Atlantic States Marine Fisheries Commission

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MEMORANDUM

TO: **American Lobster Management Board**

FROM: **Jonah Crab Technical Committee**

DATE: **January 8, 2024**

SUBJECT: **Response to Board Task Following 2023 Stock Assessment**

The 2023 Jonah Crab Benchmark Stock Assessment determined that the abundance of three of four Jonah crab stocks (Offshore Southern New England or OSNE, Inshore Gulf of Maine or IGOM, and Offshore Gulf of Maine or OGOM) has not been depleted to historical lows observed in the 1980s and 1990s. Data were insufficient to make determinations about abundance for the Inshore Southern New England stock (ISNE) or fishing mortality rates for any of the four stocks. The Peer Review of the assessment noted substantial uncertainty about stock status and expressed concern due to similarities between some trends in data for the US stocks and a Canadian stock assessed in the late 2000s that appeared sensitive to fishing pressure and experienced a rapid decline in abundance.

Following review and acceptance of the assessment in October 2023, the American Lobster Management Board tasked the Jonah Crab Technical Committee (TC) to "recommend possible management measures or other options to correct what appear to be deficiencies in the stock". The Board requested several components of information including (1) current information on management and stock conditions for the Canadian Jonah crab stock to better understand this stock's response following its apparent decline, (2) recommendations on additional indicators from existing data to monitor the stocks, (3) recommendations on the appropriate frequency of indicator updates following the assessment, (4) recommendations on management measures that could be used for a potential management response, and (5) recommendations to improve monitoring in the short term.

The TC met on November 16, 2023 and January 2, 2024 to gather and review information requested and make recommendations in response to the Board task. Additionally, the TC requested input on several questions from the Jonah Crab Advisory Panel (AP) during it's December 14, 2023 meeting to review the stock assessment. Input from the AP was provided in a memo and was considered in the TC's recommendations.

Canadian Stock Post-Mortem Analysis

The Peer Review Report for the assessment highlighted similarities between the period just prior to the apparent decline of the Canadian Jonah crab stock in the 2000s and the current US Jonah crab population. To provide more context on the Canadian stock and fishery before and after its decline, information was gathered on management through time and the structure of the fishery. The Canadian stock has not been assessed or formally monitored since the 2009 stock assessment that found a decline in abundance, so the recovery status is unknown.

At the time of the 2009 stock assessment, there was a sole license holder in the Jonah crab fishery, Clearwater Seafoods, which operated several boats. The fishery has largely been inactive for Jonah crab since 2009, with landings reported only in 2013 and 2016. The stock has historically been managed with

a 130mm minimum carapace width, a prohibition on female harvest, and a catch limit (Table 1). The only management measures to change through time have been decreasing catch limits, once following the stock assessment in 2010 and again in 2017. The decrease in 2017 was a precautionary measure due to the fishery expressing interest again in retention of Jonah crab and the conclusion from the stock assessment that the resource appeared very sensitive to fishing pressure.

Table 1. Management measures for the Canadian Lobster Fishing Area (LFA) 41 Jonah crab stock.

Year	Prohibition of Females?	Min. Carapace Width	Season	Catch Limit
1995-2005	Yes	130 mm	October 16 - October 15	720 t
2006-2009	Yes	130 mm	January 1 - December 31	720 t
2010-2016	Yes	130 mm	January 1 - December 31	540 t
2017-2023	Yes	130 mm	January 1 - December 31	270 t

Additional Indicators

The TC considered potential new indicators to include with those selected during the stock assessment to update on a periodic basis. Additional indicators considered included fishery-dependent CPUE from Rhode Island, fishery-dependent effort from Massachusetts, sex ratios from fishery-dependent biosampling and fishery-independent trawl surveys, price per pound data for landings of Jonah crab and other crustacean species, and mean size from fishery-dependent biosampling.

Fishery-Dependent Effort Indicators

Following a preliminary analysis of fishery-dependent RI CPUE data during the stock assessment peer review workshop, the TC considered this dataset as a potential indicator. These data were calculated as Jonah crab landings per trip from a select fleet of "high liners" that have consistently targeted Jonah crab through time. In addition to these data, the TC also considered the number of trips landing Jonah crab in Massachusetts. These data were provided as an alternative to the CPUE data calculated from RI because the MA data do not include number of days fished for most years and vessel participation has been more inconsistent, complicating selection of a "high liner" fleet. Both data sets are for the OSNE stock and include the states that account for the majority of landings from this stock and coastwide.

