

Forecast for the 2012 Gulf and Atlantic Menhaden Purse-Seine Fisheries and

Review of the 2011 Fishing Season

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INTRODUCTION

The 2012 fishing year is the fortieth year for which quantitative forecasts of purse-seine landings of gulf and Atlantic 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. Our 2012 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, that is, 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 thirty-nine year period, 1973-2011. Landings in the gulf menhaden fishery have differed from those forecast by an average of 15% for the same period. In this forecast report, we review the 2011 gulf and Atlantic menhaden fishing seasons in terms of:

- landings and fleet size,
- age composition of the catch,
- status of the 2011 forecasts, and

we forecast landings for the 2012 gulf and Atlantic menhaden fishing seasons.



GULF MENHADEN FISHERY

Gulf Menhaden Landings, Fishing Conditions, and Vessel Participation in 2011

Final purse-seine landings of gulf menhaden for reduction in 2011 amounted to 613,261 metric tons (2,018 million standard fish). This is up 62% from total landings in 2010 (379,727 t), and up 41% from the previous 5-year mean (436,170 t) (Fig. 1). Landings in 2011 were the greatest since 1999 when 684,271 t were unloaded at gulf menhaden factories.

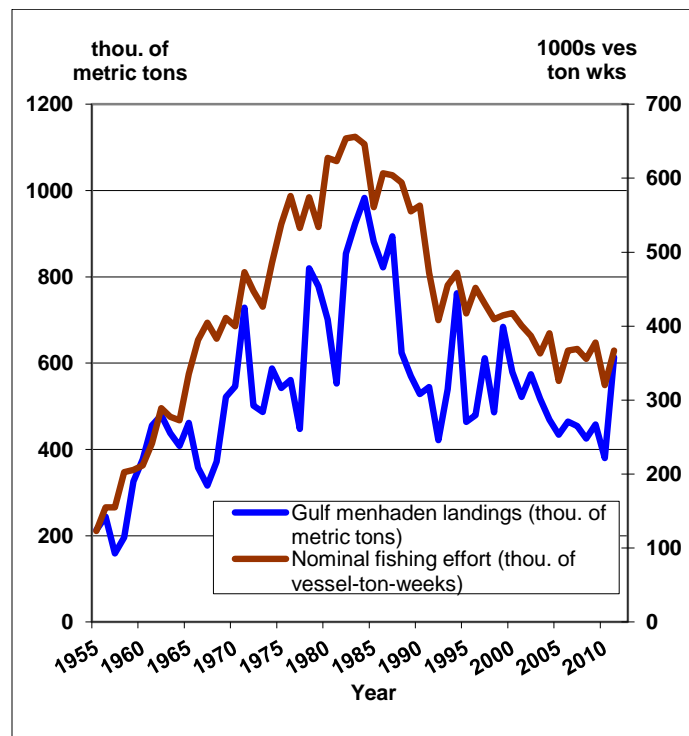


Figure 1. Gulf menhaden landings and nominal fishing effort, 1955-2011.

The 2011 gulf menhaden season opened on April 18th with four fish factories active. Persistent spring winds during late April and through most of May dampened landings west of the Mississippi

River at the fish factories near Abbeville and Cameron, LA. East of the Mississippi River, spring winds abated in early May and landings improved considerably at the fish factories in Empire, LA, and Moss Point, MS. In the US Mid-West, heavy spring rains surged down the Mississippi River toward the northern Gulf of Mexico. To alleviate river flooding to major cities downstream, the US Army Corps of Engineers (USCOE) opened two major water diversions – the Bonnet Carre Spillway on May 9th which flows into Lake Ponchartrain, and the Matanzas Spillway on May 14th which flows into the Atchafalaya Basin. One consequence of these rediversions to fishing operations was that a muddy freshwater lens overlain heavier Gulf waters around the Mississippi River mouth; spotter pilots had difficulty finding fish through turbid nearshore waters. In a tragic accident, the menhaden vessel Sandy Point from Moss Point sank after colliding with a container ship near Gulfport in mid-May; unfortunately, three crew members from the Sandy Point perished in the mishap.

Recurring themes voiced by plant managers throughout the 2011 gulf menhaden fishing season were the small size of individual fish in the catch, low fish oil yields, and low protein content of the fish meal. Some plant personnel spoke in terms of historical lows for fish oil yields. At one point in August, some plant managers instructed their captains to avoid certain areas, e.g., Breton Sound, where small fish were abundant. These issues are discussed further in the Age Composition section below.

