



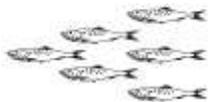
Forecast for the 2020
Gulf and Atlantic Menhaden Purse-Seine Fisheries
and
Review of the 2019 Fishing Season
March 2020
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INTRODUCTION

The 2020 fishing year marks the forty-eighth year that the National Marine Fisheries Service has made quantitative forecasts of purse-seine landings of menhaden. The forecasts are based on a multiple regression equation that relates landings and fishing effort over the series of years. Landings forecasts are conditioned on estimates of expected fishing effort for the upcoming fishing year. Fishing effort estimates are vessel-specific and are derived from 1) industry input regarding the number of vessels that companies expect to be active during the upcoming fishing year, and 2) historical performance (catch and effort) of the vessels expected to participate in the fishery. In the Atlantic Menhaden fishery, actual purse-seine landings have differed an average of 13% from those forecasted for the forty year period, 1973-2012 (pre-TAC years; see page 4). Landings in the Gulf Menhaden fishery have differed from those forecasted by an average of 13% for the forty-eight year period, 1973-2020. In this forecast report, we review the 2019 Gulf and Atlantic Menhaden fishing seasons in terms of:

- landings and fleet size
- age composition of the catch
- status of the most recent forecast

Finally, we will forecast estimated landings for the 2020 menhaden fishing season.



GULF MENHADEN FISHERY

Gulf Menhaden Landings, Fishing Conditions, and Vessel Participation in 2019

Final purse-seine landings of Gulf Menhaden for reduction in 2019 totaled 486,980 metric tons (mt; 1,602 million standard fish). This is a decrease of 7.4% from total landings in 2018 (525,635 mt), and 1.5% more than the previous 5-year mean (479,948 mt; Figure 1).

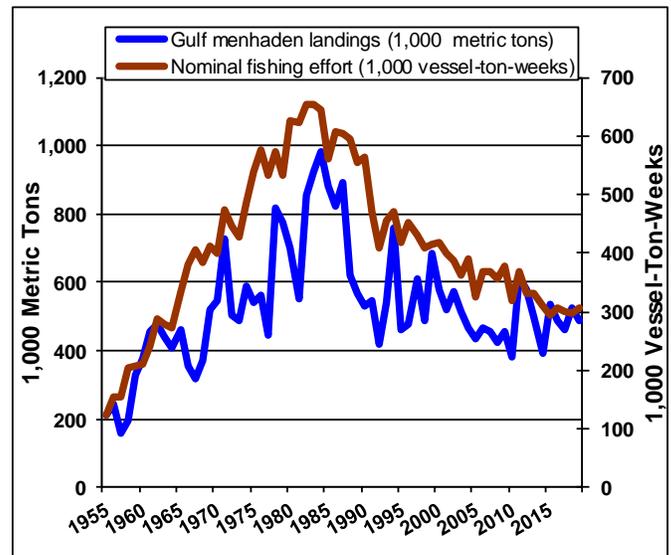


Figure 1. Gulf Menhaden landings in 1,000s of metric tons (mt) and nominal fishing effort in 1,000s of vessel-ton-weeks (VTW), 1955–2020.

Winter 2018-2019 began with a drought across much of the high plains that feed into the Mississippi River with temperatures above average

for much of the region and season. Although precipitation increased on the high plains, it was hypothesized that the frozen, dry soil would absorb much of the snow melt, thereby reducing the amount of the above-average snow pack's effects on the Spring river flow. Throughout much of the southeastern region, temperatures were above-average for the winter. This caused a rapid snowmelt that coincided with higher-than average precipitation in the Mississippi River Basin from March through to the beginning of the fishing season.

