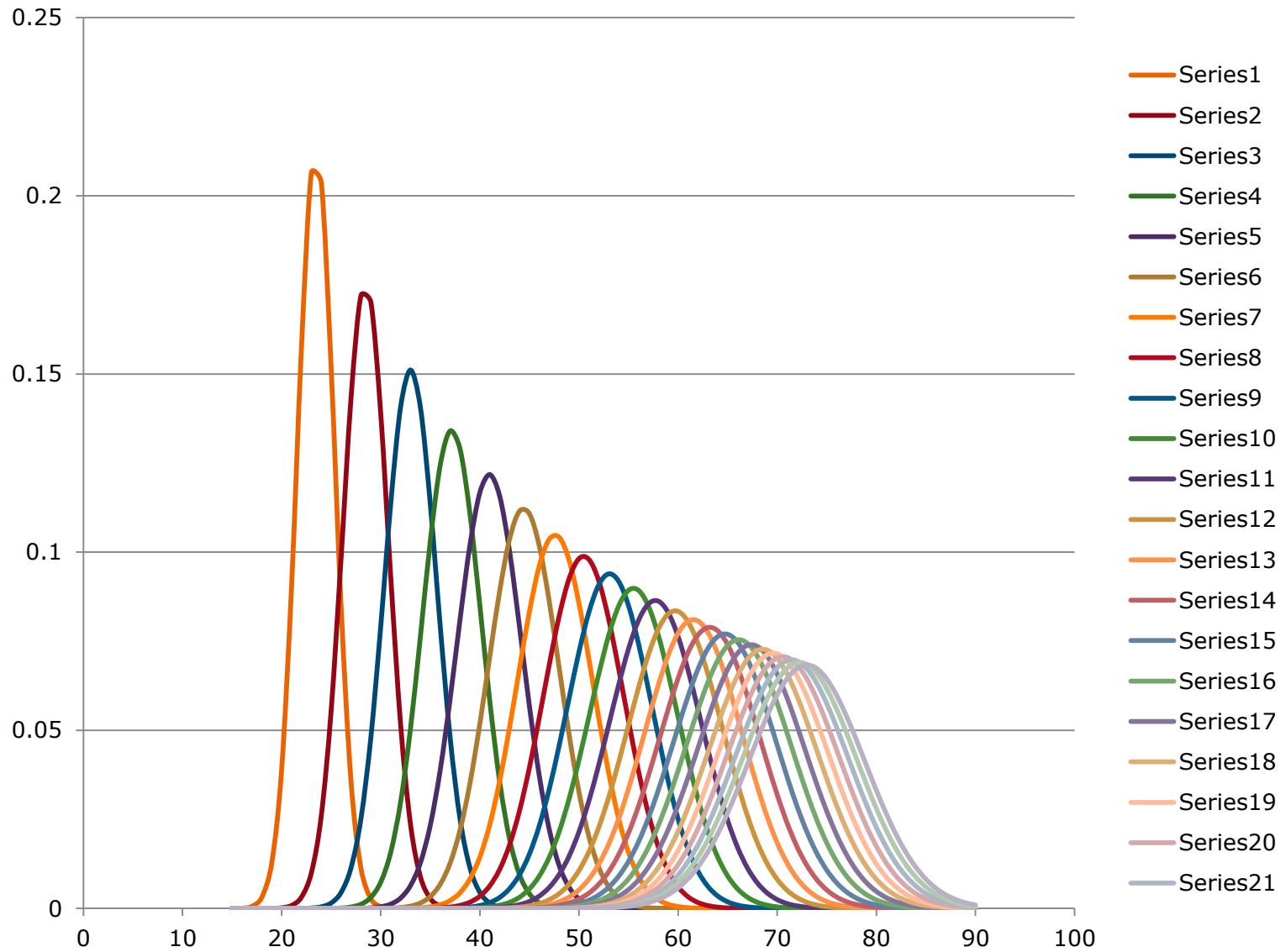


From applying the length-at-age fitted data from the 2010 Aleutian Islands size composition estimates to the length-weight data.



22 year average = 37% shelf, 20% slope and 42% in the Aleutian Islands

Kamchatka flounder female conversion matrix



The suite of parameters estimated by the base model are classified by the following likelihood components:

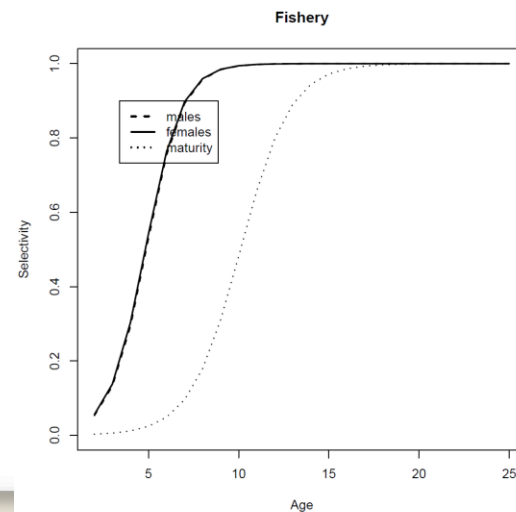
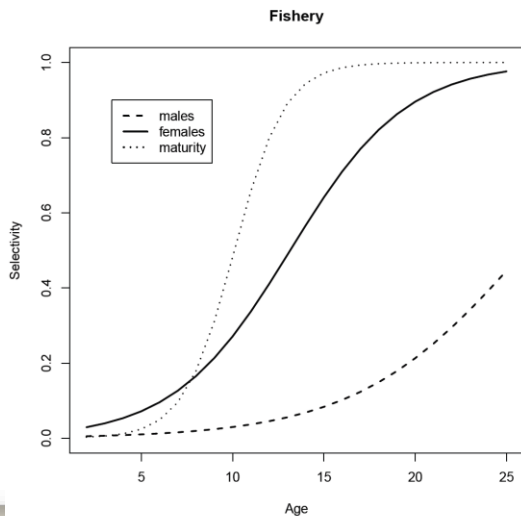
Data Component	Distribution assumption
Trawl fishery size composition	Multinomial
Shelf survey population size composition	Multinomial
Slope survey population size composition	Multinomial
Slope survey age composition (2002 and 2012)	Multinomial
Aleutian Islands survey size composition	Multinomial
Aleutian Islands age composition (2010)	Multinomial
Trawl survey biomass estimates and S.E.	Log normal
Slope survey biomass estimates and S.E.	Log normal
Aleutian Islands biomass estimates and S.E.	Log normal

Parameters estimated:

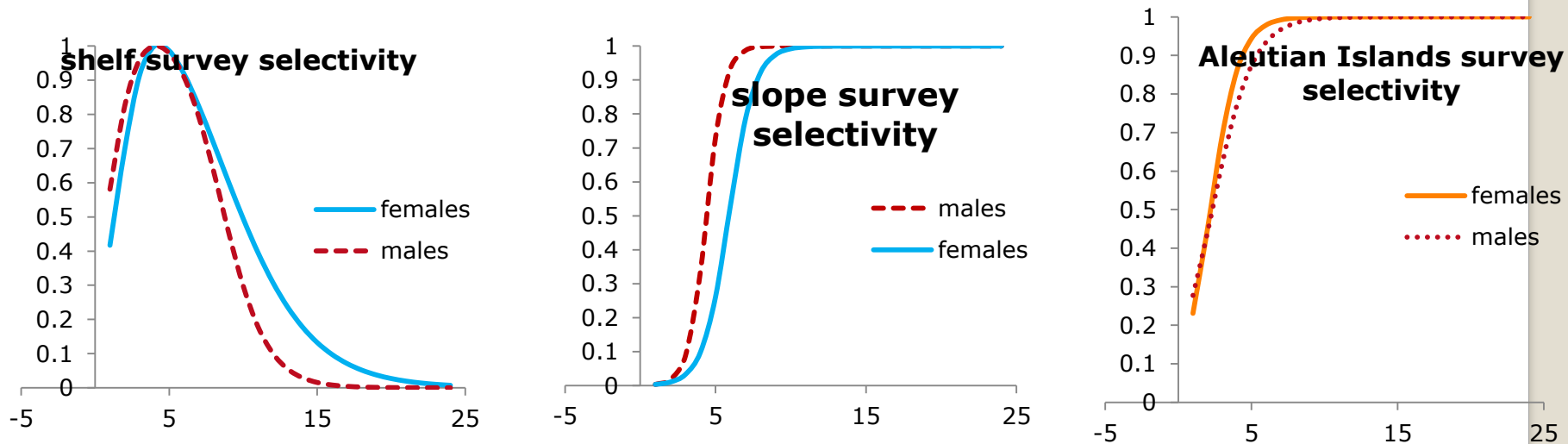
Fishing mortality	Selectivity	Aleutian Island and shelf survey- q	Year class strength	Total
25	16	2	48	91

Started with q 's (catchability) apportioned by their relative survey biomass estimates for the three survey areas.

Examination of the results from the initial model run indicated that fishery selectivity is poorly determined (presumably due to the low sample sizes) and that there are males present in the length records that are larger than those observed in any survey data. It is suspected that this is the result of some mis-sexing of Kamchatka flounder in the commercial fishery sampling. This was resolved by fixing the slope of the logistic curve (age at 50% selection is still estimated for each sex) which produced more sensible results and estimated reference F values similar to other Bering Sea flatfish species.