Fair weather prevailed across the northern Gulf during June and through most of July; accordingly, landings improved at all factories. Winds from Tropical Storm Don in late July impacted fishing operations in the western Gulf. Good weather for most of August and an abundance of fish put several factories on record-setting landings trends in mid-summer. In early September however, TS Lee dumped 10-20 inches of rain along the Gulf coast from Louisiana to the Florida Panhandle. Rough seas from TS Nate in the Gulf of Campeche followed shortly thereafter contributing to a slow resumption of the fishery after the Labor Day weekend. Good weather prevailed in mid-September, although windy conditions swept across the western Gulf in late September and early October. Landings at Empire and Moss Point were exceptionally good through October. Several

vessels from Empire fished on November 1st which was the last day of the 2011 fishing season.

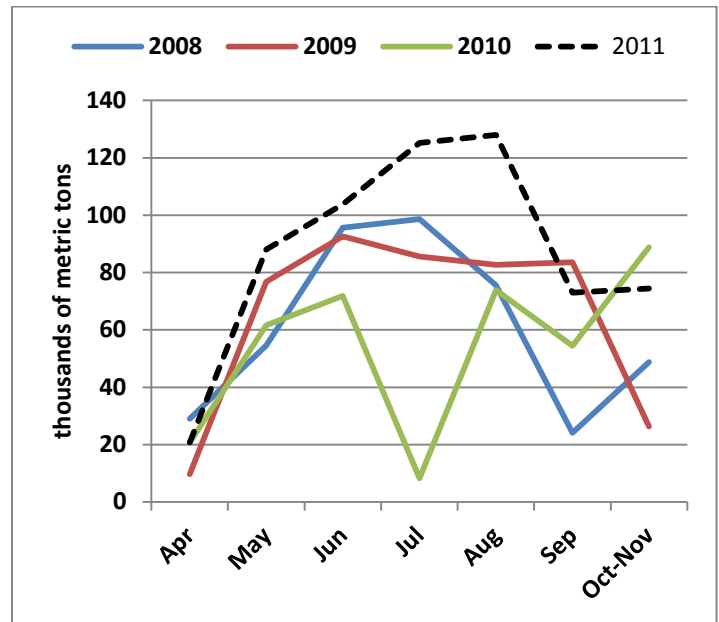


Figure 2. Gulf menhaden landings by month, 2007-2011.

Gulf menhaden landings by month during 2011 were generally greater than those of respective months in recent years (Fig. 2). Landings in April 2011 (20,830 t) were on par with those of recent fishing seasons. Landings improved in May (88,060 t), continued their climb in June (103,780 t) and July (125,200 t), and peaked in August (127,960 t). Gulf menhaden landings fell in September (72,990 t), but rebounded slightly in October (74,450 t, which included catches on November 1st).

A total of 41 vessels reported unloading gulf menhaden for reduction in 2011 - 37 regular steamers and four run boats (one run boat was active for only one week). The run boats do not fish, but rather transfer menhaden from steamers on the fishing grounds to the factory.

Age Composition of Gulf Menhaden in 2011

About 7,250 gulf menhaden were aged from the 2011 port samples (Fig. 3). From the catch-at-age matrix, coastwide age-1 fish (62%) outnumbered age-2 fish (33%) by almost two-to-one (Table 1). Age-1 fish dominated age-2s by a wide margin at all ports except Abbeville. At Moss Point age-1 gulf menhaden (63%) outnumbered age-2s (35%) almost two-to-one. Similarly, at Empire age-1s (65%) were more than twice as numerous as age-2s (30%). At Abbeville, however, age-1s (46%)

and age-2s (44%) were nearly equivalent. At Cameron, age-1 gulf menhaden (76%) swamped age-2 fish (22%).

As noted above, menhaden industry personnel commented last summer about the small size of individual fish in the 2011 landings, historical low fish oil yields, and low protein content of the fish meal. Reasons for these observations may be multi-faceted.

