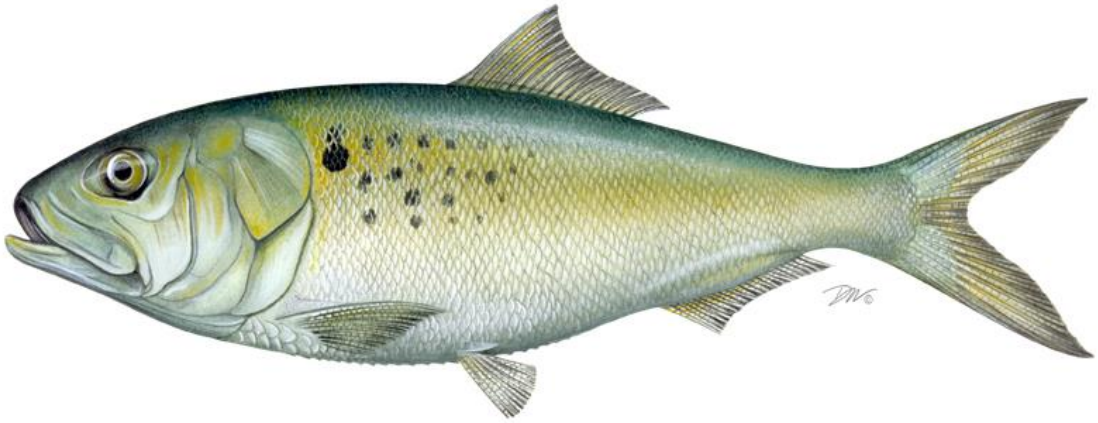
ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR ATLANTIC MENHADEN
(*Brevoortia tyrannus*)

2019 FISHING YEAR



Prepared by the Plan Review Team

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Revised September 2020

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE FOR ATLANTIC MENHADEN *(Brevoortia tyrannus)* FOR THE 2019 FISHERY

Management Summary

Date of FMP:	Original FMP: August 1981
Amendments:	Plan Revision: September 1992 Amendment 1: July 2001 Amendment 2: December 2012 Amendment 3: November 2017
Management Unit:	The range of Atlantic menhaden within U.S. waters of the Northwest Atlantic Ocean, from the estuaries eastward to the offshore boundary of the Exclusive Economic Zone (EEZ).
States With Declared Interest:	Maine – Florida, including Pennsylvania
Additional Jurisdictions:	Potomac River Fisheries Commission, National Marine Fisheries Service, United States Fish and Wildlife Service
Active Boards/Committees:	Atlantic Menhaden Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team, Plan Development Team, Ecological Reference Point Workgroup
Stock Status:	Not overfished, and overfishing is not occurring relative to the current single-species reference points (2019 Single-Species Benchmark Stock Assessment)

I. Status of the Fishery Management Plan

Atlantic menhaden management authority is vested in the states because the vast majority of landings come from state waters. All Atlantic coast states and jurisdictions, with the exception of the District of Columbia, have declared interest in the Atlantic menhaden management program.

The first coastwide fishery management plan (FMP) for Atlantic menhaden was passed in 1981. The FMP did not recommend or require specific management actions, but provided a suite of options should they be needed. In 1992, the plan was revised to include a suite of objectives intended to improve data collection and promote awareness of the fishery and its research needs.

Amendment 1, implemented in 2001, provided specific biological, ecological and socioeconomic management objectives for the species. Addenda I and V revised the biological reference points for menhaden and specified that stock assessments are to occur every three years. Although Amendment 1 did not implement any recreational or commercial management measures, Addenda II through IV instituted a harvest cap on the reduction fishery in Chesapeake Bay. Specifically, Addendum II initially implemented a harvest cap for 2006-2010 seasons; before its first year of implementation, Addendum III revised the cap amount to be the average landings from 2001 to 2005 (or 109,020 mt); and Addendum IV extended the provisions of Addendum III through 2013.

Amendment 2, implemented in 2012, established a 170,800 metric ton (mt) total allowable catch (TAC) for the commercial fishery beginning in 2013. This TAC represented a 20% reduction from average landings between 2009 and 2011. The 2009-2011 time period was also used to allocate the TAC among jurisdictions. Additionally, the Amendment established timely reporting requirements for commercial landings and required states to be accountable for their respective quotas by paying back any overages the following year. Amendment 2 also included provisions that allowed for the transfer of quota between jurisdictions and a bycatch allowance of 6,000 pounds per day for non-directed fisheries that operate after a jurisdiction's quota has been landed. Addendum 1 to Amendment 2 allows two licensed individuals to harvest up to 12,000 pounds of menhaden bycatch when working from the same vessel using stationary multi-species gear. The intent of this provision is to accommodate cooperative fishing practices that traditionally take place in Chesapeake Bay. The Amendment also reduced the Chesapeake Bay reduction fishery harvest cap by 20% to 87,216 mt.

Amendment 2 also enables the Board to set aside 1% of the coastwide TAC for episodic events. Episodic events are times and areas where Atlantic menhaden are available in more abundance than they normally occur. Technical Addendum I to Amendment 2 established a mechanism for New England states from Maine to Connecticut[1] to use the set aside, which includes a qualifying definition of episodic events, required effort controls to scale a state's fishery to the set aside amount, and a timely reporting system to monitor the set aside. Any set aside quota that is unused as of October 31 is redistributed to jurisdictions on November 1 based on the Amendment 2 allocation percentages.

In 2015, the TAC was increased by 10% to 187,880 mt for the 2015 and 2016 fishing years. In 2016, the Board again increased the TAC by 6.45% to 200,000 mt for the 2017 fishing year.

Atlantic menhaden are currently managed under Amendment 3. Approved in November 2017, the Amendment maintains the management program's single-species biological reference points until the review and adoption of menhaden-specific ecological reference points (ERPs) as part of the 2019 benchmark stock assessment process. In doing so, the Board placed development of menhaden-specific ERPs as its highest priority and supports the efforts of the ERP Workgroup to reach that goal.

[1] At its May 2016 meeting, the Board added New York as an eligible state to harvest under the set aside.