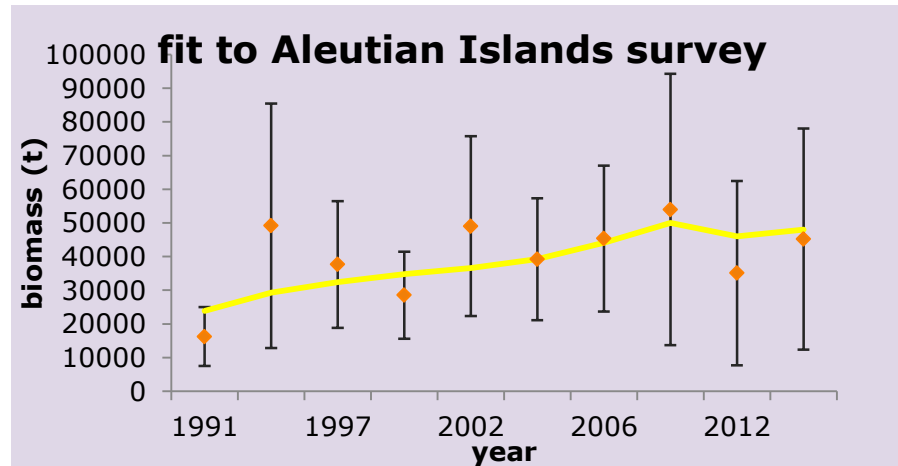
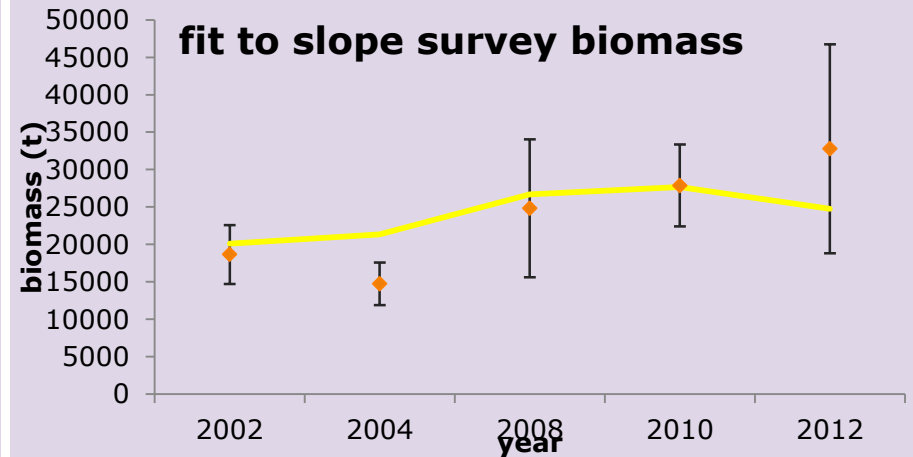
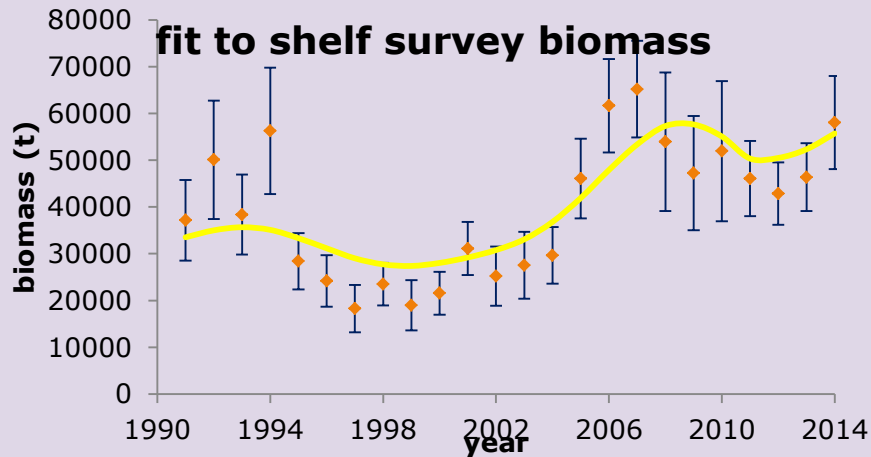


Based on selectivity patterns, the shelf survey showed big differences in the ages of fish available to these different surveys. The slope survey selectivity estimates seemed most stable hence: Alternative values of q were fixed for the slope survey and freely estimated the q values for the shelf and Aleutian Islands surveys.