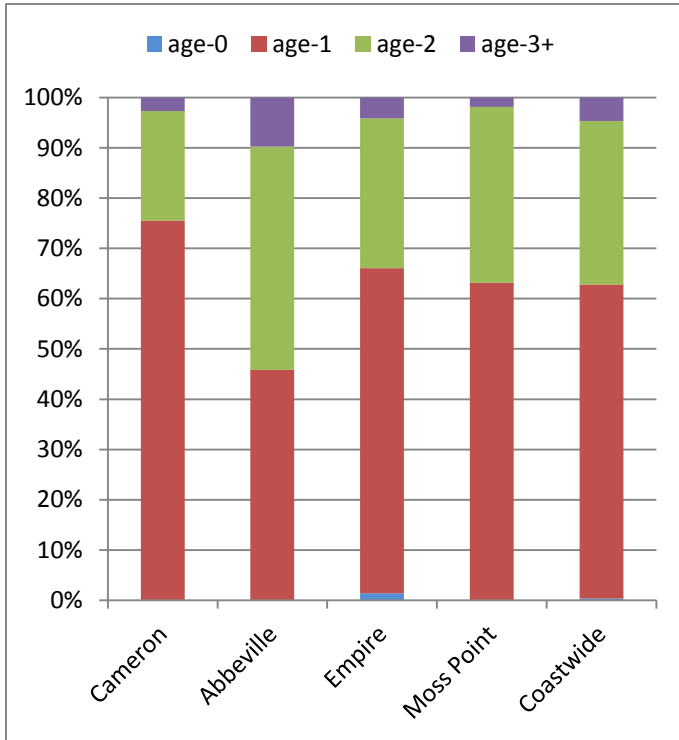


Figure 3. Percent estimated numbers-at-age of gulf menhaden by port in 2011.

Indexes of juvenile abundance computed from state seine and trawl surveys indicated that the 2010 year class may be one of the best in recent decades. This would account for the abundance of small age-1 gulf menhaden in the 2011 landings. Additionally, exceptional rains in the US Mid-West during spring 2011 forced the USCOE to open two spillways in Louisiana. This super-abundance of freshwater shunted into the Mississippi-Atchafalaya river systems could have forced below average-sized age-1 gulf menhaden from "inside" or estuarine waters, where they might have spent most of the summer, into coastal areas and the major sounds of the northern Gulf (Breton, Chandeleur, and Mississippi sounds) where they were more available to the purse-seine fishery. Regardless, judging from the proportion of age-1's in the 2011 catch-at-age matrix, age-2 gulf menhaden (again, the 2010 year class) should be

Table 1. Percent age composition, estimated total numbers of fish caught, and total landings for the gulf menhaden fishery, 2007-2011; 2011 data are preliminary.					
Year	Age-0	Age-1	Age-2	Est. total number of fish caught in billions	Landings in thou. of metric t
2011	<1%	62%	33%	7.13	613.3
2010	-	53%	40%	3.89	379.7
2009	-	13%	73%	3.62	457.5
2008	-	27%	68%	3.61	425.4
2007	-	46%	51%	4.75	453.8

abundant off the coasts of central Louisiana and western Mississippi during 2012.

Fishing Effort in 2011 and Review of the 2011 Forecast for Gulf Menhaden

Nominal fishing effort for the gulf menhaden fishery during 2011 is estimated at 367,200 vessel ton weeks. This is up 15% from nominal fishing effort in 2010, the year of the BP Deepwater Horizon Disaster (320,300 vessel ton weeks).

In March 2011, we anticipated that nominal fishing effort during 2011 could amount to 350,000 vessel ton weeks with 40 vessels participating in the fishery. With this level of anticipated fishing effort, we forecasted 2011 gulf menhaden landings of 437,000 t with 80% confidence levels of 318,000 and 556,000 t. A "hindcast" using our forecast model and actual nominal fishing effort in 2011 produced a post-season forecast of 458,000 t with 80% confidence levels of 338,000 and 577,000 t. Actual landings of 613,261 t were 34% greater than our post-season forecast.

Forecast for the 2012 Gulf Menhaden Fishing Season

We expect that four menhaden factories (Moss Point, MS, and Empire, Abbeville, and Cameron, LA) will process gulf menhaden in 2012. Our best estimate of vessel participation is for 38 vessels: 35 regular steamers and three run boats. Based on average nominal fishing effort for recent years by vessels expected to be active in 2012, we estimate

that nominal fishing effort in 2012 may be about 330,000 vessel ton weeks. With 330,000 vessel ton weeks of effort, we forecast 2012 gulf menhaden landings of 482,000 t, with 80% confidence levels of 359,000 and 605,000 t. If the 2010 year class of gulf menhaden is indeed a dominant one, age-2 fish should be abundant along the central Louisiana coast to Mississippi Sound in summer 2012; consequently, landings in 2012 could exceed our forecast significantly.

