



Mid-Atlantic Fishery Management Council
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Michael P. Luisi, Chairman | P. Weston Townsend, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: July 28, 2021
To: Council and Board
From: Matthew Seeley, Council staff
Subject: 2022-2023 Bluefish Specifications

The Council and Board will set 2022-2023 specifications for bluefish on Monday, August 9, 2021. Recreational management measures for 2022-2023 will be considered later in 2021. Materials listed below are provided for the Council and Board's consideration of this agenda item.

Please note that some materials are behind other tabs. Items are listed in reverse chronological order.

- 1) Bluefish Advisory Panel meeting summary
- 2) Monitoring Committee meeting summary
- 3) July 2021 Scientific and Statistical Committee meeting report (*behind Tab 14*)
- 4) Staff memo on 2022-2023 bluefish specifications dated June 30, 2021 (revised on July 23, 2021)
- 5) Bluefish 2021 Northeast Fisheries Science Center management track assessment update
- 6) Bluefish F Rebuild projections
- 7) 2021 Advisory Panel Fishery Performance Report
- 8) 2021 Bluefish Fishery Information Document



**Bluefish Advisory Panel
Meeting Summary
July 28, 2021**

Advisory Panel Members (MAFMC and ASMFC): Mike Plaia, Frank Blount, Jim Kaczynski, Philip Simon, Willy Goldsmith, Paul Lane, Mike Waine, Eric Burnley, Victor Hartley, William Mandulak, Ben Vuolo, Steve Heins, Jason Mleczeko, and Charlie Locke.

Others in attendance: Matthew Seeley (Council Staff), Mary Sabo (Council Staff), Dustin Colson Leaning (ASMFC), Chris Batsavage (MAFMC), David Stormer (MAFMC), Greg DiDomenico (Lunds), Jessica Valenti, James Fletcher (UNFA), and a few unknown individuals (no identification or call-in numbers).

The Bluefish Advisory Panel (AP) met on Wednesday, July 28th from 2:00 – 4:00 p.m. The goal of the meeting was to discuss the AP process, review recent fishery performance (2020), review the recent management track assessment, and review the Scientific and Statistical Committee (SSC) and Monitoring Committee (MC) recommendations.

This AP meeting was the first meeting where new AP members were introduced to the bluefish specifications process. Staff presented and summarized what it means to be an AP member, the expected role to be filled, and the difference between this meeting, as it compares to AP meetings where ample time is spent developing the Fishery Performance Report. Below are individual AP questions and comments on fishery performance, the current management measures, and the recommendations provided by staff, the SSC, and MC.

Willy Goldsmith – Can we compare early waves’ landings for 2021 to 2020 and 2019 to see what the impacts of the bag limit changes are on landings? Answer: These sorts of comparisons will occur with the Monitoring Committee at their November meeting prior to when the Council and Board take action on recreational management measures in December.

Philip Simon – Should we be concerned about the RHL overage and how it relates to the rebuilding plan? Answer: We need to be concerned with any overages, as they will impact the quotas and management measures in future years, as well as the expected duration of the rebuilding plan.

Bill Mandulak – I fish primarily from the beach in northern NC on the Outer Banks near Hatteras, and bluefish are a substantial part of my (and other’s) harvest. In recent years, I have seen a fairly substantial decline in abundance.

Mike Waine – Can you explain how the 2020 RHL overage affects the 2022 specifications? Answer: Total catch was estimated at 19.93 million pounds, which exceeds the 16.28 M pound

ACL by ~22%. The regulations stipulate that a pound for pound payback is warranted in the next fishing year. The accountability measures have been incorporated into the 2022 specifications and the 2022 RHL includes those reductions.

Jim Kaczynski: The 200,000 MT SSB target is at a level where bluefish biomass has never been before. Can you offer some insight on where this estimate came from? Answer: This value is a biological reference point that is direct output from the management track stock assessment. As the assessment is updated, this target may be adjusted to reflect any model adjustments/revisions.

Philip Simon – I challenge the impact of ever decreasing quotas and RHLs on "fixing" the perceived low SSB and R numbers seen over the last 30 years, and, I challenge that SSB and R values that have guided fishery management have changed substantially at all. However, I understand that things might change, including the SSB threshold and target values, as a result of the upcoming management track assessment.

Greg DiDomenico – Why are sector transfers not allowed this year? Answer: The new amendment details transfers can not occur when the stock is either overfished or experiencing overfishing. Additionally, we anticipate the recreational sector fully landing the RHL, therefore there would be no quota to transfer.

Willy Goldsmith – Just to clarify are the new RHLs based on the rebuilding plan? Answer: Yes. How do we factor in the likelihood that the 2021 RHL will have an overage into future specifications? Answer: The Monitoring Committee will take up this discussion at their specifications meeting next year once we know if any overages did actually occur.

Greg DiDomenico – Should we expect an overage in 2022 for bluefish, and if so, will the measures change? Answer: Given the current trends and small quotas for 2021, it is possible. Again, the Monitoring Committee will take up this discussion at their specifications meeting next year once we know if any overages did actually occur.

Captain Victor Hartley – The for-hire sector has to get separated from the private anglers through a formal sector separation process.

Paul Lane – In NC, bluefish are bycatch in the mackerel fishery. A reduction of allocation from 17% to 14% is harmful to the commercial fishery. Why do we not have census data from the recreational fishery, especially for bluefish which is overfished? Answer: MRIP data is what we are currently using to monitor the recreational fishery. All data will be thoroughly reviewed prior to the research track assessment scheduled for 2022.

Bill Mandulak – Sounds like a lot of folks who are able to catch large bluefish are offshore. Are there efforts to quantify offshore abundance? Answer: Currently, there are no surveys addressing offshore abundance. This has been a consistent research recommendation to help improve our understanding prior to the 2022 research track assessment.

James Fletcher – P.L 109-479 Every saltwater angler was supposed to register! In NC, recreational landings will triple as Oregon inlet improves. Small for-hire recreational landings will also triple.

Also, the national park closing beach access for bird hatching lessens beach driving. When beach driving occurs in towns and the national seashore, recreational landing will go out of site.

Mike Waine – Asked about for-hire estimates used in the stock assessment and how they are compared. Answer: MRIP estimates include for-hire landings. Vessel trip report (VTR) data may also be incorporated.

Charlie Locke – We are held to trip tickets and VTRs and I think the recreational side should be held to the same standards. Until the recreational side is held to the same catch accounting standards there should not be any reallocation.

Captain Victor Hartley – The for-hire fleet is going to look for a bag-limit increase. They would be ok with a minimum size limit if it meant having a larger bag limit.

James Fletcher – Could a hook size or total length measures be utilized to reduce discards for recreational? Answer: Those are both measures that can be discussed by the Monitoring Committee.

Bill Mandulak – Discard mortality rates (15%) are a little high compared to other fisheries. What is the opportunity for examining that and researching how to reduce that? Treble hooks are quite destructive and have a high mortality. I am interested to find out what other measures could be implemented to reduce mortality.

Willy Goldsmith – The 3 and 5 bag limits represent a de facto reallocation. This should again be part of the Monitoring Committee conversation in regard to fairness and equitability. The for-hire sector should either be completely separated with their own ACL or not have separate measures at all.

Emailed Comments

TJ Karbowski – Plenty of bluefish this year due to the abundance of forage fish. Various year classes represented. No regulation changes necessary either way up or down. If a further bag or size reduction is necessary via the data than a separate "for-hire" category is absolutely imperative for the industry to stay in business.



**Bluefish Monitoring Committee
Meeting Summary
July 26, 2021**

Monitoring Committee Members: Matthew Seeley (Council Staff), Dustin Colson Leaning (ASMFC), Cynthia Ferrio (GARFO), Mike Celestino (NJ-F&W), Richard Wong (DE-F&W), Eric Durrell (MD-DNR), Nicole Lengyel Costa (RI DMF), Jim Gartland (VIMS), Tony Wood (NEFSC), Joseph Munyandorero (FL FWC), David Behringer (NC DMF), Same Truesdell (MA DMF), and Sandra Dumais (NY DEC).

Others in attendance: John Foster (NMFS), Chris Batsavage (MAFMC), Dewey Hemilright (MAFMC), David Stormer (MAFMC), Joseph Cimino (MAFMC), Nichola Meserve (MA DMF), Greg DiDomenico (Lund's Fisheries) and James Fletcher (UNFA).

Introduction

The Monitoring Committee (MC) discussed the impacts of COVID-19 on recreational data collection and the uncertainty associated with the 2020 catch estimates. As discussed in the staff memo, due to a lapse in angler intercept sampling caused by COVID-19 restrictions, a portion of the 2020 catch estimates were imputed using 2018 and 2019 data and may not fully reflect the management measures implemented in early to mid-2020 (i.e., 3-fish and 5-fish bag limits for the private and for-hire sectors, respectively).

John Foster (NMFS Office of Science and Technology, Fisheries Statistics Division) provided a presentation on the methodology used to impute the 2020 recreational catch and effort estimates, as well as a summary of select estimates. He noted that there were significant gaps in intercept data in 2020, particularly for mid-March through April. One notable trend was that interviewers received fewer length and weight measurements due to the reluctance of interviewers and anglers to closely interact. To fill these data gaps, all Access Point Angler Intercept Survey data from 2018 and 2019 collected within corresponding 2020 data gap periods were appropriately weighted and combined with available 2020 data. To assist fisheries managers and Marine Recreational Information Program (MRIP) catch query users in understanding the impacts of imputed data, a new column was incorporated to all harvest and catch queries indicating the “contribution of imputed data to total harvest rate”.

The MC reviewed the Scientific and Statistical Committee's (SSC's) acceptable biological catch (ABC) recommendation for 2022-2023, recent fishery performance, and the 2021 Northeast Fisheries Science Center (NEFSC) bluefish management track assessment and rebuilding projections. The SSC recommended an ABC of 25.26 million pounds (11,460 mt) for 2022 and an ABC of 30.62 million pounds (13,890 mt) for 2023. The ABC recommendations reflect the results

of the 2021 bluefish management track assessment and preferred constant fishing mortality (F) rebuilding plan selected through the bluefish allocation and rebuilding amendment. Following the presentation, the MC discussed various sources of management uncertainty, estimates of discards (recreational and commercial), 2021 expected recreational landings, transfers from one sector to the other, commercial management measures, and the implications of COVID-19. Ultimately, the MC endorsed the SSC's ABC recommendation for 2022 and 2023, which was consistent with Option 2 of the staff memo. Option 2 treated the total catch estimate from the F rebuild projections as an OFL proxy. Thus, the resulting F of 0.154 associated with the Council-preferred rebuilding plan was incorporated into revised projections in place of the original $F_{MSY} = 0.181$. This adjustment allowed the SSC to account for scientific uncertainty, which results in catch levels that now have the potential to rebuild the stock more quickly.

Recreational Discards

The MC discussed the two approaches used to characterize discards in the recreational fishery. First, the MC was presented with the approach the Greater Atlantic Regional Fisheries Office (GARFO) and the Council uses to monitor the recreational fishery. This approach uses the MRIP estimated mean weight (by year, state, and wave) of harvested fish (A+B1) times the number of released fish (MRIP-B2s by year, state, and wave) and an assumed 15% release mortality. The MC generally agreed that this estimate does not fully capture recreational fishery dynamics because this approach uses the mean weight of harvested fish, not discards, and the length frequency data suggests that released fish tend to be larger than retained fish. The second approach uses the NEFSC discard estimates, which applies a length-weight relationship to released fish data from the MRIP, American Littoral Society tag releases, and volunteer angler surveys from Connecticut, Rhode Island, and New Jersey. However, this sampling approach does not characterize the entire coast, which adds to the uncertainty in these estimates. Figure 1 shows the spatial distribution of live release data and release at length data for 2016-2018. Furthermore, in 2019, the NEFSC discard estimates are approximately 3x higher than the MRIP estimates, and in some cases, exceed the recreational ACT. The NEFSC assessment scientist indicated that the next research track assessment in 2022 would investigate using the MRIP release weight methodology (used by GARFO and the Council to monitor the fishery) to estimate the weight of released fish in the assessment.

Considering the lack of a NEFSC estimate for 2020, the COVID-19 pandemic, and the regulatory change in 2020, the MC recommends using the terminal year (2020) estimate of MRIP discards of 4.19 M pounds, as opposed to a 3-year average of 4.32 M pounds to develop the 2022-2023 specifications. This MC recommendation for a terminal year discard estimate differs from previous year's recommendations (3-year average) due to the regulatory change that occurred in 2020. The MC did note that the data gaps early in the year may not be a major factor for New England and Mid-Atlantic states due to them not having robust spring fisheries.

The MC endorsed the NEFSC methodology as the best approach but are not convinced sufficient data are available to inform the calculations, and hence believe the approach assuming that the average weight of a landed fish equals the average weight of a released fish, while not ideal, has less uncertainty in comparison. Consequently, the MC believes it would be helpful to evaluate the

potential or need for a coastwide biological sampling program to provide additional data for the NEFSC approach¹.

Commercial Discards

The MC discussed recent reports of increased commercial discards in the bluefish fishery. Commercial discards were not included in the benchmark stock assessment or operational assessment as they were deemed negligible (SAW 60). In recent years, Advisory Panel members indicated that localized discards in the commercial fishery are increasing and may not be insignificant. The MC further discussed that while commercial discards may have been negligible in the past, with reduced commercial quotas in recent years, the number of regulatory discards could be more significant. The assessment scientist indicated that commercial discards are likely to be incorporated into the 2022 research track assessment to improve transparency, despite the fact that commercial discards comprise a very small percentage of total removals in a given year.

2022-2023 Expected Recreational Landings (ERL)

In recent years, expected recreational landings have been calculated from three-year averages using the most recent complete fishing years during the July MC meetings. This year, the MC recommends waiting until the November Recreational Measures MC meeting to provide a recommendation for ERL. In November, wave 4 recreational data will be available for 2021 and projections can be made using the most up to date data. However, in the meantime, the MC recommends using the previous year's landings (2020 = 13.58 M lbs) as a proxy for ERL for the same reasons only the terminal year estimate was used for recreational discards, as discussed above.

Management Uncertainty

The MC is recommending management measures and specifications based on the updated bluefish flowchart (Figure 2). This flowchart was revised through the Bluefish Allocation and Rebuilding Amendment, and now allows the MC to adjust catch limits based on management uncertainty for each sector (commercial and recreational).

Regarding specifications, the MC discussed various sources of management uncertainty in considering an adjustment from the annual catch limits (ACL) to the fishery-specific annual catch target (ACT). Most comments were related to the uncertainties surrounding the recreational dead discards and whether to use a one-year estimate or an average of the most recent three years, as well as being able to make an informed recommendation on whether to use the MRIP-estimated or NEFSC-estimated method to calculate recreational discards. For the commercial sector, the MC indicated that there is no formal analysis available to make appropriate estimates of commercial discards. To deal with the lack of commercial discard estimates, the MC recommends a review of commercial discard data that can allow for inclusion into the 2022 research track assessment.

¹ In February 2021, the Atlantic States Marine Fisheries Commission's Management Board signed off on a TC recommendation to encourage states that comprise >4% of coastwide removals to collect recreational release length data.

Finally, the MC recommends a retrospective analysis be performed to identify how accurate estimations of recreational discards have been historically, in order to help quantify management uncertainty and inform how recommendations are developed in future years; as the timeseries of calibrated MRIP harvest and calibrated RHLs lengthens, a similar analysis for predicted harvest will be helpful.

Another source of uncertainty is tied to the 2020 recreational harvest estimates. Following the overfished designation in 2019, the Council implemented 2020 management measures for bluefish that resulted in a 3 and 5-fish bag limit for private and for-hire anglers, respectively. This reduction in bag limit was anticipated to result in a ~28% reduction in recreational harvest to ensure the RHL was not exceeded. However, many states were not able to implement the new measures until at least midway through 2020. Then, the COVID-19 pandemic further influenced the uncertainty tied to the 2020 estimates, but MRIP offered data imputations to help inform 2020 harvest. The data imputations by MRIP used 2018 and 2019 to estimate 2020 harvest. While the timing of the imputation likely minimizes uncertainties in many mid-Atlantic and New England states, these 2020 imputed estimates unfortunately did not include the impacts of the revised management measures that reflect the reduction in bag limits, particularly in South Atlantic states. Therefore, the true impacts of the reduced bag limits are not yet reflected in the best available estimates of bluefish catch.

For the reasons provided above, the MC recommends no reductions be taken for management uncertainty. Additionally, the MC feels that the decisions discussed above regarding recreational discards and 2021 expected recreational landings account for some of the management uncertainty in the recreational sector providing further support for no management uncertainty reductions.

The MC recommends development of a structured process to quantify management uncertainty; the MC has started this process with an agreement to evaluate the performance of MC and Council predicted versus observed releases. As commercial discards are incorporated into the stock assessment and as the time series of calibrated MRIP harvest and calibrated RHLs lengthens, this analysis will be replicated for those fishery components as well.

Transfers

The MC recommends no transfer be applied from the recreational fishery to commercial fishery. No transfer can occur (as indicated in the regulations) because the recreational fishery is anticipated to harvest the full RHL, and the stock is still overfished. However, the MC continues to endorse the provisions that allow for commercial state-to-state transfers on an as needed basis. While the FMP changes are not expected to be formally implemented until early 2022, the MC thought it would be more efficient to make decisions under the assumption that all FMP changes will be adopted; in the event this does not happen, the MC will re-convene as necessary.

Resulting Commercial Quota and RHL

For 2022, the resulting RHL and CQ recommended by the MC are 13.89 M lbs and 3.54 M lbs, respectively (Table 1). For 2023, the resulting RHL and CQ recommended by the MC are 22.14 M lbs and 4.29 M lbs, respectively (Table 1). The decisions made by the MC to recommend MRIP-estimated terminal year recreational discards and no transfer, on top of the already restricted quotas

results in a low RHL and CQ for 2022 compared to historical values. Defining the RHL and CQ in this manner likely accounts for a large amount of the uncertainty present in the management of the bluefish stock, which faces rebuilding over the next seven years. The Monitoring Committee acknowledges that such low levels of allowable landings present challenges to managers and fishery participants.

Recreational Management Measures

The MC needs Council/Board action on the RHLs and CQs prior to identifying the associated recreational management measures. To constrain harvest to the RHL, the MC will review the current management measures in place and will reconvene in November 2021 to utilize the Council approved RHLs and CQs to set management measures (as conducted in 2020).

