Atlantic States Marine Fisheries Commission

PUBLIC INFORMATION DOCUMENT

For Amendment 4 to the Interstate Fishery Management Plan For

NORTHERN SHRIMP

June 2024

Sustainable and Cooperative Management of Atlantic Coastal Fisheries

The Atlantic States Marine Fisheries Commission seeks your input on the initiation of Amendment 4 to the Northern Shrimp Fishery Management Plan

The public is encouraged to submit comments regarding this document during the public comment period. Comments must be received by 11**:59 PM (EST) on August 16, 2024.** Regardless of when they were sent, comments received after that time will not be included in the official record. The Northern Shrimp Section will consider public comment on this document when developing the first draft of Amendment 4.

You may submit public comment in one or more of the following ways:

1. Attend public hearings pertinent to your state or jurisdiction; please note, some hearings may be held via webinar.
2. Refer comments to your state's members on the Northern Shrimp Section or Northern Shrimp Advisory Panel, if applicable.
3. Mail or email written comments to the following address:

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Fishery Management Plan Coordinator
Atlantic States Marine Fisheries Commission
1050 North Highland Street, Suite 200A-N
Arlington, Virginia 22201
Fax: 703.842.0741
comments@asmfc.org (subject line: Northern Shrimp PID)

If you have any questions, please call Chelsea Tuohy at 703.842.0740.

YOUR COMMENTS ARE INVITED

The Atlantic States Marine Fisheries Commission (Commission) is developing an amendment to revise the Interstate Fishery Management Plan (FMP) for Northern Shrimp. The Commission is responsible for developing FMPs which are based on the best available science and promote the conservation of the stock throughout its range. The states and jurisdictions of Maine, New Hampshire, and Massachusetts participate in the management of this species as part of the Commission's Northern Shrimp Section (Section).

This is your opportunity to inform the Commission about changes observed in the fishery, actions you feel should or should not be taken in terms of management, regulation, enforcement, and research, and any other concerns you have about the resource or the fishery, as well as the reasons for your concerns.

WHY IS THE ASMFC PROPOSING THIS ACTION?

The last time a new plan amendment to the Northern Shrimp FMP was adopted was in 2017 (Amendment 3). Since then, the status of the northern shrimp (*Pandalus borealis*) stock has remained unchanged with a depleted stock status and continued fishing moratorium. Given the poor condition of the stock, the Section supported initiation of a new plan amendment to consider several changes to the FMP including to the current management program requirement of annual specifications and addition of management triggers for stock monitoring. Through extending the specifications timeline, the Section may implement an ongoing or multiyear moratorium on harvest rather than meeting annually to implement a new moratorium for the following year, if preferred. A management trigger for the stock could inform when an ongoing or multiyear moratorium should be re-evaluated if improved stock conditions are evident, indicated through recruitment trends or other specified biological indicators. The 2022 and 2023 northern shrimp data updates led the Section to discuss a number of significant challenges facing the northern shrimp resource and its management. Consequently, in December 2023, the Section passed the following motion:

"Move to initiate an amendment to implement an ongoing moratorium until the wake-up index is triggered."

WHAT IS THE PROCESS FOR DEVELOPING AN AMENDMENT?

The publication of this document is the first step of the Commission's formal amendment process. Following this initial phase of information gathering and public comment, the Section will select the range of issues to be addressed through this Amendment, and identify potential management options. Other issues not addressed here can be addressed through a subsequent management document. The Commission will then develop Draft Amendment 4, incorporating the identified management options, for public review. Following that review and public comment, the Commission will specify the management measures to be included in Amendment 4, as well as a timeline

for implementation. In addition to issues identified in this Public Information Document (PID), Draft Amendment 4 may include issues identified during the public comment period of the PID.

The timeline for completion of Amendment 4 is as follows. Please note that the timeline is subject to change per the direction of the Section:

June 2024	Section reviews Draft PID and considers approving the PID for public comment
June - August 2024	Public comment on PID ***Current Step***
August 2024	Section reviews public comment; directs Plan Development Team to develop Draft Amendment 4
August - September 2024	Preparation of Draft Amendment 4 with input from Technical Committee and Advisory Panel
September 2024	Section reviews Draft Amendment 4 and considers approving for public comment
October 2024-November 2024	Public comment on Draft Amendment 4
December 2024	Section reviews public comment and selects final measures for Amendment 4; Policy Board and Commission approve Amendment 4

WHAT IS THE PURPOSE OF THIS DOCUMENT?

The purpose of this document is to inform the public of the Commission's intent to gather information concerning northern shrimp and to provide an opportunity for the public to identify major issues and alternatives relative to the management of this species. Input received at the start of the amendment process can have a major influence in the final outcome of the amendment. This document is intended to solicit observations and suggestions from commercial fishers, the public, and other interested parties, as well as any supporting documentation and additional data sources.

To facilitate public input, this document provides a broad overview of the issues already identified for consideration in the amendment; background information on the northern shrimp population, fisheries, and management; and a series of questions for the public to consider about the management of the species. In general, the primary question on which the Commission is seeking public comment is: **"How would you like management of the northern shrimp fishery to look in the future?"**

WHAT ISSUES WILL BE ADDRESSED?

The primary issues considered in the PID are:

1. Specifications timeline
2. Management triggers
3. Any other issues concerning the management of northern shrimp

ISSUE 1: Specifications Timeline

Background: The Fishery Management Plan (FMP) for Northern Shrimp (1986) established the requirement for northern shrimp fishing seasons to be set annually by the Section after considering recommendations from the Northern Shrimp Technical Committee (TC). Amendment 1 (2004) and subsequent amendments to the FMP made no changes to the annual specifications requirement, with Amendment 3 (2017) stating, "The Section has the ability to set a closed season annually up to 366 days (i.e., impose a moratorium)". Based on the current requirements of the FMP, measures subject to annual specification may only be modified through an amendment to the FMP.

