7. Assessment of the Kamchatka flounder stock in the Bering Sea and Aleutian Islands

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Executive summary

The assessment of Bering Sea and Aleutian Islands (BSAI) Kamchatka flounder has been moved to a biennial schedule according to the stock assessment prioritization schedule. A partial assessment was done for BSAI Kamchatka flounder this year. In partial assessment years, an executive summary is presented with recommendations of harvest levels for the next two years. The 2016 full assessment is available online at https://www.afsc.noaa.gov/REFM/Docs/2016/BSAIkamchatka.pdf. The next full assessment will be conducted in 2018.

A statistical age-structured model was used as the primary stock assessment tool for BSAI Kamchatka flounder, which qualifies as a Tier 3 stock. This assessment consists of a population model to estimates historical time series of population estimates and a projection model to predict future population estimates and recommended harvest levels. The data sets used in this assessment included fishery catch data, biomass estimates from the Eastern Bering Sea shelf and slope surveys and the Aleutian Islands survey, length composition data from the fishery, the EBS shelf and slope surveys, and the Aleutian Islands survey, and age data from the EBS slope and Aleutian Islands surveys. For a partial assessment year, we do not re-run the assessment model, but update the projection model with the new catch data. This report incorporates the most current catch information without re-estimating model parameters and biological reference points.

Summary of changes in the assessment inputs

Changes were not made to the assessment model inputs and the assessment model was not run since this was an off-year cycle.

New data added to the projection model included a new estimate of the 2016 catch and estimated catch for 2017 and 2018. The 2016 catch was updated from 4,533 t to 4,851 t. Partial 2017 catch, 4,112 t, was also available for the projections. Projected catch to the end of 2017 was determined as the product of the 2017 TAC (5,000 t) and the average fraction of the TAC captured from the past two years (86.9%). The projected 2017 catch was set equal to 4,347 t and was lower than the value specified in last year's projections, 4,533 t. The 2018 catch value was set equal to 2017 catch.

Female and male fishery selectivity and the numbers-at-age were also updated. The 2016 assessment projections used the selectivity curves and numbers-at-age from a model run where natural mortality was set equal to 0.09 rather than the 0.11. The accepted assessment model in 2016 assumed natural mortality was equal to 0.11. The corrections to fishery selectivity and numbers-at-age were made to reflect the model output from the last accepted model. Figure 1 shows the differences between the selectivity curves. Female selectivity is higher for ages 2 through 8 for the 2017 projections than the 2016 projections (Figure 1a). Male selectivity was lower ages 3 through 10 for the 2017 projections than the 2016 projections (Figure 1b). The 2016 numbers-at-age were higher for ages 2 through 14 for the 2017 projections than the 2016 projections (Figure 2).

Summary of the results

For the 2018 fishery, we recommend the maximum allowable ABC of 9,737 t from the updated projection model. The recommended 2018 maxABC and ABC are larger than those specified for 2017 and 2018 from last year's projection model. Reference values for BSAI Kamchatka flounder are summarized in the following table with the recommended ABC and OFL values for 2018 in bold.

	As estimated or *specified last* year for:		As estimated or *recommended this* year* for:	
Quantity	2017	2018	2018	2019
M (natural mortality rate)	0.11	0.11	0.11	0.11
Tier	3	3	3	3
Projected total (age 2+) biomass (t)	170,300	181,000	189,868	199,223
Female spawning biomass (t)				
Projected	60,300	62,200	63,718	67,390
$B_{100\%}$	127,000*	127,000*	126,954	126,954
$B_{40\%}$	50,800*	50,800*	50,782	50,782
$B_{35\%}$	44,400*	44,400*	44,434	44,434
F_{OFL}	0.078	0.078	0.075	0.075
$maxF_{ABC}$	0.066	0.066	0.064	0.064
F_{ABC}	0.066	0.066	0.064	0.064
OFL (t)	10,360	10,700	**11,347**	12,022
maxABC (t)	8,800	9,200	9,737	10,317
ABC (t)	8,800	9,200	**9,737**	10,317
	As determined *last* year for:		As determined *this* year for:	
Status	2015	2016	2016	2017
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

* *B100%, B40%, and B35%* specified last year were rounded estimates and were equal to this year's recommended values in the projection output file.

The stock is not being subjected to overfishing, is not currently overfished, nor is it approaching a condition of being overfished. The tests for evaluating these three statements on status determination require examining the official total catch from the most recent complete year and the current model projections of spawning biomass relative to $B_{35\%}$. The official total catch for 2016 is 4,851 t which is less than the 2016 OFL of 11,100 t; therefore, the stock is not being subjected to overfishing. The estimates of spawning biomass for 2017 and 2018 from the current year (2017) projection model are 63,718 t and 67,390 t, respectively. Both estimates are above the estimate of $B_{35\%}$ at 44,434 t and, therefore, the stock is not currently overfished nor approaching an overfished condition.