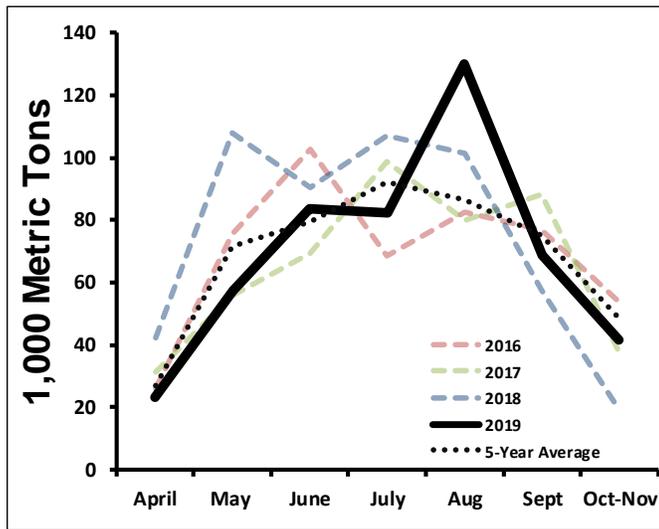


Figure 2. Gulf Menhaden landings by month, 2016-2019.

The 2019 Gulf Menhaden fishing season opened on April 15th. Landings in April (23,023 mt) were slightly below the 5-year average (26,963 mt), landings in May (57,179 mt) continued the trend of below-average landings for the early months of the season.

For the second year in a row, no tropical cyclones developed in the Atlantic for the month of June. June landings (83,601 mt) were very close to the 5-year average for the month.

Landings in July decreased slightly to 82,450 mt, below both 2018 and the five-year average. On July 10th, south of Mississippi, a tropical depression was formed that developed into Hurricane Barry, which travelled over to Vermilion Bay and made direct landfall on Intracoastal City. The Gulf of Mexico

hypoxic zone was estimated to be quite large this year, but the churning of Hurricane Barry is thought to have restrained its growth to 6,952 square miles by the end of July. Despite this restriction on its growth, the dead zone was still the eighth largest in the 33-year history of monitoring.

For the second year in a row, August was a very productive month. With generally good weather throughout the month, landings in August (130,145 mt), were the highest landings for that month in over 25 years.

September conditions were favorable, with the exception of Tropical Storm Imelda's formation on the western portion of the Gulf of Mexico which disrupted weather and fishing in the middle of the month. Landings for September returned to close to the 5-year average for the month (68,785 mt).

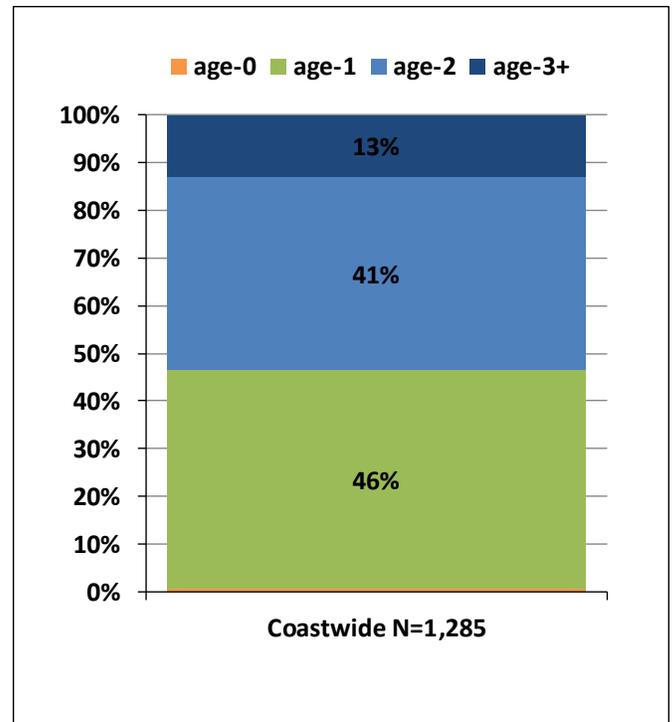


Figure 3. Percent estimated numbers-at-age of Gulf menhaden by port in 2019.

The middle of October was impacted by Tropical Storm Nestor, which was not a very strong storm, but passed over most of the Gulf before making landfall on Florida's panhandle and affecting areas still recovering from Hurricane Michael. Shortly after Nestor passed, Tropical Storm Olga began in

much the same place, but made landfall farther west. Menhaden landings for the last month of fishing amounted to 41,796 mt, somewhat below the 5-year average. All plants “cut-out” for the fishing season at the end of the month.

