

Forecast for the 2014 Gulf and Atlantic Menhaden Purse-Seine Fisheries and Review of the 2013 Fishing Season

March 2014

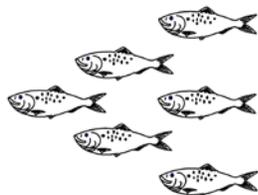
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INTRODUCTION

The 2014 fishing year is the forty-second year for which quantitative forecasts of purse-seine landings of menhaden have been made by the National Marine Fisheries Service. The forecasts are based on a multiple regression equation that relates landings and fishing effort over a series of years. Forecasts of landings are conditioned on estimates of expected fishing effort for the upcoming fishing year. Estimates of fishing effort 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 forecast for the forty year period, 1973-2012. Landings in the gulf menhaden fishery have differed from those forecast by an average of 15% for the forty-one year period, 1973-2013. In this forecast report, we review the 2013 gulf and Atlantic menhaden fishing seasons in terms of:

- landings and fleet size,
- age composition of the catch,
- status of the 2013 forecasts, and

we forecast landings for the 2014 menhaden fishing season.



GULF MENHADEN FISHERY

Gulf Menhaden Landings, Fishing Conditions, and Vessel Participation in 2013

Final purse-seine landings of gulf menhaden for reduction in 2013 totaled 497,503 metric tons (1,637 million standard fish). This is down 14% from total landings in 2012 (578,362 t), but up 1% from the previous 5-year mean (490,850 t) (Fig. 1). Landings in 2013 were the third best since 2003 when 517,079 t were unloaded at gulf menhaden factories.

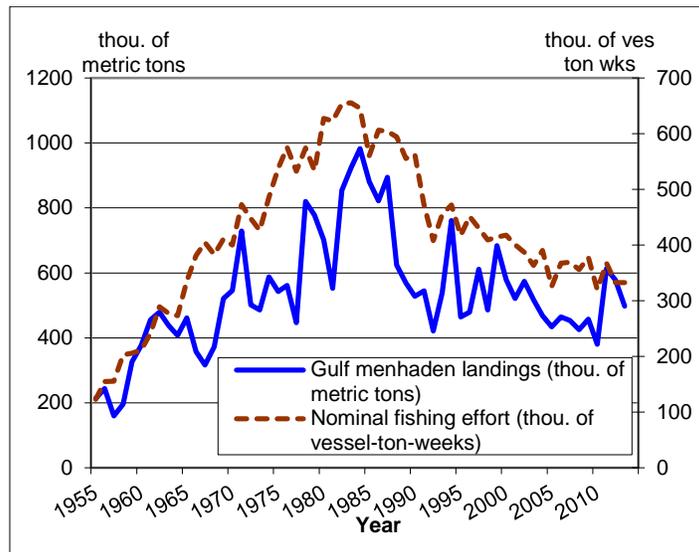


Figure 1. Gulf menhaden landings and nominal fishing effort, 1955-2013.

The 2013 gulf menhaden fishing season opened on April 15th. Landings by vessels at Moss Point and Empire were fair and best catches occurred just west of the Mississippi River. Rain and some fog hampered fishing off central and western Louisiana during the first two weeks of the fishery and landings at Abbeville and Cameron were sporadic. Total landings for April amounted to 25,859 t.

As in the recent past, some plants had difficulty staffing their vessels at the start of the fishing season. Crewmen from Atlantic menhaden vessels in Reedville served as itinerant crew on some vessels well into May at Abbeville and Cameron. Several other vessels at these plants did not fish until late May when crew issues were resolved.

Weather in May improved as did landings at all Gulf ports; best fishing occurred west of the Mississippi River to Cameron, especially near Timbalier Sound. All factories reported improved fish oil yields over historically low yields witnessed during recent fishing seasons. One vessel struck a submerged object in late May and was taken out of service for the remainder of the year; it was replaced by a "moth-balled" vessel in mid-July. Total landings for May reached 79,658 t.

Fair weather prevailed through June, however, a Bermuda high pressure system stalled over the southeast U.S. and pumped persistent strong southwest winds into the northern Gulf often hampering fishing operations. Landings for June fell accordingly to 68,217 t.