The RI CPUE declined markedly in 2021 and remained at this lower level in the updated data since the assessment (2022; Figure 1). The MA effort data showed similar declines for these years as well as 2020 (Figure 2). The cause of these declines in not known. Given data limitations for Jonah crab, the TC believes reviewing these data on a regular basis would be useful for identifying changes in the fishery that may indicate concern. Considered along with the AP input from its December 14, 2023 meeting, the TC also believes market factors are impacting these fishery-dependent indicators, adding uncertainty to using these indicators for inference on stock status.

The TC recommends these datasets be added as indicators to be updated alongside those selected during the assessment, but stresses these indicators should not be viewed in a vacuum without important context from market indicators such as price per pound (see below).

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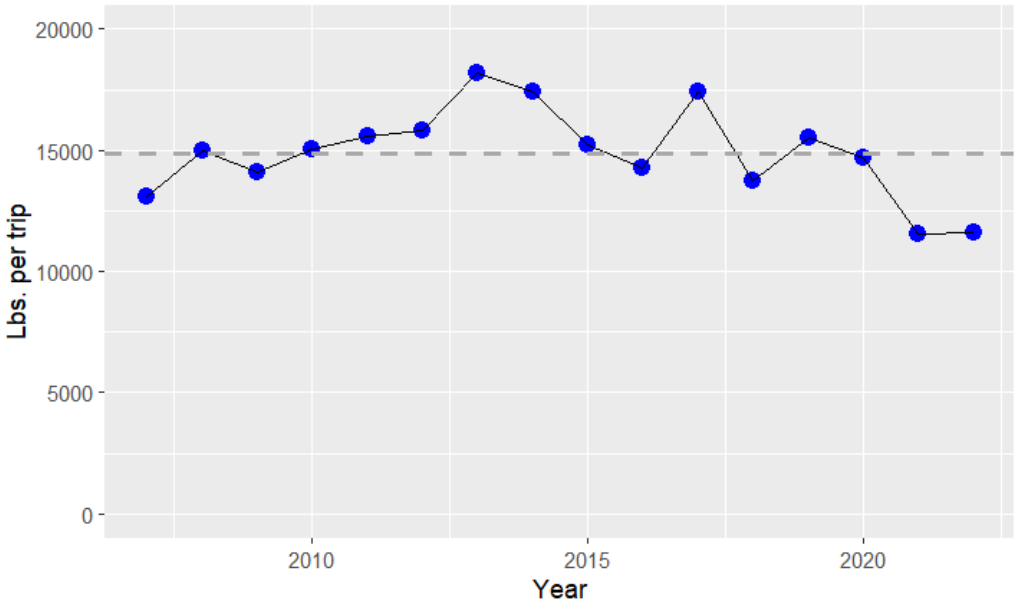

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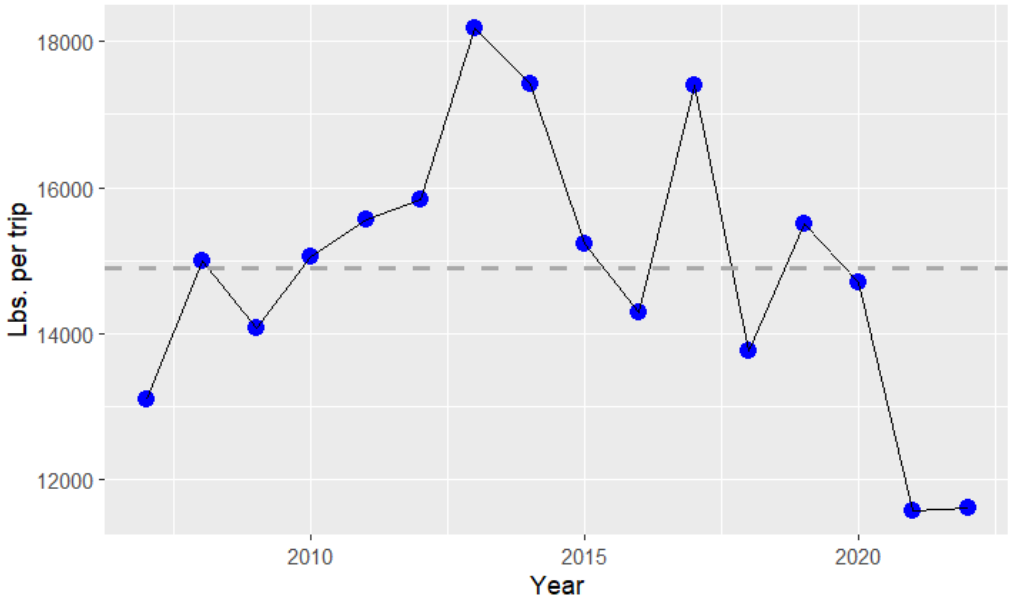

Figure 1. Rhode Island commercial Jonah crab CPUE of a “high liner” fleet targeting Jonah Crab with the y-axis extended to zero to show scale (a.) and zoomed in to the observed range to show contrast (b.).