Age Composition of Gulf Menhaden in 2019

Approximately 1,285 Gulf Menhaden have been aged from the 2019 port samples to date (Fig. 3). From the preliminary catch-at-age matrix, coastwide, age-1 fish made up almost half of the samples collected (46%) age-2 fish (41%) comprised most of the remainder, with 12% comprising the 3+ group (Table 1). A more detailed examination of the age structure of the fishery will be conducted when age estimation of the samples submitted is complete later this year.

Table 1. Percent age composition, estimated total numbers of fish caught, and total landings for the Gulf Menhaden fishery, 2015-2019; 2018-2019 data are preliminary and incomplete.

Year	Age-0	Age-1	Age-2	Estimated total number of fish caught (billions)	Landings (1,000 metric tons)
2019	<1%	46%	41%	*	487.0
2018	*	*	*	*	525.6
2017	1%	61%	30%	5.49	460.7
2016	<1%	47%	44%	4.95	485.8
2015	-	56%	35%	6.20	535.7

Fishing Effort and Review of the 2019 Forecast for Gulf Menhaden

Nominal fishing effort for the Gulf Menhaden fishery during 2019 was estimated at 305,700 vessel ton weeks; this is 3% higher than nominal fishing effort in 2018 (296,700 vessel ton weeks).

In March 2019, we anticipated that nominal fishing effort during 2019 could amount to 291,300 vessel

ton weeks with 33 vessels participating in the fishery. With this level of anticipated fishing effort, we forecasted 2019 Gulf Menhaden landings of 454,000 mt with 80% confidence levels of 334,000 and 574,000 mt. A “hindcast” using our forecast model and actual nominal fishing effort in 2019 produced a post-season forecast of 470,000 mt with 80% confidence levels of 350,000 and 589,000 mt. Actual landings of 486,980 mt were 7.2% higher than our forecast and 3.5% greater than our post-season estimate.

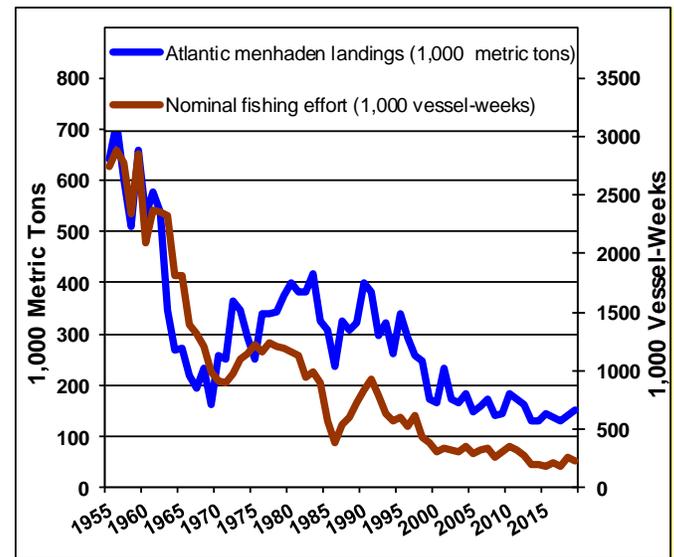


Figure 4. Atlantic Menhaden landings in 1,000s of metric tons (mt) and nominal fishing effort in vessel-weeks (VW), 1955–2019.

Forecast for the 2020 Gulf Menhaden Fishing Season

As in 2019, we expect three menhaden factories (Moss Point, MS, and Empire and Abbeville, LA) will process Gulf Menhaden for the season. Our best estimate is for 33 vessels: 28 regular steamers, as many as five run boats, and one bait boat participating. Based on average nominal fishing effort for recent years by the vessels expected to be active in 2020, we estimate that nominal fishing effort in 2020 may be about 290,400 vessel ton weeks; with this level of nominal fishing effort, 2020 Gulf Menhaden forecasted landings are 434,000 mt, with 80% confidence levels of 316,000 and 552,000 mt.