Amendment 3 also changes commercial quota allocations in order to strike an improved balance between gear types and jurisdictions. The Amendment allocates a baseline quota of 0.5% to each jurisdiction, and allocates the rest of the TAC based on average landings between 2009 and 2011. This measure provides fishing opportunities to states that had little quota under Amendment 2, while still recognizing historic landings in the fishery. States also have the option to relinquish all or part of its quota which is then redistributed to the other jurisdictions based on the 2009-2011 landings period. The Amendment also prohibits the rollover of unused quota; maintains the quota transfer process; maintains the bycatch provision (which was rebranded as the 'incidental catch' provision and applicable gear types were defined) and the episodic events program for the states of Maine – New York. Finally, the Amendment reduces the Chesapeake Bay cap to 51,000 mt, recognizing the importance of the Chesapeake Bay as nursery grounds for many species by capping recent reduction landings from the Bay at current levels.

State	Allocations
Maine	0.52%
New Hampshire	0.50%
Massachusetts	1.27%
Rhode Island	0.52%
Connecticut	0.52%
New York	0.69%
New Jersey	10.87%
Pennsylvania	0.50%
Delaware	0.51%
Maryland	1.89%
PRFC	1.07%
Virginia	78.66%
North Carolina	0.96%
South Carolina	0.50%
Georgia	0.50%
Florida	0.52%
Total	100%

In addition to its Amendment 3 deliberations, the Board increased the TAC by 8% to 216,000 mt for the 2018 and 2019 fishing seasons with the expectation that setting of the TAC for subsequent years would be guided by menhaden-specific ERPs. However, the 2019 benchmark stock assessments and peer-review reports would not be available for Board review until February 2020. As a result, in August 2019, the Board maintained the 216,000 mt TAC for 2020 with the option to revisit the 2020 TAC following review of the assessments.

In October 2019, the Commission found the Commonwealth of Virginia out of compliance with the Interstate FMP for failing to implement and enforce Section 4.3.7 of Amendment 3: Chesapeake Bay Reduction Fishery Cap. Implementation of this measure is necessary to achieve the goals and objectives of Amendment 3 and maintain the Chesapeake Bay marine environment to assure the availability of the ecosystem's resources on a long-term basis. The noncompliance finding was sent to the Secretary of Commerce who concurred with the Commission's finding and declared a moratorium on Atlantic menhaden fisheries in Virginia waters, effective June 17, 2020. These actions were taken pursuant to the provisions of the Atlantic Coastal Fisheries Cooperative Management Act of 1993. In order to avert the moratorium, Virginia must effectively implement and enforce the cap prior to June 17th.

II. Status of the Stock

Per Amendment 3, Atlantic menhaden are managed by single-species reference points until menhaden-specific ERPs are adopted. Fishing mortality rates (*F*), a measure of the intensity with which the population is being fished, is used to evaluate whether the stock is experiencing overfishing. The current single-species threshold and target *F* reference points are calculated as the maximum and median geometric mean *F* for ages-2 to -4 during the reference period of 1960-2012. These ages represent the fully selected *F* rates depending upon the year and fishery (i.e., bait and reduction). Population fecundity, a measure of reproductive capacity, is used to evaluate whether the stock is overfished. The fecundity reference points match the *F* reference points meaning they are equal to the fecundity estimated when *F* reaches equilibrium at its target and threshold MSP levels, respectively.

In February 2020, the Board accepted the results of the Single-Species and Ecological Reference Point (ERP) Benchmark Stock Assessments and Peer Review Reports for management use. These assessments were peer-reviewed and approved by an independent panel of scientific experts through the 69th SouthEast, Data, Assessment and Review (SEDAR) workshop. The single-species assessment acts as a traditional stock assessment using the Beaufort Assessment Model (BAM), a statistical catch-at-age model that estimates population size-at-age and recruitment. According to the model, the stock is not overfished or experiencing overfishing relative to the current single-species reference points. Population fecundity in 2017 is above the single-species threshold and *F* has remained below the single-species overfishing threshold (0.6) since the mid-1970s, and below the single-species overfishing target (0.22) since the mid-1990s. The model also found that juvenile abundance was low in 2017, while biomass was relatively high.

The ERP assessment evaluates the health of the stock in an ecosystem context, and indicates that the *F* reference points for menhaden should be lower to account for species' role as a forage fish[2]. The ERP assessment uses the Northwest Atlantic Coastal Shelf Model of Intermediate Complexity for Ecosystems (NWACS-MICE) to develop Atlantic menhaden ERPs. NWACS-MICE is an ecosystem model that focuses on four key predator species (striped bass, bluefish, weakfish, and spiny dogfish) and three key prey species (Atlantic menhaden, Atlantic herring, and bay anchovy). These species were chosen because diet data indicate they are top predators of Atlantic menhaden or are key alternate prey species for those predators.

The ERP assessment indicates that the *F* reference points for menhaden should be lower than the single-species reference points, but it also concluded that the final ERP definitions, including the appropriate harvest level for menhaden, depend on the management objectives for the ecosystem (i.e., management objectives for both Atlantic menhaden and its predators). Accordingly, instead of proposing a specific ERP definition, the assessment recommends a combination of the BAM and the NWACS-MICE models as a tool for managers to evaluate trade-offs between menhaden harvest and predator biomass.

[2] it should be noted, however, that the conservative TAC the Board has set for recent years is consistent with the ERP *F* target provided in the ERP Assessment

In order to explore the utility of this new management tool, the Board tasked the ERP Workgroup to explore how different assumptions of *F* on the other predator and prey species in the NWACS-MICE model might affect the ERP *F* target and threshold for menhaden. The Board will review these analyses and take up the issue of formally adopting ERPs in 2020.

III. Status of the Fishery

Commercial

Total commercial Atlantic menhaden landings in 2019, including directed, incidental catch, and episodic event set aside (EESA) landings, are estimated at 460.4 million pounds (208,837 mt), approximately an 9% increase relative to 2018 (Table 1). The non-incidental catch fishery landings (directed landings plus landings under the EESA) total for 2019 is estimated at 449.6 million pounds (203,960 mt) and represents an approximate 5% underage of the coastwide commercial TAC of 476.2 million pounds (216,000 mt). Landings from the incidental catch fishery are estimated at 10.75 million pounds (4,877 mt) and do not count towards the coastwide TAC.