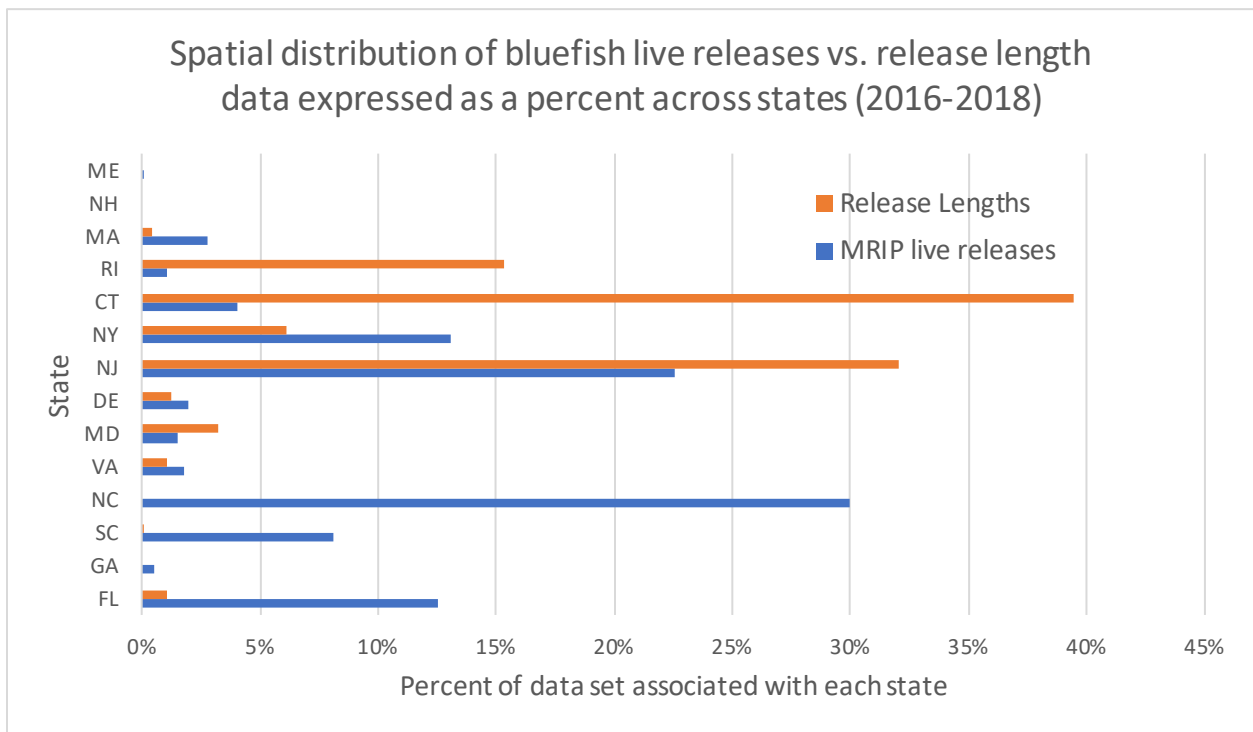


Figure 1. Spatial distribution of bluefish live releases and release length data. Legend and source: orange = release lengths – RI, CT, NJ volunteer angler surveys (RI 297 samples, CT 1057 samples, NJ 380 samples), American Littoral Society (660 samples), MRIP Type 9 (328 samples); blue = MRIP estimates of live releases (B2s) across Atlantic coast states.

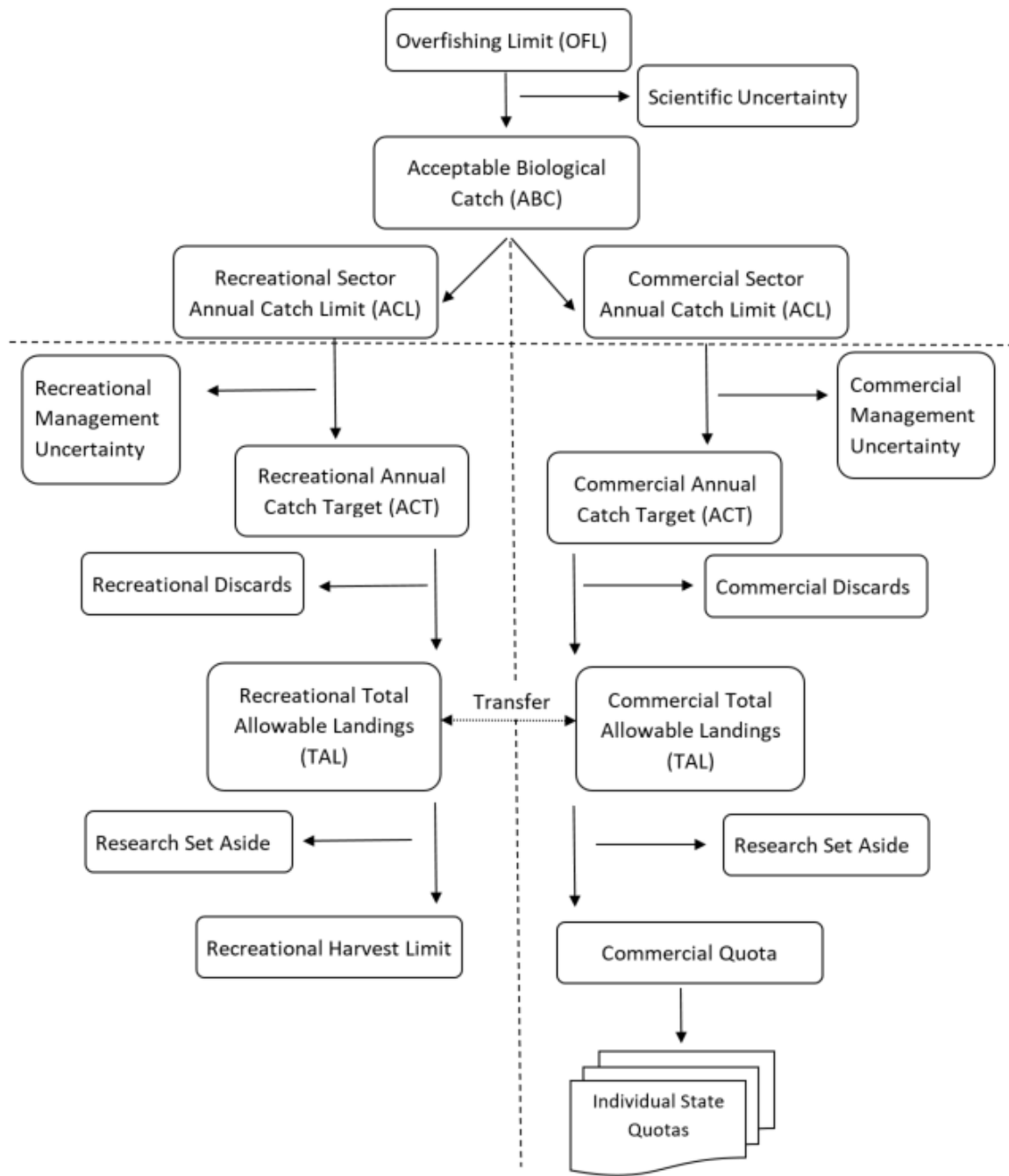


Figure 2. Council-approved bluefish flow chart from the Bluefish Allocation and Rebuilding Amendment, which includes sector specific management uncertainty.

Table 1. Monitoring Committee recommended bluefish specifications for 2022-2023.

Management Measure	Option 2				Basis
	2022		2023		
	mil lb.	mt	mil lb.	mt	
Overfishing Limit (OFL)	40.56	18,399	45.17	20,490	Stock assessment projections
ABC	25.26	11,460	30.62	13,890	Derived by SSC; Follows the rebuilding plan through NEFSC projections
ACL	25.26	11,460	30.62	13,890	Defined in FMP as equal to ABC
Commercial ACL	3.54	1,604	4.29	1,945	ABC x 14%
Commercial Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Commercial ACT	3.54	1,604	4.29	1,945	(ACL – Commercial Management Uncertainty) x 14%
Recreational ACL	21.73	9,856	26.34	11,945	ABC x 86%
Recreational Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Recreational ACT	21.73	9,856	26.34	11,945	(ACL – Recreational Management Uncertainty) x 86%
Recreational AMs	3.65	1,656	0	0	2022 only: 2020 ABC coverage
Commercial Discards	0	0	0	0	Value used in assessment
Recreational Discards	4.19	1,901	4.19	1,901	2020 GARFO-estimated (MRIP) discards
Commercial TAL	3.54	1,604	4.29	1,945	Commercial ACT - commercial discards
Recreational TAL	13.89	6,298	22.14	10,044	Recreational ACT - recreational discards - Rec AMs
Combined TAL	17.42	7,903	26.43	11,989	Commercial TAL + Recreational TAL
Transfer	0	0	0	0	No transfer while overfished or overfishing
Expected Recreational Landings	13.58	6,160	13.58	6,160	2020 Recreational Landings, but remains TBD in December
Commercial Quota	3.54	1,604	4.29	1,945	Commercial TAL +/- transfer
RHL	13.89	6,298	22.14	10,044	Recreational TAL +/- transfer

The SSC Report is
behind Tab 14.



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Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: June 30, 2021
To: Dr. Chris Moore, Executive Director
From: Matthew Seeley, Staff
Subject: 2022-2023 Bluefish Specifications

Executive Summary

A management track assessment for bluefish was conducted in June 2021. The assessment incorporates data through 2019, including the revised time series (1985-2019) of recreational catch provided by the Marine Recreational Information Program (MRIP).¹

The Council and Board approved the Bluefish Allocation and Rebuilding Amendment at their June 2021 meeting. The rebuilding portion of the Amendment includes a 7-year constant fishing mortality plan that will begin in 2022. For comparison purposes, updated rebuilding projections were developed for the P* and 7-year constant fishing mortality approach. All projections were developed using the new risk policy for 2022 and beyond. Projections will be rerun every two years through the Northeast Fisheries Science Center (NEFSC) assessment process to ensure adequate rebuilding progress is being made. The next assessment is a research track assessment scheduled for 2022, which will inform the 2024-2025 specifications package. This assessment will thoroughly explore discard estimates and other model issues.

In July 2021, the Monitoring Committee (MC) will review recent fishery performance and make a recommendation to the Council and Board regarding 2022-2023 annual catch targets (ACTs), total allowable landings (TALs), commercial quotas, recreational harvest limits (RHLs), and any other associated management measures.

This memo provides two options for review of the 2022-2023 bluefish specifications. Option 1 treats the total catch values (e.g., 2022 = 40.70 million pounds (18,463 mt) and 2023 = 43.36 million pounds (19,667 mt)) from the 7-year constant fishing mortality rebuilding plan as an ABC (Table 1). Option 2 treats the total catch value from the 7-year constant fishing mortality rebuilding

¹ In July 2018, MRIP released revisions to their time series of recreational catch and landings estimates based on adjustments for a revised angler intercept methodology and a new effort estimation methodology (i.e., a transition from a telephone-based effort survey to a mail-based effort survey). The revised, or calibrated, estimates of catch and landings for most years are several times (~3x) higher than the previous estimates for shore and private boat modes, substantially raising the overall bluefish catch and harvest estimates.

plan as an OFL proxy (resulting in an ABC of 25.26 million pounds (11,460 mt) for 2022 and 30.62 million pounds (13,890 mt) for 2023, which allows for a scientific uncertainty buffer through the ABC calculations risk policy spreadsheet (Table 2). Ultimately, staff recommends Option 2, which includes an ABC of 25.26 million pounds (11,460 mt) for 2022 and an ABC of 30.62 million pounds (13,890 mt) for 2023.

Table 1. Option 1 for 2022-2023 bluefish specifications.

Management Measure	Option 1				Basis
	2022		2023		
	mil lb.	mt	mil lb.	mt	
Overfishing Limit (OFL)	40.70	18,463	43.36	19,667	Stock assessment projections
ABC	40.70	18,463	43.36	19,667	Derived by SSC; Follows the rebuilding plan through NEFSC projections
ACL	40.70	18,463	43.36	19,667	Defined in FMP as equal to ABC
Commercial ACL	5.70	2,585	6.07	2,753	ABC x 14%
Commercial Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Commercial ACT	5.70	2,585	6.07	2,753	(ACL – Management Uncertainty) x 14%
Recreational ACL	35.01	15,878	37.29	16,914	ABC x 86%
Recreational Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Recreational ACT	35.01	15,878	37.29	16,914	(ACL – Management Uncertainty) x 86%
Recreational AMs	3.65	1,656	0	0	2022 only: 2020 ABC overage
Commercial Discards	0	0	0	0	Value used in assessment
Recreational Discards	4.19	1,901	4.19	1,901	2020 GARFO-estimated (MRIP) discards
Commercial TAL	5.70	2,585	6.07	2,753	Commercial ACT - commercial discards
Recreational TAL	27.16	12,321	33.10	15,012	Recreational ACT - recreational discards
Combined TAL	32.86	14,906	39.17	17,766	Commercial TAL + Recreational TAL
Transfer	0	0	0	0	No transfer while overfished or overfishing
Expected Recreational Landings	13.58	6,160	13.58	6,160	2020 Recreational Landings, but remains TBD in December
Commercial Quota	5.70	2,585	6.07	2,753	Commercial TAL +/- transfer
RHL	27.16	12,321	33.10	15,012	Recreational TAL +/- transfer

Table 2. Option 2 for 2022-2023 bluefish specifications – Staff recommendation.

Management Measure	Option 2				Basis
	2022		2023		
	mil lb.	mt	mil lb.	mt	
Overfishing Limit (OFL)	40.56	18,399	45.17	20,490	Stock assessment projections
ABC	25.26	11,460	30.62	13,890	Derived by SSC; Follows the rebuilding plan through NEFSC projections
ACL	25.26	11,460	30.62	13,890	Defined in FMP as equal to ABC
Commercial ACL	3.54	1,604	4.29	1,945	ABC x 14%
Commercial Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Commercial ACT	3.54	1,604	4.29	1,945	(ACL – Management Uncertainty) x 14%
Recreational ACL	21.73	9,856	26.34	11,945	ABC x 86%
Recreational Management Uncertainty	0	0	0	0	Derived by the Monitoring Committee
Recreational ACT	21.73	9,856	26.34	11,945	(ACL – Management Uncertainty) x 86%
Recreational AMs	3.65	1,656	0	0	2022 only: 2020 ABC overage
Commercial Discards	0	0	0	0	Value used in assessment
Recreational Discards	4.19	1,901	4.19	1,901	2020 GARFO-estimated (MRIP) discards
Commercial TAL	3.54	1,604	4.29	1,945	Commercial ACT - commercial discards
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Combined TAL	17.42	7,903	26.43	11,989	Commercial TAL + Recreational TAL
Transfer	0	0	0	0	No transfer while overfished or overfishing
Expected Recreational Landings	13.58	6,160	13.58	6,160	2020 Recreational Landings, but remains TBD in December
Commercial Quota	3.54	1,604	4.29	1,945	Commercial TAL +/- transfer
RHL	13.89	6,298	22.14	10,044	Recreational TAL +/- transfer

Introduction

The Magnuson-Stevens Act (MSA) requires each Council's SSC to provide ongoing scientific advice for fishery management decisions, including recommendations for ABC, preventing overfishing, and achieving maximum sustainable yield. The Council's catch limit recommendations for the upcoming fishing year(s) cannot exceed the ABC recommendation of the SSC. In addition, the MC established by the Fishery Management Plan (FMP) is responsible for developing recommendations for management measures designed to achieve the recommended catch limits. The SSC recommends ABCs that addresses scientific uncertainty, while the MC recommends ACTs that address management uncertainty and management measures to constrain catch to the TALs.

This year, the SSC and MC will recommend 2022-2023 ABCs and management measures, respectively, based on the updated management track assessment and ongoing rebuilding plan. The Council/Board will meet jointly to consider these recommendations in August 2021.

Recent Catch and Landings

Recreational harvest, dead discards (GARFO-estimated), and commercial landings from 2000-2020 are presented in Figure 1.

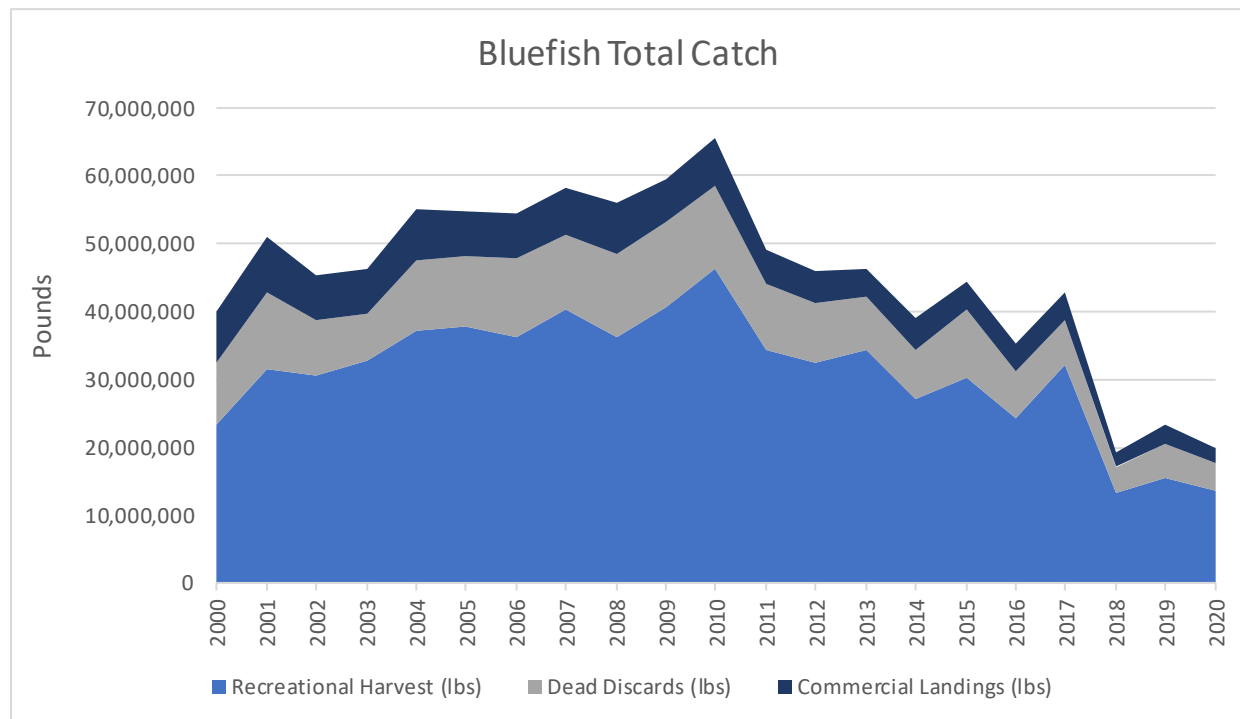


Figure 1. Bluefish total catch (recreational harvest, recreational dead discards and commercial landings) from 2000-2020.