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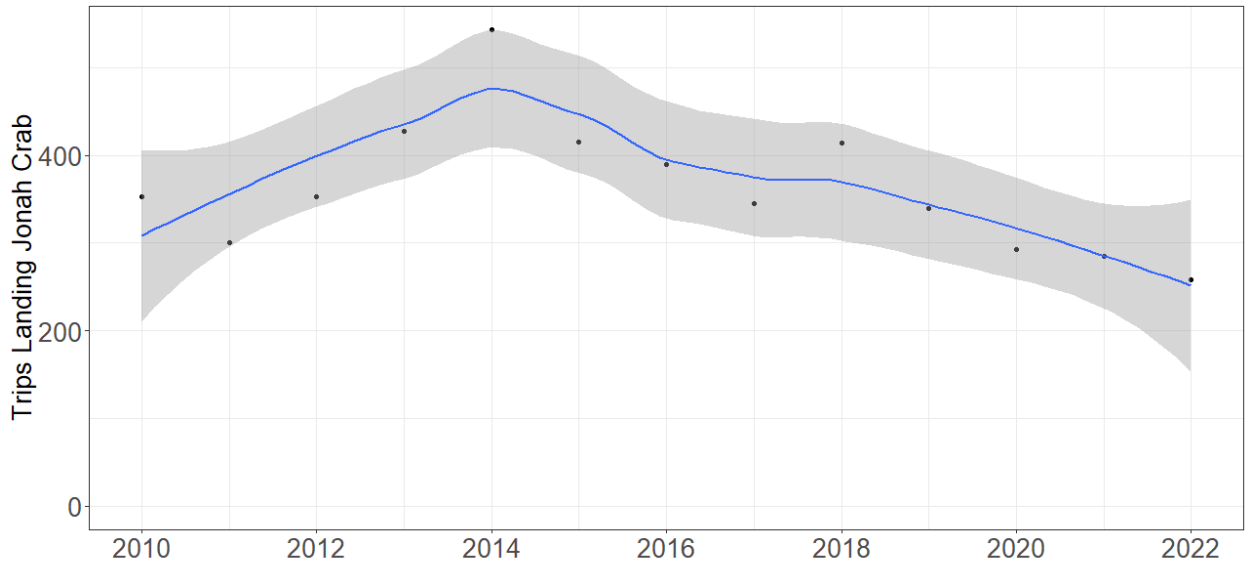

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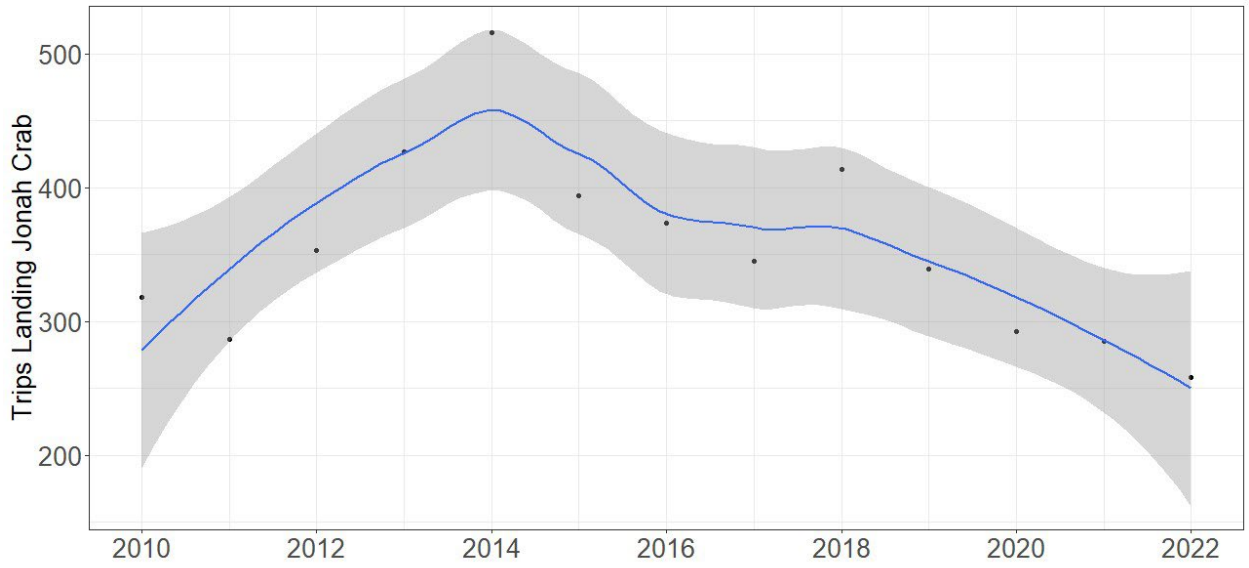