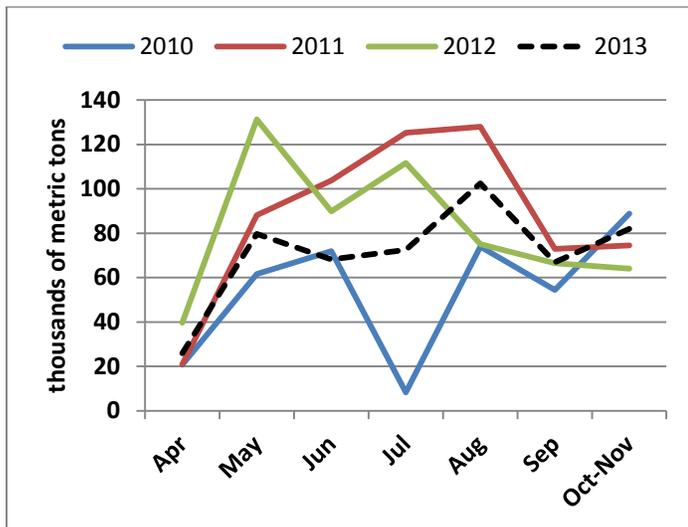


Figure 2. Gulf menhaden landings by month, 2010-2013.

Summer 2013 was noteworthy for its lack of tropical cyclone activity in the Gulf of Mexico. Weather in July was generally fair, although southwest winds persisted often making fishing operations difficult. Few fish were seen east of the Mississippi River; best catches occurred near Terrebonne Bay and vicinity. Landings for July improved slightly to 72,497 t.

Southwest gusts abated in August, weather was mostly fair with light winds, and landings for the fishing season peaked at 102,507 t. Fair weather extended into September, although Hurricane Ingrid formed in the Gulf of Campeche in mid-month, then made landfall in northern Mexico. Wind and rain from the storm dampened catches in mid-month; total landings for September declined to 66,895 t.

Despite a mix of fair and windy weather, landings in October rebounded to 81,869 t. Best catches continued to be made west of the Mississippi River. Rain and wind hampered fishing during the last week of the fishing season and all fish plants "cut-out" on October 31st.

In December Omega Protein Corporation announced that it was closing its fish factory in Cameron, LA; several of the vessels from Cameron have been reassigned to the company's fish factories at Abbeville or Moss Point for the 2014 fishing season.

A total of 37 vessels reported unloading gulf menhaden for reduction in 2012 - 33 regular steamers, two run boats, and two bait vessels which unloaded small amounts of fish for reduction at the Abbeville fish factory. The run boats do not fish, but rather transfer menhaden from steamers on the fishing grounds to the factory; one run boat operated throughout the fishing season at Moss Point, the other operated sparingly at Cameron.

Age Composition of Gulf Menhaden in 2013

About 6,000 gulf menhaden were aged from the 2013 port samples (Fig. 3). From the preliminary catch-at-age matrix, coastwide age-2 fish (73%) outnumbered age-1 fish (25%) by a wide margin (Table 1); age-2 gulf menhaden predominated at all ports except Moss Point where age-1 fish (53%) slightly outnumbered age-2s (46%). At Empire age-2s (74%) predominated over age-1s (25%). At Abbeville age-2s (88%) swamped age-1s (6%), while at Cameron age-2s (78%) outnumbered age-1s (21%).

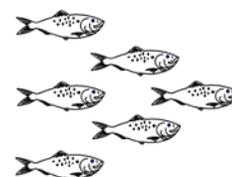


Table 1. Percent age composition, estimated total numbers of fish caught, and total landings for the gulf menhaden fishery, 2009-2013; 2013 data are preliminary.

Year	Age-0	Age-1	Age-2	Est. total number of fish caught in billions	Landings in thou. of metric t
2013	<1%	25%	73%	4.54	497.5
2012	<1%	31%	66%	6.78	578.4
2011	1%	63%	32%	7.21	613.3
2010	-	53%	40%	3.89	379.7
2009	-	13%	73%	3.62	457.5

In March 2012, we anticipated that nominal fishing effort during 2013 could amount to 315,000 vessel ton weeks with 35 vessels participating in the fishery. With this level of anticipated fishing effort, we forecasted 2013 gulf menhaden landings of 475,000 t with 80% confidence levels of 352,000 and 597,000 t. A “hindcast” using our forecast model and actual nominal fishing effort in 2013 produced a post-season forecast of 496,000 t with 80% confidence levels of 374,000 and 618,000 t. Actual landings of 497,503 t were nearly equivalent to our post-season forecast.

