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Proceedings of the Regional Peer Review of the Stock Assessment of American Lobster in Lobster Fishing Area (LFA) 41

September 27-28, 2017
Dartmouth, Nova Scotia

Chairpersons: Lottie Bennett and Manon Cassista-Da Ros
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May 2021

Canada

Foreword

The purpose of these Proceedings is to document the activities and key discussions of the meeting. The Proceedings may include research recommendations, uncertainties, and the rationale for decisions made during the meeting. Proceedings may also document when data, analyses or interpretations were reviewed and rejected on scientific grounds, including the reason(s) for rejection. As such, interpretations and opinions presented in this report individually may be factually incorrect or misleading, but are included to record as faithfully as possible what was considered at the meeting. No statements are to be taken as reflecting the conclusions of the meeting unless they are clearly identified as such. Moreover, further review may result in a change of conclusions where additional information was identified as relevant to the topics being considered, but not available in the timeframe of the meeting. In the rare case when there are formal dissenting views, these are also archived as Annexes to the Proceedings.

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SUMMARY

A regional science peer review meeting was held on September 27-28, 2017, at the Bedford Institute of Oceanography in Dartmouth (BIO), Nova Scotia, to assess the stock status of American Lobster in Lobster Fishing Area (LFA) 41 and to provide management advice in a manner consistent with the Fisheries and Oceans Canada (DFO) precautionary approach. As outlined in the Terms of Reference, the focus of the meeting was to apply the suite of indicators proposed during the 2017 stock framework to assess the stock status of Lobster in LFA 41 and to evaluate the primary indicators against the reference points for LFA 41. Participation in this meeting included DFO Science and Fisheries Management, non-DFO scientists, environmental non-government organization, and the fishing industry.

American Lobster (*Homarus americanus*) is found in coastal waters from Maryland to southern Labrador, with the major fisheries concentrated around Gulf of Maine and the Gulf of St. Lawrence areas. The LFA 41 stock boundaries are offshore encompassing the Scotian Shelf, Gulf of Maine and Georges Bank. The last stock assessment was conducted in January 2014 and was consistent with the stock framework adopted in December 2013. The 2017 Framework presented a suite of primary and contextual indicators for use as stock assessment indicators, as well as upper stock and limit reference indicators.

This proceedings document includes a summary of the presentation and is the record of the meeting discussions and conclusions. The Research Document and Science Advisory Report resulting from this meeting will be published on the Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat's (CSAS) Website.

INTRODUCTION

American Lobster (*Homarus americanus*) is found in coastal waters from Maryland to southern Labrador, with the major fisheries concentrated around Gulf of Maine and the Gulf of St. Lawrence areas. Though lobster is most common in coastal waters, they are also found in deeper, warm water areas of the Gulf of Maine and along the outer edge of the continental shelf from North Carolina to Sable Island.

The offshore fishery for American Lobster in Lobster Fishing Area (LFA) 41 was established in 1971, although fishing occurred prior to this time. The LFA 41 fishing area is delineated by the inshore/offshore 50 nautical mile line off of Nova Scotia, and extends from Georges Bank to the Laurentian Channel off of Cape Breton. It is the only lobster fishery in Canada managed with a total allowable catch, and has a total of 8 active licenses that are currently owned by one license holder.

The last stock assessment was conducted in January 2014 and was consistent with the stock framework adopted in December 2013 (DFO 2014; Pezzack et al. 2015). The last stock status update was completed in November 2016 (DFO 2017). The 2017 Framework (Cook et al. 2017) presented a suite of primary and contextual indicators for use as stock assessment indicators as well as upper stock and limit reference indicators. This stock assessment will assess the stock in a manner consistent with the stock framework developed for the fishery in January 2017.

The meeting Chairpersons, Lottie Bennett and Manon Cassista Da-Ros, introduced themselves, followed by an introduction of meeting participants (Appendix 1). The Chairs thanked meeting participants for attending the Fisheries and Oceans Canada (DFO) Regional Peer Review Process. The Chairs provided a brief overview of the Canadian Science Advisory Secretariat (CSAS) peer review process and invited participants to review the meeting Terms of Reference (Appendix 2) and Agenda (Appendix 3).