ATLANTIC MENHADEN FISHERY

Atlantic Menhaden Landings, Fishing Conditions, and Vessel Participation in 2020

Final 2019 landings of Atlantic Menhaden for reduction amounted to 150,825, mt (496 million standard fish; Fig. 4). This is 6% less than purse-seine landings for the 2012 season (160,627 mt), the last season before implementation of the coastwide total allowable catch (TAC). It is also 6% less than average landings for the years 2008-12 (160,524 mt). As has been the case since 2005, only one menhaden factory, the Omega Protein plant at Reedville, VA, operated on the Atlantic coast in 2019.

In December 2012, the Atlantic States Marine Fisheries Commission (ASMFC) approved Amendment 2 to the Fishery Management Plan for Atlantic Menhaden which established a TAC for the reduction and bait fisheries combined of 170,800 mt beginning in 2013, this TAC was subsequently raised to 187,880 mt in 2015, 200,000 mt for 2017, and 216,000 mt in 2018. The menhaden reduction fishery was allocated about 152,392 mt of the TAC for 2019.

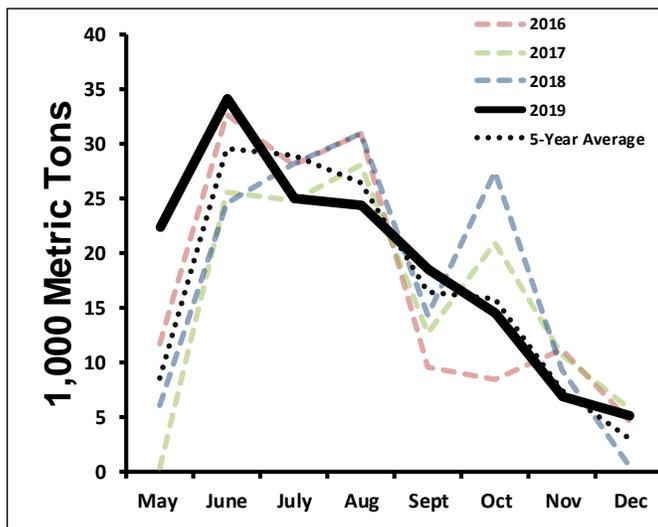


Figure 5. Atlantic Menhaden landings by month, 2016–2019.

As in many recent years, menhaden were observed to be more abundant than usual in New England waters. Reported landings from New England states

did not allow for unused set-aside quota to be reallocated to the reduction fishery in 2019.

The mid-Atlantic region experienced favorable weather for the beginning of the fishing season. Atlantic Menhaden landings for reduction during May 2019 were high (287 mt, Fig. 5). May landings were the highest since the implementation of the TAC in 2012. Favorable fishing conditions continued until June, with no tropical cyclones to disrupt fishing operations. Landings in June were 34,098 mt, the highest June landings since the implementation of the TAC in 2012. July landings dipped below the 5-year average finishing the month with 25,057 mt landed.