Forecast for the 2014 Gulf Menhaden Fishing Season

We expect that only three menhaden factories (Moss Point, MS, and Empire and Abbeville, LA) will process gulf menhaden in 2014. Omega Protein made a corporate decision to close their Cameron fish factory after the 2013 fishing season. Our best estimate of vessel participation is for 32 vessels: 31 regular steamers and one run boat. Based on average nominal fishing effort for recent years by vessels expected to be active in 2014, we estimate that nominal fishing effort in 2014 may be about 300,000 vessel ton weeks; with this level of nominal fishing effort, we forecast 2014 gulf menhaden landings of 428,000 t, with 80% confidence levels of 308,000 and 548,000 t.

ATLANTIC MENHADEN FISHERY

Atlantic Menhaden Landings, Fishing Conditions, and Vessel Participation in 2013

Final catch information indicated that 2013 landings of Atlantic menhaden for reduction amounted to 131,031 t (431 million standard fish) (Fig. 4). This is 18% less than purse-seine landings for the 2012 season (160,627 t), and 18% less than average landings for the previous five years (160,524 t). As has been the case since 2005, only one menhaden factory, the plant at Reedville, Virginia, operated on the Atlantic coast in 2013.

In December 2012, the Atlantic States Marine Fisheries Commission (ASMFC) approved Amendment 2 to the Fishery Management Plan for Atlantic menhaden which established a total allowable catch (TAC) for the reduction and bait fisheries combined of 170,800 t beginning in 2013.

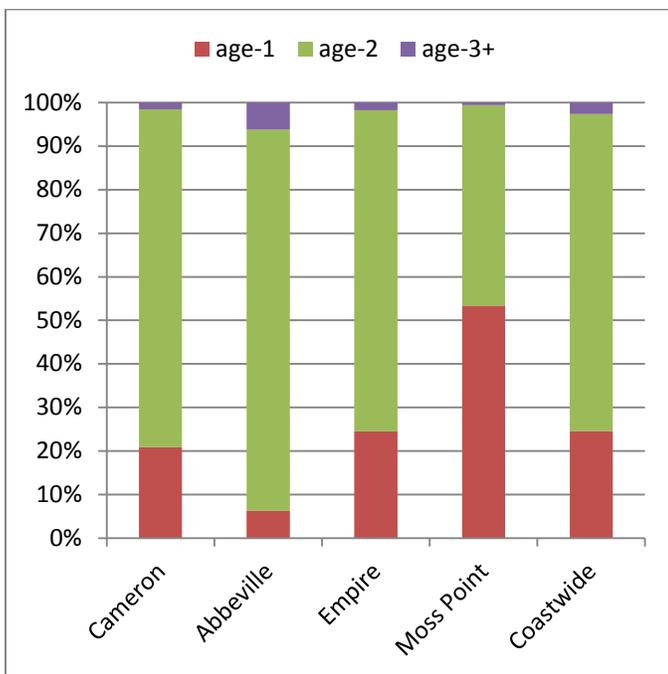


Figure 3. Percent estimated numbers-at-age of gulf menhaden by port in 2013.

Fishing Effort in 2013 and Review of the 2013 Forecast for Gulf Menhaden

Nominal fishing effort for the gulf menhaden fishery during 2013 is estimated at 332,500 vessel ton weeks; this is equivalent to nominal fishing effort in 2012 (332,700 vessel ton weeks).

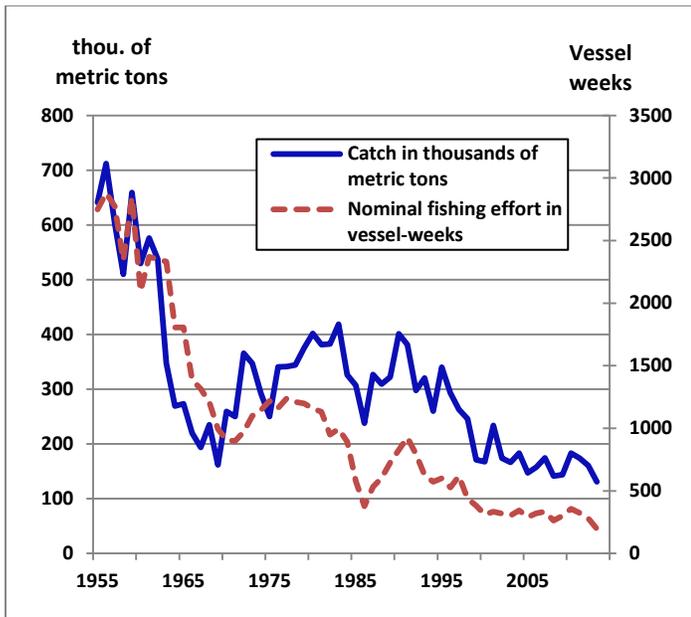


Figure 4. Atlantic menhaden landings and nominal fishing effort, 1955-2013.