Each year, the Section meets in the late fall or early winter to discuss fishery specifications for the upcoming year. However, after the northern shrimp stock collapse in 2013, the Section has implemented a moratorium every year since 2014. Additionally, annual TC data updates indicate the northern shrimp stock continues to be depleted, with environmental conditions remaining unfavorable for northern shrimp in the Gulf of Maine. The 2023 data update for the species found no improvement in status, with indices of abundance, spawning stock biomass (SSB), and recruitment at new time-series lows (ASMFC, 2023). After receiving the results of the 2023 data update, the Section continued the fishing moratorium through the 2024 fishing year.

Statement of the Problem: The requirement of annual specifications in the Northern Shrimp FMP may no longer be appropriate given the continued poor condition of the stock. The northern shrimp fishery in the Gulf of Maine was first placed under a fishing moratorium in 2014, and has remained in a moratorium since that time due to further decline in SSB and poor recruitment among other negative trends in biological indicators. The Section is interested in considering lengthened specifications setting timelines (e.g., 3, 5, indefinite, or other number of specified years instead of annual). A lengthened specifications setting timeline would allow the Section the flexibility to no longer meet annually if the TC's annual data update or other evaluation method indicates no improvement in stock conditions and continued poor recruitment to the fishery. However, it is important to note that if the specifications setting timeline is lengthened through Amendment 4 and the Section is not required to meet each year, a member of the Section may call a Section meeting at any time regardless of whether specifications are being set. This process for calling a Section meeting would not be altered

by Amendment 4, and will remain in place with or without a new amendment to the Northern Shrimp FMP.

Public Comment Questions: Is a specifications setting timeline longer than one year appropriate given the status of the northern shrimp stock and fishery? What would an appropriate specifications setting timeline be? Should the Section explore the option of an ongoing or multiyear harvest moratorium?

ISSUE 2: Management Triggers

Background: In 2022, recognizing the northern shrimp stock has remained at low levels of biomass despite no fishing pressure, the Section tasked the TC to work in collaboration with the Northern Shrimp Work Group to "develop a set of biological indicators along with a threshold that could serve as a trigger to indicate when the northern shrimp stock approaches a healthy population level that may be able to support a viable fishery". The Section's motivation behind the TC and Work Group tasking was to explore the potential for the northern shrimp stock in the Gulf of Maine to be placed in an ongoing or multiyear moratorium with annual evaluation of the management trigger. If the trigger, composed of a set of biological indicators, suggested an improvement in the perception of northern shrimp stock status, the Section could then task the TC to conduct a more thorough evaluation of stock health through a full assessment update with projections to inform potential specifications setting in future years. The Section has previously noted that given the continued condition of the stock, a management trigger may be an improved management option moving forward. While the Section has expressed initial support for an ongoing or multiyear moratorium, it is also possible to implement a management trigger under the current annual specifications process, if desired.

The Striped Bass FMP provides an example of management triggers used in action, and includes a recruitment trigger which is intended to identify when the population is entering a period of low recruitment that may make current harvest levels unsustainable. Every year, the Striped Bass TC reviews the young-of-year indices from four major spawning grounds. If any of the indices falls below the recruitment threshold for three consecutive years, the recruitment trigger is tripped, and the fishing mortality target will be changed to an interim lower value that accounts for the new, lower recruitment regime. If current fishing mortality (F) is above the interim F target, management action will be taken to reduce F to the interim F target. For striped bass, the recruitment trigger identifies a period of declining recruitment. For northern shrimp, which is already in a period of low recruitment, a similar approach could alternatively identify a period of increasing recruitment as a trigger for reviewing stock health and potential for sustainable harvest, for example.

Statement of the Problem: Each year, the TC conducts a data update to incorporate the most recent fishery independent surveys and environmental indices into the longstanding timeseries, to apprise managers and stakeholders of current stock trends. A Strict Traffic Light Approach (TLA) is applied to a suite of survey and environmental indicators including: a predation pressure index (PPI) calculated from the Northeast Fisheries Science Center (NEFSC) Fall Survey data, spring bottom temperature from the NEFSC survey, summer bottom temperature from the NEFSC Summer Survey, and winter surface temperature from Boothbay Harbor, ME. In recent years, the PPI has been dropped from the TLA due to an unfilled NEFSC Northern Shrimp TC seat and inability to run the PPI in a way consistent with previous years lacking this representation (ASMFC, 2023). Additionally, beginning in 2024, the NEFSC Summer Survey, which provides the most robust stock abundance data, will be indefinitely postponed.

Despite these challenges, a TC exploration of the impacts of the loss of the Summer Survey found the remaining two surveys, the NEFSC Fall Bottom Trawl Survey and the ME-NH Spring Inshore Trawl Survey, can reliably inform the stock assessment model and annual data updates in the absence of the Summer Survey. Additionally, the TC discussed that the remaining two surveys provide sufficient evidence of northern shrimp recruitment (i.e., year class strength and persistence) and other indicators to inform potential management triggers in the future.

Each year since 2021, the last time a full stock assessment for northern shrimp was completed, the northern shrimp data updates have indicated no improvement in stock status, with indices of abundance, SSB, and recruitment at new time-series lows and continued unfavorable environmental conditions in the Gulf of Maine for northern shrimp (ASMFC, 2021, 2022, & 2023). Given this trend, a management trigger in concert with an ongoing or multiyear moratorium may serve as a more appropriate tool to initiate a re-evaluation of stock status.