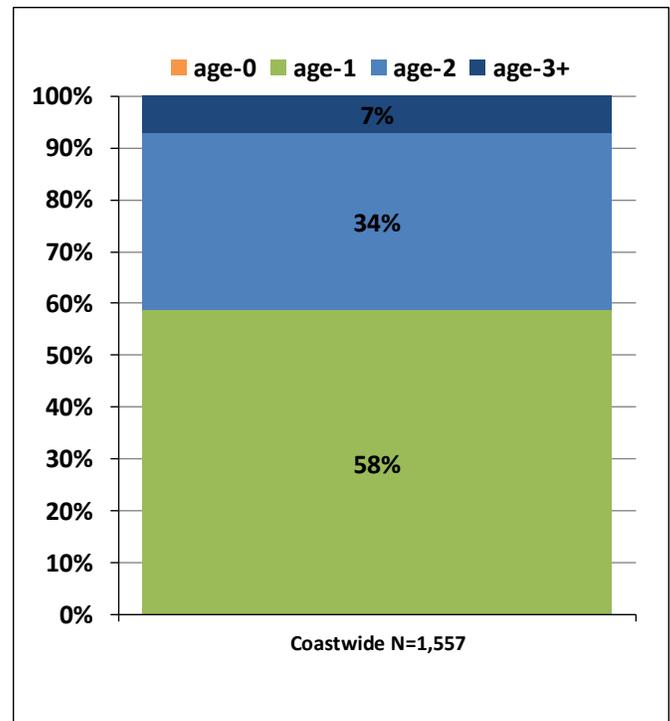


Figure 6. Percent estimated numbers at age of Atlantic Menhaden by area in 2019.

In August, landings approached but remained slightly below the 5-year average for that month (24,333 mt). Hurricane Dorian formed at the end of August, quickly accelerating to a Category 5 Hurricane before sweeping up the Atlantic Coast in September. Fortunately, due to a high wind shear, the storm ultimately lowered in strength before affecting the mid-Atlantic Coast. A similar path was followed by Hurricane Humberto directly behind it.

Since 2015, September landings have been relatively low, with a 5-year average of 16,438 mt. The landings in 2019 of 18,500 mt approaches the average amounts landed prior to 2015.

In October there was a constant stream of weather-related disruptions to fishing, but none of these tropical cyclones peaked at a higher intensity than a tropical depression. Landings continued to decrease to 14,459 mt, slightly below the 5-year average for that month. The fishing season continued about average for the month of November with 6,857 mt of landings. December landings slightly decreased from November, but still above the five-year average with 5,154 mt of landings before all reduction vessels cut out in mid-December.

The coastwide TAC for Atlantic Menhaden also included the bait fisheries. Bait allocations by state were allotted based on landings histories during 2009-11, but readjusted beginning with the 2018 season so that the minimum allocation to each state was 0.5% of the total TAC. The abundance of menhaden in northern waters meant that the portion of the quota reserved for such episodic events was not available for reallocation to the reduction fishery.

Maine’s episodic event fishery closed July 28th, allowing incidental take of menhaden up to a 6,000-pound limit. Massachusetts reduced their limit to 25,000 lbs upon reaching 85% of their allocation on August 9 and 6,000 pounds when reaching 95% on August 16. Following quota transfers from Connecticut and Rhode Island, raised their trip limit back to 25,000 lbs through the end of the season. New York limited their fishery to 40,000 lbs on July 9th.

New Jersey’s purse-seine fishery closed July 30 and re-opened in early August.

Age Composition of Atlantic Menhaden in 2019

Approximately 1,350 Atlantic Menhaden were sampled for length and weight and approximately 1,320 have been aged to date from the reduction fishery in 2019. From the preliminary age

estimates, coastwide, age-1 fish (58%) outnumbered age-2 fish (34%) and age-3+ fish (7%) by a large margin (Fig. 6 and Table 2). These percentages represent fish sampled, and have not been applied to total landings.

Fishing Effort in 2020 Atlantic Menhaden Season

Nominal fishing effort in 2020 was estimated at 235 vessel weeks, decreasing from 256 vessel weeks expended in 2019.

Table 2. Percent age composition of the reduction catch in the Atlantic Menhaden fishery, 2015–2019. *Results are preliminary or incomplete for 2018,2019

Year	Age-0	Age-1	Age-2	Age-3+
2019*	0%	58%	34%	7%
2018*	*	*	*	*
2017	0%	81%	17%	2%
2016	0%	26%	50%	24%
2015	0%	14%	70%	16%

Forecast for the 2020 Atlantic Menhaden Fishing Season

Amendment 2 to the Fishery Management Plan for Atlantic Menhaden specified an annual coastwide TAC of about 129,900 mt for the purse-seine reduction fishery. This TAC was to be revisited every three years and was raised to 142,894 mt in 2015, 152,112 mt in 2017, and 164,280 in 2018. Landings are anticipated to be close to the TAC.