ATLANTIC MENHADEN FISHERY

Atlantic Menhaden Landings, Fishing Conditions, and Vessel Participation in 2011

Final catch information indicated that 2011 landings of Atlantic menhaden for reduction amounted to 174,021 t (573 million standard fish) (Fig. 4). This is 5% less than purse-seine landings for the 2010 season (183,085 t), but 9% greater than average landings for the previous five years (159,962 t). As in the previous six years, only one menhaden factory, the plant at Reedville, VA, operated on the Atlantic coast in 2011.

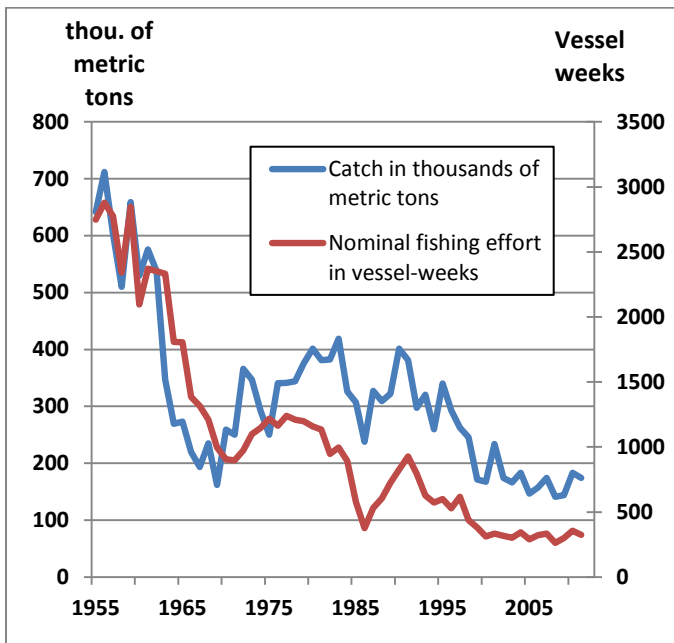


Figure 4. Atlantic menhaden landings and nominal fishing effort, 1955-2011.

Landings of Atlantic menhaden for reduction during May 2011 were good (14,200 t) and rivaled those of May from the previous year (Fig. 5). Landings for the 2011 fishing season peaked in June (34,400 t), then declined slowly in July (33,500 t), August

(31,600 t), and September (25,600 t) (Fig. 5). In fall landings continued their slide into October (18,400 t); they declined sharply in November (12,000 t) and December (4,300 t).

As was the case the previous year, the winter of 2010-2011 was exceptionally cold and long. Several fish kills were documented: large numbers of menhaden died off Folly Beach, South Carolina, in January 2011 and off Sebastian Inlet and Vero Beach, Florida, in February 2011. Low dissolved oxygen levels in the water column were suspected as the culprit in each kill. Spotter pilots reported good signs of menhaden schools off the Virginia capes in late April.

Virginia "snapper" vessels fishing for bait made initial sets on menhaden schools in Chesapeake Bay on May 2nd and 3rd; five reduction vessels followed suit on May 9th. Through May, best catches were concentrated near the mouth of Chesapeake Bay and were mostly comprised of a small class of menhaden, about 150-170 mm fork length. During June few schools of menhaden were found in Chesapeake Bay proper; fish schools remained concentrated around the Chesapeake Bay Bridge Tunnel at the Bay mouth and along ocean beaches of Virginia's Eastern Shore barrier islands. Larger fish, ranging 180-210 mm fork length, appeared in the catches during June. Spotter pilots reported good concentrations of menhaden schools off the New Jersey coast, but reduction vessels were reluctant to fish farther north when fish were so abundant at the Chesapeake Bay mouth.

By late June and early July a few schools were spotted in the upper Chesapeake Bay near Smith Point and catches by "snapper" boats fishing for bait improved. However, the main concentrations of menhaden schools remained near the Bay mouth and along Virginia's ocean beaches. This trend continued throughout summer 2011. In late July a few Virginia steamers ventured off the Delmarva and New Jersey coasts to fish, while menhaden were also abundant off the Virginia Beach area. Similar to recent summers, the fish factory at Reedville had some mechanical breakdowns, many related to the local abundance of fish and an inability to process them in a timely manner. Many weeks, vessels remained rafted at the dock for several days waiting to unload their catches.