A management trigger would define specific management responses tied to definable metrics that indicate changes in northern shrimp biological and/or environmental conditions as opposed to the current system of annual data updates. In the case of annual data updates, the TC provides information about the northern shrimp stock to the Section, but there is no pre-defined management response to data update results. However, if a management trigger were implemented, and the trigger remained un-tripped (no change in stock status), a moratorium would be maintained. On the other hand, if the trigger were to be tripped, it could prompt steps to be taken such as a stock assessment update that would allow the Section to examine the potential for reopening the fishery. If a management trigger were to be implemented, the

TC would continue to provide annual data updates for northern shrimp in addition to trigger reviews.

Specifically, favorable trends in biological indicators such as recruitment could serve as a trigger for the TC to review whether the northern shrimp stock is projected to be able to support a sustainable fishery followed by management response by the Section. An example of a favorable trend may include year-class strength persisting for multiple years, as an indication of potential stock recovery. Recruitment has been identified as a preferred indicator to support a management trigger due to higher northern shrimp landings observed in years following recruitment of dominant year classes that have survived to adulthood.

Public Comment Questions: Should this amendment consider adopting a management trigger for northern shrimp, where a particular set of biological indicators (to be defined) trigger a more thorough evaluation of stock condition and a potential management response? Would recruitment (both in terms of year-class strength and persistence) serve as an effective indicator of northern shrimp stock health to inform a management trigger? What other stock indicators should be relied upon to inform a management trigger for re-evaluation of whether the stock could support a sustainable fishery? Are there any other sources of data that exist now or may exist in the future that could inform the management trigger?

ISSUE 3: Other Issues

Background: The intent of this document is to solicit feedback on a broad range of issues for consideration in the next amendment for northern shrimp. Stakeholder feedback should generally focus on **"How would you like management of the northern shrimp fishery to look in the future?"**

After reading the above issues, are there any other topics that should be addressed in Amendment 4? Some examples may include:

- Impacts due to climate change, including, but not limited to, increased predation due to changing environmental conditions and species distribution shifts;
- Habitat degradation; and
- Research priorities

When providing comment on other management issues, it's important to indicate how the issue can be addressed through Section action.

Public Comment Questions: What other changes should be made to the northern shrimp fishery that are not covered by the topics included in this document?

BACKGROUND INFORMATION ON THE MGMT & STOCK STATUS OF NOTHERN SHRIMP

Summary of Fishery Management

Before the 2014 fishery moratorium, northern shrimp (*Pandalus borealis*) supported small but valuable commercial and recreational fisheries in New England states. The Commission coordinates interstate management of the species in state waters (0-3 miles from shore), while management authority in the exclusive economic zone (3-200 miles) lies with NOAA Fisheries. The management framework for the species evolved during 1972-1979 under the auspices of the State/Federal Fisheries Management Program. In 1980, this program was restructured as the Interstate Fisheries Management Program (ISFMP) of the Commission. The first Interstate FMP for the species was approved in 1986.

The Commission approved Amendment 1 to the FMP in May 2004. Amendment 1, which replaced the original FMP, established biological reference points for the first time in the shrimp fishery and expanded the tools available to manage the fishery. Amendment 2, which completely replaced Amendment 1 and was approved in October 2011, further expanded the tools available to manage northern shrimp, including options to slow catch rates throughout the season. It also established a threshold level for the fishing mortality reference points; included a more timely and comprehensive reporting system; and allowed for the initiation of a limited entry program to be pursued through the adaptive management addendum process. The goal of Amendment 2 is "to manage the northern shrimp fishery in a manner that is biologically, economically, and socially sound, while protecting the resource, its users, and opportunities for participation." Addendum I to Amendment 2, approved in November 2012, refined the annual specification process, and allocated the total allowable catch (TAC) to the trawl (87%) and trap (13%) fisheries based on historical landings since 2001.

Despite these management efforts, in 2013, the northern shrimp stock collapsed prompting the Section to impose a complete harvest moratorium starting with the 2014 fishing year. This moratorium has been continued in each subsequent year since 2014 and is currently maintained through 2024. Amendment 3 to the FMP, approved in 2017, modified the FMP objectives and provides the flexibility to use the best available information to define the status of the stock and to set the total allowable catch. Additionally, the Amendment implements a state-specific allocation program to better manage effort in the fishery; 80% to Maine, 10% to New Hampshire, 10% to Massachusetts. Furthermore, the amendment strengthens catch and landings reporting requirements, implements mandatory use of size sorting grate systems to minimize harvest of small (presumably male) shrimp, incorporates accountability measures, specifies a maximum fishing season length, and formalizes fishery-dependent monitoring requirements. Addendum I to

Amendment 3, approved in 2018, transferred authority to the states to annually determine the split of northern shrimp quota between gear types.

The Northern Shrimp Technical Committee (NSTC) provides annual data updates and related information to the Section. After considering the data update, TC recommendations, and input from the Northern Shrimp Advisory Panel (AP), the Section annually sets specifications on management measures, or as in recent years, implements a fishing moratorium for up to 366 days.

Summary of Stock Status

The 2021 Northern Shrimp Stock Assessment Update and the 2023 data update contain the latest and best information available on the status of the Gulf of Maine northern shrimp stock for use in fisheries management. The most recent Benchmark Assessment for the stock was completed and approved for management in 2018 using a new statistical catch-at-length model developed in collaboration with the University of Maine (the UME model). The 2021 assessment update presented new data compiled since 2018 and results from the accepted statistical catch-at-length model and traffic light analysis.