Reduction Fishery

The 2019 harvest for reduction purposes is estimated at 332.5 million pounds (150,824 mt), a 7% increase from 2018 and 11% above the previous 5-year average of 300.7 million pounds (136,430 mt) (Table 2; Figure 3). Omega Protein's plant in Reedville, Virginia, is the only active Atlantic menhaden reduction factory on the Atlantic coast.

Bait Fishery

The coastwide bait harvest estimate for 2019, including directed, incidental catch, and EESA landings, is 127.89 million pounds (58,012 mt). This represents a 16% increase relative to 2018 and a 29% increase compared to the previous 5-year average (Table 2; Figure 3). New Jersey (39%), Virginia (28%), Maine (18%), and Massachusetts (7%) landed the four largest shares in 2019.

Incidental Catch and Small Scale Fisheries Landings

Incidental catch landings in 2019 are estimated at 10.75 million pounds (4,877 mt), which is a 234% increase relative to 2018 and above the time series average (Table 3). Only Maine reported incidental catch landings (88% from purse seines and 10% from gill nets) in 2019 (Table 4). Maine accounted for 90% of total incidental fishery landings in 2018. Incidental catch trips in 2019 were higher than trips in 2017 and 2018 (Table 4).

Episodic Events Set Aside (EESA) Program

The 2019 EESA quota was 4.76 million pounds (2,160 mt). Maine began harvesting under the EESA program on July 15, with projections indicating that 80% of the EESA quota had been landed by July 18. Maine's EESA fishery closed July 20, although the directed fishery was able to reopen on July 22 following the state's acquisition of 6.6 million pounds of quota through eight state-to-state transfers. As of October 31, an estimated 4.4 million pounds (1,995 mt) of

menhaden was landed under the EESA fishery (Table 5). The remaining 364,159 pounds of EESA quota was reallocated back to the states on November 1 based on the 2009-2011 time period (see Table 7).

Chesapeake Bay Reduction Fishery Cap (cap)
Amendment 3 implemented a 51,000 mt harvest cap for the reduction fishery in the Chesapeake Bay, which is roughly the average harvest from the Chesapeake Bay reduction fishery over the 5-year time period from 2012-2016. Harvest above the cap in any given year will be deducted from the next year's allowable harvest. Reported reduction landings from Chesapeake Bay in 2019 was about 65,803 mt which represents a 14,803 mt overage. As a result, the cap for 2020 is 36,197 mt.

Recreational
Menhaden are important bait in many recreational fisheries; some recreational fishermen use cast nets to capture menhaden or snag them with hook and line for use as bait, both dead and live. The Marine Recreational Information Program (MRIP) estimate for Atlantic menhaden harvest (A + B1) in 2019 is 1.93 million pounds (873 mt) which is a 44% decrease from 2018 (3.46 million pounds or 1,569 mt).

It is important to note, however, that recreational harvest is not well captured by MRIP because there is not a known identified direct harvest for menhaden, other than for bait. MRIP intercepts typically capture the landed fish from recreational trips as fishermen come to the dock or beach. However, since menhaden caught by recreational fishermen are often used as bait during their trip, they are typically not part of the catch that is seen by the surveyor completing the intercept.

IV. Status of Research and Monitoring

Commercial fisheries monitoring
Reduction fishery - The NMFS Southeast Fisheries Science Center Beaufort Laboratory in Beaufort, North Carolina, continues to monitor landings from the Atlantic menhaden purse-seine reduction fishery and collect biological samples. The Beaufort Laboratory processes and ages all reduction samples collected on the East Coast. In addition, the purse-seine reduction fishery continues to provide Captains Daily Fishing Reports (CDFRs) to the Beaufort Laboratory where NMFS personnel enter data into a database for storage and analysis.

Bait fishery - Per Amendment 3, states are required to implement a timely quota monitoring system in order to maintain menhaden harvest within the TAC and minimize the potential for quota overages. The SAFIS daily electronic dealer reporting system allows near real time data acquisition for federally permitted bait dealers in the Mid-Atlantic and Northeast. Landings by Virginia's purse-seine for-bait vessels (snapper rigs) in Chesapeake Bay are tabulated at season's end using CDFRs maintained on each vessel during the fishing season. A bait-fishery sampling program for size and age composition has also been conducted since 1994. The

Beaufort Laboratory, and some states, age the bait samples collected. See *Section VII* for more information on quota monitoring and biological sampling requirements.

Atlantic menhaden research

The following studies relevant to menhaden assessment and management have been published within the last year:

- Deyle, E., A. M. Schueller, H. Ye, G. M. Pao, and G. Sugihara. 2018. Ecosystem-based forecasts of recruitment in two menhaden species. Fish and Fisheries 19(5): 769-781.
- Liljestrand, E.M., M.J. Wilberg, and A.M. Schueller. 2019. Estimation of movement and mortality of Atlantic menhaden during 1966-1969 using a Bayesian multi-state mark recapture model. Fisheries Research 210: 204-213.
- Liljestrand, E.M., M. J. Wilberg, and A. M. Schueller. 2019. Multi-state dead recovery mark-recovery model performance for estimating movement and mortality rates. Fisheries Research 210: 214-233.
- Lucca, B. M., and J. D. Warren. 2019. Fishery-independent observations of Atlantic menhaden abundance in the coastal waters south of New York. Fisheries Research 218: 229-236.
- Nesslage, G. M., and M. J. Wilberg, M. J. 2019. A performance evaluation of surplus production models with time-varying intrinsic growth in dynamic ecosystems. Canadian Journal of Fisheries and Aquatic Sciences 76(12): 2245-2255.

Theses and Dissertations of Potential Interest:

- McNamee, J. E. 2018. A multispecies statistical catch-at-age (MSSCAA) model for a Mid-Atlantic species complex. University of Rhode Island.

V. Implementation of FMP Compliance Requirements for 2019

All states are required to submit annual compliance reports by April 1.