MRIP recreational landings decreased by approximately 13% from 2019 to 2020 (15.56 million pounds to 13.58 million pounds) and reported the second lowest recreational landings (2018-

lowest) for the time series (Table 3). This coincides with effort, as the number of recreational trips² in 2020 (8,745,993) is the third lowest reported in the 2000-2020 period.

Commercial landings decreased by approximately 22% from 2019 to 2020 (2.78 million pounds to 2.16 million pounds), which represents the lowest commercial landings in the time series (Table 2). Landings identified through the dealer database (cfders) were harvested with the following gear: gillnet (52%), followed by unknown gear (24%), otter trawl/bottom fish (15%), handline (5%) and other (4%).

Table 3. Recreational harvest/catch and commercial landings by state for 2020.

State	Recreational						Commercial
	Harvest			Catch	Released Alive	Dead Discards	Landings
	Pounds	Number	Average Weight ¹ (pounds)	Number	Number	Number	Pounds ³
ME	0	0	0	0	0	-	527
NH	1,800	376	4.8	376	0	-	0
MA	553,242	162,128	3.4	906,269	744,141	111,621	112,674
RI	508,227	220,556	2.3	1,089,449	868,893	130,334	334,745
CT	594,546	298,383	2.0	1,407,730	1,109,347	166,402	22,312
NY	1,478,719	885,517	1.7	3,701,474	2,815,957	422,394	341,623
NJ	1,808,548	595,103	3.0	3,372,216	2,777,113	416,567	152,799
DE	94,901	53,751	1.8	219,288	165,537	24,831	4,303
MD	214,991	173,846	1.2	494,214	320,368	48,055	21,000
VA	305,092	395,751	0.8	1,172,803	777,052	116,558	165,623
NC	2,124,224	2,108,296	1.0	8,666,047	6,557,751	983,663	857,719
SC	154,420	289,339	0.5	2,187,307	1,897,968	284,695	0
GA	9,902	10,795	0.9	187,272	176,477	26,472	0
FL	5,732,605	4,142,380	1.4	7,277,380	3,135,000	470,250	144,698
Total	13,581,217	9,336,221	-	30,681,825	21,345,604	3,201,841	2,158,023

Discard Estimates

There are currently two methods to estimate recreational bluefish discards that result in very different estimates (e.g., 2019 GARFO estimated = 4,880,759 pounds, 2019 NEFSC estimated = 15,414,721 pounds), however there is only one estimate for 2020 (2020 GARFO estimated =

² Estimated number of recreational fishing trips where the primary or secondary target was bluefish, Maine – Florida's East Coast. Source: MRIP.

³ State only commercial landings from North Carolina and Florida are not always present in the cfders database, and thus may not yet be finalized. Final commercial catch accounting will be made available by GARFO prior to setting specifications.

4,191,779 pounds). The first approach, which is used by GARFO and Council staff (for catch accounting), applies the MRIP estimated mean weight (by year, state and wave) of harvested fish (A+B1) times the number of released fish (MRIP-B2s by year, state and wave) and an assumed 15% release mortality. Previously, the Monitoring Committee generally agreed that this estimate does not fully capture recreational fishery dynamics because this approach uses the mean weight of harvested fish, not discards, and the length frequency data suggests that released fish tend to be larger than retained fish. The second approach, which is used by the NEFSC for catch accounting, incorporates a length-weight relationship for released fish data from the MRIP, American Littoral Society tag releases, and volunteer angler surveys from Connecticut, Rhode Island, and New Jersey. However, this sampling approach does not characterize the entire coast, which adds to the uncertainty in these estimates. Given there is no NEFSC estimate of discards for 2020 (since the assessment only goes through 2019), Council staff used the GARFO estimated discards to generate the specifications. Moreover, the constant F-rebuilding projections used to inform the 2022-2023 ABCs incorporate the 2020 GARFO estimated discards.

Due to the ongoing discussion surrounding bluefish discards and which estimate is more appropriate, the NEFSC assessment scientist indicated that the next research track assessment would thoroughly investigate using the MRIP release weight methodology (used by GARFO and the Council to monitor the fishery) to estimate the weight of released fish in the assessment.

Review of Prior SSC Recommendations

In September 2019, the SSC recommended new ABCs for 2020-2021, which incorporated the results of the 2019 operational stock assessment. To make this recommendation, the SSC reviewed 2018 fishery performance, the 2019 data update, and materials from the SAW 60 benchmark assessment.

To derive the 2020-2021 ABCs, a CV of 100% was applied to the OFL with a typical life history (which was increased from 60% due to the patterns in the revised MRIP estimates). The SSC offered ABCs using the constant/average and varied approach (Table 4). Upon review, the Council selected to move forward with the average ABC approach. This resulted in ABCs of 7,385 mt.

In July 2020, the SSC did not recommend any changes to the ABC of 7,385 mt.

Table 4. 2019 bluefish operational assessment ABC projections for 2020-2021. The projections assume the 2019 ABC of 9,897 mt with recreational catch in ‘New’ MRIP equivalents will be taken in 2019, providing an estimated catch of 22,614 mt in 2019. OFL Total Catches are catches in each year fishing at $F_{MSY} = 0.183$, prior to calculation of the associated annual ABC. The projections sample from the estimated recruitment for 1985-2018 and use the MAFMC SSC OFL CV working group recommended OFL CV = 100%.

Average ABC 2020-2021
 Total Catch, Landings, Discards, Fishing Mortality (F)
 and Spawning Stock Biomass (SSB)
 Catches and SSB in metric tons

Year	OFL Total Catch	ABC Total Catch	ABC F	ABC P* value	ABC SSB
2019	15,373	22,614	0.279	0.679	92,773
2020	14,956	7,385	0.087	0.198	102,166
2021	17,228	7,385	0.075	0.154	115,041

Stock Status and Biological Reference Points

Projections

In June 2021, a bluefish management track assessment, which included revised bluefish MRIP estimates and commercial landings through 2019 indicated the bluefish stock is still overfished and overfishing is not occurring. This update builds upon the 2019 operational assessment with data through 2018 that first indicated the stock was overfished and overfishing was not occurring.

At the June 2021 Council meeting, the Council and Board approved a 7-year constant fishing mortality rebuilding plan as part of the Bluefish Allocation and Rebuilding Amendment. Throughout their discussion, support was also provided for the p* rebuilding approach, and thus, both projections are available for comparison (Table 5 – top and bottom).

The biological reference points for bluefish revised through the 2021 management track assessment include an updated fishing mortality threshold of $F_{MSY} = F_{35\%}$ (as the F_{MSY} proxy) = 0.181, and a biomass reference point of $SSB_{MSY} = SSB_{35\%}$ (as the SSB_{MSY} proxy) = 444.74 million lbs (201,729 mt). The minimum stock size threshold ($1/2 SSB_{MSY}$) is estimated to be 222.37 million lbs (100,865 mt); Table 5. SSB in 2019 was 211.07 million lbs (95,742 mt) (Figure 2 and Table 6).

Management track assessment results indicated that the bluefish stock was overfished and overfishing was not occurring in 2019 relative to the biological reference points. Fishing mortality on the fully selected age 2 fish was estimated to be 0.172 in 2019, 95% of the updated fishing mortality threshold reference point F_{MSY} proxy = $F_{35\%} = 0.181$ (Figure 3). There is a 90% probability that the fishing mortality rate in 2019 was between 0.140 and 0.230.

Table 5. 2021 Bluefish Operational Assessment ABC Projection for 2022-2026 and a 7 year rebuilding projection (2022-2028) with constant fishing mortality. The rebuilding target (SSBMSY) from the 2021 assessment is 201,729 mt. The projections use an estimated 2020 catch and the 2021 ABC of 7,385 mt. The 2020 total catch estimate uses dealer (cfders) data for commercial landings, MRIP harvest (A+B1) data for recreational landings, and GARFO estimated dead discards (MRIPB2 by Wave and State * Discard Mortality * Average weight). Note: Discard Mortality = 0.15 and Average Weight = (Total weight harvested (A+B1) / Total harvest in numbers (A+B1)). OFL Total Catches are catches in each year fishing at Frebuild = 0.154, prior to calculation of the associated annual ABC. The projections sample from the distribution of estimated recruitment for 1985-2019 and use the MAFMC SSC OFL CV working group recommended OFL CV = 100%.

Frebuild Iterative Projection 2022-2026

Total Catch, Fishing Mortality (F)

Pstar and Spawning Stock Biomass (SSB)

Catches and SSB in metric tons

Year	OFL Total Catch	ABC Total Catch	ABC F	ABC P* value	ABC SSB
2020	14,727	9,041	0.093	0.230	112,864
2021	15,352	7,385	0.068	0.285	135,071
2022	18,399	11,460	0.094	0.320	149,387
2023	20,490	13,890	0.102	0.362	166,096
2024	22,773	16,960	0.113	0.391	177,910
2025	24,043	19,094	0.121	0.427	192,273
2026	25,787	22,103	0.131	0.451	204,244

7 year Frebuild projection

Total Catch, Fishing Mortality (F)

Spawning Stock Biomass (SSB)

Catches and SSB in metric tons

Year	Total Catch	F	SSB
2020	9,041	0.093	112,892
2021	7,385	0.068	135,081
2022	18,463	0.154	146,103
2023	19,667	0.154	155,671
2024	21,113	0.154	161,005
2025	21,782	0.154	169,690
2026	23,081	0.154	178,163
2027	24,570	0.154	192,196
2028	25,646	0.154	202,299

Table 6. Summary of changes in biological reference points and terminal year SSB and F estimates resulting from SAW/SARC 60 process to the 2019 operational assessment and 2021 management track assessment.

	SAW/SARC 60 (2015) Biological Reference Points and most recent update stock status results (data through 2014)	Bluefish Operational Assessment (2019) Biological Reference Points and stock status results (data through 2018)	Bluefish Management Track Assessment (2021) Biological Reference Points and stock status results (data through 2019)
Stock Status	Not Overfished, Not Overfishing	Overfished, Not Overfishing	Overfished, Not Overfishing
SSB_{MSY}	223.42 million lbs (101,343 mt)	438.10 million lbs (198,717 mt)	444.74 million lbs (201,729 mt)
½ SSB_{MSY}	111.71 million lbs (50,672 mt)	219.05 million lbs (99,359 mt)	222.37 million lbs (100,865 mt)
Terminal year SSB	2014: 258.76 million lbs (86,534 mt) 85% of SSB _{MSY}	2018: 200.71 million lbs (91,041 mt) 46% of SSB _{MSY}	2019: 211.07 million lbs (95,742 mt) 47.5% of SSB _{MSY}
F_{MSY}	0.190	0.183	0.181
Terminal year F	2014: 0.157 83% of F _{MSY}	2018: 0.146 80% of F _{MSY}	2019: 0.172 95% of F _{MSY}

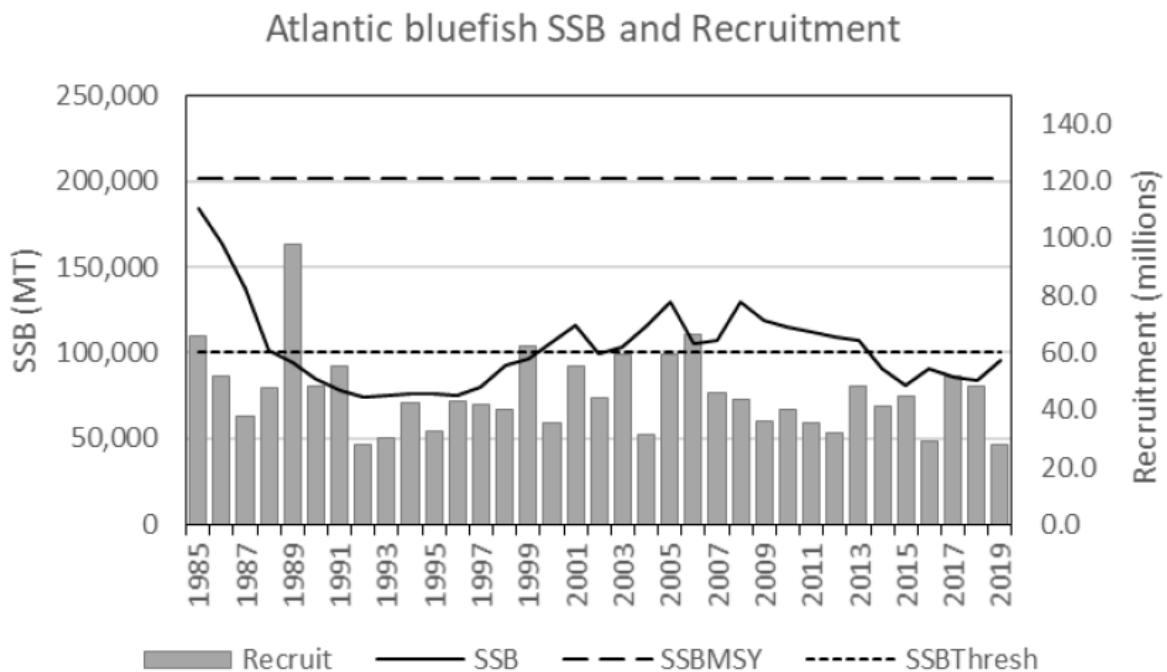


Figure 2. Atlantic bluefish spawning stock biomass (SSB; solid black line) and recruitment at age 0 (R; gray vertical bars) by calendar year. The horizontal dashed line is the updated SSB_{MSY} proxy = SSB_{35%} = 201,729 MT, and the dotted black line is the SSB_{Threshold} = 100,865 MT.

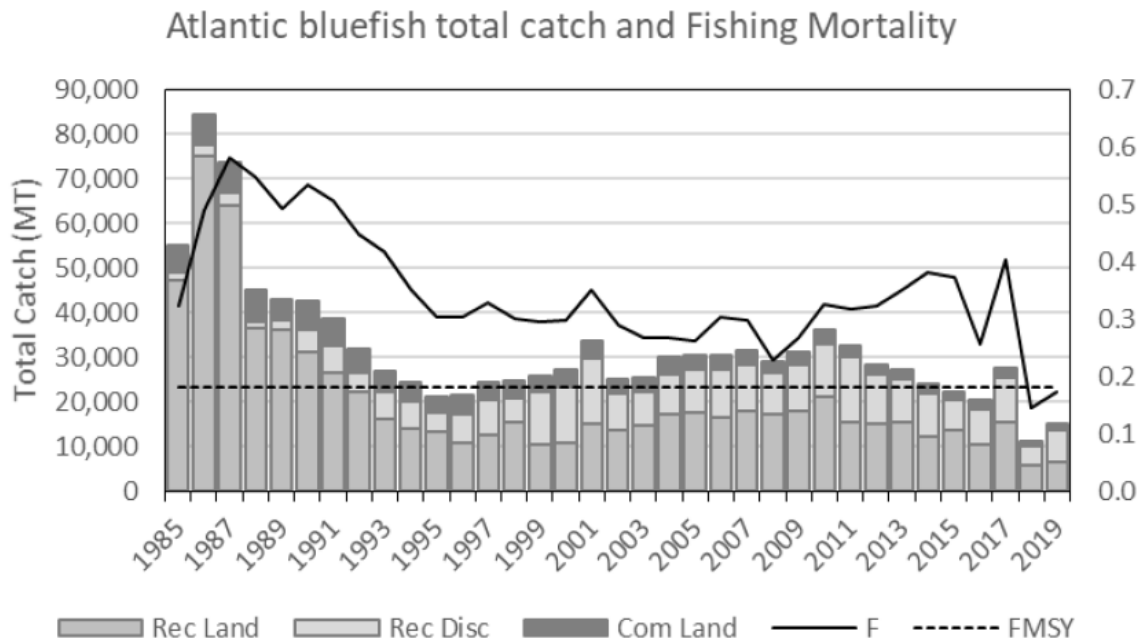


Figure 3. Total fishery catch (metric tons; MT; solid line) and fishing mortality (F, peak at age 3; squares) for Atlantic bluefish. The horizontal dashed line is the updated F_{MSY} proxy = $F_{35\%}$ = 0.181.

The 2021 management track assessment indicated the bluefish stock has experienced a decline in SSB over the past decade, coinciding with an increasing trend in F. Recruitment has remained fairly steady, fluctuating just below the time-series mean of 46 million fish. Both commercial and recreational fisheries have had lower catches in recent years. These lower catches are possibly a result of availability. Anecdotal evidence suggests larger bluefish stayed offshore and inaccessible to most of the recreational fishery during the past few years.

Staff Recommendations for 2022-2023 ABCs

Two ABC options are available for SSC consideration so they can make an informed decision given the many uncertainties and moving parts present in the bluefish fishery and assessment.

Option 1 treats the total catch value (2022 = 40.70 million pounds (18,463 mt) and 2023 = 43.36 million pounds (19,667 mt)) from the 7-year constant fishing mortality rebuilding plan as an ABC. Option 2 treats the total catch value from the 7-year constant fishing mortality rebuilding plan as an OFL proxy (resulting in an ABC of 25.26 million pounds (11,460 mt) for 2022 and 30.62 million pounds (13,890 mt) for 2023), which allows for a scientific uncertainty buffer through the ABC calculations risk policy spreadsheet. Ultimately, staff recommends Option 2, which includes an ABC of 25.26 million pounds (11,460 mt) for 2022 and an ABC of 30.62 million pounds (13,890 mt) for 2023.

The Council and ASMFC's Bluefish Board approved a 7-year constant fishing mortality rebuilding plan with higher associated catches than the P* Council risk policy rebuilding plan. The preferred rebuilding plan projects total catch at 40.56 million pounds for 2022. This projected total catch is not an ABC or OFL, but instead the resulting total catch when fishing at the highest possible F to rebuild in 7 years. Typically, the assessment scientist projects at F_{MSY} , which is a target that cannot be exceeded because it is associated with an OFL. By using the 7-year constant F rebuilding plan, the Council has chosen a new "OFL proxy". This new level of F cannot be exceeded since the goal is to rebuild in 7 years. Therefore, the SSC may want to consider applying the risk policy to this new OFL proxy since there is a new F target, which is no longer F_{MSY} . Ultimately, by being more conservative and fishing below the targeted F, rebuilding may occur more quickly. Fishing above the targeted F will likely result in total catch that does not achieve a rebuilt status within 7 years.