To guide discussions, a Working Paper had been prepared, which would be produced as a research document upon acceptance. The meeting Chairs noted that the meeting Working Paper is for purpose of meeting discussion, and is not to be used in any other forum, distributed, or cited. This Proceedings document constitutes a record of meeting discussions and conclusions, and any statements within should not be attributed as being consensus-based.

PRESENTATION AND DISCUSSIONS

ASSESSMENT OF OFFSHORE LOBSTER IN LFA 41

Working Paper: 2017 Assessment of the Offshore American Lobster (*Homarus americanus*) in LFA 41. CSAM Working Paper 2017/10.

Science Leads: A.M. Cook, B. Hubley, and C. Denton
Rapporteur: L. Bennett

Presentation Summary

Background information was presented on the history of the fishery and the life history of American Lobster. The results of the assessment, which applies the methods and agreed upon primary and contextual indicators from the 2017 framework, were presented with data to the end of 2016. A suite of standard indicators including total abundance, median and maximum size, mature and immature sex ratio, distribution patchiness, area occupied, abundance of large females, and recruit abundance were used to describe the changes in the LFA 41 Lobster stock

over time. In addition, ecosystem indicators including predation, bottom water temperature, and the Atlantic Multi-decadal Oscillation (AMO) provide some of the external factors that may impact Lobster productivity. Overall patterns suggest decreasing median and maximum size of Lobster stock over time, as well as decreasing predation pressure and increasing abundance, distribution, bottom temperature, and AMO.

Primary indicators consisted of commercial Lobster biomass indices and a reproductive potential indicator from the four bottom trawl surveys conducted within the region. The biomass primary indicator was assessed against the proposed reference points, which showed overall stock status being in the Healthy Zone as all four surveys were above their respective upper stock indicators. The reproductive potential primary indicator remains above the upper bound. Although median and maximum size are decreasing, the increase in abundance is expected to offset this reduction, resulting in high levels of reproductive potential.

An analysis of bycatch indicates the levels of bycatch in the LFA 41 Lobster fishery have been decreasing in recent years. The most frequently captured non-target species include Jonah Crab, Cusk, Atlantic Cod, Red Hake, White Hake, and Sea Raven.

Discussion

Estimation of Incidental Catch

It was asked why estimates of incidental catch were prorated by landings rather than effort. It was clarified that while data on landings is recorded, the recording of data in the Industry Surveys Database (ISDB) is limited to traps for which there is an associated animal and that the database is unable to record information on empty traps. Once the database is modified, and information on empty traps can be entered into it, estimates of incidental catch can be prorated by effort.

There was a discussion of the at-sea observer coverage for the Lobster fishery in LFA 41. The implemented sampling plan proposed at-sea observed trips for the first commercial fishing trip of the month in March, May–July, November and December, resulting in 6 sampled trips per year, which was considered low by a meeting participant. It was suggested that at-sea observer coverage use a random style deployment or be deployed to areas with historically high level of bycatch, rather than a fixed time deployment schedule. There was a concern that fishing grounds with high levels of bycatch could be missed with the current deployment schedule. The influence of the current sampling scheme relative to a random deployment is not known; however, fishing patterns appear consistent and estimates of incidental catch are, therefore, not anticipated to be biased.

It was suggested that the at-sea sampling schedule be amended to increase sampling effort on a less frequent sampling schedule, therefore, the completion of 12 observed trips every 2 years rather than 6 observed trips per year. Altering the sampling schedule can be problematic when considering inter-annual variability, especially in highly variable years which are not indicative of stock norms. It was suggested that the sampling frequency be reviewed, with the needs of other data users being considered.

There was a discussion on the Catch Per Unit Effort (CPUE) associated with the Lobster fishery in LFA 41. It was noted that the assessment contains little information on CPUE. Estimates of effort per trip have not been calculated; however, data pertaining to the amount of effort per trip could be extracted from the fishery log books.