Combined 2020 Gulf and Atlantic Menhaden Landings

Combined landings by the Gulf and Atlantic Menhaden purse-seine fisheries for reduction during 2020 year amounted to 1.41 billion pounds, a slight decrease from landings during the 2018 calendar year which amounted to 1.47 billion pounds.

Fishing effort and landings in the Gulf Menhaden purse-seine fishery,1955-2019

Year	Fishing effort 1,000 vessel- ton-weeks	Landings 1,000 metric tons	Year	Fishing effort 1000 vessel- ton-weeks	Landings 1,000 metric tons
1955	122.9	213.3	1988	594.1	623.7
1956	155.1	244.0	1989	555.3	569.6
1957	155.2	159.3	1990	563.1	528.3
1958	202.8	196.2	1991	472.3	544.3
1959	205.8	325.9	1992	408.0	421.4
1960	211.7	376.8	1993	455.2	539.2
1961	241.6	455.9	1994	472.0	761.6
1962	289.0	479.0	1995	417.0	463.9
1963	277.3	437.5	1996	451.7	479.4
1964	272.9	407.8	1997	430.2	611.2
1965	335.6	461.2	1998	409.3	486.2
1966	381.3	357.6	1999	414.5	684.3
1967	404.7	316.1	2000	417.6	579.3
1968	382.8	371.9	2001	400.6	521.3
1969	411.0	521.5	2002	386.7	574.5
1970	400.0	545.9	2003	363.2	517.1
1971	472.9	728.5	2004	390.5	468.7
1972	447.5	501.9	2005	326.0	433.8
1973	426.2	486.4	2006	367.2	464.4
1974	485.5	587.4	2007	369.2	453.8
1975	538.0	542.6	2008	355.8	425.4
1976	575.8	561.2	2009	377.8	457.5
1977	532.7	447.1	2010	320.3	379.7
1978	574.3	820.0	2011	367.2	613.3
1979	533.9	777.9	2012	332.7	578.4
1980	627.6	701.3	2013	332.5	497.5
1981	623.0	552.6	2014	312.9	391.9
1982	653.8	853.9	2015	294.2	535.7
1983	655.8	923.5	2016	307.7	484.8
1984	645.9	982.8	2017	301.3	460.7
1985	560.6	881.1	2018	296.7	525.6
1986	606.5	822.1	2019	305.7	487.0
1987	604.2	894.2			

Fishing effort and landings in the Atlantic Menhaden purse-seine fishery, 1955-2019

Year	Fishing effort vessel-weeks	Landings 1,000 metric tons	Year	Fishing effort vessel-weeks	Landings 1,000 metric tons
1955	2748	641.4	1988	604	309.3
1956	2878	712.1	1989	725	322.0
1957	2775	602.8	1990	826	401.2
1958	2343	510.0	1991	926	381.4
1959	2847	659.1	1992	794	297.6
1960	2097	529.8	1993	626	320.6
1961	2371	575.9	1994	573	260.0
1962	2351	537.7	1995	600	339.9
1963	2331	346.9	1996	528	292.9
1964	1807	269.2	1997	616	259.1
1965	1805	273.4	1998	437	245.9
1966	1386	219.6	1999	382	171.2
1967	1316	193.5	2000	311	167.2
1968	1209	234.8	2001	334	233.7
1969	995	161.6	2002	318	174.0
1970	906	259.4	2003	302	166.1
1971	897	250.3	2004	345	183.4
1972	973	365.9	2005	291	146.9
1973	1099	346.9	2006	322	157.4
1974	1145	292.2	2007	333	174.5
1975	1218	250.2	2008	262	141.1
1976	1163	340.5	2009	300	143.8
1977	1239	341.1	2010	356	183.1
1978	1210	344.1	2011	324	174.0
1979	1198	375.7	2012	279	160.6
1980	1158	401.5	2013	196	131.0
1981	1133	381.3	2014	201	131.1
1982	948	382.4	2015	182	143.5
1983	995	418.6	2016	213	137.4
1984	892	326.3	2017	185	128.9
1985	577	306.7	2018	256	141.3
1986	377	238.0	2019	235	150.8
1987	531	327.0			