Figure 2. Number of trips landing Jonah crab in Massachusetts from statistical area 526 and the LMA3 portion of statistical area 537 with the y-axis extended to zero to show scale (a.) and zoomed in to the observed range to show contrast (b.). Data source: state and federal trip reports.

Sex Ratios

Sex ratio data developed during the assessment do not show consistent trending through time (Figure 3 and Figure 4). The fall NEFSC trawl survey sex ratios for the stock considered the most exploited stock (OSNE) show increasing proportions of males through time, which is not an intuitive signal for a fishery executed almost exclusively on males. ***The TC does not believe sex ratios are informative indicators at this time and does not recommend they be used for indicator updates.***

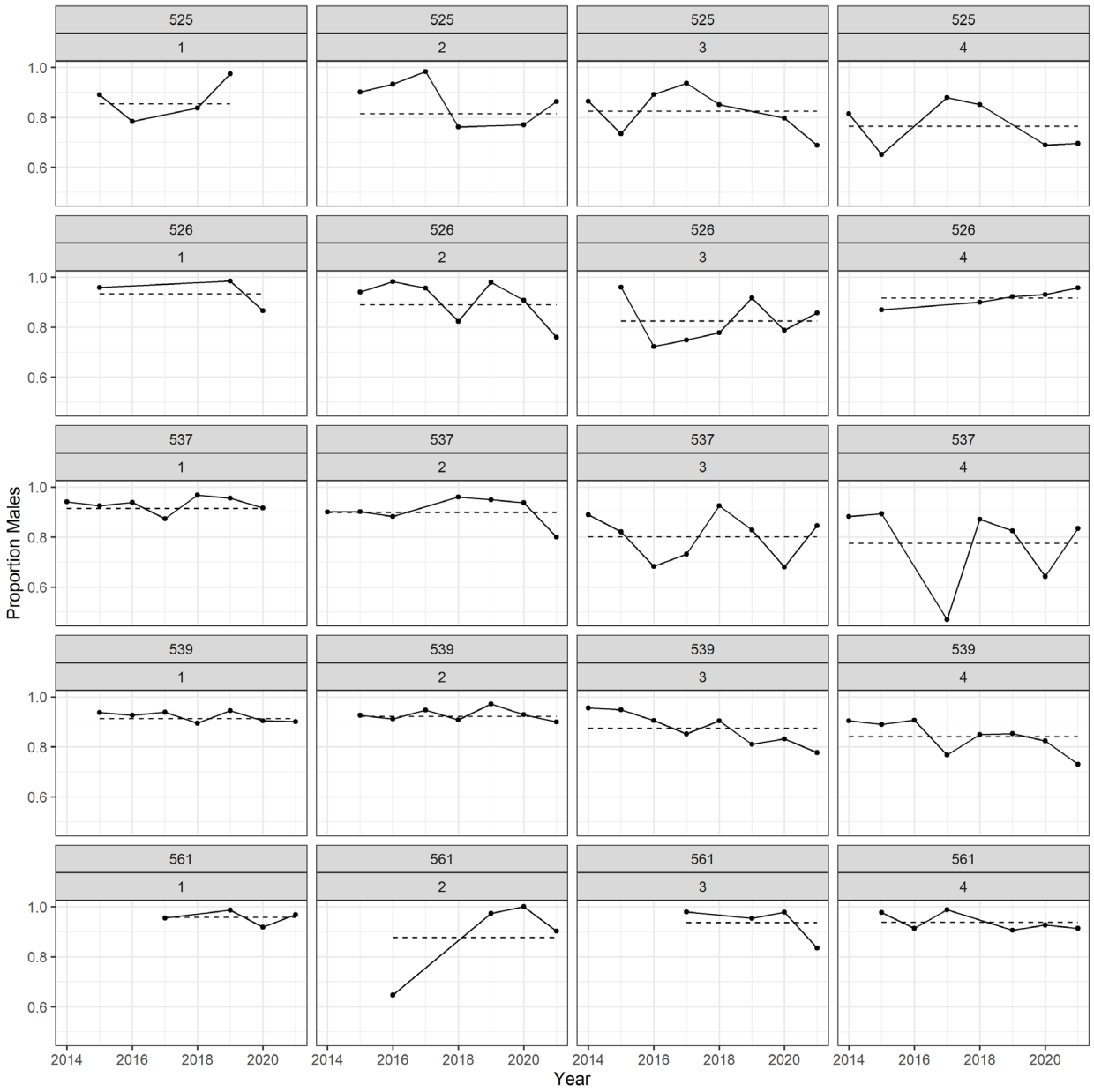

Figure 3. Proportion males from fishery-dependent sea sampling data in select, well-sampled statistical areas. Statistical areas 525 and 526 are part of the Offshore Southern New England stock, statistical area 539 is part of the Inshore Southern New England stock, and statistical area 561 is part of the Offshore Gulf of Maine stock. Statistical area 537 overlaps the Offshore and Inshore Southern New England stocks.

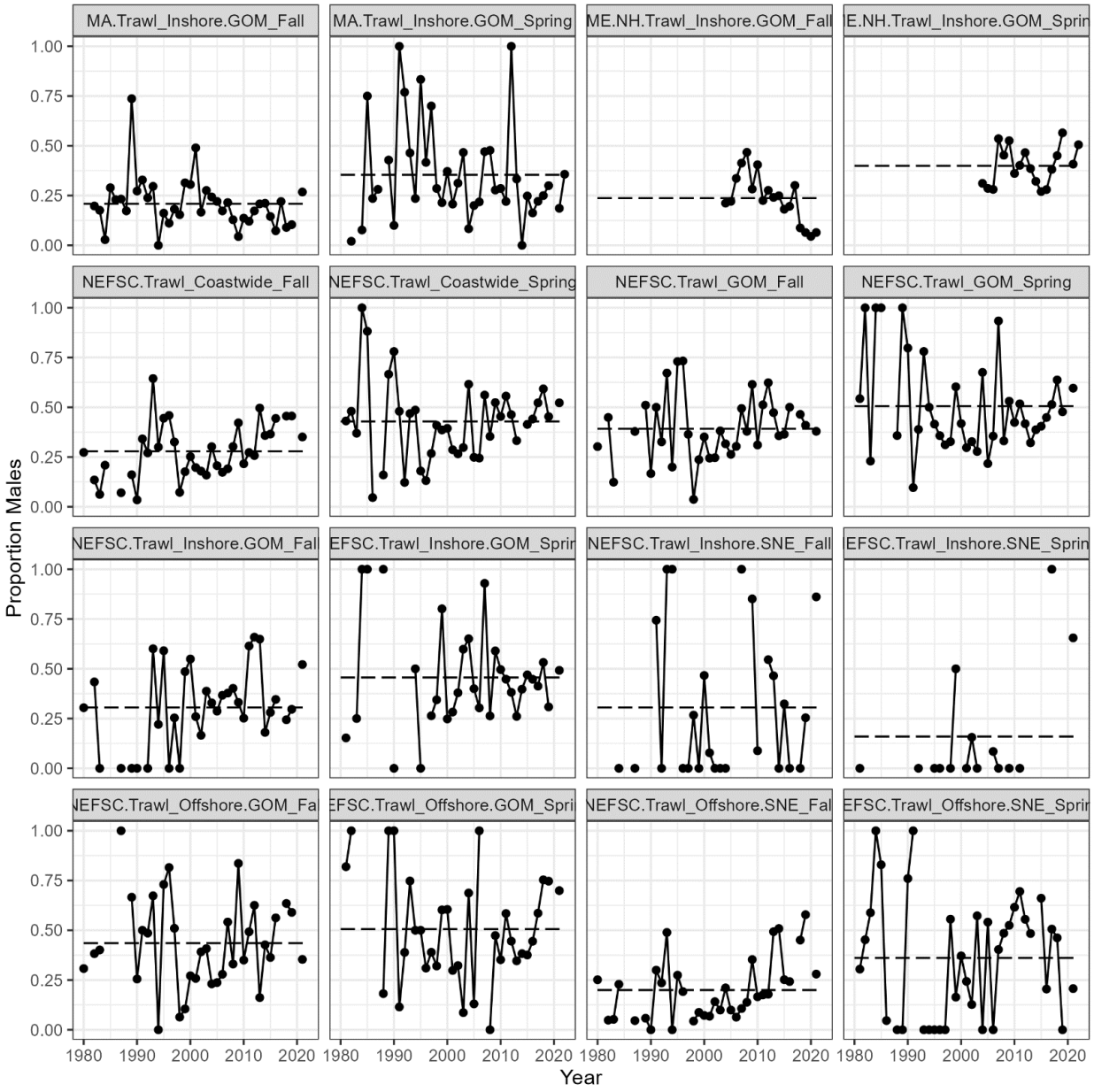

Figure 4. Proportion males from fishery-independent trawl surveys.