The results of the 2021 Northern Shrimp Stock Assessment Update indicated that stock status continued to be poor in both the traffic light approach and the catch-at-length model. SSB was projected to decline from 2021 levels to about 444 mt in 2026, and there was less than a 1% chance that it would be greater in 2026 than in 2021, even under the scenario of zero fishing mortality (Table 1).

Size composition data from both the fishery and summer trawl surveys used in the 2021 assessment update and previous assessments for the species indicate that higher landings have followed the recruitment of strong (dominant) year classes. Low biomass and landings during 1998 – 2004 can be attributed in part to the below-average recruitment of the associated year classes. In 2014, the female population was comprised of the 2009 and 2010 year classes; the 2010 year class was the first of three successive year classes of recruitment failure. The last several year classes have failed to recruit into the fishery; therefore, it is anticipated that the fishery will remain at its current depleted status until recruitment trends improve.

The 2023 data update presented information from the most recent years of fishery independent surveys and environmental indices using the traffic light approach to keep managers and stakeholders informed about current stock trends. Additionally, the 2023 data update for northern shrimp showed no improvement in status, with indices of abundance, SSB, and recruitment at new time-series lows. Recruitment has been below the 20th percentile of the

1984-2017 reference period in 9 of the last 11 years. Figures displaying abundance, total biomass, SSB, recruitment, and environmental conditions from the 2021 Stock Assessment Update and 2023 data update may be found in the figures section below.

Summary of the Fishery

Most northern shrimp fishing in the Gulf of Maine historically was conducted using otter trawls designed for shrimp, although traps were also utilized off the central Maine coast while the fishery was still active. Drastic fluctuations in landings have characterized the Gulf of Maine northern shrimp fishery throughout its history. Annual landings of Gulf of Maine northern shrimp declined from an average of 11,400 metric tons (mt) during 1969-1972 to about 400 mt in 1977, resulting in a closure of the fishery in 1978. The fishery reopened in 1979 and landings increased steadily to over 5,000 mt by 1987. Landings ranged from 2,100 to 6,400 mt during 1988-1995, and then rose dramatically to 9,500 mt in 1996, exceeding the previous high in 1973. Landings subsequently declined from 1997 to 2002, only to increase again between 2003 and 2011, from 1,300 to 6,400 mt, with a slight drop in 2009.

In 2010-2012, the fishery closed early when landings approached the Total Allowable Catch (TAC). In 2011, the fishery closed early due to the TAC being exceeded.

The Section considered several factors in setting the specifications for the 2014 shrimp fishery, and ultimately implemented a harvest moratorium to protect the limited number of spawning females. The Section's deliberation considered the biomass in 2013 that was the lowest value in recent history, estimated at 5.2% of the biomass of the reference period (1985-1994). Additionally, there was recent recruitment failure of three consecutive year classes (2010-2012).

Typically, Maine accounts for about 90% of the landings of northern shrimp. In 2013, the most recent year with landings, Maine landed 84% of the season total, New Hampshire followed with 11% and Massachusetts landed 5% of the season total (Table 1). The proportional distribution of landings among the states was similar between 2003 and 2013, though it has shifted gradually since the 1980's when Massachusetts averaged about 34% of the catch (Table 2).

References

Atlantic States Marine Fisheries Commission (ASMFC). 1986. Fishery Management Plan for Northern Shrimp.

ASMFC. 2017. Amendment 3 to the Interstate Fishery Management Plan for Northern Shrimp.

ASMFC. 2018. Assessment Report for Gulf of Maine Northern Shrimp - 2018

ASMFC. 2021. Northern Shrimp Stock Assessment Update 2021.

ASMFC. 2023. Northern Shrimp 2023 Data Update.

Tables

Table 1. Projection results from the UME model under different *F* scenarios using recent M and recent recruitment. (Source: Northern Shrimp Stock Assessment Update 2021).

Year	Trawl F	Trap F	Trawl Catch	Trap Catch	Total Catch	Probability of SSB being above SSB_{2021}	SSB (mt)
2022	F = 0	F = 0	0 mt (0 lbs)	0 mt (0 lbs)	0 mt (0 lbs)	0%	716
2023			0 mt (0 lbs)	0 mt (0 lbs)	0 mt (0 lbs)	0%	624
2024			0 mt (0 lbs)	0 mt (0 lbs)	0 mt (0 lbs)	0.08%	507
2025			0 mt (0 lbs)	0 mt (0 lbs)	0 mt (0 lbs)	0.42%	460
2026			0 mt (0 lbs)	0 mt (0 lbs)	0 mt (0 lbs)	0.35%	444
2022	F = 0.02	F = 0.0024	7.1 mt (15,622 lbs)	0.8 mt (1,815 lbs)	7.9 mt (17,437 lbs)	0%	713
2023			6.1 mt (13,343 lbs)	0.7 mt (1,588 lbs)	6.8 mt (14,931 lbs)	0%	618
2024			5.1 mt (11,315 lbs)	0.6 mt (1,323 lbs)	5.7 mt (12,639 lbs)	0.06%	500
2025			4.6 mt (10,103 lbs)	0.5 mt (1,134 lbs)	5.1 mt (11,237 lbs)	0.32%	452
2026			4.3 mt (9,515 lbs)	0.5 mt (1,055 lbs)	4.8 mt (10,570 lbs)	0.27%	436
2022	F = 0	F = 0.05	0 mt (0 lbs)	21.2 mt (46,729 lbs)	21.2 mt (46,729 lbs)	0%	708
2023			0 mt (0 lbs)	18.2 mt (40,162 lbs)	18.2 mt (40,162 lbs)	0%	606
2024			0 mt (0 lbs)	15 mt (33,170 lbs)	15 mt (33,170 lbs)	0.03%	486
2025			0 mt (0 lbs)	12.7 mt (28,094 lbs)	12.7 mt (28,094 lbs)	0.20%	440
2026			0 mt (0 lbs)	11.9 mt (26,188 lbs)	11.9 mt (26,188 lbs)	0.24%	423

