

Assessment of the Arrowtooth Flounder Stock in the Bering Sea and Aleutian Islands

Ingrid Spies and Wayne Palsson
Alaska Fisheries Science Center, National Marine Fisheries Service
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE., Seattle, WA 98115-6349
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Executive summary

The Bering Sea and Aleutian Islands (BSAI) arrowtooth flounder (*Atheresthes stomias*) stock is managed in Tier 3a and is assessed on a biennial basis. Survey data for the BSAI comes from the eastern Bering Sea shelf survey which takes place annually, the Aleutian Islands survey which is biennial, and the eastern Bering Sea slope survey which is also typically biennial, although has not taken place since 2016. In even years a full assessment of arrowtooth flounder (ATF) in the BSAI is conducted. On odd years, parameter values from the previous year's assessment model and total catch information for the current and previous year are used to make projections and to recommend ABC and OFL for the following two years.

A single species projection model was used to predict the status of the BSAI ATF stock for 2020 and 2021 and to calculate ABC and OFL for those years. The projection model incorporated parameter values from the 2018 assessment model (Spies et al. 2018) as well as catch information from 2018 and 2019 (Table 6.1).

Summary of changes in assessment inputs

Changes in the data

1. The stock assessment model was not run for this update. New input data for the projection model consisted of the total catch for 2018 (7,002 t) and the current year's catch downloaded October 26, 2019 was 8,071 t.
2. Running the projection model to predict 2020 and 2021 ABCs requires estimates for the total catches in 2019 and 2020. Catch through the end of October has represented 96.2% of the catch over the past 5 full years of fishing in the Bering Sea and Aleutian Islands. Catch downloaded October 26, 2019 for 2019 was 8,071 t. This was extrapolated to an estimate of 8,391 t for the total catch in 2019. The 2020 catch estimate of 12,000 t is based on the average catch from 2014-2018. There has been a decreasing trend in ATF catch since 2015 but catch in 2019 appears higher than previous years (Figure 6.1).

Changes in the assessment methods

There were no changes to the assessment methodology.

Summary of Results

The estimate of total biomass in 2020 is similar to the value estimated in the 2018 full assessment, 932,024 t vs. 891,959 t. Recommended ABCs for 2020 and 2021 were 70,606 t and 71,618 t, respectively, and the OFLs were 82,860 t and 84,057 t, based on projection model results. The new ABC and OFL recommendations for 2020 are similar to those developed using the 2018 full assessment model for 2019. The stock is not overfished, and is not approaching a condition of being overfished. Reference values are presented in the following table.

A research survey was conducted on the Eastern Bering Sea shelf in 2019. The EBS arrowtooth flounder biomass estimate was 578,389 t for 2019, which was slightly higher than the estimate in 2018 of 511,192 t (Figure 6.1 and Table 6.1). These biomass estimates are lower than the estimate for the entire Bering Sea and Aleutian Islands, because the full assessment is based on survey results from the Aleutian Islands, eastern

Quantity	As estimated or <i>specified</i> <i>last</i> year for:		As estimated or <i>recommended</i> <i>this</i> year for:	
	2019	2020	2020	2021
M (natural mortality rate, ages 3+)	0.35, 0.2	0.35, 0.2	0.35, 0.2	0.35, 0.2
Tier	3a	3a	3a	3a
Projected total (age 1+) biomass (t)	892,591 t	932,024 t	891,959 t	934,008 t
Projected female spawning biomass (t)	482,174 t	472,507 t	481,845 t	478,260 t
$B_{100\%}$	606,237 t	606,237	606,237 t	606,237 t
$B_{40\%}$	242,495 t	242,495	242,495 t	242,495 t
$B_{35\%}$	212,183 t	212,183	212,183 t	212,183 t
F_{OFL}	0.161	0.161	0.161	0.161
$maxF_{ABC}$	0.136	0.136	0.136	0.136
F_{ABC}	0.136	0.136	0.136	0.136
OFL	82,939 t	83,814 t	82,860 t	84,057 t
$maxABC$	70,673 t	71,411 t	70,606 t	71,618 t
ABC	70,673 t	71,411 t	70,606 t	71,618 t
Status	2017	2018	2018	2019
Overfishing	No	n/a	No	n/a
Overfished	n/a	No	n/a	No
Approaching overfished	n/a	No	n/a	No

Projections were based on estimated catches of 8,391 t for 2019 and 12,000 for 2020 which was based on the 5 year average (2015-2019) and used in place of ABC.