Price Per Pound

Price per pound data for landings of Jonah crab and American lobster were reviewed as potential indicators of market influence on Jonah crab fishery-dependent indicators. Jonah crab price steadily increased since 2010 to a high in 2022, but decreased in 2023 (Table 2). American lobster price also steadily increased (Table 3), but peaked a year earlier in 2021 which was the year when fishery-dependent Jonah crab CPUE and effort data showed marked decreases. American lobster price decreased in 2022, but remained relatively high in some states. These prices could be causing target shifting that would result in decreased Jonah crab CPUE. The TC believes these price data provide important context for changes in fishery-dependent indicators because of their direct link to each other in the mixed crustacean fisheries harvesting Jonah crab. The TC also reviewed price data for US Dungeness crabs and Canadian snow crabs as these species are considered competitors in the crab

market that would impact Jonah crab demand. However, the TC notes more work is necessary to understand the relationship among these crab species in the market before inferring impacts to Jonah crab fishery-dependent indicators from these data.

The TC recommends updating price per pound data for both Jonah crab and American lobster to be considered along with fishery-dependent effort indicators during indicator updates.

Table 2. Jonah crab landed price per pound by state and regional means. Confidential data is marked with an asterisk. Data for 2023 is preliminary and marked with a caret (^). Data source: NMFS commercial fisheries statistics web page (https://www.fisheries.noaa.gov/foss/f?p=215:200::::::) for 2010-2022, SAFIS dealer reports for 2023.

Year	ME	NH	MA	RI	Mean	MA/RI Mean
2010	$0.34	*	$0.56	$0.52	$0.47	$0.54
2011	$0.35	*	$0.68	$0.57	$0.53	$0.62
2012	$0.39	*	$0.74	$0.68	$0.60	$0.71
2013	$0.49	$0.69	$0.90	$0.72	$0.70	$0.81
2014	$0.30	$0.71	$0.78	$0.75	$0.64	$0.76
2015	$0.51	*	$0.76	$0.69	$0.65	$0.72
2016	$0.51	$0.70	$0.77	$0.77	$0.69	$0.77
2017	$0.54	$0.72	$0.98	$0.96	$0.80	$0.97
2018	$0.59	$0.66	$0.94	$0.92	$0.78	$0.93
2019	$0.55	$0.60	$0.84	$0.80	$0.70	$0.82
2020	$0.54	$0.63	$0.82	$0.83	$0.71	$0.82
2021	$0.77	$0.76	$1.20	$1.20	$0.98	$1.20
2022	$0.97	$1.32	$1.81	$1.86	$1.49	$1.83
2023^		$0.95	$1.28	$1.23	$1.15	$1.26

Table 3. Lobster landed price per pound by state and regional means. Data for 2023 is preliminary and marked with a caret (^). Data source: NMFS commercial fisheries statistics web page (https://www.fisheries.noaa.gov/foss/f?p=215:200::::::) for 2010-2022, SAFIS dealer reports for 2023.

Year	ME	NH	MA	RI	ME-RI Mean	MA-RI Mean
2010	$3.31	$4.07	$3.94	$4.24	$3.89	$4.09
2011	$3.19	$4.17	$3.99	$4.64	$4.00	$4.31
2012	$2.69	$4.06	$3.68	$4.48	$3.73	$4.08
2013	$2.90	$4.35	$3.87	$4.51	$3.91	$4.19
2014	$3.70	$4.74	$4.46	$4.85	$4.44	$4.66
2015	$4.10	$5.20	$4.76	$5.34	$4.85	$5.05
2016	$4.08	$5.25	$4.63	$5.26	$4.81	$4.95
2017	$3.92	$5.73	$4.92	$5.42	$5.00	$5.17
2018	$4.06	$5.75	$5.02	$5.75	$5.14	$5.38
2019	$4.82	$5.91	$5.61	$6.15	$5.62	$5.88
2020	$4.21	$5.30	$4.98	$5.62	$5.03	$5.30
2021	$6.71	$7.74	$7.46	$7.92	$7.46	$7.69

2022	$3.97	$6.19	$5.61	$6.89	$5.67	$6.25
2023^			$6.22			

Additional Length-Based Indicators

The TC considered several length-based indicators during the assessment, but ultimately recommended against using these indicators for inference on stock status due to lack of signal in the data available for US Jonah crab as well as data for the Canadian Jonah crab stock assessed in 2009. Here, the mean size of the 5% smallest crabs retained for harvest in port sampling was considered as an additional length-based indicator that would signal changes in harvester selectivity due to market preference. ***However, the data remain too sparse to identify trends over time and the TC does not recommend using these data sets as indicators during indicator updates.***