Through August the trend in fish distribution continued – few menhaden seen in Chesapeake Bay, large concentrations of fish at the Bay mouth

and along Eastern Shore beaches. Hurricane Irene made landfall in North Carolina on August 27th and caused considerable damage to the Reedville fish factory as it swept north along the Eastern Seaboard; fishing operations were disrupted for almost two weeks. Most fishing activity resumed in mid-September, although heavy rains late in the month created turbid water conditions and made fish spotting difficult.

Beginning in mid-October the fleet from Reedville fished mostly in ocean waters on migratory "roe" fish. Good catches occurred off the Delmarva Peninsula in mid-October and off False Cape, Virginia, to Nags Head, North Carolina, in mid-November. In late November the Virginia fleet fished for about one day off Ocracoke Inlet. Reduction vessels fished off the Virginia capes on December 5th and the factory at Reedville "cut out" for the year on December 6th.

Bait purse-seining for menhaden off the New Jersey coast was reported as very good throughout summer 2011. In Narragansett Bay, Rhode Island, a few purse-seine sets were made on menhaden schools in late May, however, these crews quickly moved their operations to the New Jersey coast by early June to take advantage of the abundance of menhaden off the coast of the Garden State.

Throughout winter 2011-2012 large aggregations of menhaden schools have been reported off the Virginia coast near Virginia Beach. Not surprisingly, good catches of striped bass and bluefin tuna have occurred in the vicinity. The proximity of these overwintering menhaden to Chesapeake Bay suggest purse-seine fishing for menhaden could commence in early May if mild winter temperatures continue.

During 2011, fifteen purse-seine vessels (10 regular steamers and five "snapper" boats) unloaded Atlantic menhaden for reduction at Reedville, VA. Eight regular steamers began fishing from the port of Reedville at the start of the 2011 fishing season. One was "tied-up" in August, and two were added to the fleet in August following extensive repairs at the shipyard. The vessel side-lined in August was used as a run boat for five weeks during the fall fishery.

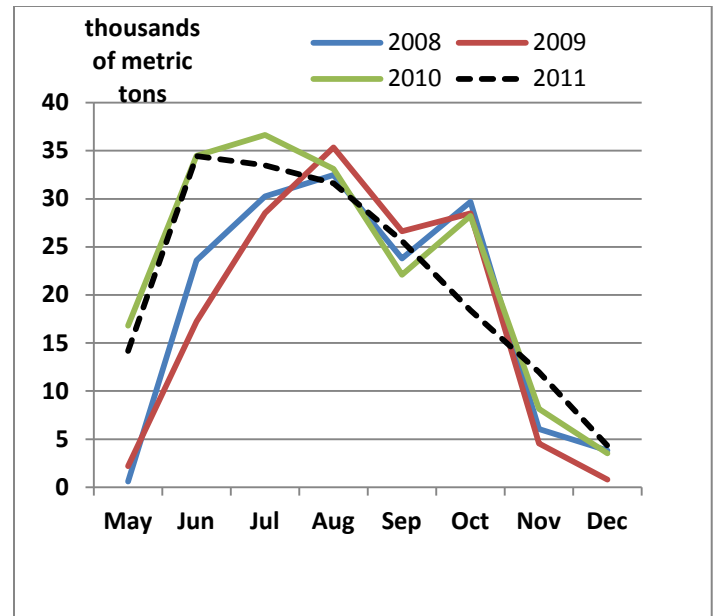


Figure 5. Atlantic menhaden landings by month, 2007-2011.

Age Composition of Atlantic Menhaden in 2011

About 2,700 Atlantic menhaden were sampled for size and age from the 2011 reduction fishery. From the preliminary catch-at-age matrix, coastwide age-2 fish (50%) slightly outnumbered age-1 fish (43%) (Fig. 6 and Table 2). Age-3+ fish (7%) ranked a distant third.