Natural mortality rate was fixed at 0.35 for males, 0.2 for females.

Bering Sea, and Bering Sea slope surveys. Between 1987 and 2019 the EBS shelf survey biomass estimates for arrowtooth flounder have ranged from 239,708 t to 662,711 t (Table 6.1).

Assessments conducted in “off years” are required to present a catch to biomass ratio, which is calculated here as the catch divided by the total age 1+ biomass from the assessment model and includes the 2020 total biomass from the projection model (Spies et al. 2018). Catches of arrowtooth flounder have been decreasing in recent years in the BSAI (Table 6.2). The catch to biomass ratio has ranged from 0.008 to 0.065 between 1987 and 2020 (Table 6.2).

Literature Cited

Spies, I., Wilderbuer, T., Nichol, D., Hoff, J., Palsson, W. 2018. Assessment of the arrowtooth flounder stock in the Eastern Bering Sea and Aleutian Islands. North Pacific Fishery Management Council, P. O. Box 103136, Anchorage, AK 99510.

Tables

Table 6.1: Biomass estimates of arrowtooth flounder (in metric tons) from the NMFS eastern Bering Sea survey, 1991-2019.

Year	Survey biomass estimate (t)
1987	280,116
1988	297,331
1989	339,246
1990	402,326
1991	298,788
1992	345,561
1993	446,816
1994	476,355
1995	448,016
1996	527,254
1997	463,080
1998	345,172
1999	239,708
2000	314,694
2001	378,107
2002	313,074
2003	498,040
2004	519,129
2005	662,711
2006	608,054
2007	482,358
2008	530,126
2009	406,854
2010	528,666
2011	522,105
2012	402,886
2013	405,508
2014	465,616
2015	409,243
2016	475,263
2017	424,194
2018	511,192
2019	578,389

Table 6.2: Biomass estimates, catch, and catch/biomass ratio for 1976-2021. Biomass estimates were generated using the 2018 full assessment model, except for 2019, 2020 and 2021, which were generated with the single species projection model. Catch data is from the NMFS AKRO BLEND/Catch Accounting System, except for 2019, 2020 and 2021 which were extrapolated as described in the text.

Year	Biomass	Catch	Catch/Biomass Ratio
1976	318,843	17,834	0.056
1977	306,325	10,685	0.035
1978	294,589	9,430	0.032
1979	280,137	13,352	0.048
1980	262,107	17,079	0.065
1981	246,440	15,915	0.065
1982	239,708	10,712	0.045
1983	245,051	12,991	0.053
1984	255,318	8,790	0.034
1985	275,301	6,926	0.025
1986	303,277	6,678	0.022
1987	339,649	4,519	0.013
1988	387,906	18,591	0.048
1989	431,691	6,795	0.016
1990	494,098	12,144	0.025
1991	548,332	19,510	0.036
1992	589,693	11,897	0.020
1993	625,598	9,299	0.015
1994	651,743	14,338	0.022
1995	662,015	9,284	0.014
1996	671,228	14,654	0.022
1997	671,884	10,469	0.016
1998	676,515	15,237	0.023
1999	681,530	11,378	0.017
2000	697,736	13,230	0.019
2001	720,593	14,058	0.020
2002	749,885	11,855	0.016
2003	786,132	13,253	0.017
2004	824,573	18,185	0.022
2005	855,712	14,243	0.017
2006	887,244	13,442	0.015
2007	914,427	11,916	0.013
2008	935,734	21,370	0.023
2009	943,717	29,900	0.032
2010	939,969	38,803	0.041
2011	925,548	20,141	0.022
2012	901,347	22,324	0.025
2013	872,920	20,537	0.024
2014	848,196	19,111	0.023
2015	827,152	11,270	0.014
2016	816,183	11,105	0.014
2017	822,634	6,518	0.008
2018	849,621	7,002	0.008
2019	849,615	8,072	0.010
2020	891,959	8,391	0.009
2021	934,008	12,000	0.013