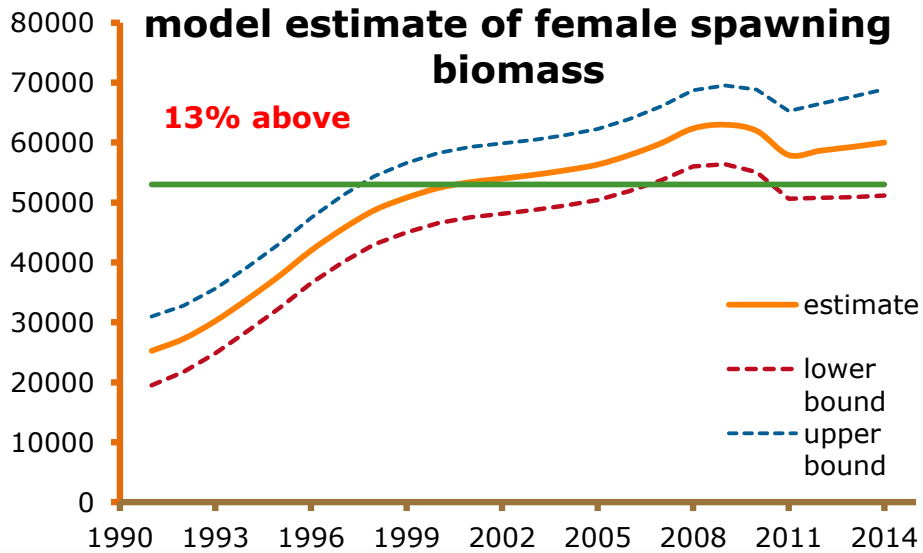
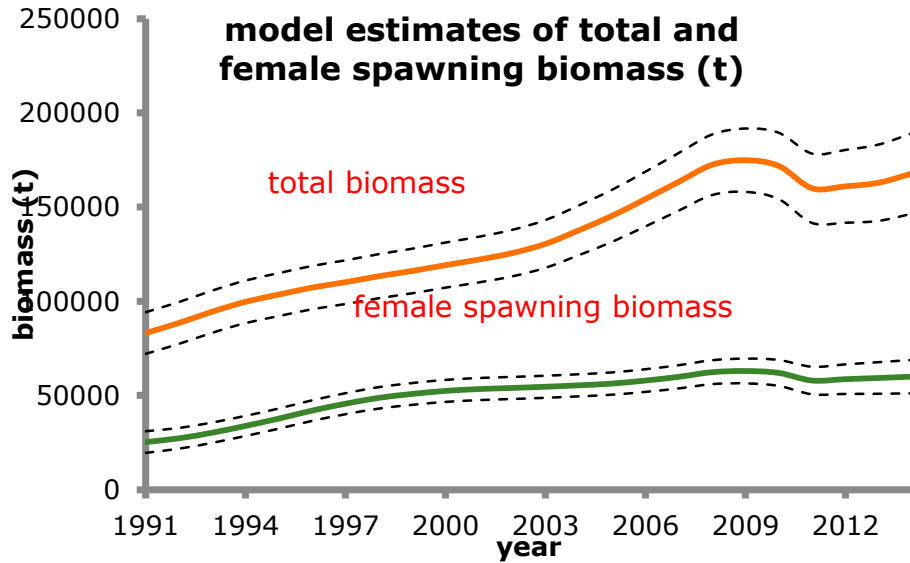


M is confounded with q and was discerned through profiling to have a value around 0.11. With the model configured in this way (slope survey $q=0.18$, $M = 0.13$ and fishery selectivity logistic slope fixed) the model was run to estimate the status and the population dynamics of the Kamchatka flounder stock over the period 1991-2014.