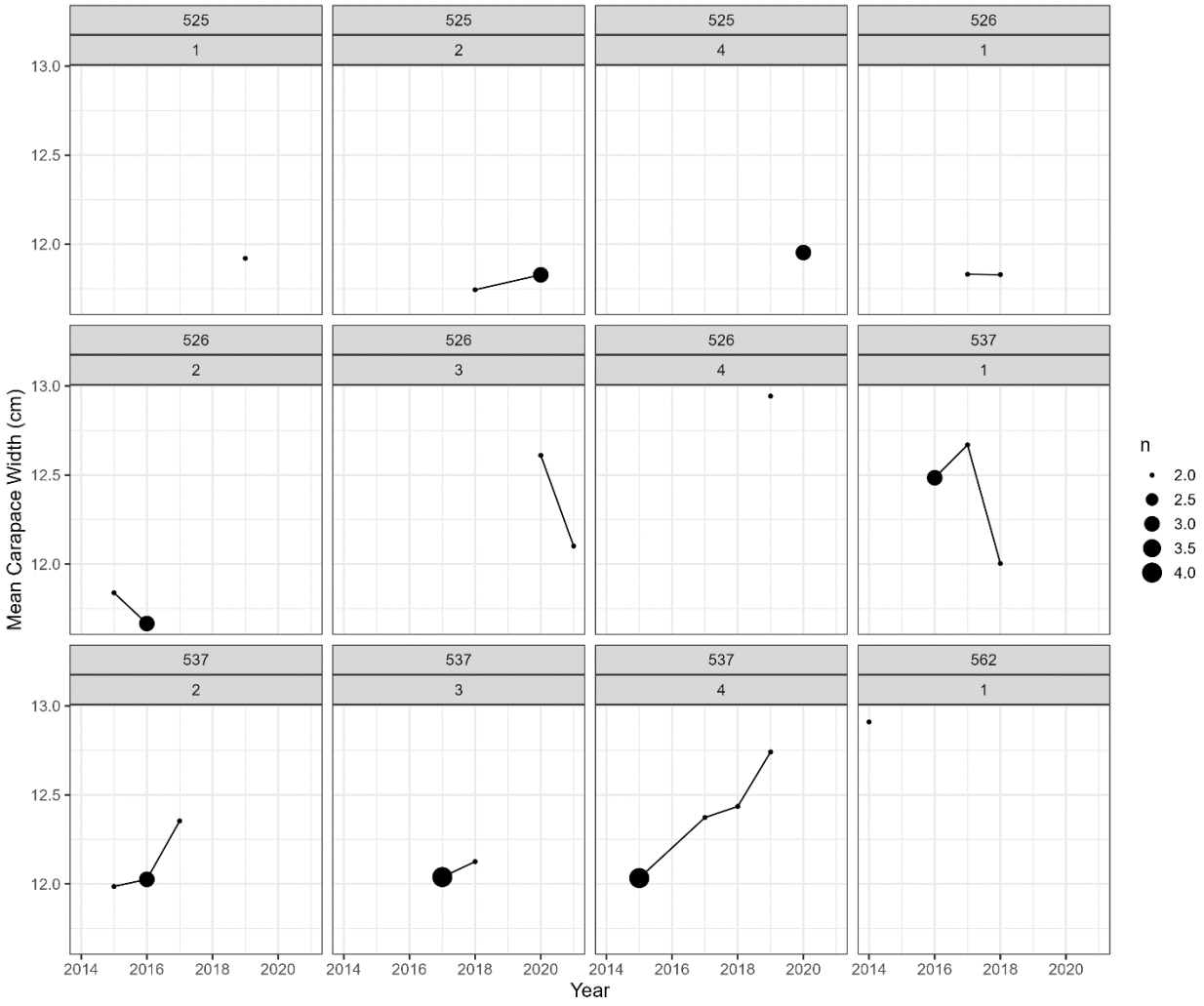

Figure 5. Mean carapace width of the smallest 5% male Jonah crabs sampled during port sampling in select, most frequently sampled Offshore Southern New England statistical areas.