In addition to the ongoing rebuilding plan, there are many uncertainties associated with the bluefish fishery. There are still two estimates of discards (NEFSC and GARFO MRIP-estimated) used to inform fishery performance and the projections. The 2019 discard estimates from the NEFSC exceed the GARFO MRIP-estimated discards by over 11 million pounds (and there are no 2020 estimates of discards from the NEFSC). Since there are no 2020 NEFSC discard estimates, the F rebuild projections use the 2020 realized catch that incorporates the GARFO MRIP-estimated total catch (including the commercial dealer landings). Moreover, the 2020 realized catch exceeds the 2020 ACL by 3.65 million pounds, which triggers accountability measures on the recreational ACT for 2022.

The last major source of uncertainty is tied to the 2020 recreational harvest estimates. Following the overfished designation in 2019, the Council implemented 2020 management measures for bluefish that resulted in a 3 and 5-fish bag limit for private and for-hire anglers, respectively. This reduction in bag limit was anticipated to result in a ~28% reduction in recreational harvest to ensure the RHL was not exceeded. However, many states were not able to implement the new measures until at least midway through 2020. Then, the COVID-19 pandemic further influenced the uncertainty tied to the 2020 estimates, but MRIP offered data imputations to help inform 2020 harvest. The data imputations by MRIP used 2018 and 2019 to estimate 2020 harvest. These 2020 imputed estimates unfortunately did not include the impacts of the revised management measures that reflect the reduction in bag limits. Therefore, the bluefish fishery still has not realized the true impacts of the reduced bag limits.

In 2022, a research track assessment will be conducted where discards and other data and model issues will be thoroughly explored. This assessment may change the overall model used to assess bluefish, and in turn update all biological reference points and the resulting rebuilding plan. This assessment will ultimately inform the 2024-2025 specifications package. Therefore, the SSC should consider the uncertainties associated with raising the ABC from 16.28 million pounds to 40.70 million pounds the year a rebuilding plan starts (while overfished and almost overfishing – 2019 F is 95% F_{MSY}) and the year prior to a research track assessment.

For all the reasons outlined above, staff recommends the SSC consider Option 1 and Option 2 for setting ABCs for the 2022-2023 bluefish specifications package.

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Atlantic Bluefish Operational Assessment for 2021

National Marine Fisheries Service
Northeast Fisheries Science Center
166 Water St.
Woods Hole, MA 02543

State of Stock: This assessment of Atlantic bluefish (*Pomatomus saltatrix*) is a Level 1 update of the existing 2015 benchmark assessment (NEFSC 2015). Based on the previous assessment, the stock was overfished and overfishing was not occurring (NEFSC 2019). This assessment updates commercial and recreational fishery catch data, research survey indices of abundance, and the analytical ASAP assessment model and reference points through 2019. Based on this updated assessment, the bluefish stock was overfished and overfishing was not occurring relative to the updated biological reference points (Figure 1). Spawning stock biomass (SSB) was estimated to be 95,742 MT in 2019, about 47.5% of the updated biomass target reference point SSB_{MSY} proxy = $SSB_{35\%}$ = 201,729 MT, and 95% of the $SSB_{threshold} = \frac{1}{2}SSB_{MSY}$ proxy = 100,865 MT (Table 1, Figure 2). There is a 90% probability that SSB in 2019 was between 73,992 and 105,151 MT. Fishing mortality on the fully selected age 2 fish was estimated to be 0.172 in 2019, and 95% of the updated fishing mortality threshold reference point F_{MSY} proxy = $F_{35\%}$ = 0.181 (Table 1, Figure 3). There is a 90% probability that the fishing mortality rate in 2019 was between 0.140 and 0.230. The average age-0 recruitment from 1985 to 2019 was 46 million. The largest recruitment in the time series occurred in 1989 at 98 million fish, and the lowest recruitment was in 2016 at 29 million fish. Recruitment over the last 10 years has varied around the time series average. In both 2017 and 2018, recruitment estimates were above the average at 52, and 48 million fish, respectively. However, recruitment dropped dramatically in 2019 by 42%, with an estimate of 28 million fish (Table 1, Figures 2 & 4). The 2019 model estimates of F and SSB adjusted for internal retrospective error are within the model estimated 90% confidence intervals and no adjustment of the terminal year estimates has been made for stock status determination or projections (Figure 1).

OFL Projections: Projections using the 2021 bluefish Operational Assessment ASAP model (data through 2019) were made to estimate the OFL catches for 2022-2023. Projections assumed that the 2020 ABC of 7,385 MT was harvested in both 2020 and 2021 and sampled from the distribution of recruitment for 1985-2019. The OFL projection uses F_{2022} and F_{2023} = updated F_{MSY} proxy = $F_{35\%}$ = 0.181. The OFL catches are 21,729 MT in 2022 (CV = 10%) and 22,641 MT in 2023 (CV = 10%).

Atlantic bluefish OFL for 2022-2023 Catches and SSB in metric tons

Year	Total Catch (MT)	F	SSB (MT)
2020	7,385	0.075	113,672
2021	7,385	0.067	137,162
2022	21,729	0.181	146,890
2023	22,641	0.181	153,066

Catch: Reported 2019 commercial landings from ACCSP were 1,353 MT = 3.0 million lbs. Estimated MRIP 2019 recreational landings were 6,612 MT = 14.6 million lb. Total commercial and recreational landings in 2019 were 7,965 MT = 17.6 million lb. Estimated 2019 recreational discards were 6,992 MT = 15.4 million lbs. Commercial discards are not considered significant and not included in the assessment. The estimated total catch in 2019 was 14,957 MT = 33.0 million lbs.

Catch and Status Table: Atlantic bluefish
(Weights in mt, recruitment in thousands, arithmetic means, includes New MRIP estimates)

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Commercial landings	3,304	2,453	2,212	1,974	2,236	1,902	1,929	1,873	1,105	1,353
Recreational landings	21,013	15,430	15,051	15,526	12,050	13,524	10,433	15,421	5,695	6,612
Recreational discards ²	11,965	14,606	11,039	9,537	9,848	6,953	8,008	10,111	4,489	6,992
Catch used in assessment	36,281	32,489	28,303	27,037	24,135	22,379	20,370	27,404	11,288	14,957
Spawning stock biomass	115,365	112,514	109,466	106,880	90,295	81,315	90,615	85,423	83,410	95,742
Recruitment (age 0, thousands)	39,925	35,543	31,687	48,399	41,368	44,532	29,106	51,806	48,147	27,918
F full ³	0.327	0.322	0.331	0.362	0.399	0.400	0.276	0.450	0.152	0.172

	Min ¹	Max ¹	Avg ¹
Commercial landings	1,105	7,162	3,807
Recreational landings	5,695	74,988	21,012
Recreational discards ²	1,440	14,850	7,717
Catch used in assessment	11,288	84,201	32,536
Spawning stock biomass	74,547	183,843	102,587
Recruitment (age 0, thousands)	27,917	98,151	45,744
F full ³	0.152	0.579	0.351

¹ Years 1985-2019

² dead discards

³ F on fully selected age 2. Note that table values are not retro adjusted.

Stock Distribution and Identification: The Atlantic States Marine Fisheries Commission (ASMFC) and Mid-Atlantic Fishery Management Council (MAFMC) jointly developed the Fishery Management Plan (FMP) for the bluefish fishery and adopted the plan in 1989 (ASMFC 1989, MAFMC 1990). The Secretary of Commerce approved the FMP in March 1990. The FMP defines the management unit as bluefish (*Pomatomus saltatrix*) in U.S. waters of the western Atlantic Ocean.

Assessment Model: The assessment model for Atlantic bluefish is a complex statistical catch-at-age model (ASAP SCAA; Legault and Restrepo 1998, NFT) incorporating a broad range of fishery and survey data (NEFSC 2015). The model assumes an instantaneous natural mortality rate (M) = 0.2. The fishery catch is modeled as two fleets: 1. Commercial landings, and 2. Combined recreational landings and recreational discards.

Indices of stock abundance included a recreational catch-per-unit-effort index developed from the MRIP intercept data. In addition, eight fishery-independent indices were included in the model. Age-0+ fishery-independent indices included the NEFSC fall Bigelow trawl survey, the New Jersey ocean trawl survey, the Connecticut Long Island Sound trawl survey (CTLISTS), the NEAMAP fall inshore trawl survey, and the North Carolina Pamlico Sound independent gillnet survey (PSIGN). Young-of-year indices included the SEAMAP fall trawl survey and a composite index developed from state seine indices from New Hampshire to Virginia. In 2019, there was no consistent trend across indices from 2018 values. SEAMAP, PSIGN, CTLISTS, and the composite YOY seine index all increased from 2018 values. The NEFSC Bigelow, MRIP, NEAMAP, and NJ Ocean, all decreased from 2018 values, with the NEFSC and NJ indices being the lowest estimates in their time-series.

There is not a major retrospective pattern in the bluefish assessment model. The minor internal model retrospective error underestimates F by 22% and overestimate SSB by 22% over the last 7 terminal years. The 2019 model estimates of F and SSB adjusted for internal retrospective error ($F = 0.221$; $SSB = 78,093$ MT) are within the model estimate 90% confidence intervals and no adjustment of the terminal year estimates was needed for stock status determination or projections. The ‘historical’ retrospective comparison between the SARC60 benchmark, a 2017 continuity run using old MRIP data, the 2019 OA, and this update, indicates similar trends for SSB , F , and recruitment for most of the time-series (Figure 5).

Biological Reference Points (BRPs): Reference points were calculated using the non-parametric yield and SSB per recruit long-term projection approach. The cumulative distribution function of the 1985-2019 recruitment estimates (corresponding to the period of input fishery catches-at-age) was re-sampled to provide future recruitment estimates for the projections used to estimate the biomass reference point.

The existing biological reference points for bluefish are from the 2019 operational update of the SAW 60 benchmark assessment (NEFSC 2015). The reference points are $F_{35\%}$ as the proxy for F_{MSY} , and the corresponding $SSB_{35\%}$ as the proxy for the SSB_{MSY} biomass target. Based on the benchmark, the $F_{35\%}$ proxy for $F_{MSY} = 0.183$; the proxy estimate for $SSB_{MSY} = SSB_{35\%} = 198,717$ MT = 438 million lbs; the proxy estimate for the $\frac{1}{2} SSB_{MSY}$ biomass threshold = $\frac{1}{2} SSB_{35\%} = 99,359$ MT = 219 million lbs; and the proxy estimate for $MSY = MSY_{35\%} = 29,571$ MT = 65 million lbs.

The $F_{35\%}$ and corresponding $SSB_{35\%}$ proxy biological reference points for bluefish were updated for this 2021 Operational Assessment. The updated fishing mortality threshold $F_{35\%}$ proxy for $F_{MSY} = 0.181$; the updated biomass target proxy estimate for $SSB_{MSY} = SSB_{35\%} = 201,729$ MT = 445 million lbs; the updated biomass threshold proxy estimate for $\frac{1}{2} SSB_{MSY} = \frac{1}{2} SSB_{35\%} = 100,865$ MT = 222 million lbs; and the updated proxy estimate for $MSY = MSY_{35\%} = 29,549$ MT = 65 million lbs.

million lbs.

Qualitative status description:

The bluefish stock has experienced a decline in SSB over the past decade, coinciding with an increasing trend in F. Recruitment has remained fairly steady, fluctuating just below the time-series mean of 46 million fish. Both commercial and recreational fisheries have had lower catches in recent years, with poor catch in 2016 (20,370 MT), 2018 (11,288 MT), and 2019 (14,957 MT), well below the time series average of 32,034 MT. With the low catch in 2019, fishing mortality (0.172) was again estimated below the reference point (0.181). These low catches in recent years could be due to lower bluefish availability. Anecdotal evidence suggests larger bluefish stayed offshore and inaccessible to most of the recreational fishery during the past few years.

Research and Data Issues:

The large increase in recreational landings and discards from the new MRIP calibration has further increased the importance of the recreational data to this assessment. Accurately characterizing the recreational discard lengths is an important component of the assessment and research that improves the methodology used to collect these data is recommended. Bluefish is scheduled for a Research track assessment in 2022, where discards and other data and model issues will be thoroughly explored.

References:

- Atlantic States Marine Fisheries Commission (ASMFC). 1989. Fishery Management Plan for Bluefish. 81 pp. + append.
- Legault CM, Restrepo VR. 1998. A flexible forward age-structured assessment program. ICCAT. Col. Vol. Sci. Pap. 49:246-253.
- Mid-Atlantic Fishery Management Council. 1990. Fishery management plan for the bluefish fishery. Dover, DE. 81 p. + append.
- Northeast Fisheries Science Center (NEFSC). 2015. 60th Northeast Regional Stock Assessment Workshop (60th SAW) Assessment Report. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 15-08; 870 p.
- Northeast Fisheries Science Center (NEFSC). 2019. Operational Assessment of the Black Sea Bass, Scup, Bluefish, and Monkfish Stocks, Updated Through 2018. US Dept Commerce, Northeast Fish Sci Cent Ref Doc. 20-01; 164 p.
- NOAA Fisheries Toolbox (NFT). Age Structured Assessment Program (ASAP) version 3.0.11. (Internet address: <http://nft.nefsc.noaa.gov>).

Table 1. Summary assessment results for Atlantic Bluefish; Spawning Stock Biomass (SSB) in metric tons (MT); Recruitment (R) at age 0 in thousands; Fishing Mortality (F) for age of peak fishery selection (S = 1) age 2.

Year	SSB	R	F
1985	183,843	66,052	0.323
1986	163,620	51,689	0.490
1987	136,954	37,877	0.579
1988	101,648	47,501	0.546
1989	94,923	98,151	0.492
1990	84,460	48,354	0.534
1991	77,579	55,160	0.507
1992	74,547	28,077	0.447
1993	74,846	30,086	0.419
1994	75,793	42,414	0.353
1995	76,526	32,508	0.306
1996	75,224	42,835	0.308
1997	79,665	42,017	0.332
1998	92,628	40,391	0.302
1999	96,285	62,117	0.298
2000	106,332	35,394	0.299
2001	116,170	55,078	0.355
2002	99,066	44,294	0.292
2003	103,768	59,639	0.272
2004	115,528	31,562	0.271
2005	129,375	59,342	0.263
2006	105,410	66,514	0.306
2007	107,083	45,824	0.300
2008	129,326	43,751	0.231
2009	118,914	35,987	0.269
2010	115,365	39,925	0.327
2011	112,514	35,543	0.322
2012	109,466	31,687	0.331
2013	106,880	48,399	0.362
2014	90,295	41,368	0.399
2015	81,315	44,532	0.400
2016	90,615	29,106	0.276
2017	85,423	51,806	0.450
2018	83,410	48,147	0.152
2019	95,742	27,918	0.172

Table 2. Total catch (metric tons) of Atlantic bluefish from Maine through Florida from 1985-2019. Does not include commercial discards as they are not considered significant for this stock. Includes the 'New' MRIP estimates of recreational catch.

Year	Commercial Landings	Recreational Landings	Recreational Discards	Total Catch
1985	6,124	47,376	1,655	55,154
1986	6,657	74,988	2,556	84,201
1987	6,579	63,834	3,198	73,610
1988	7,162	36,337	1,440	44,938
1989	4,740	36,250	2,029	43,019
1990	6,250	31,268	4,999	42,516
1991	6,138	26,485	6,137	38,760
1992	5,208	22,262	4,351	31,820
1993	4,819	16,170	5,955	26,943
1994	4,306	14,085	6,126	24,517
1995	3,629	13,228	4,400	21,257
1996	4,213	10,623	6,477	21,313
1997	4,109	12,516	7,829	24,455
1998	3,741	15,243	5,693	24,676
1999	3,325	10,501	11,809	25,634
2000	3,660	10,950	12,431	27,041
2001	3,953	14,888	14,850	33,691
2002	3,116	13,612	8,241	24,970
2003	3,359	14,758	7,281	25,398
2004	3,661	17,264	9,050	29,975
2005	3,211	17,661	9,571	30,443
2006	3,252	16,653	10,379	30,284
2007	3,390	18,077	10,136	31,603
2008	2,730	17,185	9,173	29,088
2009	3,119	18,040	10,071	31,231
2010	3,304	21,013	11,965	36,281
2011	2,453	15,430	14,606	32,489
2012	2,212	15,051	11,039	28,303
2013	1,974	15,526	9,537	27,037
2014	2,236	12,050	9,848	24,135
2015	1,902	13,524	6,953	22,379
2016	1,929	10,433	8,008	20,370
2017	1,873	15,421	10,111	27,404
2018	1,105	5,695	4,489	11,288
2019	1,353	6,612	6,992	14,957

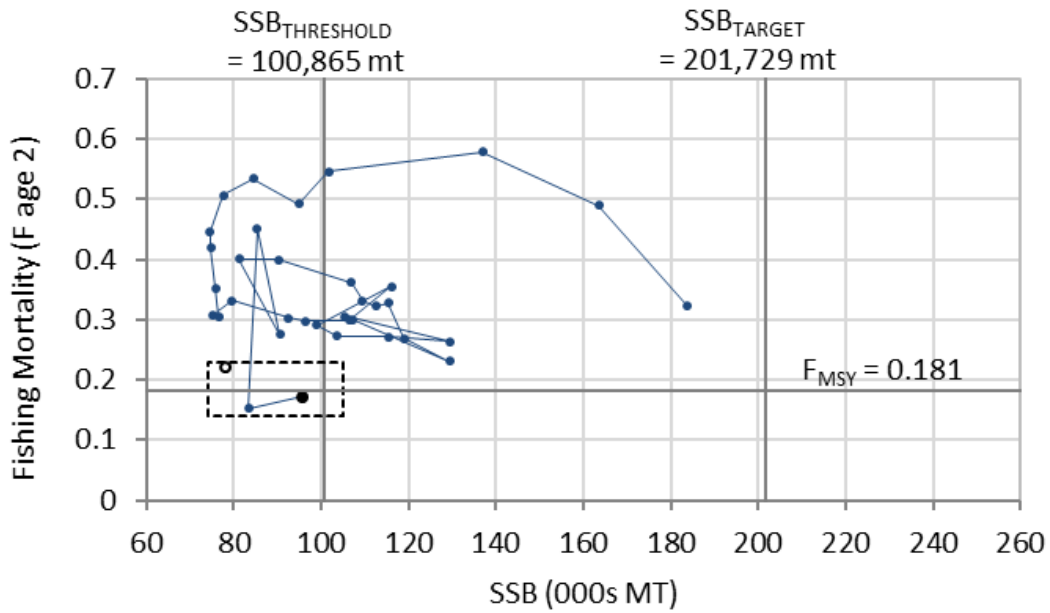


Figure 1. Estimates of Atlantic bluefish spawning stock biomass (SSB) and fully-recruited fishing mortality (F, peak at age 2) relative to the updated 2021 biological reference points. Black filled circle with 90% confidence intervals (dotted box) shows the assessment point estimates. The open circle shows the retrospective adjusted values.