Model results

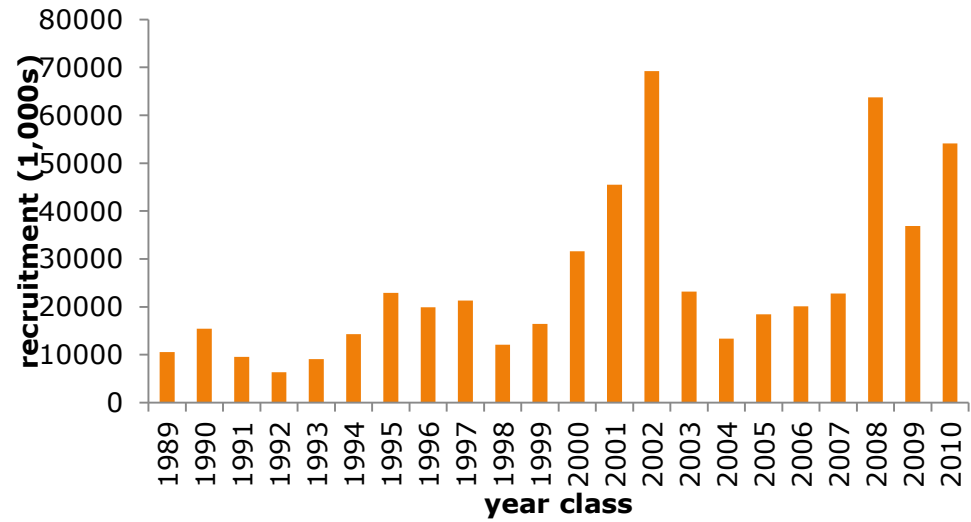


Model Results

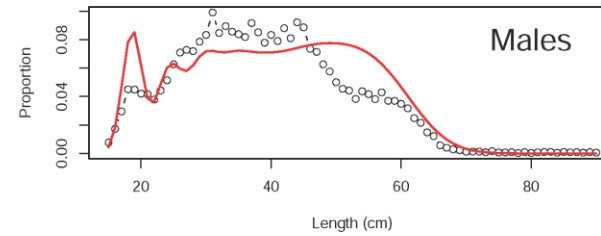
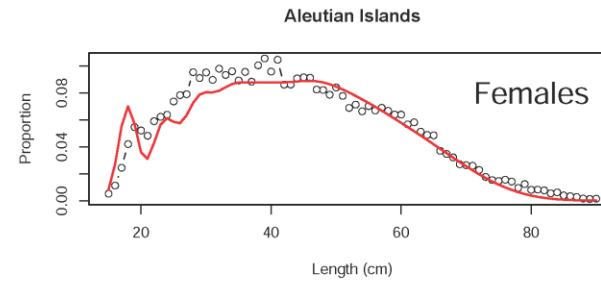
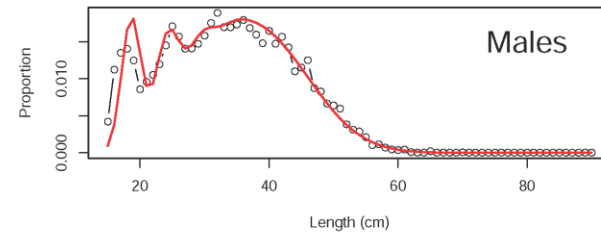
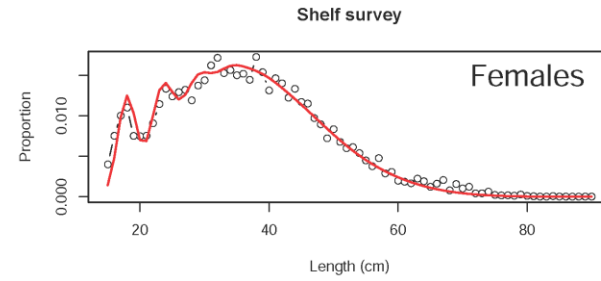
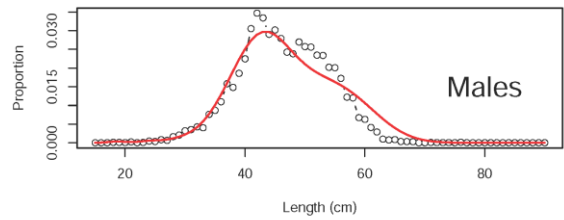
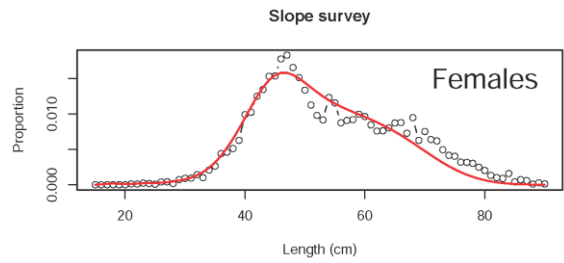
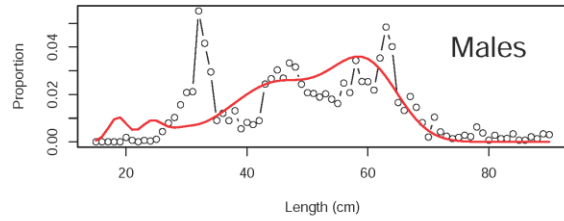
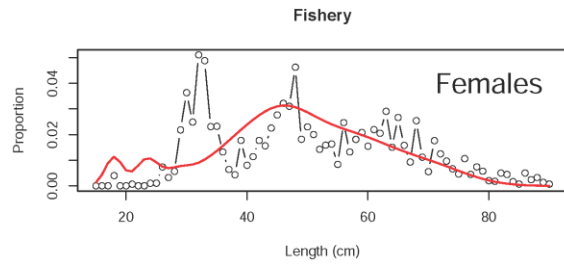