Quota Results

Table 7 contains state-specific quotas and directed harvest that occurred in 2019. The final quotas for 2019 account for 4.36 million pounds of quota relinquished by Delaware and Georgia, an adjustment of 17 state-to-state transfers (Table 8), and the reallocation of unused EESA quota (364,159 pounds). Quota transfers were generally pursued to ameliorate overages, and therefore, no quota overages occurred in 2019.

The Board maintained the TAC of 216,000 mt (476.2 million pounds) for 2020. 1% is set aside for episodic events. States may relinquish all or part of its annual quota by December 1st of the previous year. Delaware and Georgia relinquished 4.46 million pounds of quota which was redistributed to the states according to procedures outlined in Amendment 3 and is reflected in the 2020 Preliminary Quota (Table 7).

Quota Monitoring

The Board approved timely quota monitoring programs for each state through implementation of Amendment 3. Monitoring programs are intended to minimize the potential for quota

overages. Table 6 contains a summary of each state's approved quota monitoring system.

Menhaden purse seine and bait seine vessels (or snapper rigs) are required to submit CDFRs. Maine, New York, and Virginia fulfilled this requirement in 2019. New Jersey did not require purse seine vessels to fill out the specific CDFR but did require monthly trip level reporting on state forms that include complementary data elements to the CDFR. Rhode Island purse seine vessels must call in daily reports to RI DFW and fill out daily trip level logbooks. Massachusetts and Connecticut require trip level reporting for all commercial fishermen. Menhaden purse seine fisheries do not currently operate in all other jurisdictions in the management unit.

Biological Monitoring Requirements
Amendment 3 maintains biological sampling requirements for non *de minimis* states as follows:

- One 10-fish sample (age and length) per 300 mt landed for bait purposes for Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware; and
- One 10-fish sample (age and length) per 200 mt landed for bait purposes for Maryland, Potomac River Fisheries Commission, Virginia, and North Carolina

Table 8 provides the number of 10-fish samples required and collected for 2019. These are based on the best available 2019 total bait landings data (including directed, incidental, and EESA landings) provided to the Commission by the states. In 2019, Maine, Massachusetts, Connecticut fell short of the required samples. All three states worked to supplement samples not captured from bait landings with samples from fishery independent sources as was done in previous years. All other jurisdictions met the biological monitoring requirements in 2019.

The PRT continued to discuss whether a sufficient number of age and length samples are being collected from different commercial gear types as well as regions, and whether substituting samples from fishery independent sources is appropriate for meeting the requirement. The PRT recommends that this requirement be evaluated as part of the next management action or during the next benchmark stock assessment.

Adult CPUE Index Requirement
Amendment 3 requires that, at a minimum, each state with a pound net fishery must collect catch and effort data elements for Atlantic menhaden as follows; total pounds landed per day, number of pound nets fished per day. These are harvester trip level ACCSP data requirements. In May of 2013, the Board approved North Carolina's request to omit this information on the basis that it does not have the current reporting structure to require a quantity of gear field by harvesters or dealers[3]. It was unclear to the PRT whether this exemption remains in place for North Carolina. All other states with a pound net fishery met this requirement.

[3] North Carolina continues to explore developing a proxy for this from existing information collected on permits. The current method estimates a maximum number of pound nets fished per day. A more specific pound net permit data set is being explored to further narrow data.

De Minimis Status

To be eligible for *de minimis* status, a state's bait landings must be less than 1% of the total coastwide bait landings for the most recent two years. State(s) with a reduction fishery are not eligible for *de minimis* consideration. If granted *de minimis* status by the Board, states are exempt from implementing biological sampling as well as pound net catch and effort data reporting. The Board also approved a *de minimis* exemption for New Hampshire, South Carolina and Georgia from implementation of timely reporting. The states of Pennsylvania, South Carolina, Georgia, and Florida requested and qualify for *de minimis* status for the 2020 fishing season.

VI. Plan Review Team Recommendations and Notable Comments

Management Recommendations

- The PRT recommends that the *de minimis* requests from Pennsylvania, South Carolina, Georgia, and Florida, be approved.
- The PRT recommends that the incidental catch fishery provision issue and biological sampling requirement be readdressed in a future management document.
- The PRT recommends the Board clarify whether North Carolina is exempt from collecting catch and effort data from the pound net fishery.

Notable Comments

Landings data suggest that Atlantic menhaden have become increasingly available to the Gulf of Maine fishery in recent years (2016-2019). In 2019, the state of Maine reported landings in excess of 22 million pounds, marking a 60% increase relative to 2018 landings and a 463% increase relative to 2017. In 2019 New Hampshire reported 4.5 million pounds, marking a 2,200% increase relative to 2018, and the states of Maine through Massachusetts accounted for nearly 9% of the coastwide total landings. Maine has requested additional quota through in-season transfers each year since 2016; both New Hampshire and Massachusetts also received additional quota through transfers in 2019. Maine was the only state to opt into the EESA fishery in 2019, marking four consecutive years of participation in the program. Maine was the only state to report incidental catch landings in 2019 as well. Landings in the 2019 incidental catch fishery increased to 10.7 million pounds, a 234% increase overall and all attributed to Maine. With the exception of Maine, however, it appears that the Amendment 3 allocations provide states sufficient quota to keep the directed fisheries open throughout the season.

The recent increase in landings may also be attributed to the status and availability of other bait fish populations in the region (e.g., Atlantic herring), or other social and economic factors.