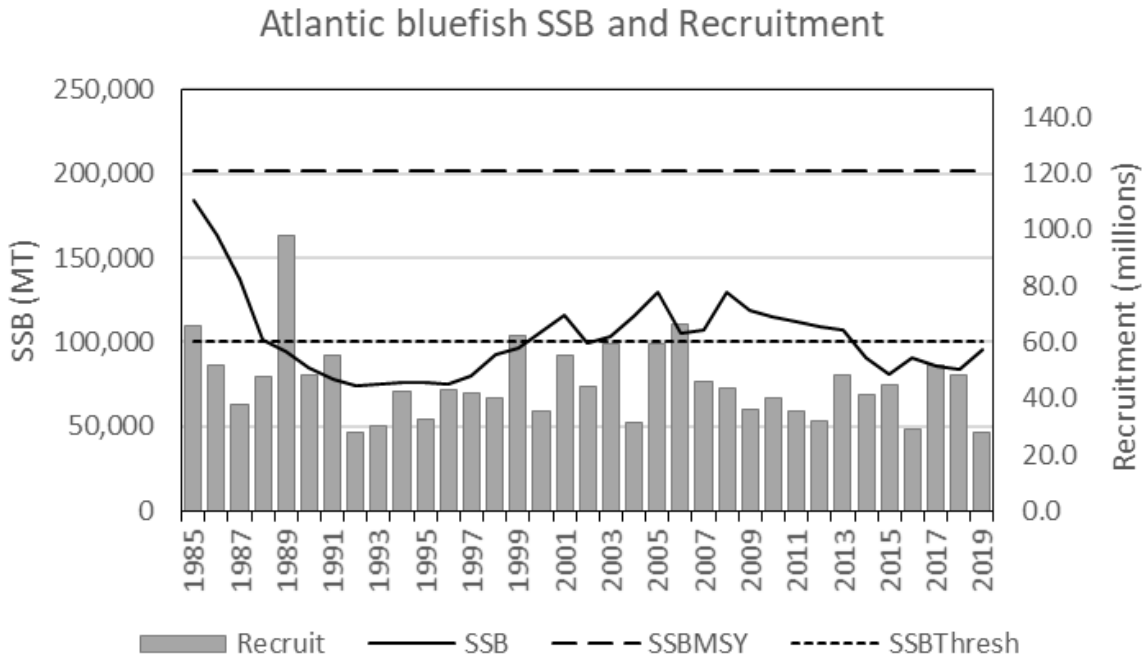


Figure 2. Atlantic bluefish spawning stock biomass (SSB; solid black line) and recruitment at age 0 (R; gray vertical bars) by calendar year. The horizontal dashed line is the updated SSB_{MSY} proxy = $SSB_{35\%}$ = 201,729 MT, and the dotted black line is the $SSB_{Threshold}$ = 100,865 MT.

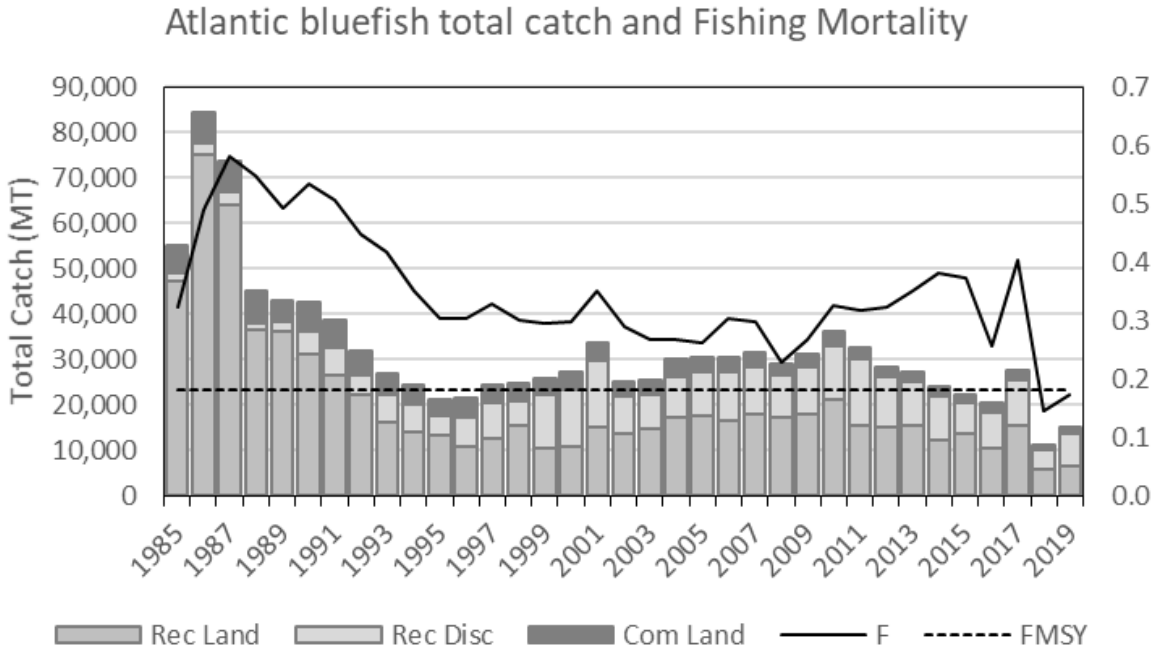


Figure 3. Total fishery catch (metric tons; MT; solid line) and fishing mortality (F, peak at age 3; squares) for Atlantic bluefish. The horizontal dashed line is the updated FMSY proxy = $F_{35\%}$ = 0.181.

Atlantic bluefish S-R Data for 1985-2019

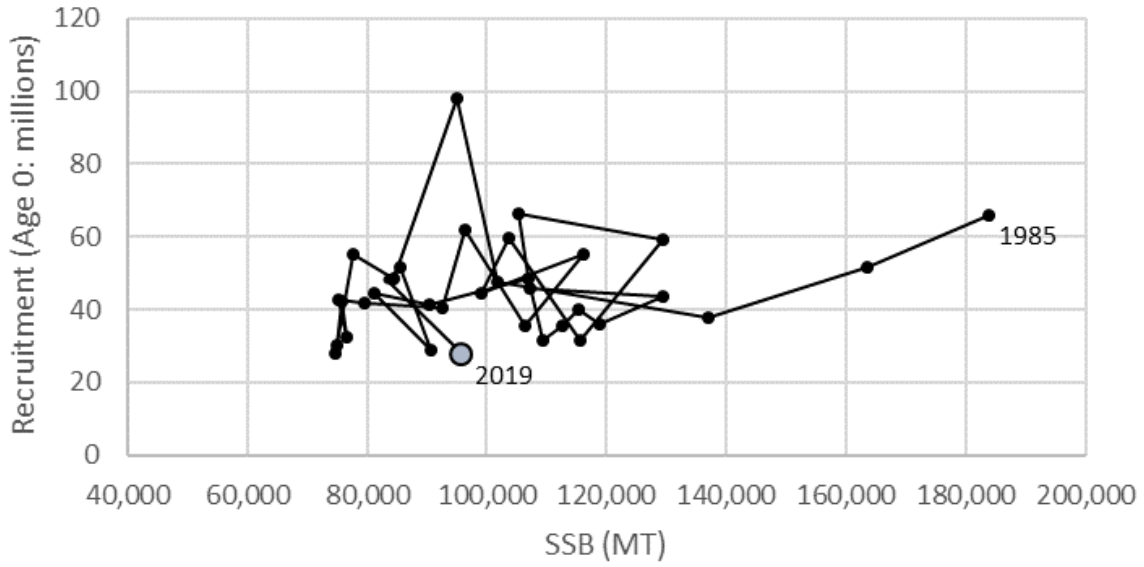


Figure 4. Spawning Stock Biomass (SSB) and Recruitment (R) scatter plot for Atlantic bluefish.

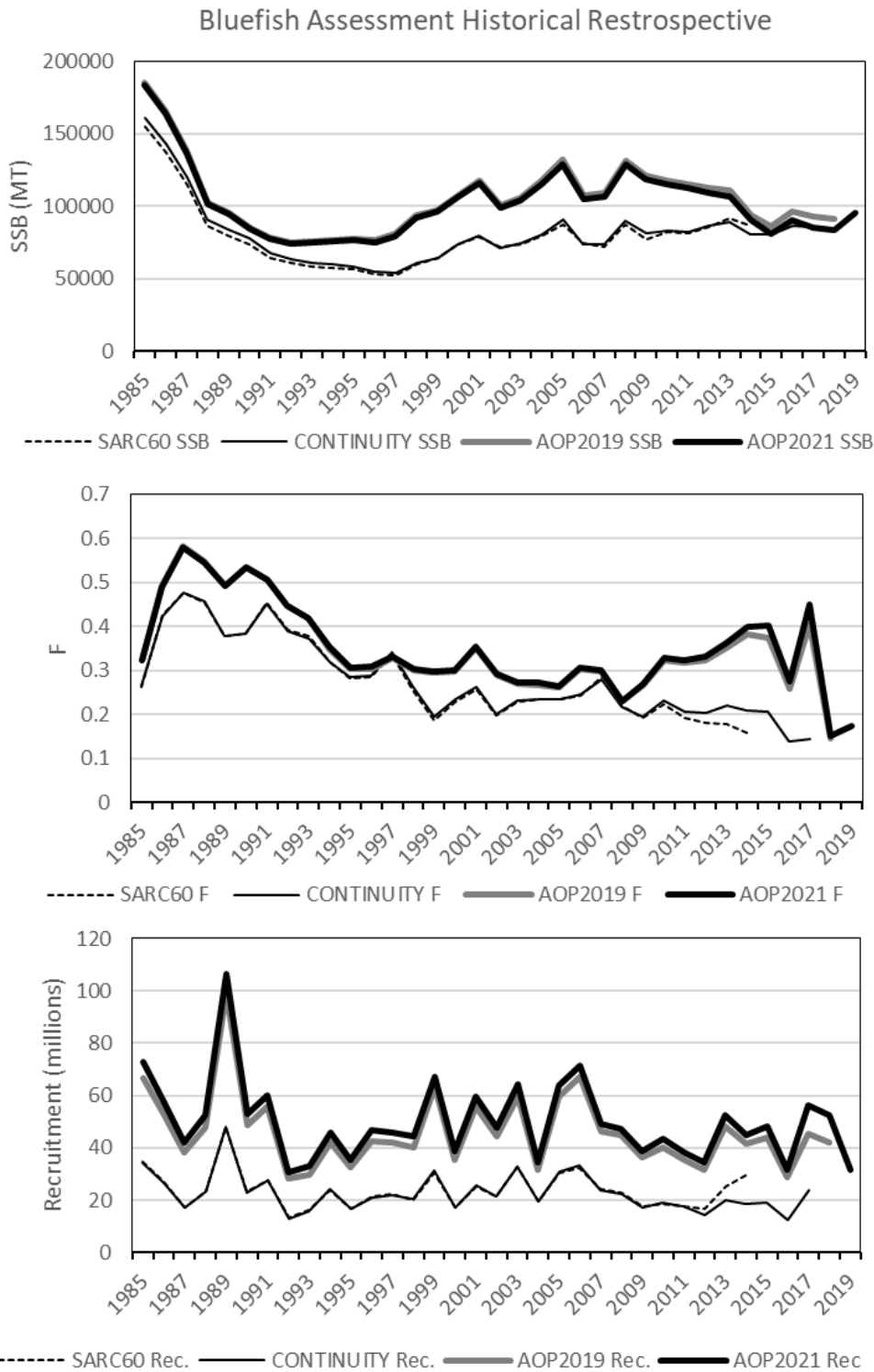


Figure 5. Historical retrospective analysis of the 2015 benchmark (dotted), 2017 (continuity run: slim black line), 2019 OA (bold grey line), and 2021 OA stock assessments of Atlantic bluefish.

Table ABC. 2021 Bluefish Operational Assessment ABC Projection for 2022-2026 and a 7 year rebuilding projection (2022-2028) with constant fishing mortality. The rebuilding target (SSBMSY) from the 2021 assessment is 201,729 mt. The projections use an estimated 2020 catch and the 2021 ABC of 7,385 mt. The 2020 total catch estimate uses dealer (cfders) data for commercial landings, MRIP harvest (A+B1) data for recreational landings, and GARFO estimated dead discards (MRIP B2 by Wave and State * Discard Mortality * Average weight). Note: Discard Mortality = 0.15 and Average Weight = (Total weight harvested (A+B1) / Total harvest in numbers (A+B1)). OFL Total Catches are catches in each year fishing at Frebuild = 0.154, prior to calculation of the associated annual ABC. The projections sample from the distribution of estimated recruitment for 1985-2019 and use the MAFMC SSC OFL CV working group recommended OFL CV = 100%.

Frebuild Iterative Projection 2022-2026

Total Catch, Fishing Mortality (F)
Pstar and Spawning Stock Biomass (SSB)
Catches and SSB in metric tons

Year	OFL Total Catch	ABC Total Catch	ABC F	ABC P* value	ABC SSB
2020	14,727	9,041	0.093	0.230	112,864
2021	15,352	7,385	0.068	0.285	135,071
2022	18,399	11,460	0.094	0.320	149,387
2023	20,490	13,890	0.102	0.362	166,096
2024	22,773	16,960	0.113	0.391	177,910
2025	24,043	19,094	0.121	0.427	192,273
2026	25,787	22,103	0.131	0.451	204,244

7 year Frebuild projection

Total Catch, Fishing Mortality (F)
Spawning Stock Biomass (SSB)
Catches and SSB in metric tons

Year	Total Catch	F	SSB
2020	9,041	0.093	112,892
2021	7,385	0.068	135,081
2022	18,463	0.154	146,103
2023	19,667	0.154	155,671
2024	21,113	0.154	161,005
2025	21,782	0.154	169,690
2026	23,081	0.154	178,163
2027	24,570	0.154	192,196
2028	25,646	0.154	202,299



Bluefish Fishery Performance Report

June 2021

The Mid-Atlantic Fishery Management Council's (Council) and the Atlantic States Marine Fisheries Commission's Bluefish Advisory Panels (AP) met via webinar on June 17, 2021 to review the Fishery Information Document and develop the following Fishery Performance Report. The primary purpose of this report is to contextualize catch histories by providing information about fishing effort, market trends, environmental changes, and other factors. A series of trigger questions listed below were posed to the AP to generate discussion of observations in the bluefish fishery. Please note: Advisor comments described below are not necessarily consensus or majority statements.

MAFMC Advisory Panel members present: Victor Hartley III (NJ – For-Hire) Thomas Roller (NC– For-Hire), and Judith Weis (NY– Researcher).

ASMFC Advisory Panel members present: Paul Caruso (MA) and Rusty Hudson (FL – Comm.)

Others present: Dustin Colson Leaning (ASMFC Staff), Cynthia Ferrio (GARFO), Paul Rago (MAFMC SSC), Cynthia Jones (MAFMC SSC), Maureen Davidson (MAFMC), David Stormer (MAFMC), James Fletcher (UNFA), Mike Waine (ASA), and Matthew Seeley (MAFMC Staff).

Written comments submitted by: John LaFountain (NY – Fox Seafood), TJ Karbowski (CT – For-hire), Kevin Wark (NJ – Comm.), and Charlie Locke (NC – Comm.).

Trigger questions

1. What factors have influenced recent catch (markets/economy, environment, regulations, other factors)?
2. Are the current fishery regulations appropriate? How could they be improved?
3. What would you recommend as research priorities?
4. What else is important for the Council to know?

Factors Influencing Catch

Recreational

Despite a decrease in Marine Recreational Information Program (MRIP) landings estimates from 2019 to 2020, AP members discussed an increase in bluefish abundance coastwide (despite some lower effort during the beginning and height of the COVID-19 pandemic). Advisors also continue to indicate that larger bluefish are often identified to be further offshore and not

available to anglers that typically target bluefish from shore or in state waters. Small fish (1-3 lbs) continue to be available early in the year while larger fish (5-10 lbs) were not present until later in the year and then more offshore quickly. AP members speculate that this may have to do with increasing water temperatures. Finally, AP members indicated that the 2021 fishing season seems to be following a similar distribution pattern with slightly more fish.

NJ – From Raritan Bay to Rockaway Inlet, we have had a phenomenal bluefish year with lots of bunker and other bait, ultimately leading to an abundance of bluefish. Often, anglers catch their 5-fish limit very early on in trips and need to shift effort away from bluefish. Typically, these anglers will transition to seabass or striper fishing.

NJ – We get a lot of people who enjoy catching and releasing bluefish. The more bunker we see, the more bluefish we see. We are also having a fantastic striper season due to the abundance of bait.

NC – In North Carolina, we do not catch as many big bluefish as up north. The big bluefish we catch are mainly 6-7 pounds and people either really want to harvest them or they do not at all. However, anglers do often keep the 1-2 pounders. Anecdotal evidence supports that many people are keeping the smaller fish as bait, in addition to personal consumption.

MA – Like in 2019, we had a slight uptick in bluefish abundance, however distribution patterns are very different than the last 30 years. The age 2-3 fish come in shore earlier and stay later, which may be consistent with local bait abundance. Similar to other states, the bigger fish often come later in the year. In 2020, we experienced more shore fishing due to COVID-19. Overall, I believe abundance is related to environmental conditions and do not think the bag limits are constraining harvest (maybe shore mode for snappers).

NC – Bluefish are a very common species in North Carolina, that even when numbers are down, you are still going to catch them. As a fulltime guide, it is hard to not notice that stock biomass has gone down. There are definitely less bluefish, especially when trolling for Spanish mackerel. We catch bluefish (around 1.5-3 pounds) in their core habitat, but there are fewer large schools and a lot less bigger fish. Now, many charter vessels from the Outer Banks are catching lots of ribbon fish because there are fewer bluefish and Spanish mackerel. They fish the same spots using the same gear, so there is definitely something going on. However, North Carolina is very different than other states because we still have a lot of room to grow. Carteret County continues to have increased population growth and fishing effort. In shore fisheries are often not in the best shape, so many people turn to bluefish, which are doing “okay”. Bait abundance seems fairly high yet seems to be correlated with salinity and precipitation. Often, bluefish are landed specifically for king mackerel and shark bait.