The TAC represents a 20% decrease from average landings (bait and reduction fisheries combined) during 2009-11. The menhaden reduction fishery was allocated about 129,900 t of the TAC for 2013. In early November 2013, the ASMFC redistributed an unused portion of the coastwide TAC that had been reserved for any unanticipated abundance of menhaden in New England waters during summer (“episodic event”). Virginia was allocated about 1,500 t of this unused reserve, hence total landings of Atlantic menhaden for reduction in 2013 were 131,031 t.

For several reasons (see below) the Omega Protein fleet at Reedville did not fish in May 2013. Menhaden landings for reduction during June 2013 were fair (14,434 t; Fig. 5). Landings improved in July (23,156 t), peaked in August (29,979 t), dipped slightly in September (29,327 t), then leveled-off in October (17,296 t) and November (16,839 t).

Winter 2012-13 along the U.S. East Coast saw generally above average temperatures and rainfall. Nevertheless, March 2013 in the Mid-Atlantic and Carolinas was colder than normal with several snow events in Virginia.

Pound nets in Northern Neck, VA, made good catches of menhaden during April 2013. However, few fish were spotted in Chesapeake Bay during May; no Omega Protein vessels fished in May and Virginia snapper rigs (small purse-seine vessels

fishing for bait) made only a few sets in the Bay during the last week of May.

Many crewmen from Omega Protein’s vessels in Virginia traveled to Mississippi and Louisiana in April to staff gulf menhaden vessels that were in need of fishermen. Crew shortages in the Gulf fishery eased by June. Weather in the Mid-Atlantic moderated during June, although Tropical Storm Andrea brought gale-force winds to the area early in the month; fish began to show in Chesapeake Bay and four reduction-fishery vessels, or steamers, started fishing near the Bay mouth. Two retrofitted vessels were added to the Reedville fleet in 2013 and two older vessels were scrapped; several weeks transpired in June before the new vessels were fully functional. All told, seven steamers unloaded menhaden for reduction at Reedville in 2013; the fish factory also accepted minor amounts of menhaden for reduction from two of the snapper rig vessels.

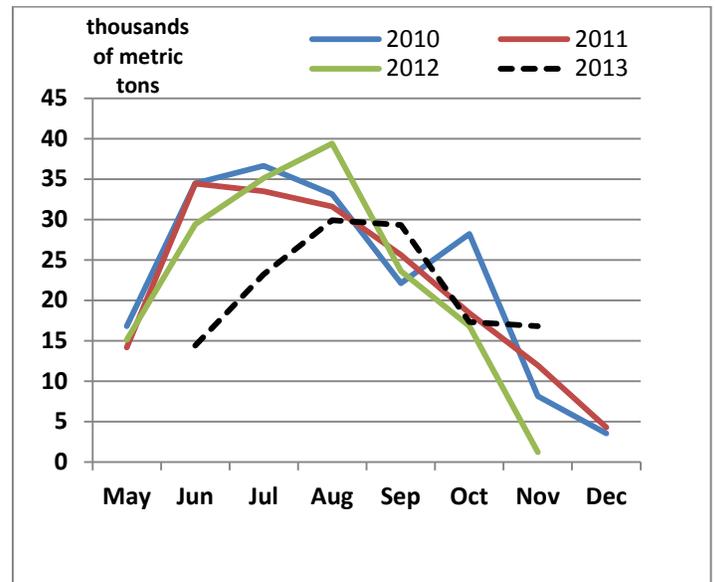


Figure 5. Atlantic menhaden landings by month, 2010-2013.

Weather in the Mid-Atlantic turned hot and humid by mid-June and fish schools began to show in Virginia waters and off the New Jersey coast; best catches occurred near the mouth of the Rappahannock River and lower Chesapeake Bay. By late June large aggregations of menhaden schools assembled off the barrier islands along Virginia’s Eastern Shore. Throughout summer and into early October, best catches occurred off the ocean beaches of Eastern Shore, Virginia Beach, and near the Bay mouth. As in recent years, fish were more abundant during summer near the Bay

mouth and in Virginia's ocean waters out to about 10 miles than in Chesapeake Bay proper.