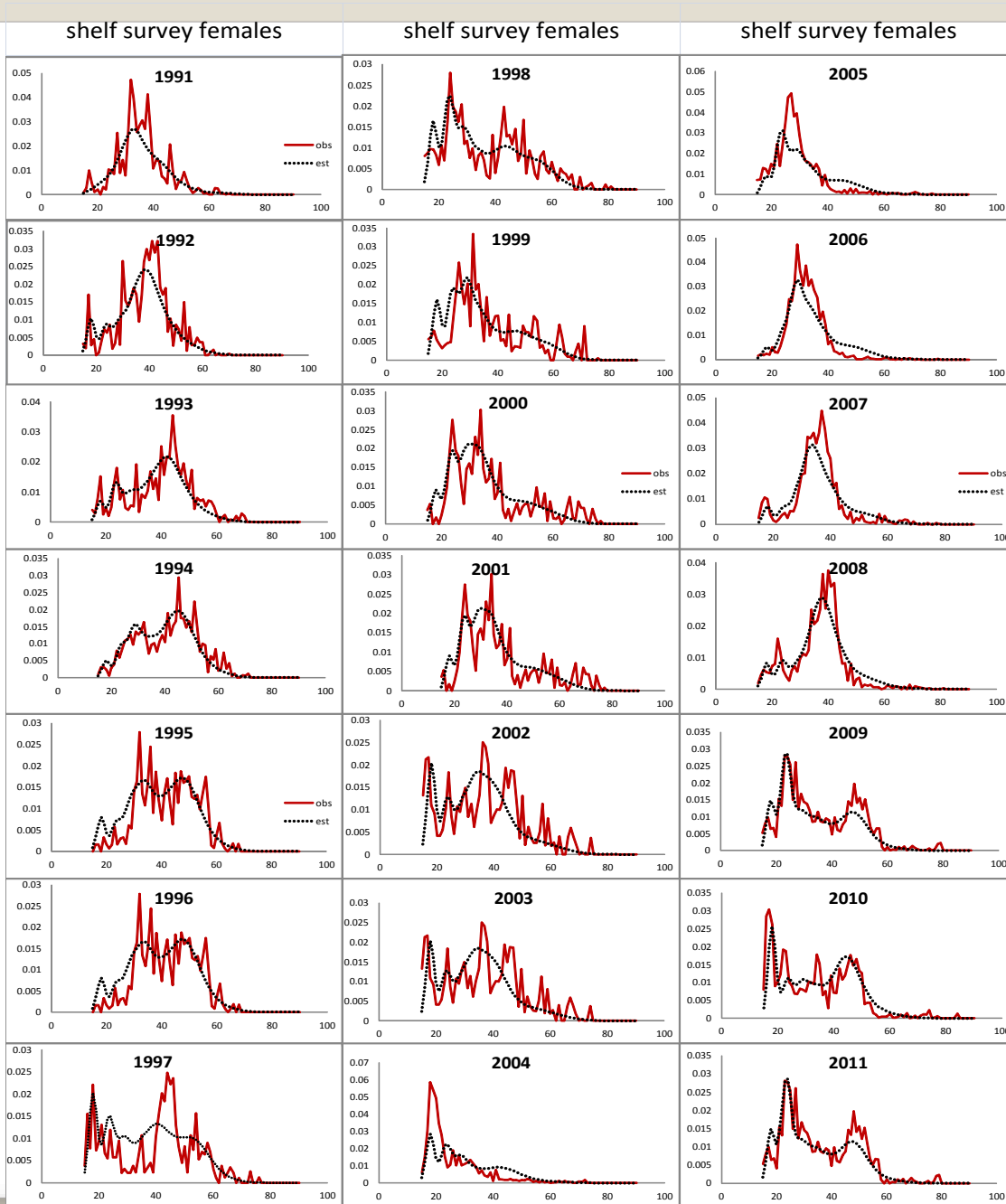
Model results

age 2 recruitment



Fit to size composition data

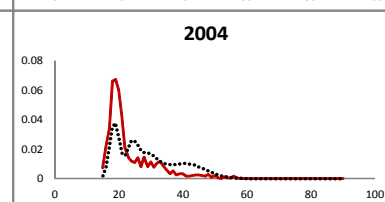
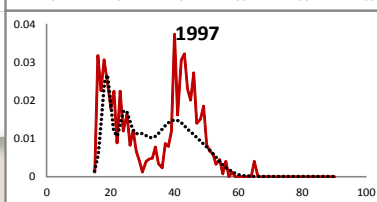
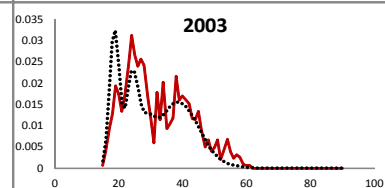
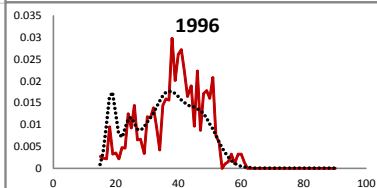
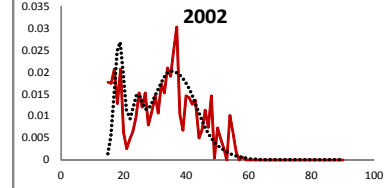
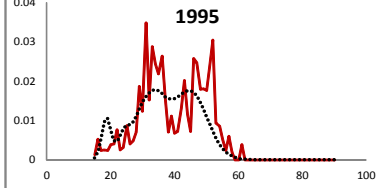
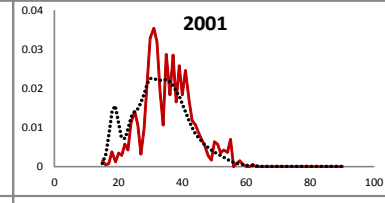
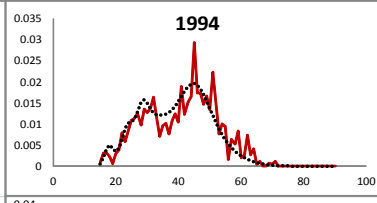
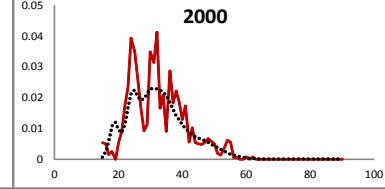
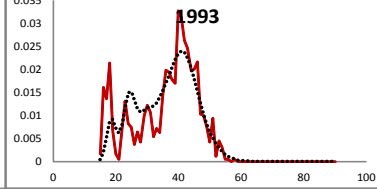
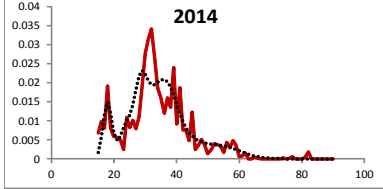
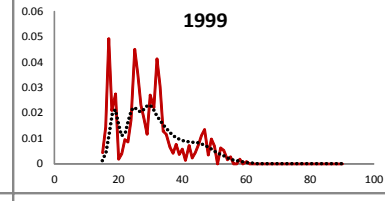
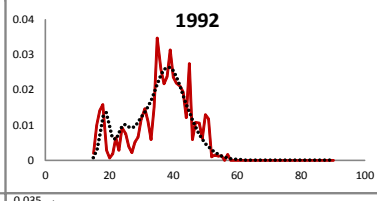
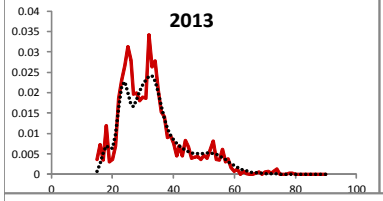
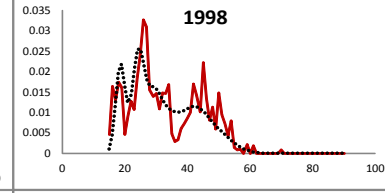
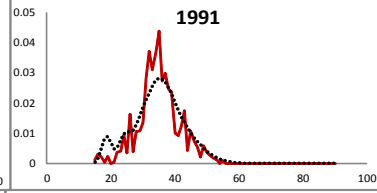
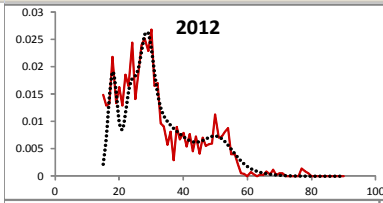