Table 2. Total removals in metric tons by season, state, and gear type. Seasons include the previous December. The Maine fishery was "Mixed" until Trawl and Trap landings could be distinguished beginning in 2000. Removals in 2014–2020 are from RSA and winter sampling programs, and include discards. 2009 data for Massachusetts and New Hampshire are combined here to preserve reporting confidentiality. (Source: Northern Shrimp Stock Assessment Update 2021. 2022 and 2023 data collected from ACCSP Date Warehouse)

Season	Maine			Massachusetts	New Hampshire	Total	Total	Total	Total
	Trawl	Mixed	Trap	Trawl	Trawl	Trawl	Mixed	Trap	
1985		2,946.4		968.8	216.7	1,185.5	2,946.4	0.0	**4,131.9**
1986		3,268.2		1,136.3	230.5	1,366.8	3,268.2	0.0	**4,635.0**
1987		3,680.2		1,427.9	157.9	1,585.8	3,680.2	0.0	**5,266.0**
1988		2,258.4		619.6	157.6	777.2	2,258.4	0.0	**3,035.6**
1989		2,384.0		699.9	231.5	931.4	2,384.0	0.0	**3,315.4**
1990		3,236.3		974.9	451.3	1,426.2	3,236.3	0.0	**4,662.5**
1991		2,488.6		814.6	282.1	1,096.7	2,488.6	0.0	**3,585.3**
1992		3,070.6		289.3	100.1	389.4	3,070.6	0.0	**3,460.0**
1993		1,492.5		292.8	357.6	650.4	1,492.5	0.0	**2,142.9**
1994		2,239.7		247.5	428.0	675.5	2,239.7	0.0	**2,915.2**
1995		5,013.7		670.1	772.8	1,442.9	5,013.7	0.0	**6,456.6**
1996		8,107.1		660.6	771.7	1,432.3	8,107.1	0.0	**9,539.4**
1997		6,086.9		366.4	666.2	1,032.6	6,086.9	0.0	**7,119.5**
1998		3,481.3		240.3	445.2	685.5	3,481.3	0.0	**4,166.8**
1999		1,573.2		75.7	217.0	292.7	1,573.2	0.0	**1,865.9**
2000	2,249.5		266.7	124.1	214.7	2,588.3	0.0	266.7	**2,855.0**
2001	954.0		121.2	49.4	206.4	1,209.8	0.0	121.2	**1,331.0**
2002	340.8		50.8	8.1	53.0	401.8	0.0	50.8	**452.7**
2003	987.0		216.7	27.7	113.0	1,127.7	0.0	216.7	**1,344.4**
2004	1,858.7		68.1	21.3	183.2	2,063.2	0.0	68.1	**2,131.4**
2005	1,887.1		383.1	49.6	290.3	2,227.1	0.0	383.1	**2,610.1**
2006	1,928.0		273.6	30.0	91.1	2,049.1	0.0	273.6	**2,322.7**
2007	3,986.9		482.4	27.5	382.9	4,397.3	0.0	482.4	**4,879.7**
2008	3,725.0		790.7	29.9	416.8	4,171.7	0.0	790.7	**4,962.4**
2009	1,936.3		379.4	MA & NH:	185.6	2,121.8	0.0	379.4	**2,501.2**
2010	4,517.9		1,203.5	35.1	506.8	5,059.9	0.0	1,203.5	**6,263.3**
2011	4,644.4		925.3	196.4	631.5	5,472.2	0.0	925.3	**6,397.5**
2012	2,026.8		193.1	77.8	187.8	2,292.4	0.0	193.1	**2,485.4**
2013	269.5		20.2	18.9	36.9	325.3	0.0	20.2	**345.5**
2014	0.3		0.0	0.0	0.0	0.3	0.0	0.0	**0.3**
2015	5.6		0.5	0.6	0.0	6.2	0.0	0.5	**6.7**
2016	7.4		4.1	0.0	1.8	9.2	0.0	4.1	**13.3**
2017	24.1		7.1	0.9	0.5	25.5	0.0	7.1	**32.6**
2018	0.1		0.0	1.9	1.1	3.1	0.0	0.0	**3.1**
2019	0.0		0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
2020	0.0		3.1	0.0	0.0	0.0	0.0	3.1	**3.1**
2021	0.0		0.0	0.0	0.0	0.0	0.0	0.0	**0.0**
2022	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0
2023	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figures