The 2017 and 2018 catch inputs were lower than the inputs used for the last projections. The reduction in catch led to an increase in projected total biomass and spawning biomass. The change to selectivity (see Summary of changed in assessment inputs section) was minimal; however, the shifts led to F_{OFL} and F_{ABC} to be lowered.

Survey trends

The Kamchatka flounder assessment used the biomass estimates from three surveys; the EBS Shelf Survey, the EBS Slope Survey, and the Aleutian Islands Survey (Figure 3). New data exist for the EBS shelf survey only. The survey declined by 13% between 2016 and 2017 (55,324 t in 2016 and 48,084 t in 2017).

Catch-biomass ratios

A time-series of catch, total biomass, and the catch-biomass ratio is presented in Table 1 and Figure 4. The denominator of the catch-biomass ratio was defined as total biomass. The ratio was stable through the 1990s until 2007, increased to a peak in 2010, and has declined since.

Summaries for Plan Team

Species	Year	Biomass	OFL	ABC	TAC	Catch
Kamchatka flounder	2015	163,108	10,500	9,000	6,500	4,994
	2016	171,433	11,100	9,500	5,000	4,851
	2017	181,995	10,360	8,880	5,000	4,347[+]
	2018*	189,868	11,347	9,737		

*Estimates from projection model. [+] Estimated as the product of the 2017 TAC and the average fraction of the TAC captured from the past two years (86.9%).

Responses to SSC and Plan Team Comments on Assessments in General

None – There were no comments specific to this assessment in the December 2016 SSC minutes.

Tables

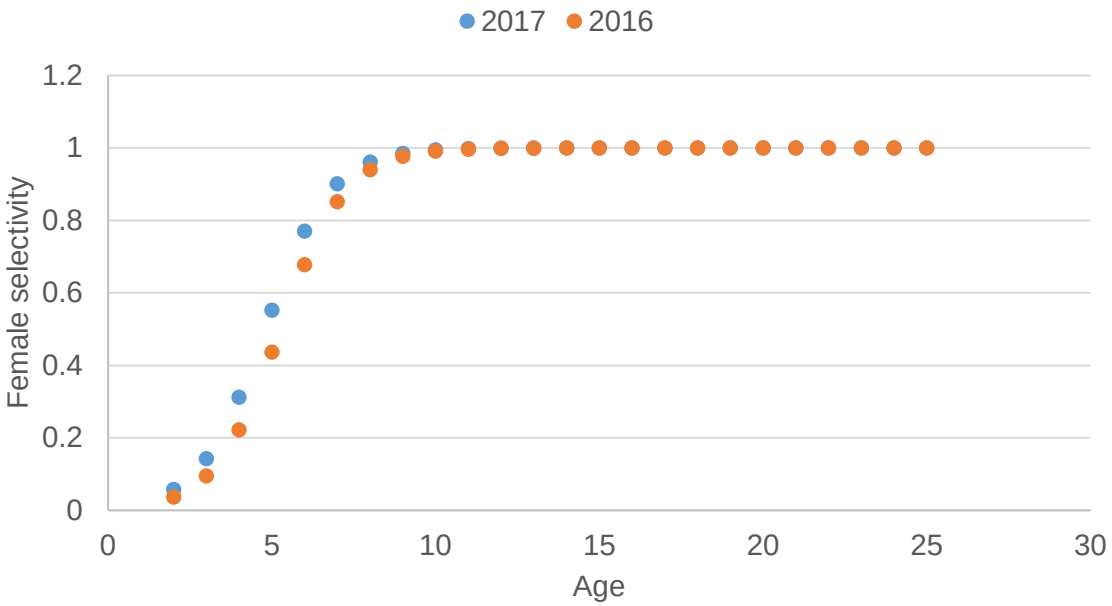
Table 1. Time series of catch and biomass in metric tons and F, where F=C/B.