Similar to last year's report, the PRT highlights how some states manage their quota relative to the incidental catch fishery. The incidental catch provision in Amendment 3 states "after a quota allocation is met for a given jurisdiction, the fishery moves to an incidental catch fishery in which small-scale gears and non-directed gear types may land up to 6,000 pounds of menhaden per trip per day" (12,000 pounds per trip per day for two authorized individuals, working from the same vessel fishing stationary multi-species gear). The amendment does not

give guidance for the incidental catch provision if a state subdivides its quota to different gear types or sectors. New Jersey and the Commonwealth of Virginia subdivide its quotas and has done so since the Commission implemented state quotas in 2013. Virginia allocates its annual quota to three sectors: the reduction sector, the purse seine bait sector, and the non-purse seine bait sector. New Jersey allocates majority of its annual quota to the purse-seine fishery, and the remaining quota is allocated to all other gear types. Once the non-purse seine bait sector or "other gears" fishery has harvested its portion of the state's allocation, that fishery moves into an incidental catch fishery regardless of whether the entire state's quota has been harvested. This has resulted in Virginia and New Jersey reporting incidental catch landings when they have not met their overall quota allocation for a given year. Since the inception of the incidental catch provision, the PRT has reported landings following the closure of Virginia's non-purse seine bait fishery and New Jersey's "other gears" fishery as incidental catch. The PRT requests guidance from the Board if they would like to see this reported differently. The PRT recommends this issue be addressed in a future management document.

VII. Literature Cited

Atlantic States Marine Fisheries Commission (ASMFC). 2017. Atlantic Menhaden Stock Assessment Update. Prepared by the ASMFC Atlantic Menhaden Stock Assessment Subcommittee. 180 pp.

Southeast Data, Assessment, and Review (SEDAR). 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. 643 pp.

SEDAR. 2020. SEDAR 69 – Atlantic Menhaden Benchmark Stock Assessment Report. SEDAR, North Charleston SC. 691 pp. available online at: http://sedarweb.org/sedar-69

SEDAR. 2020. SEDAR 69 - Atlantic Menhaden Ecological Reference Points Stock Assessment Report. SEDAR, North Charleston SC. 560 pp. available online at: http://sedarweb.org/sedar-69

Table 1. Directed, bycatch, and episodic events set aside landings in pounds for 2019 by jurisdiction. NA = not applicable; C = confidential

State	Directed	Incidental Catch	EESA
ME	7,459,280	10,750,929	4,397,826
NH	4,540,800	-	NA
MA	6,964,818	-	NA
RI	50,449	-	NA
CT	95,367	-	NA
NY	1,430,902	-	NA
NJ	50,433,506	-	NA
DE	79,090	-	NA
MD	3,379,472	-	NA
PFRC	2,341,823	-	NA
VA	367,701,342	-	NA
NC	547,455	-	NA
SC	C	-	NA
GA	-	-	NA
FL	232,277	-	NA

Table 2. Atlantic menhaden reduction and bait landings in thousand metric tons, 1985-2019

	Reduction Landings (1000 mt)	Bait Landings (1000 mt)
1985	307	26.6
1986	238	21.6
1987	310	25.5
1988	278	43.8
1989	284	31.5
1990	343	28.1
1991	330	29.7
1992	270	33.8
1993	310	23.4
1994	260	25.6
1995	340	28.4
1996	293	21.7
1997	259	24.2
1998	246	38.4
1999	171	34.8
2000	167	33.5
2001	234	35.3
2002	174	36.2
2003	166	33.2
2004	183	34.0
2005	147	38.4
2006	157	27.2
2007	174	42.1
2008	141	47.6
2009	144	39.2
2010	183	42.7
2011	174	52.6
2012	161	63.7
2013	131	37.0
2014	131	41.6
2015	143	45.8
2016	137	43.1
2017	129	43.8
2018	141	50.2
2019	151	58.0
Avg 2014-2018	136	44.9

Table 3. Incidental fishery landings by state in pounds, 2013-2019. Only states that have reported incidental catch landings are listed. Average total incidental catch landings for the time series is 5.21 million pounds.

State	2013	2014	2015	2016	2017	2018	2019
ME	-	-	-	506,145	699,874	2,900,169	10,750,929
RI	16,100	98,533	69,947	39,540	135,748	-	-
CT	-	-	10,469	-	123,666	-	-
NY	-	324,857	769,312	281,017	807,392	-	-
NJ	-	625,643	240,922	195,523	-	204,240	-
DE	75,928	111,944	91,543	20,823	29,285	-	-
MD	2,864,298	2,200,662	1,949,577	995,698	-	-	-
PRFC	1,087,410	1,112,343	455,350	105,669	670,447	-	-
VA	268,215	2,231,708	2,102,529	325,692	-	110,281	-
FL	64,790	125,772	301,963	111,165	263,643	-	-
Total	4,376,741	6,831,462	5,991,612	2,581,272	2,730,055	3,214,690	

Table 4. Total incidental landings (pounds), number of trips, and number of states reporting landings in the incidental catch fishery, 2013-2019.

Year	Landings (pounds)	Number of Trips	Number of states landing
2013	4,376,741	2,783	6
2014	6,831,462	5,275	8
2015	5,991,612	4,498	9
2016	2,581,272	2,222	9
2017	2,730,055	2,093	7
2018	3,214,690	1,224	3
2019	10,750,929	3,113	1
Total	36,480,081	21,223	

Table 5. Episodic Events Set-Aside (EESA) fishery quota, landings, and participating states by year. *the 2018 EESA quota was reduced due to an overage in 2017. The 2018 EESA overage was paid back in full by the state of Maine.

Year	States Declared Participation	EESA Quota (MT)	Landed (MT)	% EESA Quota Used
2013		1,708	-	-
2014	RI	1,708	134	7.8%
2015	RI	1,879	854	45.5%
2016	ME, RI, NY	1,879	1,728	92.0%
2017	ME, RI, NY	2,000	2,129	106.5%
2018*	ME	2,031	2,103	103.6%
2019	ME	2,160	1,995	92.4%

Table 6. State quota reporting timeframes in 2019. The **bold** text indicates which reporting program (dealer or harvesters) the states use to monitor its quotas. Blue text indicates changes from 2018.