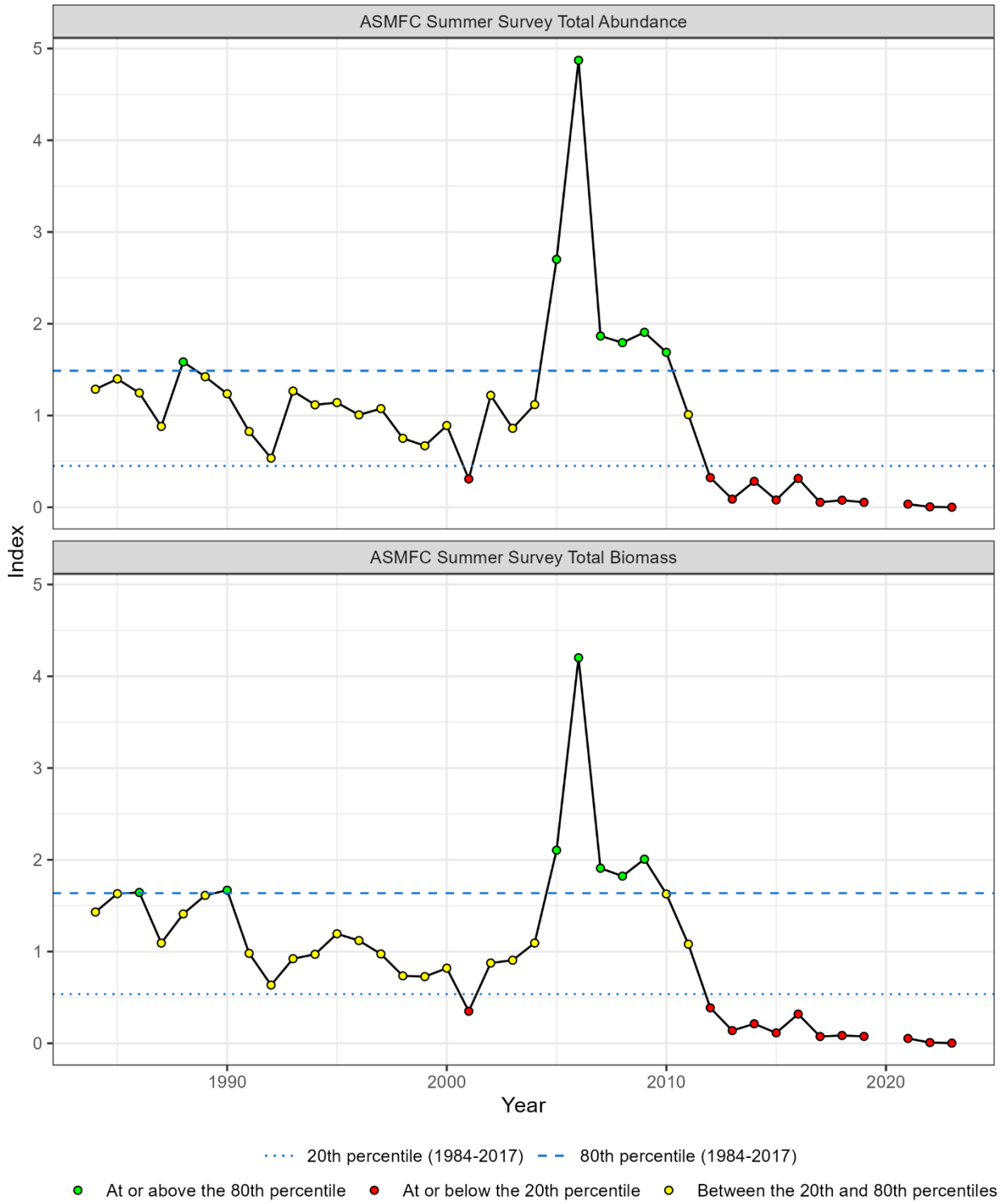

Figure 1. Traffic light analysis for the model-based index of Gulf of Maine northern shrimp from the Summer Survey 1984-2022 for total abundance (top) and total biomass (bottom). The 20th percentile of the time series from 1984-2017 delineated an adverse state, and the 80th percentile of the time series from 1984-2017 delineated a favorable state. (Source: 2023 Data Update for Northern Shrimp).

Figure 2. Traffic light analysis of recruitment (top) and spawning biomass (bottom) of Gulf of Maine northern shrimp from the Summer Survey 1984-2022. The 20th percentile of the time series from 1984-2017 delineated an adverse state, and the 80th percentile of the time series from 1984-2017 delineated a favorable state. (Source: 2023 Data Update for Northern Shrimp).