In late July the reduction fleet made a few trips to fish off the New Jersey coast, as spotter pilots reported good abundance of fish schools off the Garden State throughout summer. Regardless, the abundance of menhaden along the Virginia coast in summer made fishing trips farther north mostly unnecessary. Fair weather prevailed during August and September; landings for these months ranked first and second across the fishing season.

Catches in October were good and occurred mostly along Virginia's barrier islands, although windy conditions idled the fleet in mid-month. During the last week of October good catches of large roe fish were made south of Virginia Beach to Kitty Hawk, North Carolina, beyond three miles from shore.

Windy conditions hampered fishing in early November, but the weather moderated by mid-month. Good catches of large roe fish came from off Wachapreague and Sandbridge, Virginia. During the last week of November a mix of roe fish and peanuts (age-0 fish) were caught just off Cape Henry to about ten miles from shore. Omega Protein cut-out for the fishing season on about November 29th.

In retrospect, the 2013 Atlantic menhaden reduction fishery commenced later (June) than normal (mid-May) and with fewer vessels (seven) than in recent years. The fishery apparently sacrificed early season catches of smaller, younger, and less-oily fish in order to extend fishing into late fall when larger, older, and more oily fish are more available. This strategy will probably motivate fishing effort in 2014.

The coastwide TAC for Atlantic menhaden included the bait fishery also. Allocations by state were assigned by recent (2009-11) landings histories. Many traditional menhaden fisheries for bait were shut down in mid-season as quotas were reached. The snapper rig purse-seine fishery for bait in Virginia (with four vessels) started late with a few catches during the last week of May in upper Chesapeake Bay. Catches were poor through June and fish size was small – not very desirable for the bait markets. Bait landings by snapper rigs improved in late summer, but this sector of Virginia's bait fishery did not reach their quota in 2013. On the other hand, Virginia's gill net fishery reached its menhaden bait quota by early July and

was restricted from directed menhaden fishing for the remainder of the year. Likewise, Maryland's pound net fishery reached its quota on about June 29. The purse-seine fishery for menhaden as bait in New Jersey was closed in late June when it attained its quota. No doubt, menhaden bait prices escalated in 2013 because of quotas established by Amendment 2.

Table 2. Percent age composition of the reduction catch in the Atlantic menhaden fishery, 2009-2013.

Year	Age-0	Age-1	Age-2	Age-3+
2013	3%	38%	45%	14%
2012	1%	16%	79%	4%
2011		42%	50%	8%
2010	2%	40%	49%	9%
2009	1%	48%	31%	20%

Age Composition of Atlantic Menhaden in 2013

About 1,900 Atlantic menhaden were sampled for size and age from the 2013 reduction fishery. From the catch-at-age matrix, coastwide age-2 fish (45%) slightly outnumbered age-1 fish (38%) (Fig. 6 and Table 2). Age-3+ fish (14%) ranked a distant third followed by age-0 fish (3%).

Catches for reduction off New Jersey and Delaware during 2013 were mostly age-2 (72%) Atlantic menhaden, followed by age-3+ (23%). Catches from Chesapeake Bay and ocean areas near the mouth of the Bay during summer were slightly different than the coastwide proportions with age-1 fish (51%) outnumbering age-2 fish (39%). During the fall fishery off Virginia and North Carolina, age-2 fish (35%) outnumbered age-0s (27%) and age-3s (22%).

About 900 Atlantic menhaden were sampled for size and age from the bait fisheries on the East coast during 2013. Bait samples from snapper boats in Chesapeake Bay consisted mostly of age-1s (45%), age-2s (28%), and age-3s (17%).

Preliminary bait samples from off the New Jersey coast were mostly age-3 (52%) and age-4 (26%) fish, with a smaller proportion of age-2 fish (18%).

The higher proportion of age-1 Atlantic menhaden (51%) over age-2 fish (39%) in the catch-at-age matrix for the Chesapeake Bay area in 2013 suggests a relatively good 2012 year class. These fish should be in good abundance in Chesapeake Bay and vicinity as age-2 fish in summer 2014.