State+	Dealer Reporting	Harvester Reporting	Notes
ME	monthly	**monthly/daily**	Harvesters landing greater than 6,000 lbs must report daily during episodic event. 2020 update- **harvest schedule has been modified to Monday, Tuesday, Thursday, and Friday away from four consecutive days (M-T)**
NH	**weekly**	monthly	Exempt from timely reporting. Implemented weekly, trip level reporting for state dealers.
MA	**weekly**	monthly/daily	Harvesters landing greater than 6,000 lbs must report daily
RI	**twice weekly**	quarterly/daily	Harvesters using purse seines must report daily
CT	**weekly/monthly**	monthly/**daily**	CT operates as directed fisheries until 90% of the quota is harvested. Then operates at the 6,000 pound bycatch trip limit.
NY	**Weekly**	monthly	Capability to require weekly harvester reporting if needed
NJ	**weekly**	monthly	All menhaden sold or bartered must be done through a licensed dealer
DE	—	**monthly/daily**	Harvesters landing menhaden report daily using IVR
MD	monthly	**monthly/daily**	PN harvest is reported daily, while other harvest is reported monthly.
PRFC	—	**weekly**	Trip level harvester reports submitted weekly. When 70% of quota is estimated to be reached, then pound netters must call in weekly report of daily catch.
VA	—	**monthly/weekly/daily**	Purse seines submit weekly reports until 97% of quota, then daily reports. Monthly for all other gears until 90% of quota, then reporting every 10 days.
NC	**monthly (combined reports)**		Single trip ticket with dealer and harvester information submitted monthly. Larger dealers (>50,000 lbs of landings annually) can report electronically, updated daily.
SC	**monthly (combined reports)**		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
GA	**monthly (combined reports)**		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
FL	**monthly/weekly (combined reports)**		Monthly until 75% fill of quota triggers implementation of weekly.

Table 7. Results of 2019 quota accounting in pounds. The 2019 landings do not include landings from the incidental catch fishery because they do not count towards the TAC. A majority of the 2019 episodic events set aside (EESA) quota was used by Maine (92.4%) with the remaining set aside quota (364,159 lbs) redistributed to the states in November. The coastwide TAC was not exceeded in 2019. The 2020 base quotas account for the redistribution of relinquished quota by Delaware (2.1 million pounds) and Georgia (2.4 million pounds). * includes redistributed relinquished quota for that year and any overages from the previous season. ^includes inter-state transfers and transfers to the EESA quota.

State	2019 Base Quota*	Returned Set Aside	Transfers^	Final 2019 Quota	Overages	2020 Base Quota*
ME	2,437,866	67.7	6,573,592	9,012,337		2,437,866
NH	2,357,313	0.1	3,373,592	5,730,907		2,357,313
MA	6,008,565	3,065.8	1,120,000	7,168,317		6,008,565
RI	2,440,542	70.0	-400,000	2,041,450		2,440,542
CT	2,431,491	62.4	-2,290,000	142,300		2,431,491
NY	3,256,768	755.3	-1,830,000	1,436,562		3,256,768
NJ	51,257,740	41,057.6	0	51,790,121		51,257,740
PA	2,357,183	-	0	2,357,183		2,357,183
DE	2,416,467	49.8	0	416,517		2,416,467
MD	8,901,558	5,494.8	-1,000,000	7,972,807		8,901,558
PRFC	5,060,296	2,269.6	0	5,089,725		5,060,296
VA	370,846,528	309,388.9	-1,000,000	373,858,280		370,846,528
NC	4,507,320	1,805.3	-600,000	3,930,728		4,507,320
SC	2,357,183	-	-2,347,184	9,999		2,357,183
GA	2,357,183	-	0	0		2,357,183
FL	2,442,500	71.6	-1,600,000	843,428		2,442,500
TOTAL	471,436,501	364,158.9		471,800,660		471,436,501

Table 8. State-to-state transfers of menhaden commercial quota for the 2019 Fishing year.

Transfers	Transfer Date	ME	NH	MA	RI	CT	NY	NJ	PA	DE	MD	PRFC	VA	NC	SC	GA	FL
1	1-Jul	1,000,000				-1,000,000											
2	11-Jul		1,173,592												-1,173,592		
3	11-Jul	1,173,592													-1,173,592		
4	17-Jul	1,000,000					-1,000,000										
5	22-Jul	600,000												-600,000			
6	22-Jul	800,000															-800,000
7	22-Jul	1,000,000									-1,000,000						
8	22-Jul		800,000														-800,000
9	21-Aug			300,000		-300,000											
10	22-Aug			200,000	-200,000												
11	23-Aug		200,000		-200,000												
12	23-Aug		300,000			-300,000											
13	19-Sep			400,000		-400,000											
14	26-Sep		400,000			-400,000											
15	26-Sep		500,000				-500,000										
16	26-Sep			400,000			-400,000										
17	15-Dec	1,000,000											-1,000,000				
18	5/26/2020			-180,000		110,000	70,000										
Total		6,573,592	3,373,592	1,120,000	-400,000	-2,290,000	-1,830,000	0	0	0	-1,000,000	0	-1,000,000	-600,000	-2,347,184	0	-1,600,000

Table 8. Biological monitoring results for the 2019 Atlantic menhaden bait fishery.
*Age samples are still being processed

State	Total Bait Landings (pounds)	#10-fish samples required	#10-fish samples collected	Age samples collected	Length samples collected	Gear/Comments
ME	22,608,035	34	29	290	290	Purse seine. All samples processed and scales shipped to NMFS, Beaufort NC for aging.
NH	4,540,800	6	6	60	60	Purse seine.
MA	6,964,818	10	12	120	120	7 from Purse seine; 1 from pound net; 4 from snagging
RI	50,449	1	1	33	33	All from FI trawl survey samples
CT	95,367	1	0	182	815	All from FI Long Island Sound trawl survey; 29 tows data was collected from
NY	1,430,902	2	4	40	40	cast net
NJ	49,470,573	75	99	*	990	Purse seine
	962,933	2	16	*	160	"Other gear" grouped for confidential reasons
DE	79,090	1	1	10	10	Gill net
MD	3,379,472	8	21	277	867	Pound net
PRFC	2,341,823	6	15	150	150	Pound net
VA	3,324,307	8	63	630	630	Pound net
	2,042,572	5	20	200	200	Gill net
	10,410	0	4	40	40	Haul seine
NC	547,455	3	5	50	50	Gill net, pound net
Total	**97,849,006**	**162**	**296**	**2,082**	**4,455**	

