

8. Assessment of the Flathead Sole Stock Complex in the Gulf of Alaska

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Executive Summary

Introduction

The Gulf of Alaska flathead sole stock is assessed every four years and was last assessed in 2017. In years without a full assessment, we present an executive summary to recommend harvest levels for the next two years. Please refer to the 2017 full stock assessment report for further information regarding the assessment model (Turnock, et al., 2017, available online at <https://www.afsc.noaa.gov/REFM/Docs/2017/GOAflathead.pdf>). A full stock assessment document with updated assessment and projection model results will be presented in 2021.

Flathead sole is assessed using an age-structured model and Tier 3 determination. Thus, the single species projection model was run using parameter values from the accepted 2017 flathead sole assessment model (Turnock et al. 2017), together with updated catch information for 2017-2018, to predict stock status for flathead sole in 2019 and 2020 and to make ABC recommendations for those years. Projections are conducted using numbers-at-age for flathead sole from age 3-21+ and historical recruitment of age 3 individuals is used to calculate OFL's and ABC's.

Summary of Results

The ABC for flathead sole is 36,782 t in 2019 and 38,273 t in 2020 and the OFL is 44,865 t in 2019 and 46,666 t in 2020. The new ABC recommendation and OFL for 2019 are similar to those developed in 2017 (36,746 t and 44,822 t; Turnock et al. 2017). The principal reference values are shown in the following table:

Quantity	As estimated or <i>specified last year for:</i>		As estimated or <i>recommended this year for:</i>	
	2018	2019	2019*	2020*
<i>M</i> (natural mortality rate)	0.2	0.2	0.2	0.2
Tier	3a	3a	3a	3a
Projected total (3+) biomass (t)	281,635	283,107	283,285	282,750
Projected Female spawning biomass (t)	85,765	89,118	89,205	92,655
<i>B</i> _{100%}	91,551	91,551	91,551	91,551
<i>B</i> _{40%}	36,620	36,620	36,620	36,620
<i>B</i> _{35%}	32,043	32,043	32,043	32,043
<i>F</i> _{OFL}	0.36	0.36	0.36	0.36
<i>maxF</i> _{ABC}	0.28	0.28	0.28	0.28
<i>F</i> _{ABC}	0.28	0.28	0.28	0.28
OFL (t)	43,011	44,822	44,865	46,666
maxABC (t)	35,266	36,746	36,782	38,273
ABC (t)	35,266	36,746	36,782	38,273
Status	As determined <i>last year</i> for:		As determined <i>this year</i> for:	
	2016	2017	2017	2018
Overfishing	no	n/a	no	n/a
Overfished	n/a	no	n/a	no
Approaching overfished	n/a	no	n/a	no

*Projections are based on estimated catches of 2,063 t used in place of maximum permissible ABC for 2018 and 2,369 t used in place of maximum permissible ABC for 2019 and 2020. The 2018 projected catch was calculated as the current catch as of October 6, 2018 added to the average October 6 – December 31 catches over the 5 previous years. The 2019 and 2020 projected catch was calculated as the average catch over the previous 5 years.

Area Apportionment

Area apportionment for ABC of flathead sole is currently based on the proportion of survey biomass projected for each area in 2019 and 2020 using the survey averaging random effects model developed by the survey averaging working group. The recommended ABC area apportionment percentages are identical to last year because the last GOA groundfish survey was conducted in 2017.

Quantity	Western	Central	West Yakutat	Southeast	Total
Area Apportionment	35.98%	57.39%	5.48%	1.15%	100.00%
2019 ABC (t)	13,234	21,109	2,016	423	36,782
2020 ABC (t)	13,771	21,965	2,097	440	38,273

Figures

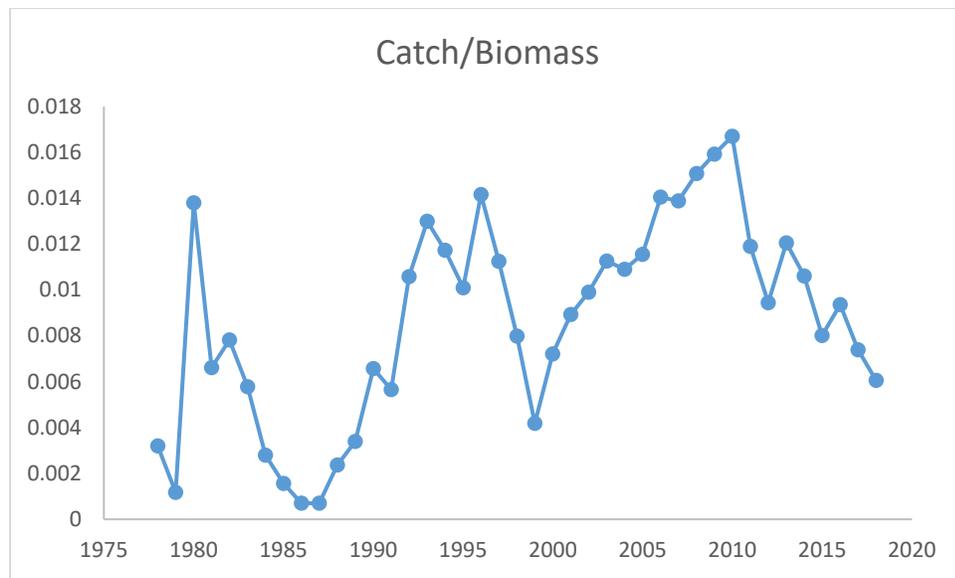


Figure 1. Catch to total biomass ratio using total biomass for age 3+ individuals for GOA flathead sole.