shelf survey females

shelf survey males

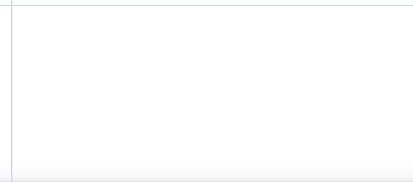
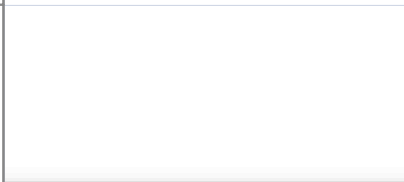
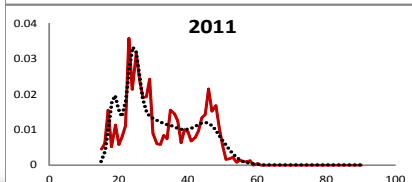
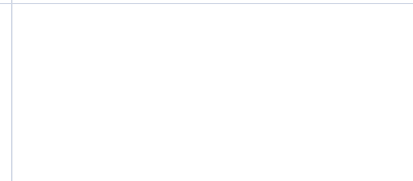
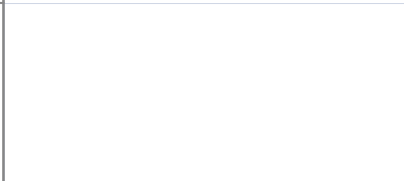
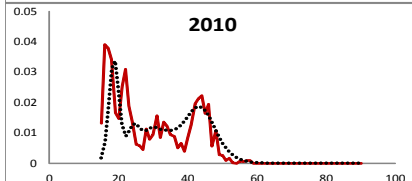
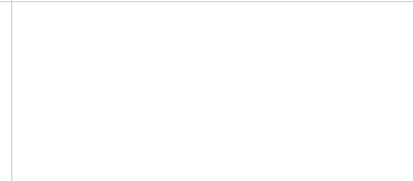
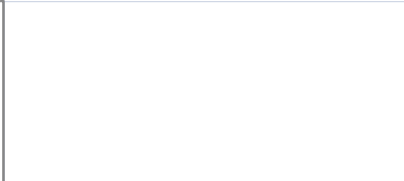
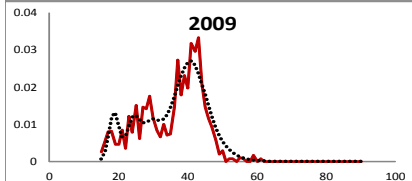
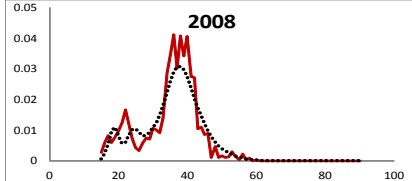
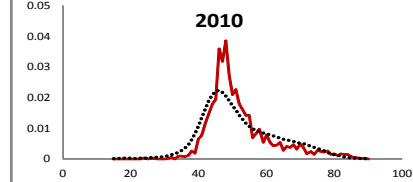
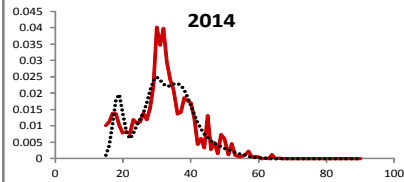
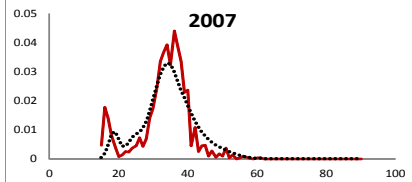
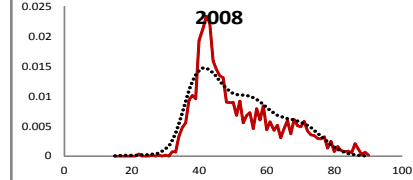
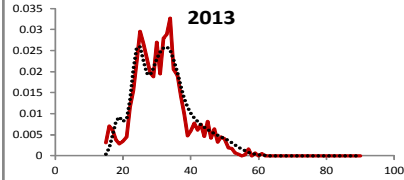
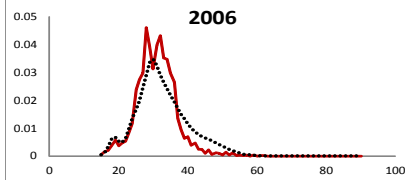
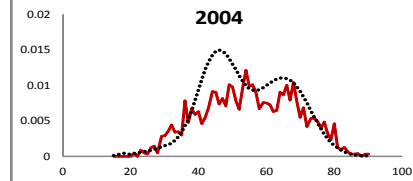
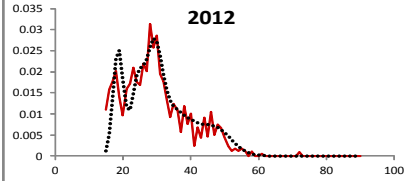
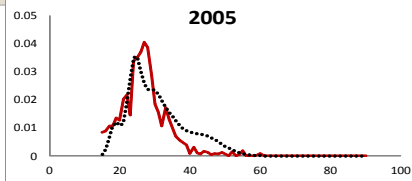
shelf survey males