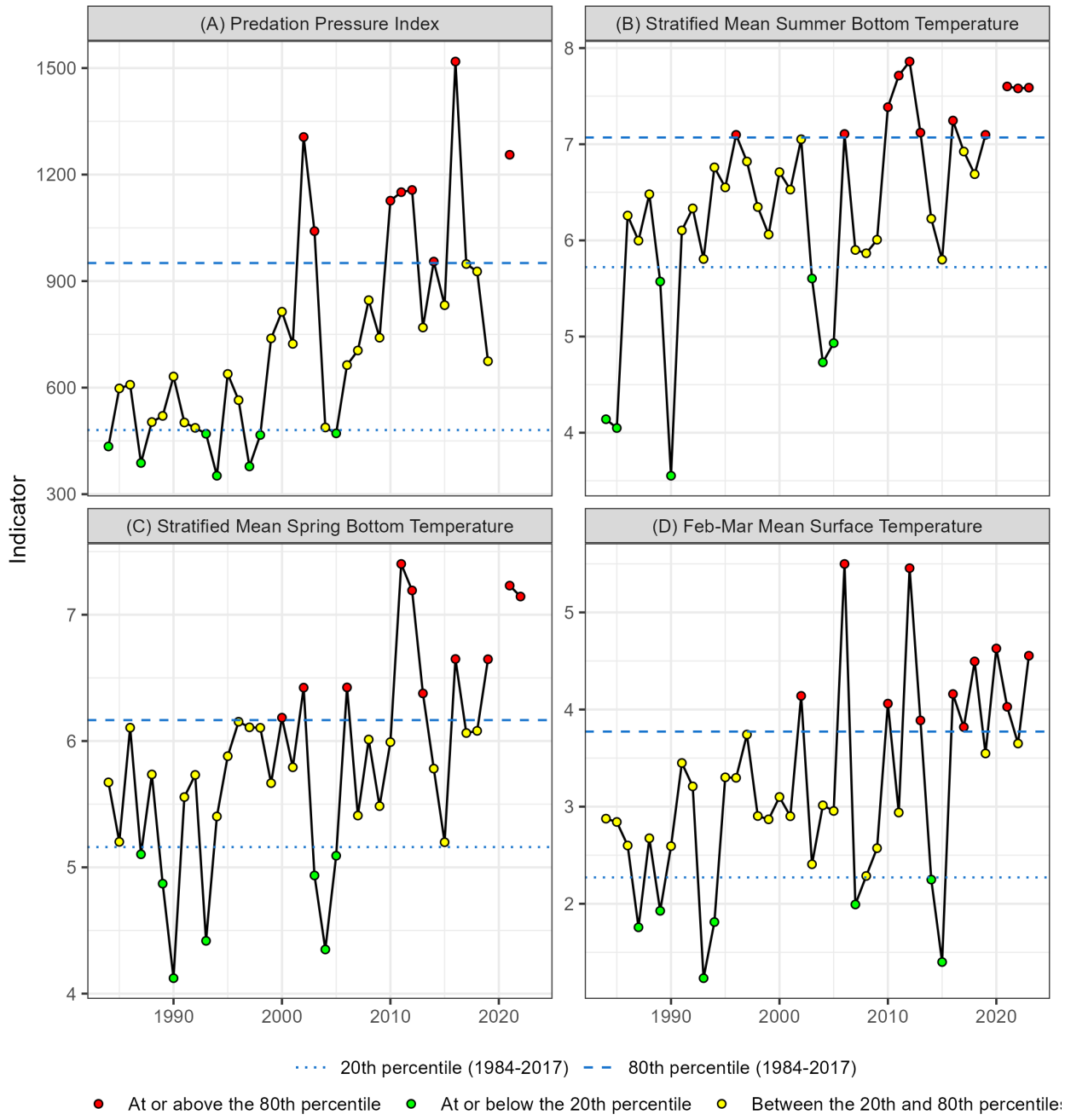

Figure 3. Traffic light analysis of environmental conditions in the Gulf of Maine, including predation pressure (A), summer bottom temperature from the Summer Survey (B), spring bottom temperature from the NEFSC Spring survey shrimp strata (C), and winter sea surface temperature from Boothbay Harbor (D). The 20th percentile of the time series from 1984-2017 delineated a favorable state, and the 80th percentile of the time series from 1984-2017 delineated an adverse state. (Source: 2023 Data Update for Northern Shrimp).