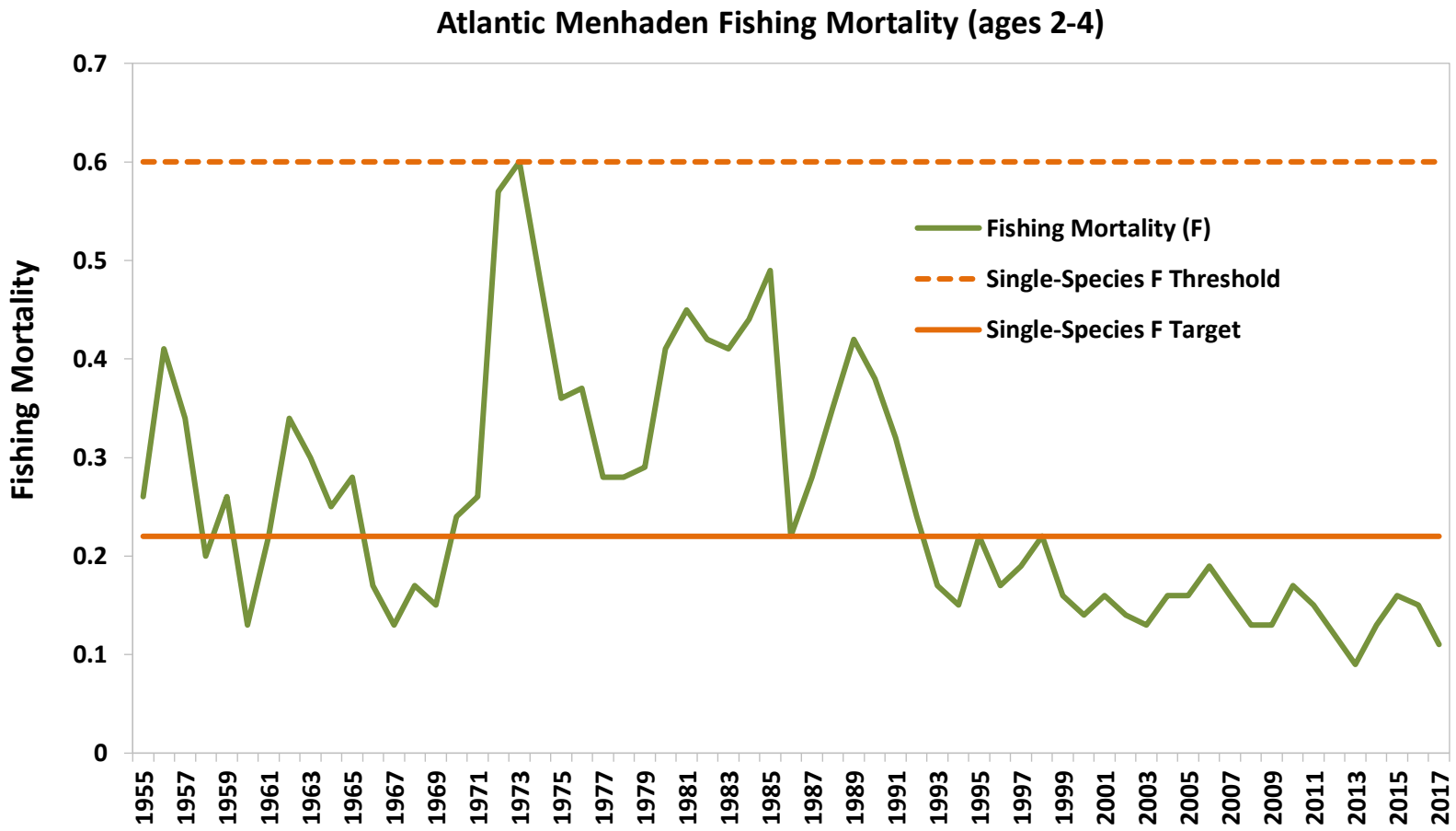

Figure 1. Fishing mortality, 1955-2017. The fishing mortality reference points are F_{target} = 0.22 and $F_{threshold}$ = 0.60. F_{2017} = 0.11. Source: ASMFC 2019.