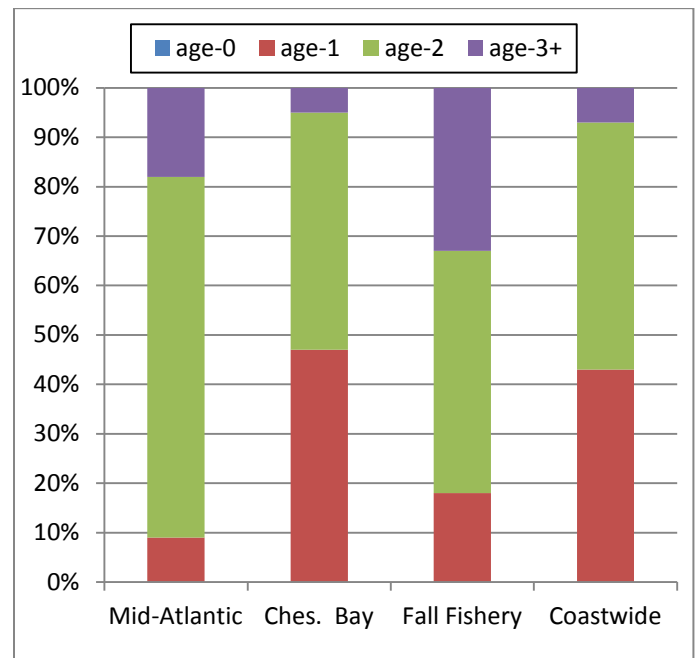


Figure 6. Percent estimated numbers at-age of Atlantic menhaden by area in 2011.

Catches for reduction off the coasts of New Jersey and Delaware during 2010 consisted mostly of age-2 (73%) Atlantic menhaden, followed by age-3+ (18%) and age-1s (9%). Catches from Chesapeake Bay and ocean areas near the mouth of the Bay during summer were almost evenly split between age-2 (48%) and age-1 menhaden (47%), followed distantly by age-3+ fish (5%). During the fall fishery off Virginia and North Carolina, age-2 fish (49%) outnumbered age-3+s (33%) and age-1s (18%) in the catch.

Over 1,200 Atlantic menhaden were sampled for size and age from the bait fisheries on the East coast during 2011. Bait samples from "snapper rigs" in Chesapeake Bay consisted of age-2s (48%), age-1s (33%), and age-3+ (18%). Bait samples from off the New Jersey coast were mostly age-3 (49%) and age-4+ (37%) fish, with a smaller proportion of age-2 fish (14%).

The high proportion of age-1 Atlantic menhaden in the catch-at-age matrix for the reduction fishery from the coastwide samples (43%) and Chesapeake Bay (47%) suggests that the 2010 year class as age-1 fish in 2011 may be a relatively strong year class. This follows in the wake of the 2010 fishery where the 2009 year class showed similar proportionalities as age-1 fish. With consecutive good year classes of Atlantic menhaden in 2009 and 2010, age-2 fish should be abundant along the Virginia coast in 2012;

correspondingly, age-2 and -3 fish should be abundant off the Mid-Atlantic coast in 2012.

Fishing Effort in 2011 and Review of the 2011 Forecast for Atlantic Menhaden

Nominal fishing effort in 2011 was estimated at 324 vessel weeks, down from 356 vessel weeks expended in 2010. The decrease in nominal effort is primarily because of the reduction in number of steamers at the factory (from ten in 2010 to eight or nine in 2011).

Last March, we anticipated that nominal fishing effort in 2011 could amount to 300 vessel weeks, and we forecasted 2011 Atlantic menhaden landings of 184,000 t with 80% confidence levels of 117,000 and 251,000 t. Nominal fishing effort in 2011 (324 vessel weeks) was 8% greater than we expected at the beginning of the fishing season. A "hindcast" using our forecast model and actual nominal fishing effort in 2011 produced a post-season forecast of 189,000 t with 80% confidence levels of 121,000 and 256,000 t. Actual landings of 174,021 t were 8% less than our post-season forecast.

Forecast for the 2012 Atlantic Menhaden Fishing Season

As during the 2011 fishing season, in 2012 the factory at Reedville, VA, will initially field eight vessels through August or September, then add one vessel for fall fishing. It will be the only active menhaden reduction plant on the Atlantic coast. We estimate that nominal fishing effort in 2012 could amount to about 300 vessel weeks. With this level of fishing effort, we forecast 2012 Atlantic menhaden landings of 182,000 t with 80% confidence levels of 115,000 and 249,000 t.

Combined 2011 Gulf and Atlantic Menhaden Landings

Combined landings by the gulf and Atlantic menhaden purse-seine fisheries for reduction during the 2011 calendar year amounted to 1.74 billion pounds, up considerably from landings during the 2010 calendar year which amounted to 1.24 billion pounds.

Year	Age-0	Age-1	Age-2	Age-3+
2011	<1%	43%	50%	7%
2010	2%	40%	49%	9%
2009	1%	49%	31%	18%
2008	1%	10%	71%	18%
2007	<1%	26%	65%	9%

Fishing effort and landings in the gulf menhaden purse-seine fishery,1955-2011

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

Fishing effort and landings in the Atlantic menhaden purse-seine fishery, 1955-2011

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