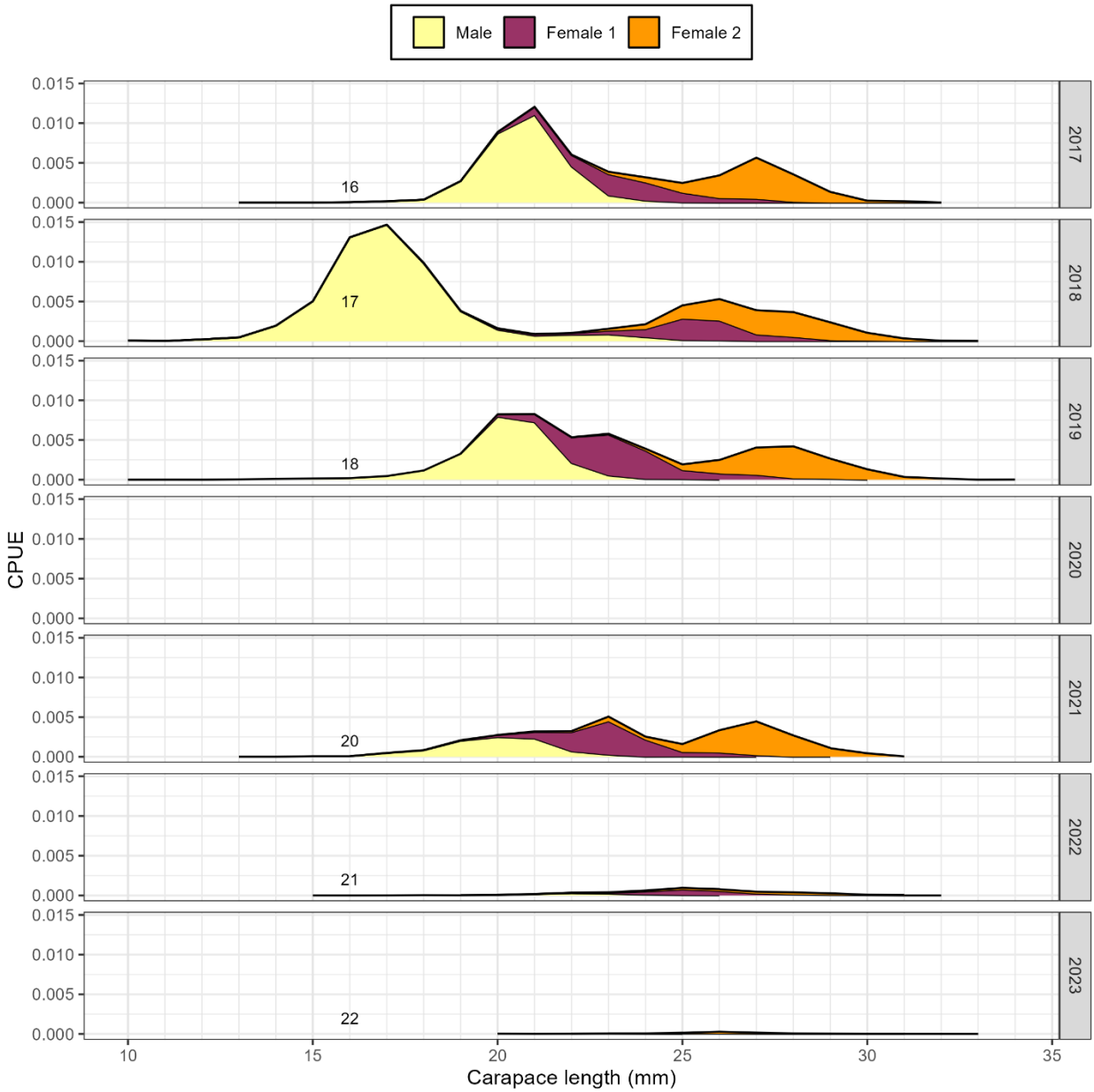

Figure 4. Gulf of Maine northern shrimp abundance from the Summer Survey by year, length, and development stage for 2017 – 2023. Two-digit years are year class at assumed age 1.5. (Source: 2023 Data Update for Northern Shrimp).

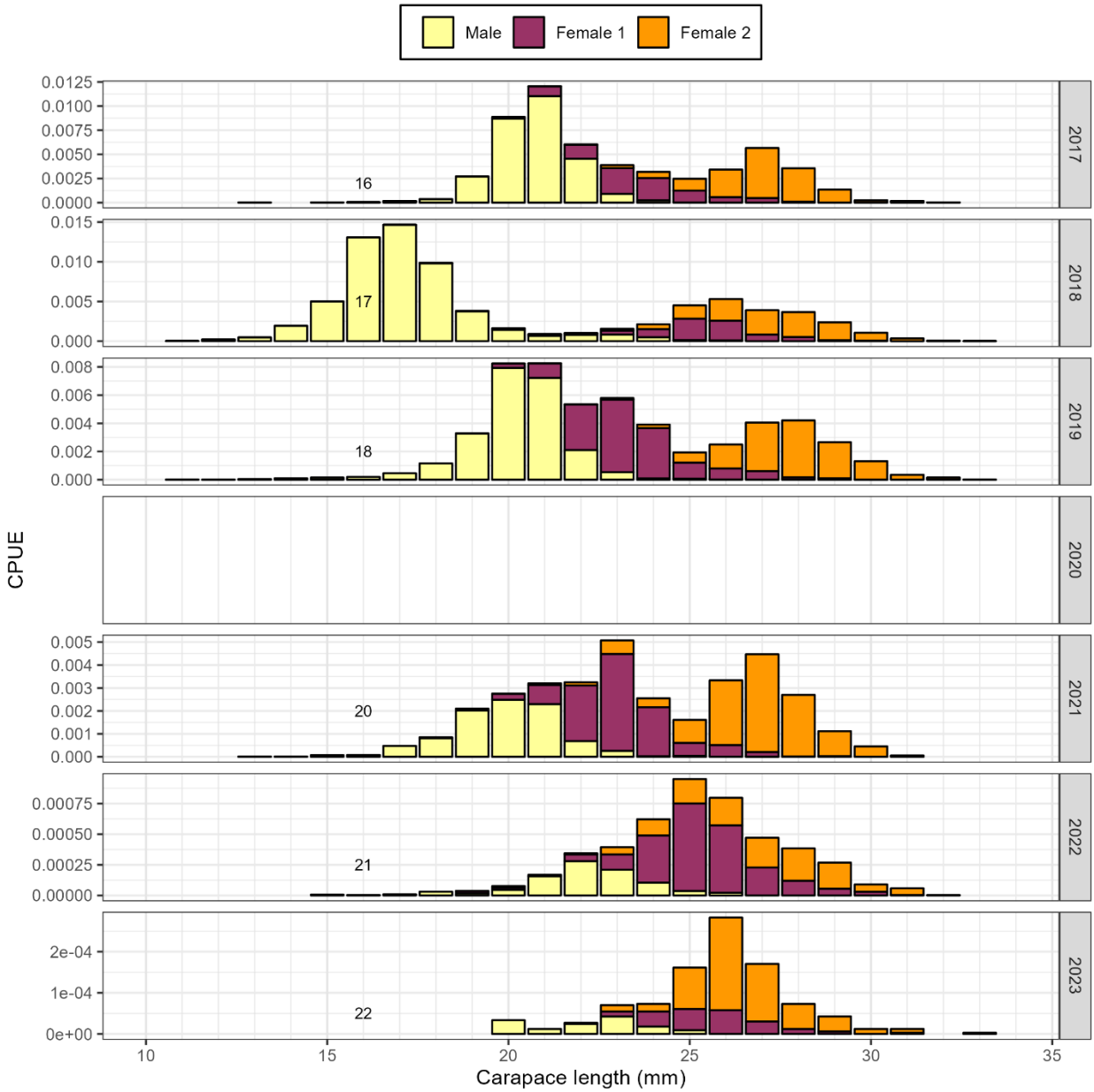

Figure 5. Gulf of Maine northern shrimp abundance from the Summer Survey by year, length, and development stage for 2017 – 2023 with different y-axes to show detail; note difference in scale from year to year. Two-digit years are year class at assumed age 1.5. (Source: 2023 Data Update for Northern Shrimp).