NC (public) – There are now a lot more fishermen. Only 641,000 saltwater licenses sold. Therefore, we must use barbless hooks and encourage anglers to keep what they catch because dead discards are very impactful - both commercial and recreational.

NJ – For the for-hire fleet, the Golden eagle, Queen Mary, Miss Belmar Princess, and Lady Flamingo all share the issue of catching bluefish limits by mid-morning. Would like to see a 7-

fish bag limit since they are putting pressure on other fisheries.

NY – In northern NJ (Hackensack), which is fairly contaminated, we studied snapper abundance. Snappers were not feeding well despite the abundance of food (killifish and menhaden). This was the result of a behavioral problem due to interactions with contaminants (mercury and PCBs). Therefore, snappers did not have much food in their stomachs and thus, were not growing well. According to other studies, most snappers often have 60-70% of their gut full of food. These snappers were often much smaller and in turn, showed that the contaminants were affecting feeding behaviors. These fish would then be outcompeted by fish that spent their early life history in a more suitable environments.

FL – recreational landings are typically around 1M+, so the larger numbers may be due to the MRIP recalibration.

Commercial

NC (public) – Commercial landings are down because inlets are sometimes not passable. There is often less than 4 feet of depth for vessels to pass in Hatteras and Oregon inlet. Commercial vessels that traditionally fish with gill nets cannot get back into the inlets with a full catch because the weight prohibits this movement through the inlets, which has nothing to do with bluefish abundance. The Army Corp of Engineers and state do not maintain the channels as well as they should.

FL – Hurricane Dorian at the end of Aug 2019 led to poor fall and winter weather. Now, the spring had significant wind that kept people in, which extended the damage. Overall, there were few gill netters targeting bluefish. In Florida, we do not harvest as many fish when they are further offshore.

Market/Economic Conditions

NC (public) – Right now the price stays strong in the NY market, only below a certain amount. Over a certain amount the price drops significantly. Boston market has been pushed out of business due to price war with NY market. Bluefish ranging 2-4 pounds often bring in ~\$1.40/lb.

FL – Bluefish price has been fairly good in recent years, especially in the summer. When the weather is good, commercial fishermen do not have too much trouble getting a higher price for Spanish mackerel and bluefish. Prices varied from \$1.35 in September 2020 to \$2.01 in March 2021.

NC – For the for-hire fleet, COVID-19 caused business to fall off early in 2020. From June to the end of the year, I had more business than ever before. Most of Carteret County experienced this large uptick, specifically for smaller private companies, but we did not have many out of state tourists. The main difficulties we encountered were with the supply chains (e.g., tackle).

Management Issues

NJ – The for-hire fleet is not happy with the 5 fish bag limit and would like to see a 7-fish limit.

Public – Is there any evidence that the SSC reviews that could help understand the cyclical fluctuations often present in the bluefish fishery? Are there environmental factors that are reviewed by the SSC to better understand this cyclical nature?

Research Priorities

The AP reviewed all the research recommendations from the 2019 Operational Assessment and Council's Comprehensive 5-year Research Priorities (short-term). AP members agreed that the most important research focus moving forward is to more accurately characterize recreational discard lengths and weights.

NC – How can management validate release information that we collect? How do we know this data will be used? When you use software that is not required, it is hard to get individuals to actually report.

NJ – Any newly collected data reported by anglers may be more reliable than MRIP.

NC (public) – Can we look back at newspapers to reference the historical cycles? Also, can we set management measure that require the use of barbless hooks, which would support the catch-and-release fishery.

NC (public) – Researchers need to think about the NAO and shifts in environmental conditions. We need to relate overfishing/overfished statuses to the environmental conditions using lunar cycles and not specifically years.

Written Comments

-----Original Message-----

From: John LaFountain [<mailto:foxseafood@gmail.com>]

Sent: Thursday, June 17, 2021 8:58 AM

To: Dustin C. Leaning <DLeaning@asmfc.org>

Subject: [External] Bluefish meeting

Hi Dustin, I am not gonna be able to make it back for the meeting this morning. I'm actually waiting at the dock now for a boat to come in with bluefish. I'm short staffed like every other business out there right now. Very good sign of fish this year in New York and Rhode Island. Nice large bluefish. I've even seen quite a few guys catching them off the rocks in point Judith which I haven't seen in a while. I would like the fishery to remain as steady and consistent as possible. Good for everyone in the commercial fishery. My input would be to try to avoid any big decreases even if it means giving up some increases from year to year.

Regards,

I cannot attend. I will be on the water all day.

* Current observations for 2021. I have never seen so many bluefish this early in the season. Lots of forage around. Water temp has been fluctuating 58 - 61. If we didn't have those few years of lean

numbers you would think there were more bluefish around than ever. Various sizes represented.

Thank you,
Capt. TJ Karbowski
Rock & Roll Charters
Clinton, CT
203.314.3765
<https://rockandrollcharters.com/>

Hello all , I have a ROSA advisory committee call tomorrow so I will not be able to attend Bluefish AP but as for commercial this season so far amounted to some blue near shore in commercial quantities for just a few days in the spring mixed size they moved through quickly , as per the last several years Tilefish long liners are seeing Bluefish in 80 to 100 fathoms in the spring and they will not come into shore.

Regards Kevin Wark
F/V Dana Christine II

The Bluefish fishery in North Carolina is complicated right now with the reduced Commercial Quota we have. We still encounter plenty of bluefish in the inshore gill net fishery but have had to adapt how we fish due to a smaller trip limits. The Big blue fishery has been almost non existent due to the warmer water through the winter months offshore, it seems the Bigger fish are staying more North and offshore than previous years. Over all over the years i have seen this same cycle so at the moment the challenge is the reduced trip limit,so i think a new stock assessment is a priority for this species. As far as the reallocation to the Recreational sector,the commercial sector is tired of the shifting of our quota to the "Unaccountable Army" this new MRIP data that is affecting every aspect of the commercial fisheries up and down the coast is highly unfair to an industry that has to record every pound of harvest as well as all discards. The time has come to bring the recreational sector to the same standards as us as far as up to date landings accountability and discard interactions. until this happens any shift of quota to there side is HIGHLY unfair to us.

Thank You,
Charlie Locke (Bluefish AP member)
F/V Salvation
Wanchese, North Carolina



Bluefish Fishery Information Document

June 2021

This Fishery Information Document provides a brief overview of the biology, stock condition, management system, and fishery performance for bluefish with an emphasis on 2020. Data sources for Fishery Information Documents are generally from unpublished National Marine Fisheries Service (NMFS) survey, dealer, vessel trip report (VTR), permit, and Marine Recreational Information Program (MRIP) databases and should be considered preliminary. For more resources, including previous Fishery Information Documents, please visit <http://www.mafmc.org/bluefish/>.

Key Facts

- According to 2019 operational assessment, bluefish is overfished and overfishing is not occurring. The bluefish stock will enter a rebuilding plan in 2022 to rebuild the stock to the SSB_{MSY} proxy = 438.10 million lbs (198,717 mt).
- Given the COVID-19 pandemic, many of the recreational estimates for 2020 were developed through imputations or proxy estimates.
- Recreational landings decreased from 15.56 million pounds to 13.58 million pounds from 2019 to 2020 (~13% decrease).
- Commercial landings decreased from 2.78 million pounds to 2.16 million pounds from 2019 to 2020 (~22% decrease).
- The 2020 bluefish Acceptable Biological Catch = Annual Catch Limit was exceeded by 3.65 million pounds.

Basic Biology

Bluefish are found worldwide in tropical and subtropical waters, but in the western North Atlantic range from Nova Scotia and Bermuda to Argentina. Bluefish travel in schools of like-sized individuals and undertake seasonal migrations, moving into the Middle Atlantic Bight (MAB) during spring and then south or farther offshore during fall. Within the MAB they occur in large bays and estuaries as well as across the entire continental shelf. Juvenile stages have been recorded in all estuaries within the MAB, but eggs and larvae occur in oceanic waters (Able and Fahay 1998). Bluefish have fast growth rates and reach lengths of 3.5 ft and can weigh up to 27 pounds (Bigelow and Schroeder 1953). Bluefish live to age 12 and greater (Salerno et al. 2001).

Bluefish eat a wide variety of prey items. The species has been described by Bigelow and Schroeder (1953) as “perhaps the most ferocious and bloodthirsty fish in the sea, leaving in its wake a trail of dead and mangled mackerel, menhaden, herring, alewives, and other species on which it preys.”

Bluefish born in a given year (young of the year) typically fall into two distinct size classes suggesting that there are two spawning events along the east coast. Studies suggest, however, that spawning is a single, continuous event, but that young are lost from the middle portion resulting in the appearance of a split season (Smith et al. 1994). As a result of the bimodal size distribution, young are referred to as spring-spawned or summer-spawned. In the MAB, spring-spawned bluefish appear to be the dominant component of the stock.

Status of the Stock

The last bluefish benchmark stock assessment was peer reviewed in June 2015 and approved for use by management at SAW/SARC 60. This benchmark assessment uses a forward-projecting statistical catch-at-age model called ASAP (Age Structured Assessment Program). For the most recent benchmark, the catch-at-age matrices were completely reconstructed to incorporate new age data, including archived historical samples that had not been processed at the time the last benchmark (SAW/SARC 41; 2005) was conducted, and to correct aging errors in the earlier years of the time series (NEFSC 2015).

2019 Operational Assessment Update

In August 2019, a bluefish operational assessment, which included revised bluefish MRIP estimates through 2018 changed the stock status and biological reference points from SAW 60, which utilized data through 2014. All information from this operational assessment were and should be interpreted as preliminary results until publication of the final report.

The biological reference points for bluefish revised through the 2019 operational assessment include a fishing mortality threshold of $F_{MSY} = F_{35\%}$ (as the F_{MSY} proxy) = 0.183, and a biomass reference point of $SSB_{MSY} = SSB_{35\%}$ (as the SSB_{MSY} proxy) = 438.10 million lbs (198,717 mt). The minimum stock size threshold ($1/2 SSB_{MSY}$), is estimated to be 219.05 million lbs (99,359 mt); Table 3. SSB in 2018 was 200.71 million lbs (91,041 mt).

Operational assessment results indicated that the bluefish stock was overfished, and overfishing was not occurring in 2018 relative to the biological reference points. Fishing mortality on the fully selected age 2 fish was 0.146 in 2018, 80% of the updated fishing mortality threshold reference point F_{MSY} proxy = $F_{35\%}$ = 0.183.

2021 Management Track Assessment

In late June/early July 2021, a bluefish management track assessment will be conducted. This assessment will update all fishery and survey data through 2019 using the most recent ASAP model configuration with no changes; biological reference points (BRPs) will be updated, stock status determined relative to BRPs, and the lead will perform standard projections of the

overfishing limit. The analyst is proposing to use the 2020 and 2021 allowable biological catch (ABC) as assumed catch for those years, and project 2022-2023 at $F = F_{MSY}$. In light of this work plan, the analyst proposed a level 1 assessment, direct delivery to the Council's Scientific and Statistical Committee (SSC).

Management System and Fishery Performance

Management

The Mid-Atlantic Fishery Management Council (Council or MAFMC) and the Atlantic States Marine Fisheries Commission (ASMFC) work cooperatively to develop fishery regulations for bluefish off the east coast of the United States. The Council and Commission work in conjunction with the National Marine Fisheries Service (NMFS), which serves as the federal implementation and enforcement entity. This cooperative management endeavor was developed because a significant portion of the catch is taken from both state waters (0-3 miles offshore) and federal waters (3-200 miles offshore, also known as the Exclusive Economic Zone or EEZ). The management unit for bluefish is the U.S. waters in the western Atlantic Ocean.

The Bluefish Fishery Management Plan (FMP) was implemented in 1990 and established the Mid-Atlantic Fishery Management Council's management authority over the fishery in federal waters. Amendment 1, implemented in 2000, addressed stock rebuilding and created the Bluefish Monitoring Committee which meets annually to make management measure recommendations to the Council. Amendment 3 incorporated the development of annual catch limits (ACLs) and accountability measures (AMs) into the specification process and Amendment 4 modified recreational accountability measures to accommodate uncertainty in recreational management and catch estimation. The original FMP and subsequent amendments and frameworks are available at: <http://www.mafmc.org/fisheries/fmp/bluefish>.

Currently for bluefish, the annual catch target (ACT) is split 83 percent and 17 percent into recreational and commercial ACTs, respectively, and the discarded component of that catch is deducted to arrive at recreational and commercial total allowable landings (TAL). Additionally, landings above the expected recreational harvest can be "transferred" from the recreational to the commercial fishery as long as the final commercial quota does not exceed 10.5 million pounds. However, the Council and ASMFC's Bluefish Board are taking final action on Bluefish Allocation and Rebuilding Amendment in June 2021. This amendment addresses reallocation and the ability to transfer quota from one sector to the other. All preferred alternatives will be implemented for the 2022 fishing year. Amendment documentation is available at: <https://www.mafmc.org/actions/bluefish-allocation-amendment>.

The Council's SSC reviews assessment results and the Advisory Panel's fishery performance report and determines the ABC for the upcoming year. The Council's Bluefish Monitoring Committee develops and recommends specific coastwide management measures (commercial quota, recreational harvest limit) that will achieve the catch target and makes further adjustments to total catch as needed based on management uncertainty. Finally, the Council and Board meet jointly to develop recommendations to be submitted to the NMFS.

Fishery Performance Relative to Management Measures

The current commercial landings are slightly behind the 2020 landings (Figure 1; as of May 18, 2021). The recreational and commercial landings relative to specified management measures are provided in Table 1. In 2020, MRIP reported the recreational fishery landed 13.58 million pounds compared to the 9.48 million pounds RHL. This (2020) is the first year that all catch/landings can be compared to the ABC/Commercial quota/RHL using the new MRIP estimates. This RHL overage will be reviewed by the Monitoring Committee and Council and Board, as well as the Greater Atlantic Regional Fisheries Office to identify if/how accountability measures will be triggered. The commercial fishery landed 2.16 million pounds compared to the 2.77-million-pound quota. Total landings in 2020 are 15.74 million pounds when calculated using the new MRIP estimates and commercial landings.

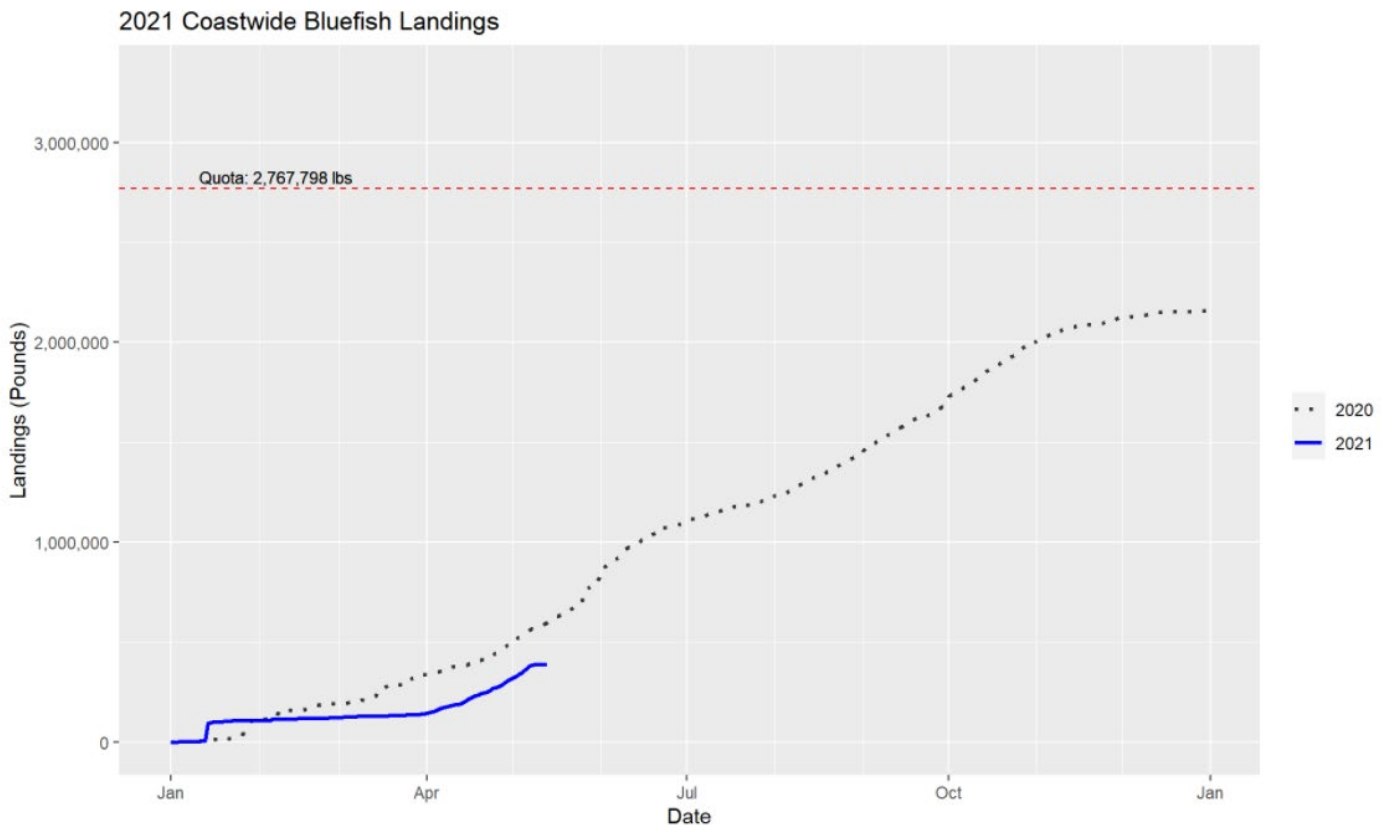


Figure 1. Atlantic bluefish commercial landings for 2021 fishing year to date (May 18, 2021).

Table 1. Summary of bluefish management measures, 2009 – 2021 (Values are in million pounds).