Review of Indicators

Differences between the United States of America (USA) and Canadian fishery-independent trawl surveys were discussed. The USA trawl surveys catch smaller and a wider size range of lobsters than the Canadian trawl survey. These differences are likely due to differences in survey design, as the USA trawl surveys are conducted closer to shore in shallower water than the Canadian survey.

Throughout the peer review, meeting participants made numerous suggestions for improving the clarity of the text and the presentation of figures and tables within the Working Paper. These suggestions were noted and provided to the author for consideration.

Analyses of at-sea samples indicate decreases in both the median and maximum size of Lobster in LFA 41. Since trap design has not changed, recruitment of Lobster from surrounding LFAs was proposed as a reason for the decreases in size distribution. Due to limited at-sea sampling of Lobster in the inshore fishery, a comparison of trends between the inshore and offshore fishery is not possible at this time.

Unlike previous assessments that only considered length of female Lobster, the current assessment considers the length of both male and female Lobster. Both sexes are important to the reproductive potential of the population and the inclusion of both male and female Lobster increases the sample sizes used for the analysis, which had been very restrictive in previous assessments.

It was asked whether predator species were weighted for the analysis of the predator index. Information on consumption rates of predator species is required to weight the species and provide a better metric. This information is currently unavailable.

The species distribution modelling used in the assessment was discussed. It was asked how 0.35 was chosen as the probability of suitable habitat threshold. The threshold of 0.35 was considered a trade-off between the information from the model and the level of background noise associated with it. Modelling results indicate an increase in the amount of Lobster habitat in recent years, with greater than 80% of the LFA 41 being classified as suitable habitat in 2016. It was noted that, statistically, this is likely an over estimate of suitable habitat based on the errors associated with the analysis and ecologically, an underestimate of suitable habitat as the decrease in Lobster patchiness suggests that area and habitat are expanding.

It was also asked whether sediment data and salinity were considered as variables in the species distribution model. Salinity was not considered for inclusion in the model as the length of the data time series is short and it is anticipated that there will be little variability in the data. It was suggested that remote sensing data for the area be considered for future use. Sediment data is also accessible through different sources (i.e., National Oceanic and Atmospheric Administration).

Within LFA 41, the minimum legal size is smaller than the size at 50% maturity (SoM). It was asked if there is a concern given increasing bottom temperatures. The impact of increasing water temperature on the fishery is unknown; however, it is anticipated that Lobster will change with increasing temperatures. It is recommended that the SoM continue to be monitored so changes to SoM can be detected and assistance can be provided to fisheries management in response to any changes.

There was a discussion on the factors that contribute to differences in catchability between traps and a trawl survey. While traps offer an increased temporal sample distribution, trawl surveys are not reliant on animal behaviour or extraneous factors such as bait choice. It was suggested

that trap surveys be standardized to ensure catchability data can be utilized, noting that standardizing trap surveys to one boat would be difficult.

In 1979, an area adjacent to LFA 41 was closed to Lobster fishing on Browns Bank, known as LFA 40. This closure was to protect Lobster broodstock, and continues to remain in effect today. It was asked whether LFA 40 has been evaluated as a broodstock area. It remains unclear whether the abundance of Lobster in LFA 40 is a result of non-fishing, changing environmental conditions, or both. A tagging program that monitors the movement of Lobster in the area was suggested to evaluate the effectiveness of LFA 40 as a brookstock area.

Reference Points and Stock Status

Overall stock status for the LFA 41 fishery will be determined from the combination of all survey indices relative to their upper stock and lower reference indicators. It was recommended that the Working Paper clarify how the stock would move between the Healthy, Cautious, and Critical zones to better understand the implications of the zone a survey index may find itself in.

It was questioned why the lowest biomass from which the stock has rebuilt, $B_{recover}$, defined as the median of the five lowest non-zero biomass in each time series, was chosen as Limit Reference Indicator (LRI) rather than a percentage of the biomass at the maximum sustainable yield, B_{msy} (e.g. LRI = 40% B_{msy}). The survey commercial biomass index has been zero in years where commercial-size Lobsters were landed. The $B_{recover}$ is considered to be a low value for the limit reference point as the commercial biomass levels equate to few Lobsters captured in the survey. Due to Lobster behavior and inability of the survey trawls to sample Lobsters in all habitat types, a low LRI based on trawl survey data is not expected to limit the stock's ability to recover.