Year	Catch (t)	Biomass (t)	F (C/B)
1991	2205.2	83416.5	0.03
1992	1038.2	88386.6	0.01
1993	933.8	93996.2	0.01
1994	1436.6	98900.3	0.01
1995	928	102429	0.01
1996	1465.2	105836	0.01
1997	1005.4	108412	0.01
1998	1524.1	111332	0.01
1999	1057.3	113824	0.01
2000	1292.9	116700	0.01
2001	1390.8	119389	0.01
2002	1154	122538	0.01
2003	1283.4	127147	0.01
2004	1780.9	134016	0.01
2005	1368.5	141382	0.01
2006	1330.9	149910	0.01
2007	1183	158728	0.01
2008	6819	167427	0.04
2009	12802	169548	0.08
2010	21153	166011	0.13
2011	9935	153748	0.06
2012	9514	153848	0.06
2013	7772	154533	0.05
2014	6220	157552	0.04
2015	4994	163108	0.03
2016	4851	171433	0.03
2017	4347	181,995	0.02

Figures

Figure 1. a) Female and b) male fishery selectivity used in the 2016 and 2017 projections.

a)



b)

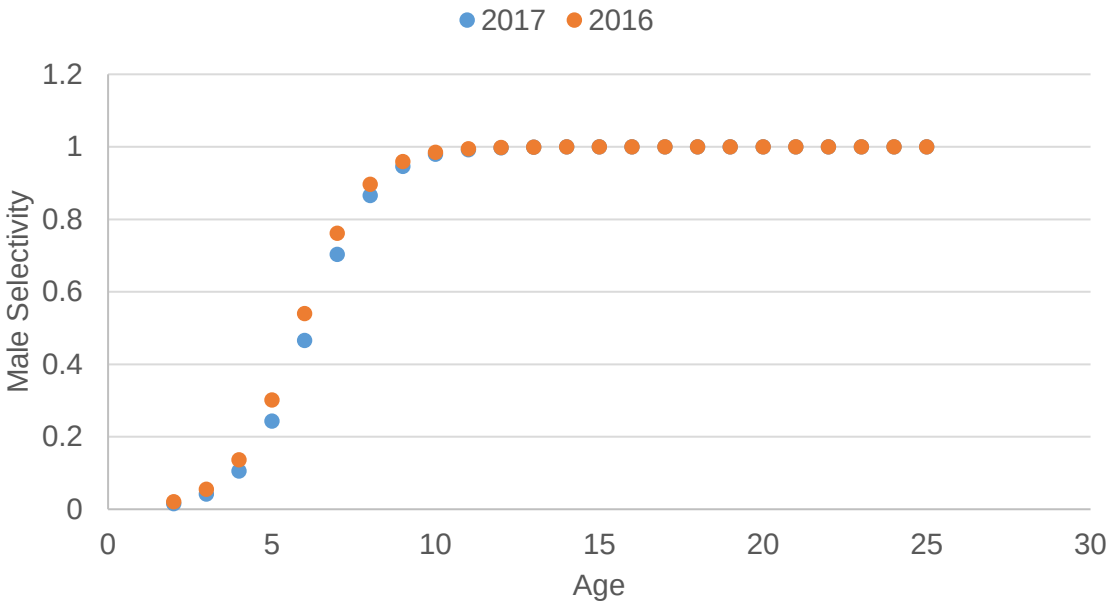
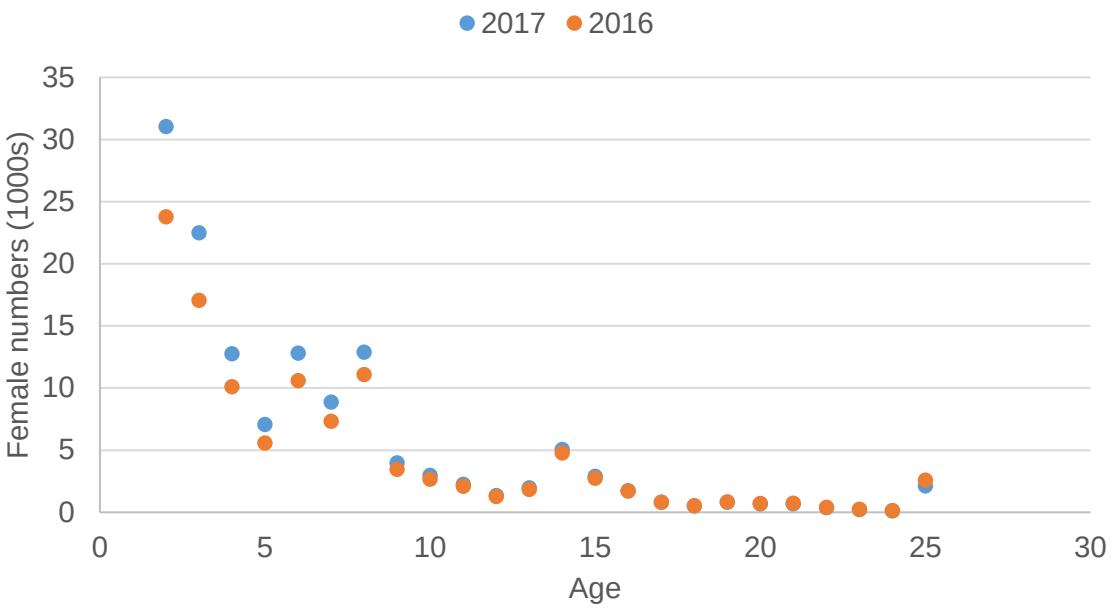