Figures

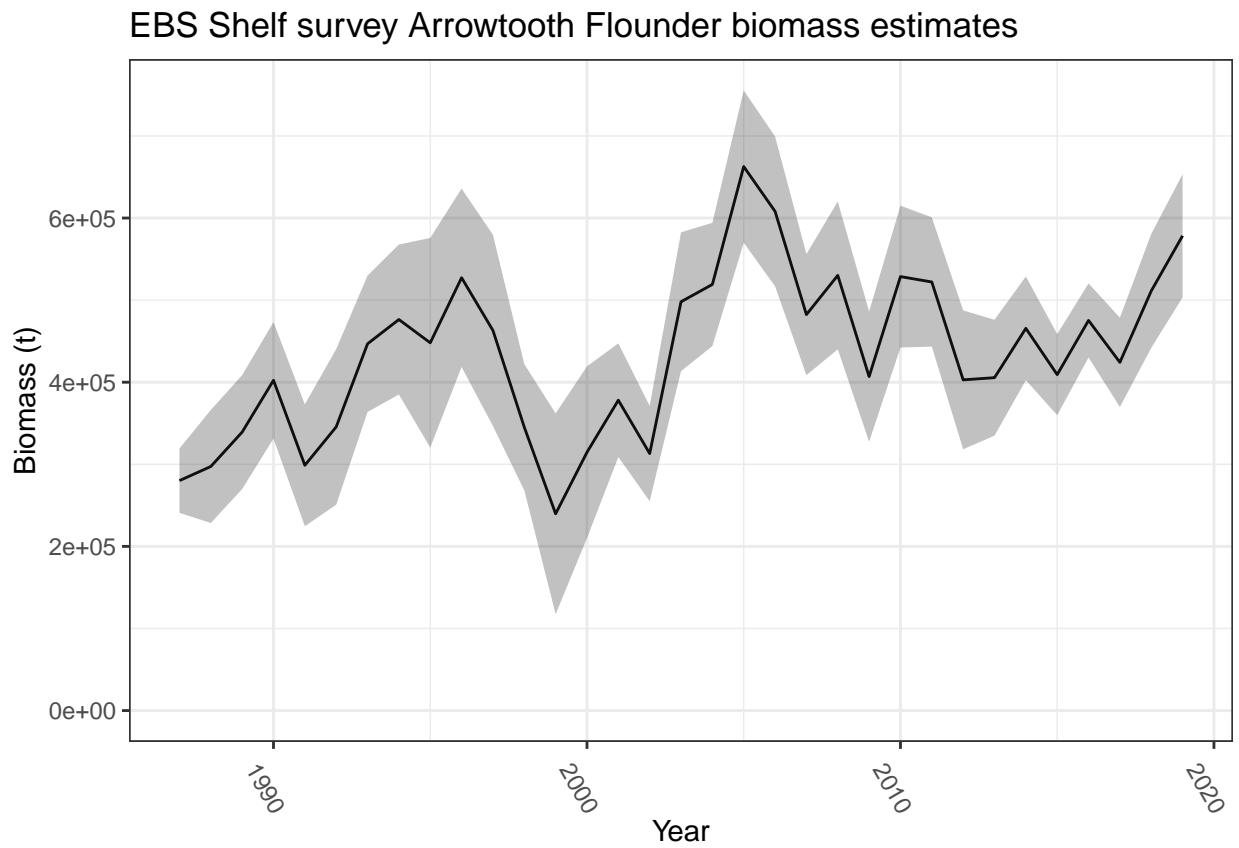


Figure 6.1: Biomass estimates of arrowtooth flounder (in metric tons) from the NMFS eastern Bering Sea survey, 1991-2019, with 95% confidence intervals.