There was a discussion concerning the selection of a target reference point for the LFA 41 Lobster fishery. It was clarified that DFO Science only considered biological productivity objectives when defining the reference points for this stock. Socio-economic objectives are considered by Resource Management in consultation with the fishing industry.

Stock Assessment Schedule, Triggers, Update Format

A five year assessment schedule, with triggers for an earlier than scheduled assessment, was proposed and accepted by meeting participants. Proposed assessment triggers included: stock status that approaches the Cautious Zone for two of the four survey indices or if any unforeseen change in stock characteristics become a cause for concern. During interim years, a CSAS Science Response Report will be produced showing the commercial biomass time series, reproductive potential, time series of anomalies from the biological and ecological indicators, and the status of those results in relation to reference points, and bycatch plots. A new framework would be triggered if the current approach does not provide the required information to characterize stock status.

DOCUMENTS

It was agreed that the Working Paper by Cook et al. (WP 2017/10) should be published as a Research Document. A CSAS Science Advisory Report (SAR) will also be published. Revised text in the SAR will be sent to meeting participants after the meeting for review and finalization. All meeting products will be published on the Fisheries and Oceans Canada (DFO) Canadian Science Advisory Secretariat's (CSAS) Website.

This CSAS Proceedings Document constitutes the record of meeting discussions, recommendations, and conclusions.

REFERENCES CITED

Cook, A.M., Cassista-Da Ros, M., and Denton, C. 2017. Framework Assessment of the Offshore American Lobster (*Homarus americanus*) in Lobster Fishing Area (LFA) 41. DFO Can. Sci. Advis. Sec. Res. Doc. 2017/065. viii + 186 p.

DFO. 2014. Assessment of Lobster (*Homarus americanus*) in Lobster Fishing Area 41 (4X + 5Zc). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/034 (Revised).

DFO. 2017. Lobster (*Homarus americanus*) in Lobster Fishing Area 41 (4X + 5Zc): 2016 Stock Status Update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/015.

Pezzack, D.S., C. Denton, M. Cassista-Da Ros, and M.J. Tremblay. 2015. Assessment of the Canadian LFA 41 Offshore Lobster (*Homarus americanus*) Fishery (NAFO Divisions 4X 5Zc). DFO Can. Sci. Advis. Sec. Res. Doc. 2015/066. v + 79 p.

APPENDICES

APPENDIX 1: LIST OF MEETING PARTICIPANTS

Name	Affiliation
Beauchamp, Brittany	DFO HQ / Fish Population Science
Bennett, Lottie	DFO Maritimes / Centre for Science Advice
Boyd, Catherine	Clearwater Seafoods
Cassista-Da Ros, Manon	DFO Maritimes / Population Ecology Division
Cook, Adam	DFO Maritimes / Population Ecology Division
Denton, Cheryl	DFO Maritimes / Population Ecology Division
Greenlaw, Michelle	DFO Maritimes / Population Ecology Division
Hanrahan, Joe	NS Department of Fisheries and Aquaculture
Howse, Victoria	DFO Newfoundland / Ecosystem Management
Hubley, Brad	DFO Maritimes / Population Ecology Division
Karbowski, Chelsey	Ecology Action Center
Miller, Robert	Ecology Action Center
Nasmith, Leslie	DFO Maritimes / Population Ecology Division
Penney, Christine	Clearwater Seafoods
Quigley, Sara	DFO Maritimes / Resource Management

APPENDIX 2: TERMS OF REFERENCE

Stock Assessment of American Lobster in Lobster Fishing Area (LFA) 41

Regional Peer Review – Maritimes Region

September 27-28, 2017
Dartmouth, NS

Chairpersons: Manon Cassista-Da Ros and Lottie Bennett

Context

American Lobster (*Homarus americanus*) is found in coastal waters from Maryland to southern Labrador, with the major fisheries concentrated around Gulf of Maine and the Gulf of St. Lawrence areas. Though lobster is most common in coastal waters, they are also found in deeper, warm water areas of the Gulf of Maine and along the outer edge of the continental shelf from North Carolina to Sable Island.