Figure 2. The 2016 a) female and b) male numbers-at-age used in the 2016 and 2017 projections.

a)



b)

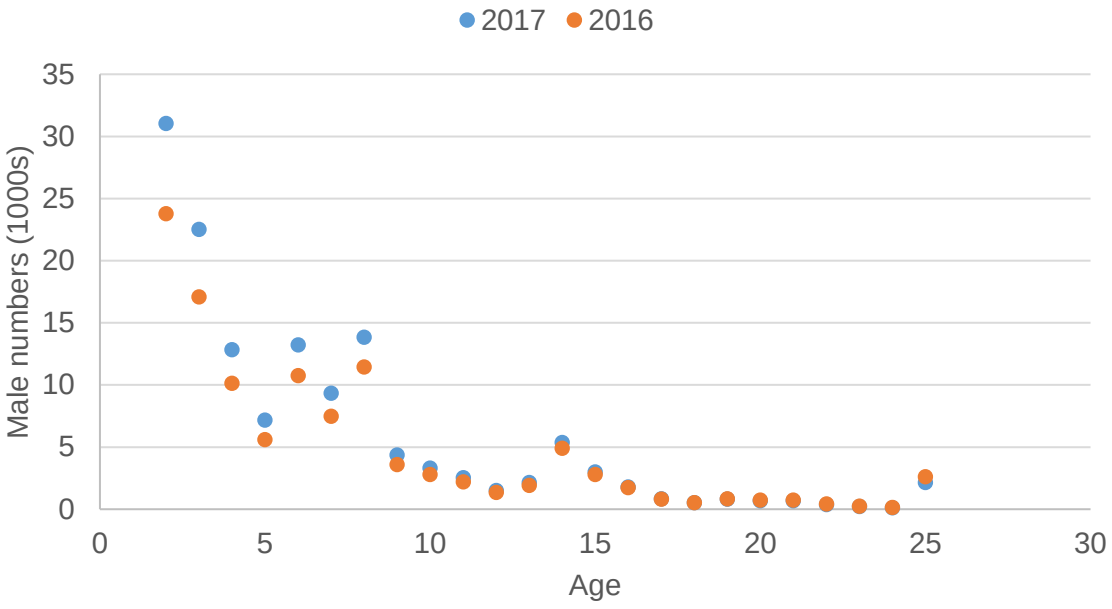


Figure 3. Survey biomass estimates in tons, Aleutian Islands Survey estimates (top panel), Eastern Bering Sea Shelf Survey estimates (middle panel), and Eastern Bering Sea Slope Survey estimates (bottom panel).