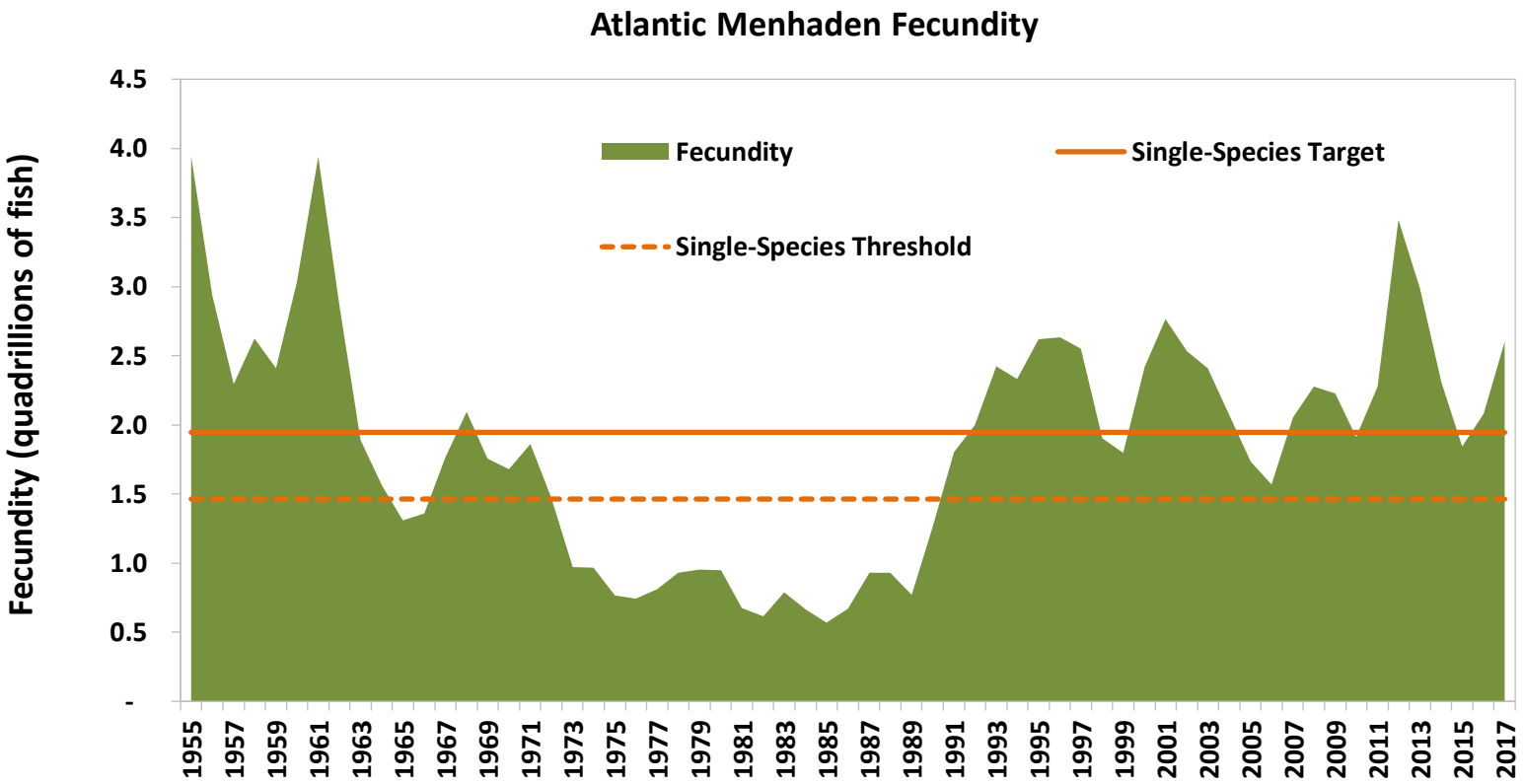

Figure 2. Atlantic menhaden fecundity, 1955-2017. The reference points for population fecundity are FEC_{target} = 1,945,613 (billions of eggs), and $FEC_{threshold}$ = 1,463,344 (billions of eggs). FEC_{2017} = 2,601,550 billion eggs.

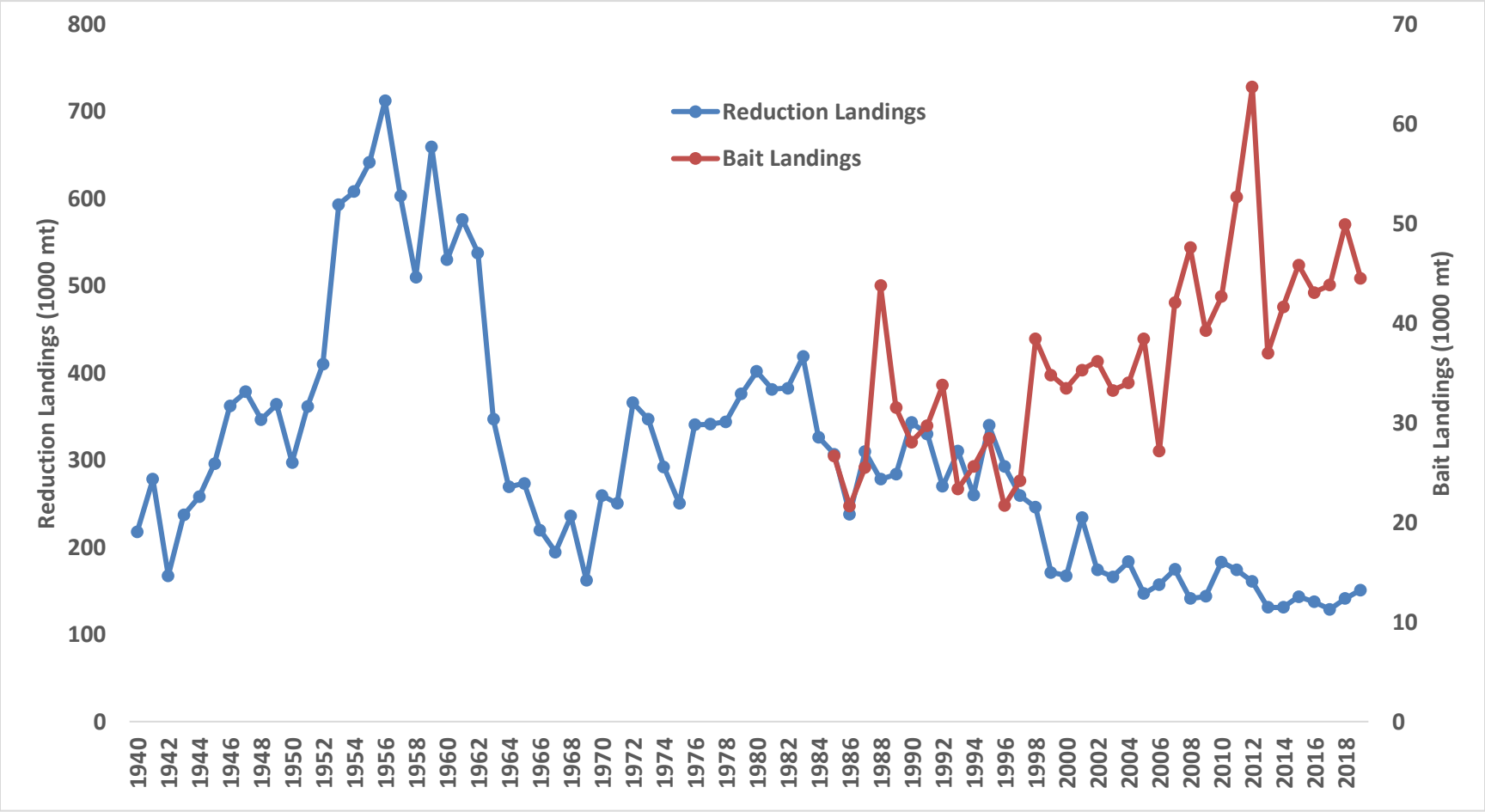

Figure 3. Landings from the reduction purse seine fishery (1940–2019) and bait fishery (1985–2019) for Atlantic menhaden. Note: there are two different scales on the y-axes.