Tables

Table 1. Total catch of GOA flathead sole. Catch for 2018 is current up to October 6, 2018.

Year	Total Catch	Western Gulf	Central Gulf	Eastern Gulf
1978	452			
1979	165			
1980	2,068			
1981	1,070			
1982	1,368			
1983	1,080			
1984	549			
1985	320			
1986	147			
1987	151			
1988	520			
1989	747			
1990	1,447			
1991	1,237	199	1,036	2.1
1992	2,315	355	1,947	12.7
1993	2,824	581	2,242	0.0
1994	2,525	499	2,013	0.0
1995	2,180	589	1,563	28.0
1996	3,073	807	2,166	100.3
1997	2,441	449	1,934	0.0
1998	1,731	556	1,168	0.0
1999	897	186	687	24.6
2000	1,548	259	1,274	0.0
2001	1,912	600	1,311	0.0
2002	2,146	420	1,725	0.0
2003	2,459	525	1,934	0.1
2004	2,398	828	1,571	0.0
2005	2,552	611	1,941	
2006	3,142	462	2,679	0.9
2007	3,130	666	2,462	2.2
2008	3,446	297	3,149	0.0
2009	3,663	303	3,359	1.0
2010	3,854	462	3,392	0.5
2011	2,729	393	2,336	0.3
2012	2,166	277	1,890	0.2
2013	2,817	588	2,228	0.2
2014	2,556	219	2,336	0.9
2015	2,000	199	1,801	0.6
2016	2,421	228	2,190	2.1
2017	2,051	73	1,978	0.1
2018*	1,707	106	1,601	0.4

*Catch for 2018 is current as of October 6, 2018

Table 2. Flathead sole survey biomass by year, region, and depth.

	Depth (meters)						Total
	1-100	101-200	201-300	301-500	501-700	701-1000	
CENTRAL GOA							
1984	64,191	85,916	8,431	0	0	0	158,539
1987	64,607	38,880	9,962	36	0	0	113,483
1990	100,061	52,600	8,591	5			161,257
1993	64,289	40,912	8,775	0			113,976
1996	56,342	59,964	6,422	3			122,730
1999	95,624	40,352	3,366	14	0	0	139,356
2001	44,046	37,467	3,906	11			85,430
2003	84,916	76,161	9,775	0	0		170,852
2005	61,294	75,699	5,050	0	0	0	142,043
2007	72,109	95,906	9,627	0	0	0	177,641
2009	60,575	62,431	5,904	0	0	0	128,910
2011	66,969	50,067	11,391	0	0		128,428
2013	72,923	42,847	5,293	0	0		121,063
2015	52,128	67,331	5,955	0	0	0	125,414
2017	70,815	44,934	7,338	0	0	0	123,087
EASTERN GOA							
1984	21,029	24,596	74	4	0	0	45,703
1987	6,060	23,835	564	0	0		30,459
1990	11,041	11,010	991	17			23,059
1993	4,839	10,377	1,434	193			16,843
1996	10,773	4,607	674	6			16,059
1999	5,145	13,271	182	0	0	0	18,598
2003	7,790	11,542	56	0	0		19,388
2005	2,060	9,365	135	151	0	0	11,712
2007	9,050	16,196	154	0	0	0	25,400
2009	10,111	6,150	90	0	0	0	16,351
2011	19,801	10,785	577	0	0		31,162
2013	11,007	6,887	146	0	0		18,039
2015	13,257	10,924	503	0	0	0	24,684
2017	3,197	11,030	266	0	0	0	14,493
WESTERN GOA							
1984	33,754	11,279	66	1	0	0	45,100
1987	20,815	12,761	27	0	0	0	33,603
1990	45,913	12,696	131	0			58,740
1993	43,944	13,854	68	5			57,871
1996	52,543	13,974	174	41			66,732
1999	44,578	5,018	33	0	8	0	49,636
2001	49,387	18,667	100	11			68,164
2003	53,313	13,718	24	0	0		67,055
2005	51,541	7,805	112	0	0	0	59,458
2007	59,759	18,560	42	0	0	0	78,361
2009	68,139	11,814	163	0	0	0	80,115
2011	63,066	12,866	117	0	0		76,049
2013	52,263	9,841	28	0	0		62,131
2015	51,636	15,991	37	0	0	0	67,665
2017	86,797	12,169	42	0	0	0	99,009

Literature Cited

Turnock, B.J., McGilliard, C.R., and Palsson, W. 2017. 5. Gulf of Alaska Deepwater Flatfish. In Stock Assessment and Fishery Evaluation Report for the Groundfish Resources of the Gulf of Alaska. pp. 841-912. North Pacific Fishery Management Council, P.O. Box 103136, Anchorage AK 99510.