Management Measures	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019⁸	2020⁹	2021
TAC ^{1/} ABC ²	34.08	34.38	31.74	32.04	27.47	24.43	21.54	19.45	20.64	21.81	21.81	16.28	16.28
TAL ³	29.36	29.26	27.29	28.27	23.86	21.08	18.19	16.46	18.19	18.82	19.33	12.25	12.25
Comm. Quota ⁴	9.83	10.21	9.38	10.32	9.08	7.46	5.24	4.88	8.54	7.24	7.71	2.77	2.77
Comm. Landings ⁵	7.1	7.55	5.61	4.66	4.12	4.77	4.02	4.1	3.64	2.20	2.78	2.16	
Rec. Harvest Limit ⁴	19.53	18.63	17.81	17.46	14.07	13.62	12.95	11.58	9.65	11.58	11.62	9.48	8.34
Rec. Landings, Old MRIP ⁶	14.47	16.34	11.5	11.84	16.46	10.46	11.67	9.54	9.52	3.64	N/A	N/A	N/A
Rec. Landings, New MRIP	40.73	46.30	34.22	32.53	34.40	27.04	30.10	24.16	32.07	13.27	15.56	13.58	
Rec. Possession Limit (# fish)	15	15	15	15	15	15	15	15	15	15	15	3: Private 5: For-Hire	3: Private 5: For-Hire
Total Landings	21.57	23.89	17.11	16.5	20.58	15.23	15.69	13.64	13.16	5.84	18.34	15.74	
Overage/Underage	-7.79	-5.37	-10.18	-11.77	-3.28	-5.85	-2.5	-2.82	-5.03	-12.98	N/A*	3.49	
Total Catch ⁷	25.10	27.93	20.39	19.26	24.06	17.96	18.65	16.09	15.65	6.96	23.50	19.93	
Overage/Underage	-8.98	-6.45	-11.35	-12.78	-3.41	-6.47	-2.89	-3.36	-4.99	-14.85	N/A*	3.65	

¹ Through 2011. ² 2012 fwd. ³ Not adjusted for RSA. ⁴ Adjusted downward for RSA. ⁵ Dealer and South Atlantic Canvas data used to generate values from 2000-2011; Dealer data (cfders) was used to generate commercial landings. ⁶ Old MRIP. ⁷ Recreational discards were calculated assuming MRIP mean weight of fish landed or harvested in a given year multiplied by the MRIP B2s and assumed discard mortality rate of 15%. ⁸ Values for 2019 and beyond are presented using the new MRIP estimates. ⁹ 2020 will be the first year that the new MRIP landings can be compared to the RHL – this will allow for calculation of total landings, catch, and overage/underages.

*Note: 2019 is the transition year for when recreational landings are reported using only new MRIP estimates. The 2019 ABC, RHL, and Commercial Quota was developed using old MRIP estimates and cannot be directly compared to the new recreational landing estimates.

Landings History

Bluefish catches were estimated via the Marine Recreational Fisheries Statistic Survey (MRFSS) starting in 1981 through 2003. Recreational data for years 2004 and later are available from the Marine Recreational Information Program (MRIP), the data collection that followed MRFSS.

From the early 1980s to the early 1990s, recreational landings declined about 70% (avg. 1981-1983 = 156.34 million pounds; avg. 1991-1993 = 46.14 million pounds) when using new MRIP estimates. Recreational landings continued to decline at a slower rate until reaching a low level in 1999-2000 but have since grown to a peak of over 46 million pounds in 2010 (new MRIP). In 2018 and 2019, recreational landings dropped to a time series low of 13.27 and 15.56 million pounds, respectively. In 2020, landings remain low at 13.58 million pounds.

Historically, landings have been relatively stable, however, overall landings have been trending downward since 2010 (Figure 2). Commercial discards are insignificant and are not estimated in the current assessment.

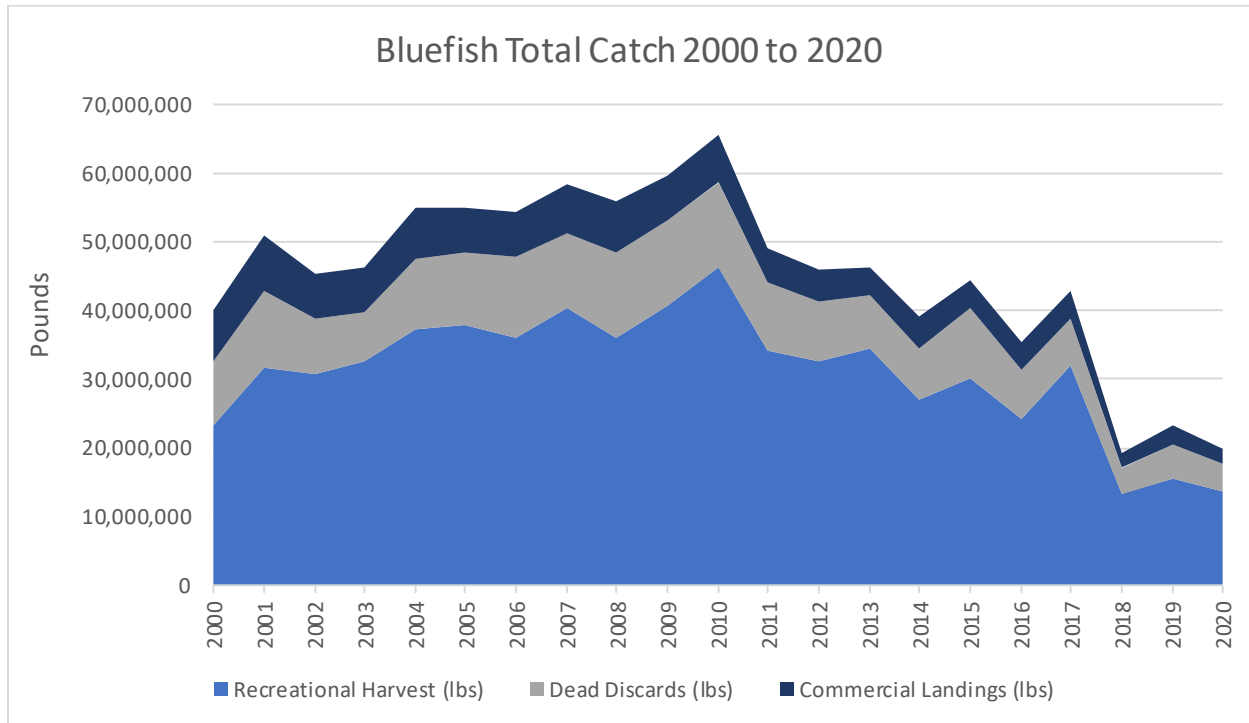


Figure 2. Bluefish catch (landings [AB1] and dead discards [B2*0.15* Avg wt. each year]), 2000-2020. Recreational dead discards are calculated as the average weight of a harvested fish by year, state and mode multiplied by the B2s and 15% discard mortality rate (Source: MRIP and Dealer data – cfders)

Recreational Fishery

Recreational fishery data is reported from MRIP using the new re-calibrated estimates. Trends in recreational trips associated with targeting or harvesting bluefish from 2000 to 2020 are provided

in Table 2. Since 2000, the lowest annual estimate of bluefish trips was 7.17 million (2018). The highest annual estimate of bluefish trips in this timeframe was 13.32 million in 2007. Over the last 5 years (2016-2020), the number of bluefish trips have ranged from 7.17 million trips in 2018 to 10.62 million trips in 2016 with an average of 8.95 million trips.

While the COVID-19 pandemic disrupted the Access Point Angler Intercept Survey (APAIS), its overall impact on recreational fishing data collection was lower than first expected, and NOAA Fisheries was able to fill gaps in 2020 catch data with data collected in 2018 and 2019. These proxy data match the time, place, and fishing mode combinations that would have been sampled had the APAIS continued uninterrupted. Proxy data were combined with observed data to produce catch estimates using the standard estimation methodology. The mail and telephone surveys that collect effort data continued largely uninterrupted.

Table 2. Number of bluefish recreational fishing trips, landings per trip, harvest, catch and releases/discards from 2000 to 2020, ME-FL. Source: MRIP.

Year	bluefish trips ¹ (N)	Recreational landings per “bluefish” trip	Recreational Harvest (N)	Recreational Harvest (lbs)	Released Alive (N)	Dead Discards ² (lbs)	Catch (N)	Catch (lbs)
2000	9,414,330	1.37	12,879,485	23,357,120	34,223,385	9,136,762	47,102,869	32,493,882
2001	11,184,219	1.61	18,048,645	31,654,978	42,463,607	11,145,791	60,512,252	42,800,769
2002	11,609,147	1.52	17,607,380	30,654,388	32,202,742	8,172,282	49,810,122	38,826,670
2003	11,270,920	1.46	16,411,932	32,758,670	21,334,305	6,882,295	37,746,238	39,640,965
2004	12,494,269	1.49	18,631,904	37,133,463	30,607,172	10,405,576	49,239,076	47,539,039
2005	12,816,693	1.43	18,341,452	37,742,807	30,141,215	10,584,246	48,482,667	48,327,053
2006	12,166,411	1.59	19,397,272	36,081,958	34,912,777	11,657,418	54,310,049	47,739,376
2007	13,324,958	1.44	19,189,747	40,239,101	37,123,644	10,982,452	56,313,391	51,221,553
2008	11,416,665	1.30	14,845,435	36,166,834	31,199,569	12,326,758	46,045,003	48,493,592
2009	11,805,296	1.53	18,085,386	40,731,438	31,781,201	12,394,411	49,866,587	53,125,849
2010	13,514,815	1.62	21,929,517	46,302,792	40,420,592	12,296,774	62,350,109	58,599,566
2011	11,921,366	1.75	20,814,884	34,218,748	37,475,767	9,850,040	58,290,651	44,068,788
2012	12,817,838	1.45	18,578,838	32,530,917	32,079,529	8,743,161	50,658,367	41,274,078
2013	9,353,805	2.14	19,975,051	34,398,327	33,519,613	7,733,548	53,494,664	42,131,875
2014	12,441,771	1.73	21,510,651	27,044,276	33,583,115	7,317,237	55,093,766	34,361,513
2015	9,406,704	1.46	13,725,106	30,098,649	28,423,854	10,170,472	42,148,960	40,269,121
2016	10,626,957	1.40	14,899,723	24,155,304	27,629,023	7,106,707	42,528,746	31,262,011
2017	9,952,090	1.39	13,845,806	32,071,432	28,317,327	6,767,813	42,163,133	38,839,245
2018	7,169,536	1.43	10,245,710	13,270,862	20,682,992	3,897,500	30,928,703	17,168,362
2019	8,250,853	1.47	12,137,290	15,555,889	26,494,646	4,880,759	38,631,936	20,436,648
2020	8,745,993	1.07	9,336,222	13,581,218	21,345,604	4,191,779	30,681,826	17,772,997

¹ Estimated number of recreational fishing trips where the primary target was bluefish or bluefish were harvested regardless of target. ² Each dead discard value in weight is calculated by querying MRIP releases by year, state and mode because the weights of fish discarded vary largely from state to state. MRIP B2s by year, state and mode are multiplied by their respective average weight of a landed fish and the assumed 15% discard mortality rate.

Recreational Landings by State

Recreational catch and harvest by state for 2020 are provided in Table 3. The greatest catches (includes discards) occurred in North Carolina with 8.67 million fish, followed by Florida with 7.27 million fish, and New York and New Jersey with over 3 million fish.

The greatest harvest of bluefish by weight in 2020 occurred in Florida with 5.73 million pounds, followed by North Carolina with 2.12 million pounds, and New York and New Jersey both over 1 million pounds. According to MRIP, 0 bluefish were caught in Maine and only 1,800 pounds in New Hampshire. Average weights, based on dividing MRIP landings in weight by landings in number for each state, suggest that bluefish size tends to increase along the north Atlantic coast.

Table 3. MRIP estimates of 2020 bluefish recreational harvest, total catch, and average weight.

State	Harvest			Catch	Released Alive	Dead Discards
	Pounds	Number	Average Weight ¹ (pounds)	Number	Number	Number
ME	0	0	0	0	0	-
NH	1,800	376	4.8	376	0	-
MA	553,242	162,128	3.4	906,269	744,141	111,621
RI	508,227	220,556	2.3	1,089,449	868,893	130,334
CT	594,546	298,383	2.0	1,407,730	1,109,347	166,402
NY	1,478,719	885,517	1.7	3,701,474	2,815,957	422,394
NJ	1,808,548	595,103	3.0	3,372,216	2,777,113	416,567
DE	94,901	53,751	1.8	219,288	165,537	24,831
MD	214,991	173,846	1.2	494,214	320,368	48,055
VA	305,092	395,751	0.8	1,172,803	777,052	116,558
NC	2,124,224	2,108,296	1.0	8,666,047	6,557,751	983,663
SC	154,420	289,339	0.5	2,187,307	1,897,968	284,695
GA	9,902	10,795	0.9	187,272	176,477	26,472
FL	5,732,605	4,142,380	1.4	7,277,380	3,135,000	470,250
Total	13,581,217	9,336,221	-	30,681,825	21,345,604	3,201,841

¹ Average weight in Table 3 is simply the pounds harvested divided by the number of fish harvested. These average weights are calculated differently than what is presented in Table 2 due to the state and wave aspect associated with released fish.

Recreational Landings by Mode

Figure 3 presents new MRIP estimates of landings by mode (1991 through 2020) and indicates that the recent primary modes landing bluefish are shore mode and private boats. Based on recreational harvest in 2020, landings from shore represented 73% of overall landings, followed by private rental mode at 24% and the for-hire sector at 3%. Over the last five years (2016-2020), ~66% of the total bluefish landings came from shore, ~31% from private/rental boats, and ~4% from for-hire boats.

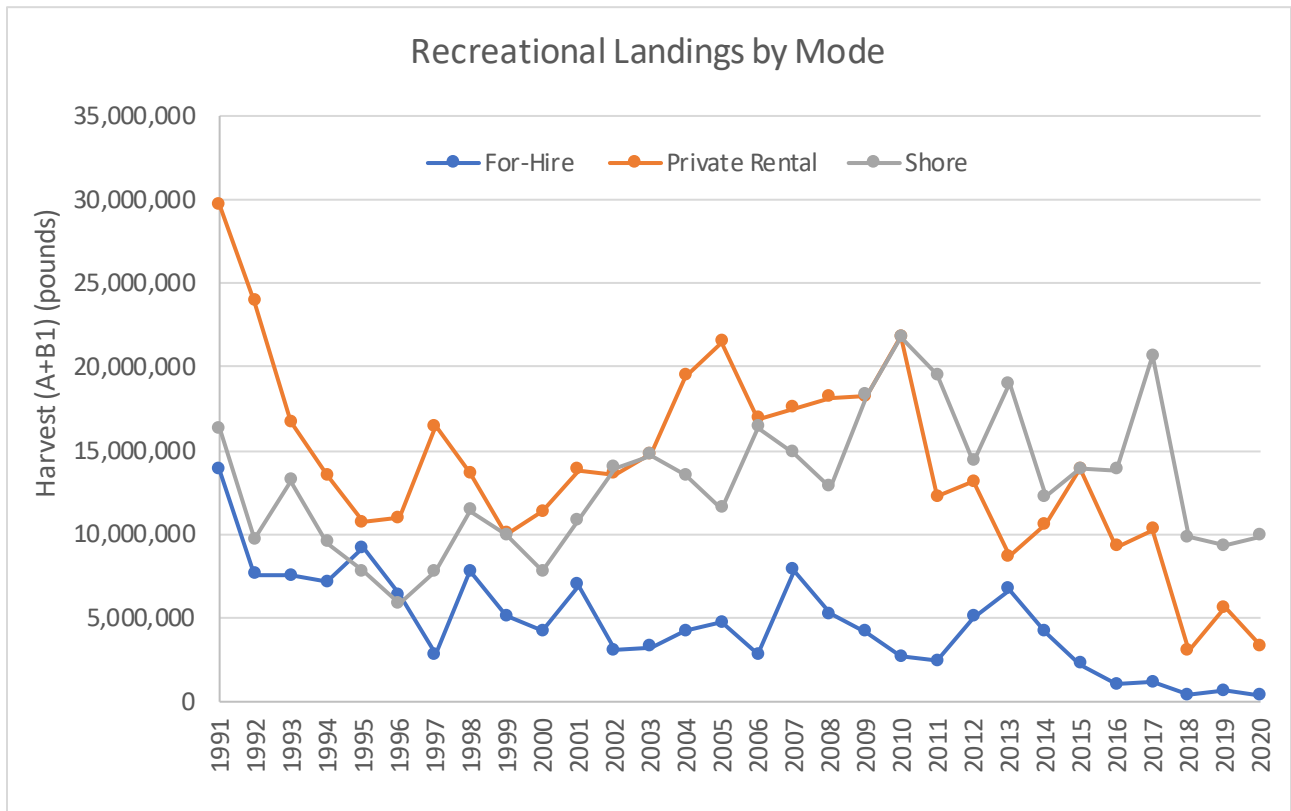


Figure 3. Bluefish recreational harvest (pounds) by mode on the Atlantic Coast, 1991-2020. Source: MRIP.

Recreational Landings by Area

MRIP classifies catch into three fishing areas: inland, nearshore ocean (< 3 mi), and offshore ocean (> 3 mi). In 2020, 40% of the landings of bluefish on a coastwide basis came from inland waters, followed by nearshore ocean at 57%, and offshore waters at 3% (Figure 4). Over the last five years (2016-2020), 39% of the total bluefish landings came from inland waters, 57% from nearshore ocean, and 4% from offshore ocean.