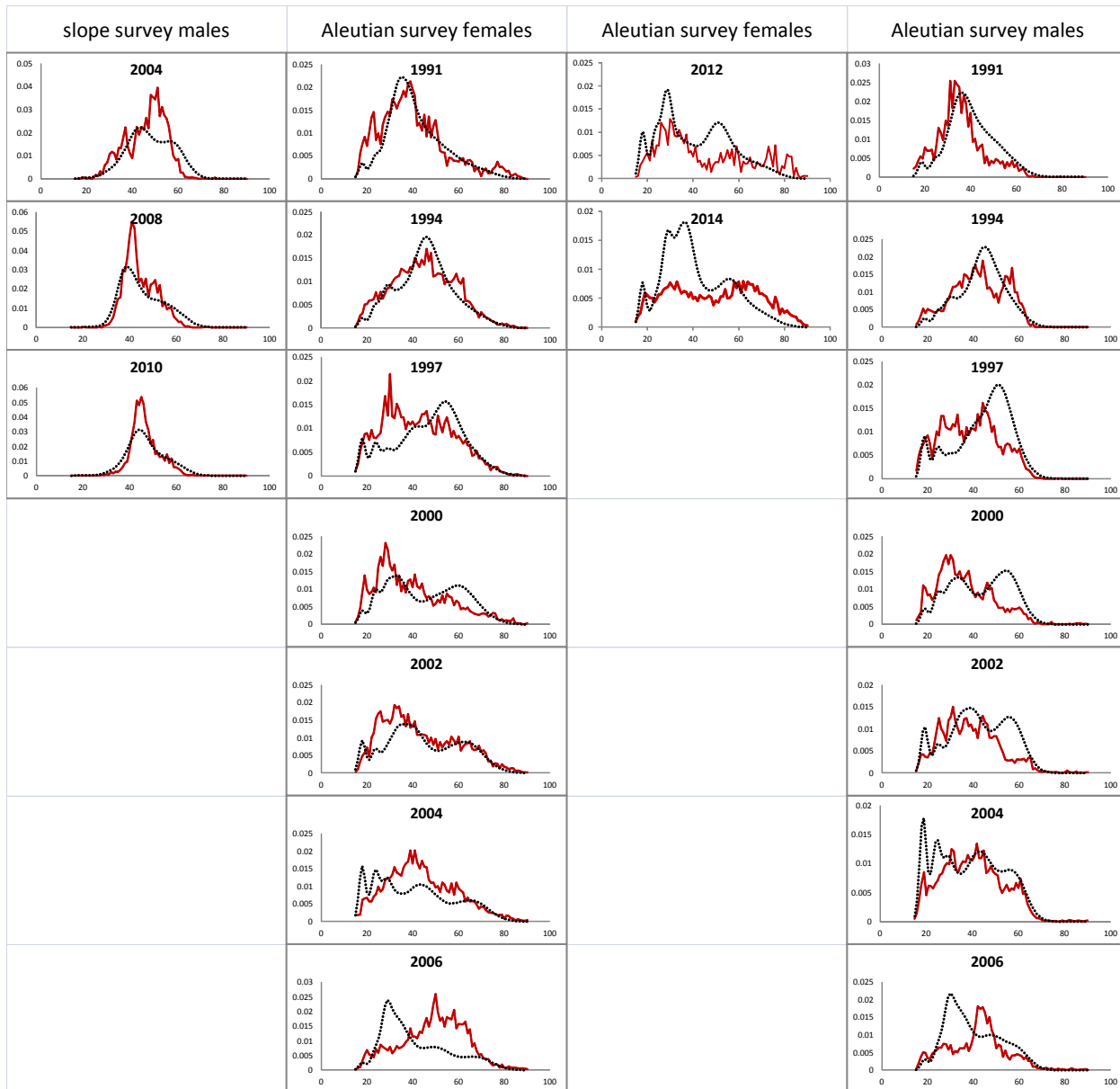


shelf survey males

shelf survey males

slope survey females





Model results