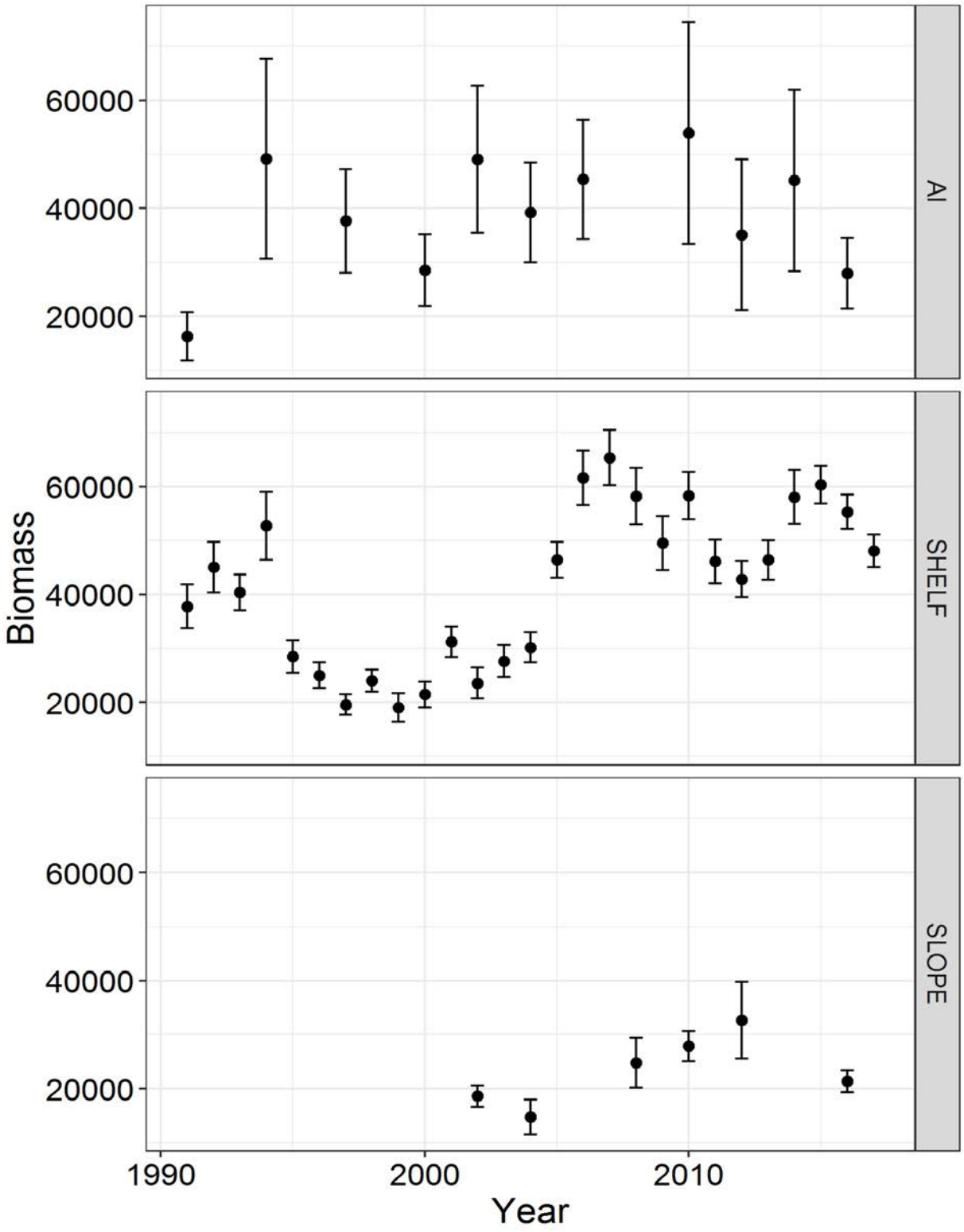
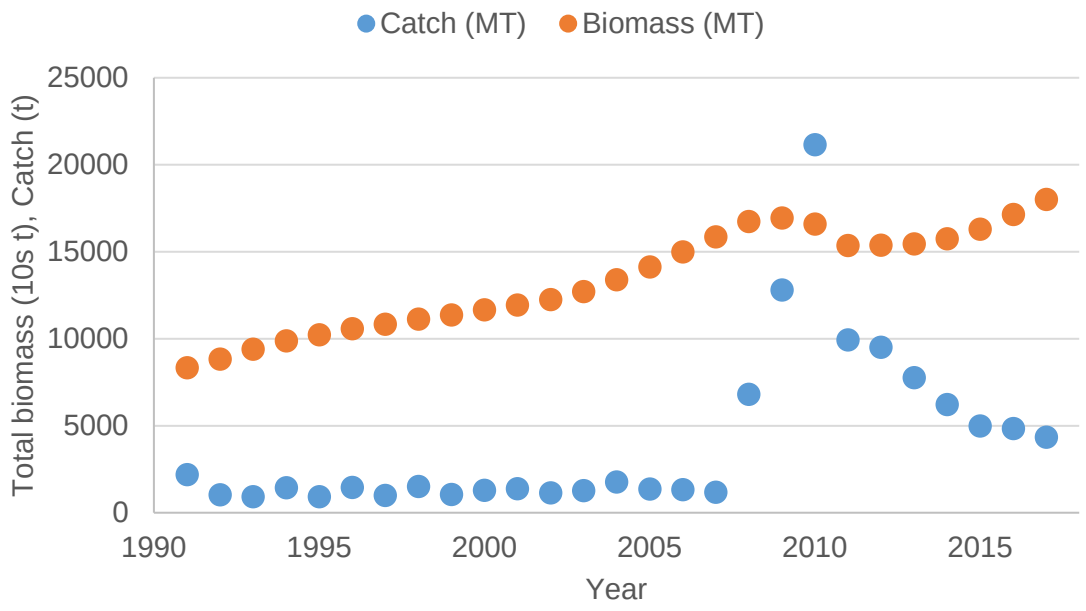


Figure 4. Time series of a) total biomass (10s of tons), catch (tons), and b) the catch-biomass ratio from 1991 – 2017.

a)



b)