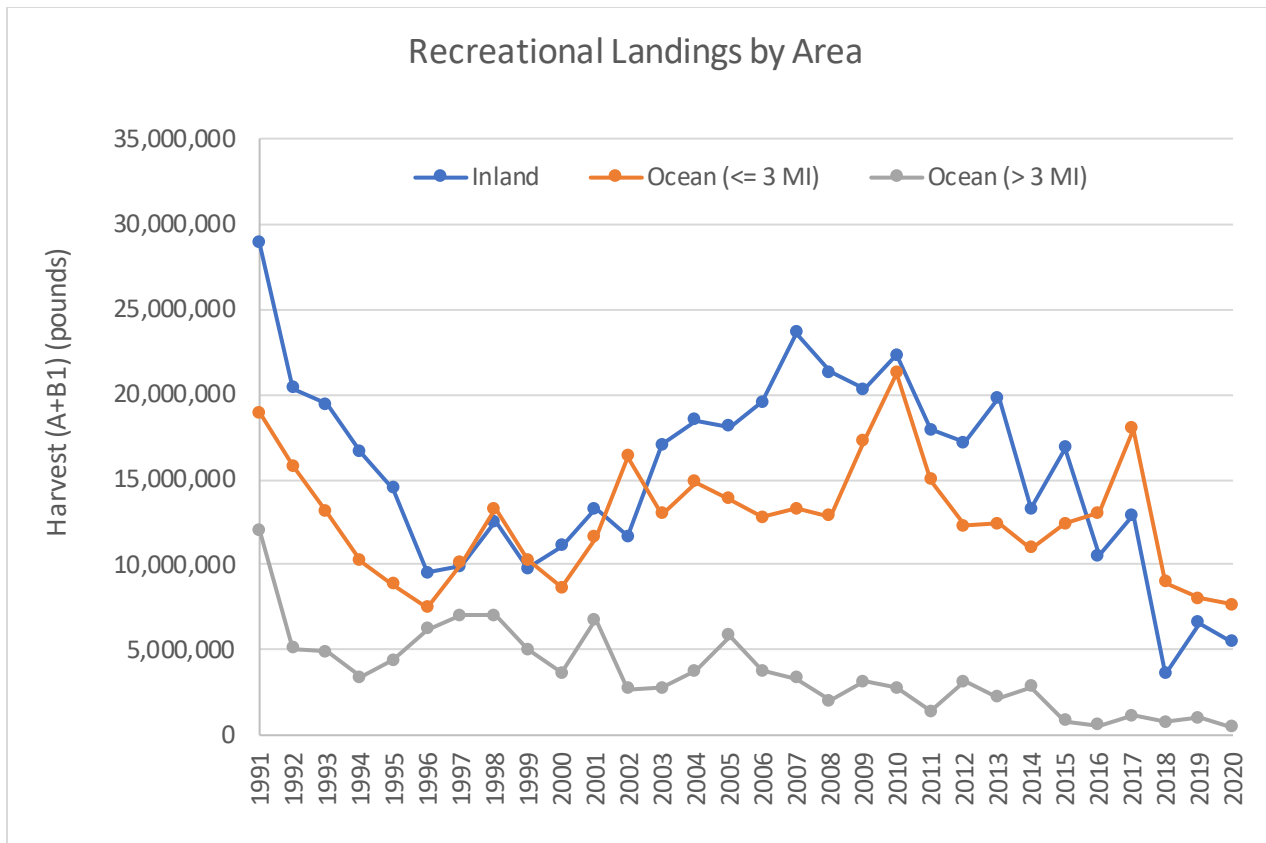


Figure 4. Bluefish recreational harvest (pounds) by area on the Atlantic Coast, 1991-2020
Source: MRIP.

Recreational Discards

In the recreational fishery, bluefish released alive (B2) are estimated by MRIP. To calculate discard mortality¹, a 15% mortality rate is applied to the B2 value. In 2020, there were 3.20 million bluefish dead discards, which represents a downward trend from the 2001 peak of 6.37 million bluefish dead discards (Figure 5).

¹ To estimate discards in pounds, multiply the number of dead discards times the average weight of fish in a given year. For more detailed results, which are used in Table 2, characterize the average weight of a bluefish by state and mode using the MRIP query tool: <https://www.st.nmfs.noaa.gov/recreational-fisheries/data-and-documentation/queries/index>.

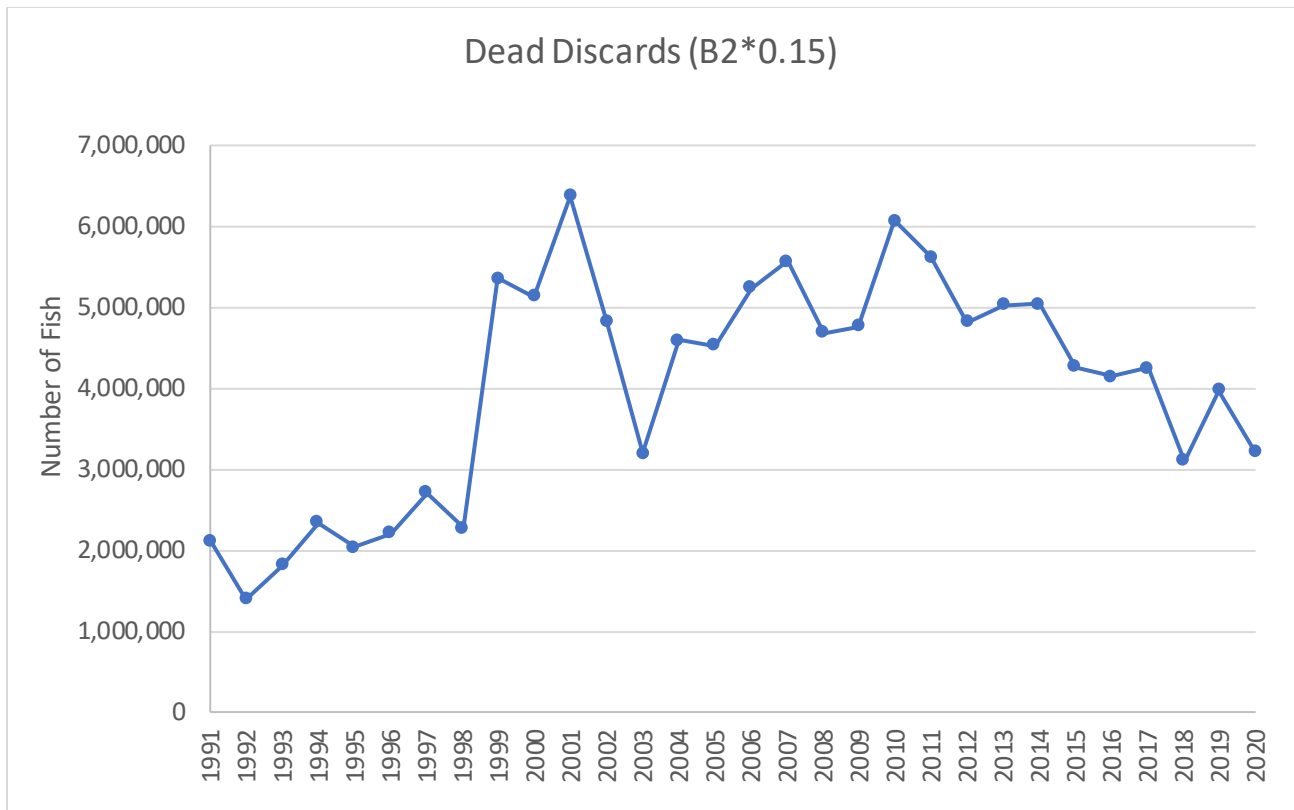


Figure 5. Bluefish dead discards (all areas and modes combined) from 1991-2020. Fish released alive (B2) are assumed to have a 15% mortality rate. Source: MRIP.

Commercial Fishery

Vessel and Dealer Activity

Federal permit data indicate that 2,351 commercial bluefish permits were issued in 2020². A subset of federally permitted vessels was active in 2020 with dealer reports identifying 423 vessels with commercial bluefish permits that actually landed bluefish. Of the 307 federally permitted bluefish dealers in 2020, there were 107 dealers who actually bought bluefish.

Landings by Gear

Dealer data for 2020 indicate that the majority of the bluefish landings were taken by gillnet (52%), followed by unknown gear (24%), otter trawl/bottom fish (15%), handline (5%), and other (4%).

²In addition, there were 863 party/charter bluefish permit issued in 2020. A subset of federally permitted party/charter vessels was active in 2020 with VTR reports identifying 258 vessels with party/charter bluefish permits that actually landed bluefish.

Landings by Area

Commercial landings in 2020 were 2.16 million pounds. Landings by state are available in Table 4. VTR catch data was used to identify all NMFS statistical areas that accounted for at least 5 percent of the total bluefish catch or 5 percent or greater of the trips which caught bluefish in 2020 (Table 5). Eight statistical areas accounted for approximately 74% of the VTR-reported catch in 2020. The highest percentage of catch was from statistical area 539 with the most trips targeting bluefish conducted in statistical area 611. A map of statistical areas that accounted for a percentage of the Atlantic bluefish catch is shown in Figure 6.

Note: Commercial VTR landings may differ from landings reported through the dealer database because VTR data are only federal landings, and some state vessels are not required to submit VTRs.

Table 4. Commercial landings by state for 2020. Source: Dealer data (cfders).

State	2020 Landings (Pounds) ¹
ME	527
NH	0
MA	112,674
RI	334,745
CT	22,312
NY	341,623
NJ	152,799
DE	4,303
MD	21,000
VA	165,623
NC	857,719
SC	0
GA	0
FL	144,698
Total	2,158,023

¹ State only commercial landings from North Carolina and Florida are not always present in the cfders database, and thus may not yet be finalized. Final commercial catch accounting will be made available by GARFO prior to setting specifications.

Table 5. Statistical areas that accounted for at least 5 percent of the total bluefish catch or 5 percent or greater of the trips which caught bluefish in 2020. Source: VTR database.

Statistical area	Pounds of bluefish caught	Percent of 2020 commercial bluefish catch	Number of trips	Percent of 2020 bluefish trips that caught bluefish
539	142,333	21%	838	20%
613	81,676	12%	615	15%
611	63,433	9%	1,100	26%
537	51,818	8%	383	9%
626	50,526	7%	36	1%
636	49,261	7%	25	1%
632	34,409	5%	18	<1%
612	32,366	5%	314	7%

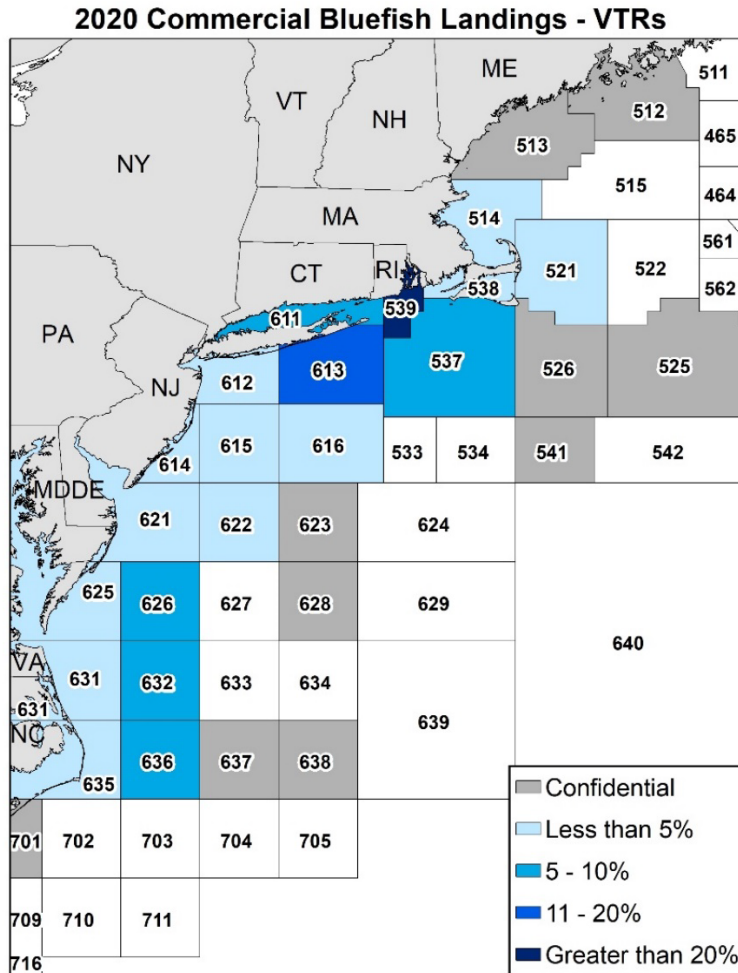


Figure 6. NMFS Statistical Areas that accounted for a percentage of the commercial bluefish landings in 2020. Source: VTR data.

The top commercial landings ports for bluefish in 2020 are shown in Table 6. Five ports qualified as "top bluefish ports," i.e., those ports where 100,000 pounds or more of bluefish were landed. Wanchese, NC was the most active commercial bluefish port with almost 400,000 pounds landed. The ports and communities that are dependent on bluefish are described in Amendment 1 to the FMP (available at <http://www.mafmc.org/fisheries/fmp/bluefish>). Additional information on "Community Profiles for the Northeast US Fisheries" can be found at http://www.nefsc.noaa.gov/read/socialsci/community_profiles/.

Table 6. Bluefish landings in pounds by port based on NMFS 2020 dealer data (cf ders).

Port ¹	Pounds	% of total commercial bluefish landings	# vessels
Wanchese, NC	368,942	17%	16
Hatteras, NC	269,655	12%	<10
Point Judith, RI	216,060	10%	99
Montauk, NY	151,200	7%	74
Little Compton, RI	105,941	5%	<10

¹This table includes only the "top ports" (ports where landings of bluefish were > 100,000 pounds), and thus does not include all 2020 landings.

Revenue

According to dealer data, commercial vessels landed about 2.16 million pounds of bluefish valued at approximately \$1.84 million in 2020. Average coastwide ex-vessel price of bluefish was \$0.85 per pound in 2020, a ~4.5% decrease from the previous year (2019 price = \$0.89 per pound). The relative value of bluefish is very low among commercially landed species, less than 1% of the total value, respectively of all finfish and shellfish landed along the U.S. Atlantic coast in 2020. A time series of bluefish revenue and price is provided in Figure 7.

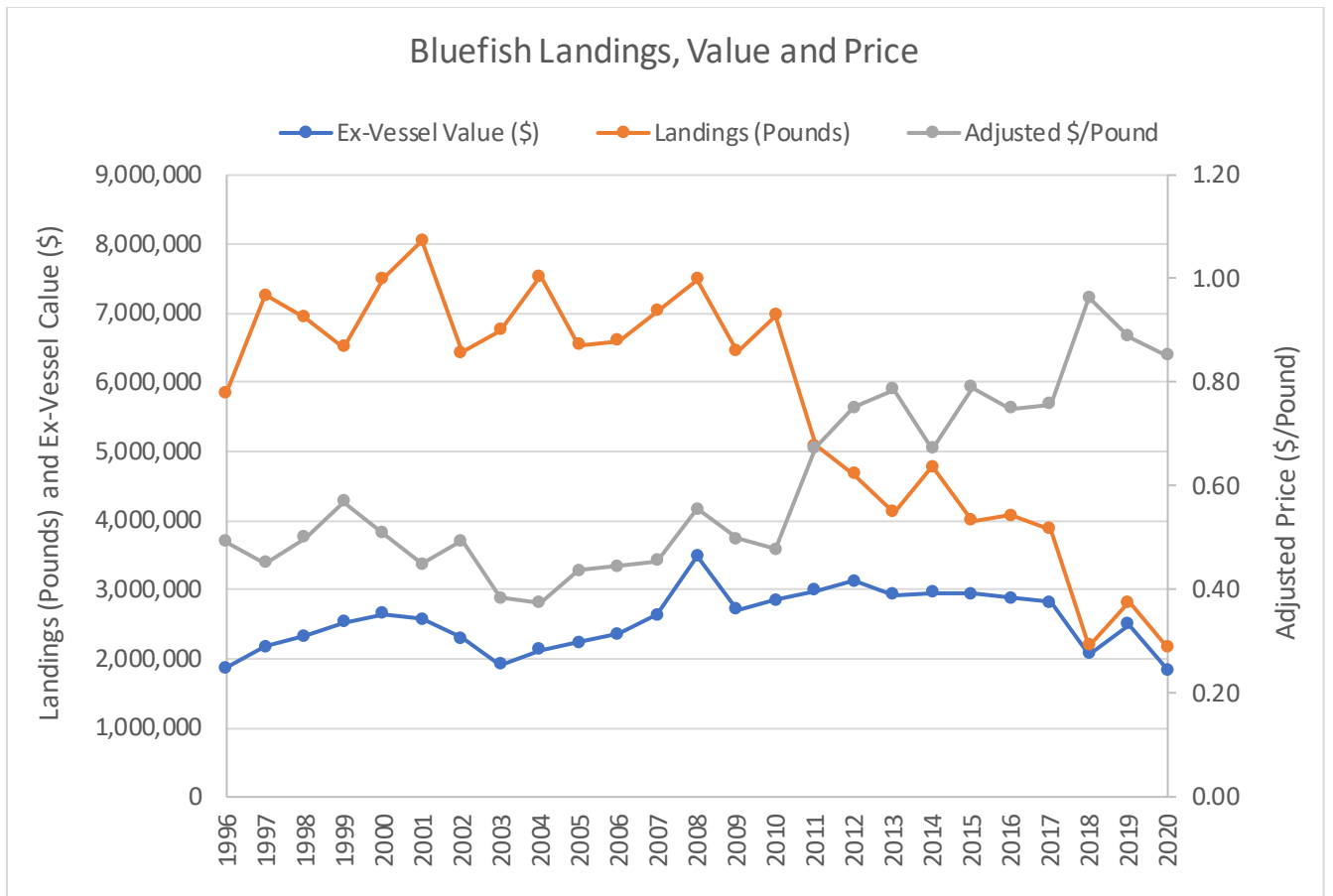


Figure 7. Landings, ex-vessel value, and price (adjusted to 2019 real dollars, 2020 unadjusted) for bluefish, 1996-2020.

Bycatch

The commercial bluefish fishery is primarily prosecuted with gillnets and handlines, although there are other small localized fisheries, such as the beach seine fishery that operates along the Outer Banks of North Carolina. Many of these fisheries do not fish exclusively for bluefish, but target a combination of species including croaker, mullet, Spanish mackerel, spot, striped bass, and weakfish. Given the mixed-species nature of the bluefish fishery, incidental catch of non-target species is not directly attributable to the bluefish fishery.

References

- Able, K.W. and M.P. Fahay. 1998. The first year in the life of estuarine fishes in the Middle Atlantic Bight. Rutgers University Press, New Brunswick, NJ. 342 p.
- Bigelow, H.B. and W.C. Schroeder. 1953. Fishes of the Gulf of Maine. U.S. Fish Wildl. Serv., Fish. Bull. 53. 577 p.
- Salerno, D.J., J. Burnett, and R.M. Ibara. 2001. Age, growth, maturity and spatial distribution of bluefish, *Pomatomus saltatrix* (Linnaeus), off the northeast coast of the United States, 1985-96. J. Northwest Atl. Fish. Sci., 29: 31-39.
- Smith, W., P. Berrien, and T. Potthoff. 1994. Spawning patterns of bluefish, *Pomatomus saltatrix*, in the northeast continental shelf ecosystem. Bull. Mar. Sci. 54(1): 8-16.
- NEFSC (Northeast Fisheries Science Center). 2015. 60th Northeast Regional Stock Assessment Workshop (60th SAW) Assessment Report. NEFSC Reference Document 15-08; 870 pp.
- Wood, T. 2014. Bluefish 2014 Stock Assessment Update Data and Model Update Through 2013. Coastal/Pelagic Working Group, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA. 37 p.
- NEFSC (Northeast Fisheries Science Center). 2019. Atlantic Bluefish Operational Assessment for 2019, Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA.
- Wood, A. 2017. Personal communication. Atlantic bluefish assessment lead. NMFS/NEFSC/READ/PDB. Woods Hole, MA.