

Chapter 9. Assessment of the Flathead Sole Stock Complex in the Bering Sea and Aleutian Islands (Executive Summary)

William T. Stockhausen
November 2013

9.1 Introduction

"Flathead sole" as currently managed by the North Pacific Fishery Management Council (NPFMC) in the Bering Sea and Aleutian Islands (BSAI) represents a two-species complex consisting of true flathead sole (*Hippoglossoides elassodon*) and its morphologically-similar congener Bering flounder (*H. robustus*). In November 2012, the BSAI Groundfish Plan Team moved flathead sole to a biennial stock assessment schedule because it has been lightly exploited for a substantial period of time (BSAI Plan Team, 2012). In "on" (even) years, a full assessment is to be conducted for the stock. In "off" (odd) years (y), the single species projection model is to be used to update OFL and ABC recommendations for the following year ($y+1$) and to produce OFL and ABC recommendations for two years' ahead ($y+2$). These results will be reported in an "Executive Summary"-type format. Results from the off-year EBS Groundfish Survey will also be briefly summarized.

Because 2013 is an "off" year in the assessment cycle for flathead sole, the single species projection model was run using parameter values from the accepted 2012 assessment model (Stockhausen et al., 2012), together with updated catch information for 2012-2013, to determine stock status for 2013 and OFLs and maximum permissible ABCs for 2014 and 2015.

9.2 New information and projection

The 2013 EBS Groundfish Survey was conducted this summer. A preliminary examination of results from the survey indicates that survey biomass in the standard survey area increased by 30% for flathead sole from 374,842 t in 2012 to 491,191 t in 2013, while it decreased by 14% for Bering flounder from 6,635 t in 2012 to 5,705 t in 2013 (Table 1).

Flathead sole is currently managed as a Tier 3a stock. New information available to update the single-species projection model for flathead sole consists of the total catch for 2012 (11,386 t) and the current catch for 2013 (16,322 t as of Oct. 12, 2013). To run the projection model to predict ABC's for 2014 and 2015, estimates are required for the total catches in 2013 and 2014. The final catch for 2013 was estimated by dividing the current catch (as of Oct. 12) by the ratio of the catch in the corresponding week in 2012 to the final 2012 catch. The estimated final catch for 2013 (17,246 t) was also used as the estimate for the final 2014 catch. Based on the updated projection model results, the maximum permissible ABC's for 2014 and 2015 are 66,293 t and 64,127 t, respectively, while the OFL's are 79,633 t and 77,023 t. The estimated spawning stock biomass for 2013 is 245,672 t. Because this is greater than $B_{35\%}$ (112,250 t), the stock is not considered overfished. In addition, because the total catch in 2012 was less than the ABC for that year (i.e., 11,386 t < 34,100 t), overfishing did not occur. Because the stock appears to be healthy and is only lightly exploited, the author's recommended ABCs for 2014 are the maximum permissible ones. The updated ABC recommendation and OFL for 2014 are quite similar to those developed last year (66,657 t and 80,069 t).

The principal reference values for this update and from last year's assessment are summarized in the following table, with the recommended values for 2014 in bold:

Quantity	As estimated or specified last year (2012)		As estimated or specified this year (2013)	
	2013	2014	2014	2015
M (natural mortality)	0.2	0.2	0.2	0.2
Specified/recommended tier	3a	3a	3a	3a
Total biomass (Age 3+; t)	748,454	747,838	745,237	744,631
Female Spawning Biomass (t)	245,175	236,009	239,985	224,112
$B_{100\%}$	320,714	320,714	320,714	320,714
$B_{40\%}$	128,286	128,286	128,286	128,286
$B_{35\%}$	112,250	112,250	112,250	112,250
$F_{OFL} = F_{35\%}$	0.348	0.348	0.348	0.348
$max F_{ABC} = F_{40\%}$	0.285	0.285	0.285	0.285
<i>recommended</i> F_{ABC}	0.285	0.285	0.285	0.285
OFL (t)	81,500	80,100	79,633	77,023
max ABC (t)	67,900	66,700	66,293	64,127
ABC (t)	67,900	66,700	66,293	64,127
Status	As determined last year (2012) for:		As determined this year (2013) for:	
	2011	2012	2012	2013
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

9.3 Research Priorities

Parameters estimated outside the assessment model (e.g., natural mortality, size-at-age) have not been updated for several years; the values currently being used in the model should be revisited. In particular, newer age data is available to update the size-at-age conversion matrices used in the assessment model. In addition, the effects of “lumping” Bering flounder together with flathead sole in the current assessment model should be more fully investigated. Alternative models that avoid this lumping should be explored. Finally, the SSC has requested that a candidate Tier 1 analysis be brought forward for this stock.