Frequency of Indicator Updates

The TC recommends updating indicator time series for the OSNE stock on an annual basis. This stock supports the primary targeted Jonah crab fishery that accounts for the majority of annual coastwide

landings. Data from trawl surveys are processed intermittently, so trawl survey-based indicators selected during the stock assessment will most likely be available every other year for updates. Indicators for the three remaining stocks (ISNE, IGOM, and OGOM) that generally support bycatch fisheries with relatively low annual landings should be updated every five years unless monitoring data indicate development of a more targeted fishery in these stocks. The TC recommends providing data updates during the Commission's Annual Meeting to allow for data from the previous calendar year to be finalized. The TC also recommends involving the AP in all update processes to provide important feedback on market drivers that can be challenging to interpret from existing datasets. The AP should have representation from dealers that can describe what is driving the current prices and demand of Jonah crab including market interactions with competing crustacean species.

Potential Management Measures

The TC considered several potential management measures including seasonal closures, effort controls (i.e., trap limits), circular vent size changes, and minimum legal-size changes. The TC believes identifying a cause of population decline is necessary to determine which of these measures would be most effective. Given the current management measures in place, the two most likely causes of a decline would be sperm limitations due to overfishing of male crabs or increased mortality due to environmental conditions. However, data were insufficient to determine cause of abundance changes in the benchmark stock assessment. Data are also insufficient to quantify benefits to the stock from these management measures if they are implemented.

If the population is determined to be declining due to overfishing of male crabs, the TC recommends seasonal closures or effort controls. These measures would reduce male mortality allowing for increased reproductive capacity. Seasonal closures should focus on the time between molting and mating. Spatially-limited data indicate peak molting in June in Rhode Island Sound and mating through late fall in Cape Cod Bay, MA occurring from mid-October through mid-November. Sampling does not cover December through April and mating activity remains unknown during this timeframe and in other areas. This period between molting and observed mating does not align with the peak of the fishery (winter), so these measures may need to be coupled with other effort controls such as trap limits depending on the level of decline.

If the population is determined to be declining due to environmental changes, the TC recommends increasing minimum legal size and circular vent sizes to protect more females from processing-induced stress and mortality. Increased female abundance would provide the best buffer against adverse environmental conditions in the case that these adverse conditions yield to more favorable conditions. An anticipated challenge with circular vent size changes is impacts to lobster catch as well as crabs in mixed target fisheries.

The Peer Review Panel was particularly concerned about a decline in CPUE data from a preliminary analysis of RI data conducted during the peer review workshop, and that it may foreshadow declines similar to those observed in the 2009 Canadian Jonah crab stock assessment. With current data limitations and the lack of biological reference points the need for management action cannot be based solely on biological condition of the stocks (i.e., biological reference points). However, the TC does not believe management action is necessary at this time. Recent declines in US market demand have decreased Jonah crab fishing effort. The MA-RI mean annual price per pound declined by 31% from 2022 to 2023 (Table 2), based on preliminary 2023 data. As a result, harvesters have indicated they are conducting fewer trips targeting Jonah crab in 2023 and dealers are accepting catch from fewer vessels. One dealer reportedly had to dump thousands of pounds of Jonah crab in a New Bedford landfill due to a lack of market. A sudden shift in market conditions is said to be related to an increase in the availability of Canadian snow crab and the Monterey Bay Aquarium Seafood Watch Program "red-

listing" Jonah crab and rock crab (*Cancer irroratus*) in September of 2022. The red-listing has apparently caused some major retailers to stop purchasing Jonah crab. The Seafood Watch Program pointed to "the risk posed by these fisheries to North Atlantic right whale and the ineffectiveness of management measures to mitigate risk" as justification for red-listing.

Monitoring Recommendations

At the request of the Peer Review Panel during the stock assessment, the TC compiled a refined list of the five highest recommendations to improve the body of information for a future assessment. Below are those recommendations and the TC believes these should remain the focus for improvements to monitoring Jonah crab.

- Inter-molt duration of adult crabs is currently unknown and growth increment data for mature crabs is limited. There are no growth data from OSNE where the bulk of the fishery occurs and differences in growth between regions are unknown. These data need to be collected.
- Video surveys should be conducted on existing survey platforms for snapshot estimates of total stock size (i.e., swept-area biomass) that could be used to gain a better understanding on exploitation levels. These data would also be useful for validating trends from existing gears (i.e., trawls) and understanding potential catchability effects, such as temperature.
- Research should be conducted to provide a more comprehensive understanding of recruitment dynamics, including tracking of spatio-temporal settlement dynamics and the source of recruitment to OSNE, to inform development of Jonah crab settlement surveys.
- Little is known about ecosystem/environmental drivers of Jonah crab population dynamics. Studies should be done to identify and understand these drivers, particularly of recruitment.
- Determine how to interpret fisheries-dependent data considering interactions between fishery response to abundance, economic drivers, and lobster fishery dynamics.