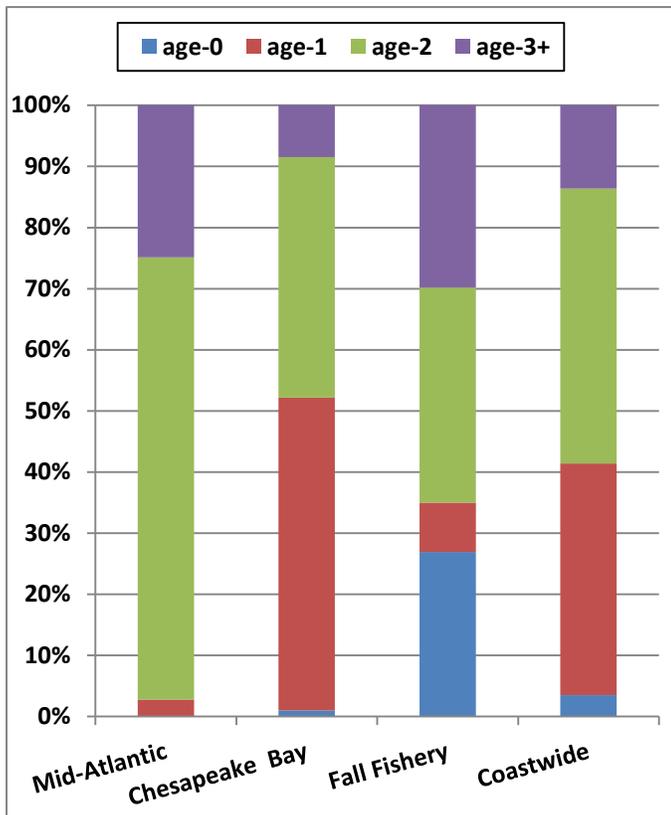


Figure 6. Percent estimated numbers at-age of Atlantic menhaden by area in 2013.

Fishing Effort in 2013

Nominal fishing effort in 2013 was estimated at 196 vessel weeks, down from 279 vessel weeks expended in 2012; this is the lowest nominal effort on record for the fishery since 1955 when the NMFS began maintaining fishery-dependent data on the Atlantic menhaden fishery. The decline is mainly due to the TAC and the decrease in number of steamers at the Reedville factory to seven. Additionally, the fishery started late (June) and had two new entrants to the fleet that were slow to become operational.

Forecast for the 2014 Atlantic Menhaden Fishing Season

As in 2013, Amendment 2 to the Fishery Management Plan for Atlantic menhaden specifies an annual coastwide TAC of 170,800 t, of which about 129,900 t is allocated to the purse-seine reduction fishery. This TAC is in place again in 2014, namely "continuing until completion of, and [Management] Board action on, the next benchmark assessment, scheduled for [completion in December] 2014".

In 2014 the factory at Reedville, VA, will again field seven vessels; it may also accept some landings for reduction from a few snapper rig vessels. Given this fleet size, the factory should be capable of processing its 2014 allocation of 129,900 t.

Combined 2013 Gulf and Atlantic Menhaden Landings

Combined landings by the gulf and Atlantic menhaden purse-seine fisheries for reduction during the 2013 calendar year amounted to 1.39 billion pounds, down from landings during the 2012 calendar year which amounted to 1.63 billion pounds.

Fishing effort and landings in the gulf menhaden purse-seine fishery,1955-2013

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

Fishing effort and landings in the Atlantic menhaden purse-seine fishery, 1955-2013

Year	Fishing effort vessel-weeks	Landings 1000 metric tons	Year	Fishing effort vessel-weeks	Landings 1000 metric tons
1955	2748	641.4	1985	577	306.7
1956	2878	712.1	1986	377	238.0
1957	2775	602.8	1987	531	327.0
1958	2343	510.0	1988	604	309.3
1959	2847	659.1	1989	725	322.0
1960	2097	529.8	1990	826	401.2
1961	2371	575.9	1991	926	381.4
1962	2351	537.7	1992	794	297.6
1963	2331	346.9	1993	626	320.6
1964	1807	269.2	1994	573	260.0
1965	1805	273.4	1995	600	339.9
1966	1386	219.6	1996	528	292.9
1967	1316	193.5	1997	616	259.1
1968	1209	234.8	1998	437	245.9
1969	995	161.6	1999	382	171.2
1970	906	259.4	2000	311	167.2
1971	897	250.3	2001	334	233.7
1972	973	365.9	2002	318	174.0
1973	1099	346.9	2003	302	166.1
1974	1145	292.2	2004	345	183.4
1975	1218	250.2	2005	291	146.9
1976	1163	340.5	2006	322	157.4
1977	1239	341.1	2007	333	174.5
1978	1210	344.1	2008	262	141.1
1979	1198	375.7	2009	300	143.8
1980	1158	401.5	2010	356	183.1
1981	1133	381.3	2011	324	174.0
1982	948	382.4	2012	279	160.6
1983	995	418.6	2013	196	131.0
1984	892	326.3			