9.4 Summaries for Plan Team

Stock	Year	Age 3+ Biomass ¹	OFL ^{2,3,4}	ABC ^{2,3,4}	TAC ^{2,3,4}	Catch ⁵
Flathead sole	2011	791,000	83,300	69,300	41,500	13,556
	2012	811,000	84,500	70,400	34,100	11,386
	2013	748,454	81,500	67,900	22,699	16,322
	2014	745,237	79,633	66,293		
	2015	744,631	77,023	64,127		

¹ Age 3+ biomass from the Tier 3 assessment and projection models.

² http://alaskafisheries.noaa.gov/sustainablefisheries/specs11_12/bsaitable1.pdf

³ http://alaskafisheries.noaa.gov/sustainablefisheries/specs12_13/bsaitable1.pdf

⁴ http://alaskafisheries.noaa.gov/sustainablefisheries/specs13_14/bsaitable1.pdf

⁵ As of Oct. 12, 2013.

References

BSAI Plan Team. 2012. Minutes of the Joint Plan Teams for the Groundfish Fisheries of the Gulf of Alaska (GOA) and Bering Sea Aleutian Islands (BSAI). November 13 - 16, 2012. North Pacific Fishery Management Council. P.O. Box 103136, Anchorage, AK 99501.

http://www.afsc.noaa.gov/REFM/stocks/plan_team/resources/Nov_2012_BSAI_Joint_Minutes.pdf.

Stockhausen, W.T., D. Nichol and W. Palsson. 2012. Assessment of the Flathead Sole Stock in the Bering Sea and Aleutian Islands. In: Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Bering Sea/Aleutian Islands Region. North Pacific Fishery Management Council, P.O. Box 103136, Anchorage, Alaska 99510. Pp. 1099-1224.

<http://www.afsc.noaa.gov/REFM/Docs/2012/BSAIfathead.pdf>.

Tables

Table 1. Survey biomass (t) for the BSAI flathead sole stock complex.

Year	Hippoglossoides spp.					Bering flounder		Flathead sole	
	EBS Biomass	CV	AI Biomass	CV	Total	EBS Biomass	CV	EBS Biomass	CV
1982	192,037	0.09			194,947	--	--	192,037	0.09
1983	270,972	0.10	1,214	0.20	272,185	18,359	0.20	252,612	0.11
1984	285,849	0.08			290,372	17,820	0.22	323,874	0.09
1985	265,428	0.07			269,601	14,241	0.12	262,110	0.08
1986	357,963	0.09	5,273	0.16	363,236	13,962	0.17	344,002	0.09
1987	393,588	0.09			399,964	14,194	0.14	379,394	0.10
1988	561,868	0.09			571,137	23,521	0.22	550,273	0.09
1989	521,140	0.08			529,708	19,050	0.20	515,435	0.09
1990	593,504	0.09			603,317	21,217	0.15	607,049	0.09
1991	546,010	0.08	6,939	0.20	552,949	27,630	0.22	518,380	0.08
1992	618,338	0.11			628,577	15,927	0.21	635,462	0.10
1993	607,724	0.07			617,781	22,324	0.21	585,400	0.07
1994	690,153	0.07	9,929	0.23	700,081	26,837	0.19	699,554	0.07
1995	594,421	0.09			604,249	15,476	0.18	578,945	0.09
1996	616,460	0.09			626,667	12,034	0.20	604,427	0.09
1997	783,909	0.21	11,540	0.24	795,449	14,410	0.19	797,991	0.22
1998	683,627	0.21			694,988	7,911	0.21	684,401	0.21
1999	401,194	0.09			407,700	13,232	0.18	388,973	0.09
2000	392,817	0.09	8,906	0.23	401,723	8,312	0.19	388,943	0.09
2001	515,362	0.10			523,831	11,419	0.21	503,943	0.11
2002	553,333	0.18	9,897	0.24	563,229	5,223	0.20	573,953	0.18
2003	514,868	0.10			523,329	5,712	0.21	509,156	0.11
2004	612,289	0.09	13,299	0.14	625,588	8,103	0.31	604,186	0.09
2005	612,540	0.09			622,680	7,116	0.28	605,424	0.09
2006	635,970	0.09	9,664	0.18	645,634	13,893	0.32	622,077	0.09
2007	562,475	0.09			571,754	10,453	0.217	552,022	0.09
2008	545,467	0.14			554,453	10,111	0.188	535,356	0.15
2009	418,812	0.12			425,621	6,649	0.166	412,163	0.12
2010	495,235	0.15	11,812	0.31	507,047	6,610	0.155	488,626	0.15
2011	583,300	0.19			592,937	6,802	0.149	576,498	0.19
2012	381,477	0.12	5,566	0.15	387,043	6,635	0.144	374,842	0.12
2013	491,191	0.17			499,245	5,705	0.145	485,486	0.17