Lobster in Lobster Fishing Area (LFA) 41 is assessed on a multi-year assessment schedule, with stock framework and assessment science advisory processes conducted approximately every five years and stock status updates conducted in the interim years. The last stock assessment was conducted in January 2014 and was consistent with the stock framework adopted in December 2013 (DFO 2014; Pezzack et al. 2015). The last stock status update was completed in November 2016 (DFO 2017). The 2017 Framework presented a suite of primary and contextual indicators for use as stock assessment indicators as well as upper stock and limit reference indicators. This stock assessment will assess the stock in a manner consistent with the stock framework developed for the fishery in January 2017.

Objective

The objectives of this Regional Advisory Process are to:

- Apply the suite of primary and secondary indicators proposed during the 2017 Stock Framework Regional Advisory Process to assess the stock status of the LFA 41 lobster to the end of the 2016 season.
- Evaluate the primary indicators against the reference points for LFA 41.
- Assess the risk of the historical total allowable catch of 720 tonnes.
- Estimate the level of incidental catch (including lobster) and the retention of non-lobster species, and report on information available on the survival of discarded target species.
- Identify indicators which would be used to characterise stock status in the intervening years of the multi-year stock assessment cycle.
- Identify changes in the indicators (trigger values) that would suggest an earlier than scheduled assessment is warranted.
- Propose the frequency and timing of interim-year updates to be provided between full peer-reviewed stock assessments as well as the information to be included within the updates.

Expected Publications

- Science Advisory Report
- Proceedings
- Research Document(s)

Expected Participation

- DFO Science
- DFO Fisheries and Aquaculture Management
- Provincial governments (NS)
- Aboriginal communities / organizations
- Industry Representatives
- Environmental Non-Government Organizations

References

DFO. 2014. Assessment of Lobster (*Homarus americanus*) in Lobster Fishing Area 41 (4X + 5Zc). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2014/034 (Revised).

DFO. 2017. Lobster (*Homarus americanus*) in Lobster Fishing Area 41 (4X + 5Zc): 2016 Stock Status Update. DFO Can. Sci. Advis. Sec. Sci. Resp. 2017/015.

Pezzack, D.S., C. Denton, M. Cassista-Da Ros, and M.J. Tremblay. 2015. Assessment of the Canadian LFA 41 Offshore Lobster (*Homarus americanus*) Fishery (NAFO Divisions 4X 5Zc). DFO Can. Sci. Advis. Sec. Res. Doc. 2015/066. v + 79 p.

APPENDIX 3: MEETING AGENDA

American Lobster (LFA 41) Assessment

Regional Peer Review – Maritimes Region

27-28 September 2017
Lewis King Boardroom, BIO
Dartmouth, Nova Scotia

Chairpersons: Lottie Bennett and Manon Cassista-Da Ros

DRAFT AGENDA

DAY 1 (Wednesday, September 27, 2017)

Time	Topic
9:00 – 9:15	Welcome and Introductions
9:15 – 10:00	Background and Review of Framework
10:00 – 10:30	Estimation of Incidental Catch
10:30 – 10:45	Break (hospitality provided)
10:45 – 12:00	Review of Indicators
12:00 – 1:00	Lunch (hospitality not provided)
1:00 – 1:45	Review of Indicators
1:45 – 3:00	Reference Points and Stock Status of LFA 41
3:00 – 3:15	Break (hospitality not provided)
3:15 – 4:15	Qualitative Risk Assessment of Harvest Strategies

DAY 2 (Thursday, September 28, 2017)

Time	Topic
9:00 – 9:15	Recap of Day 1
9:15 – 10:30	Stock Assessment Schedule, Triggers, Format of Updates
10:30 – 10:45	Break (hospitality provided)
10:45 – 12:00	Review of Science Advisory Report
12:00 – 1:00	Lunch (hospitality not provided)
1:00 – 3:00	Review of Science Advisory Report
3:00 – 3:15	Break (hospitality not provided)
3:15 – 4:00	Review of Science Advisory Report
4:00 – 4:15	Wrap up