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## **Canadian Science Advisory Secretariat (CSAS)**

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**Maritimes Region**

### **Proceedings of the Regional Peer Review of the Stock Assessment of St. Mary's Bay Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) Fishery**

**Meeting Date: March 3, 2020**

**Location: Dartmouth, NS**

**Chairperson: Lottie Bennett**

**Editor: Lottie Bennett**

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## 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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### ***Aussi disponible en français :***

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## SUMMARY

A regional peer review of the stock assessment of the St. Mary's Bay Longhorn Sculpin fishery was held on March 3, 2020, at the Bedford Institute of Oceanography in Dartmouth, Nova Scotia to review available information for evaluating the sustainability of the fishery and to identify indices to monitor the fishery. Participation in this meeting included Fisheries and Oceans Canada (DFO) and the fishing industry.

The main indicator used to assess stock status is a Limit Reference Point (LRP) based on 40% of the 1999-2019 Catch Per Unit Effort (CPUE) time series. A smoothed CPUE index, calculated using a 3-year moving median to reduce variability in the time series, was used to determine the current level of relative abundance in relation to the LRP. Additional indicators that could be used to monitor/assess stock status in future assessments were proposed. These indicators support the conclusion that the stock is now approaching the Cautious/Critical Zone boundary.

This proceedings document includes a summary of the presentations and is a record of the meeting discussions and conclusions. A Science Advisory Report and Research Document resulting from this meeting will be published on the [Fisheries and Oceans Canada \(DFO\) Canadian Science Advisory Secretariat's \(CSAS\) Website](#) as they become available.

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## INTRODUCTION

The Longhorn Sculpin is a bottom-dwelling fish found in coastal waters of the western North Atlantic, ranging from the Strait of Belle Isle, Newfoundland, south to the coast of northern Virginia (Collette and Klein-MacPhee 2002). Off Nova Scotia, they are found on Banquereau and Sable Island Bank and are also common throughout the Bay of Fundy and St. Mary's Bay.

An assessment of this fishery occurred in 2008 (DFO 2008). The assessment noted that catch rates declined during the 1999-2006 directed fishery, then stabilized at low levels, and the abundance of larger sculpin declined during this period, as well as the size of sculpin in the adjacent Fisheries and Oceans Canada (DFO) Summer Research Vessel (RV) Survey stratum (490). Although a precise estimate of the exploitation rate was not available, within season exploitation rates were considered to be high (>30%), but insufficient information was available at the time to determine what level would be sustainable. Industry participants have recently expressed concern about the sustainability of this fishery and the decreasing size of Longhorn Sculpin in their catches.

The meeting Chairperson, Lottie Bennett, introduced herself, followed by an introduction of meeting participants (Appendix 1). The Chair thanked meeting participants for attending the DFO Regional Peer Review Process. The Chair 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 draft Science Advisory Report was prepared and distributed to participants prior to meeting. This Proceedings report constitutes a record of the meeting discussions, and any statements within should not be attributed as being consensus-based.

## PRESENTATION AND DISCUSSION

### ASSESSMENT OF ST. MARY'S BAY LONGHORN SCULPIN FISHERY

Working paper: Assessment of St. Mary's Bay Longhorn Sculpin (*Myoxocephalus octodecemspinosus*), 1999-2019.

Science Leads: H. Stone

Rapporteur: L. Bennett

### Presentation Summary

Background information was presented on the life-history of Longhorn Sculpin and the fishery. A directed fishery for Longhorn Sculpin in St. Mary's Bay began in 1999 and has continued through to 2019, with the exception of 2007 and 2008 when the fishery was closed. The fishery occurs over a 6-week period during April and May, and the sculpin catch is sold for lobster bait.

Fishery and survey indices, commercial catch and exploitation rates, and bycatch data were evaluated. Longhorn Sculpin fishery landings from St. Mary's Bay peaked at 235 t and 229 t in 2011 and 2012, but declined to 29 t in 2019. At the same time, landings of Winter Flounder bycatch increased and currently exceed those of Longhorn Sculpin. The average size of Longhorn Sculpin and percentage of fish >23 cm (size at 50% maturity) in fishery catches has been below the long-term average since 2015. The average size of Longhorn Sculpin and percentage >23 cm in DFO Summer Research Vessel Survey catches also show a declining trend in strata surveyed in 4X, including stratum 490 (adjacent to St. Mary's Bay) from 1970-2019, but the decline is steeper for stratum 490, especially since 2000.

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Indices that could be developed to monitor the sustainability of the St. Mary's Bay sculpin fishery, including a proxy for an LRP, were examined. The median of the CPUE time series was used as a proxy for biomass at maximum sustainable yield ( $B_{MSY}$ ). An LRP was calculated as 40% of  $B_{MSY}$ .

## **Discussion**

### **DFO Survey Trends**

There is no directed survey for Longhorn Sculpin in St. Mary's Bay. The DFO Summer RV Survey currently completes four tows in stratum 490, which is immediately adjacent to St. Mary's Bay. Prior to 1990, two tows were completed in the stratum. The tows are located in the outer Bay of Fundy on both sides of Digby Neck. Large portions of sea bottom within stratum 490 are untrawlable, and it was noted that the limited number of tows result large annual variability within the survey results.

It was questioned whether the change in survey vessel/net and number of tows impacted Longhorn Sculpin abundance/biomass estimates. Sculpin abundance appears to increase following the switch in survey vessel/net in 1983 and decrease in abundance following the increase in the number of tows. Since 2010, catches of Longhorn Sculpin have been lower than the long-term mean (1970-2019). Although the DFO Summer RV Survey shows that the overall spatial distribution has not changed, there has been a notable decrease in survey catches on the eastern Scotian Shelf and outer Bay of Fundy. A similar trend was noted for skates and American Plaice. The condition factor (Fulton's K) based on Longhorn Sculpin length and weight data collected from the DFO Summer RV Survey has declined in mature fish since 2015, suggesting that environmental conditions are changing.

Total biomass indices may not reflect the spatial changes in the survey biomass distribution, which indicate a loss of production in Longhorn Sculpin in recent years. Current biomass indices suggest that Longhorn Sculpin biomass is near the mean biomass for the entire time-series (1979-2019). It was suggested that error bars be placed on DFO Summer RV Survey biomass estimates to show the variability associated with annual biomass estimates and to plot the catch per tow to compare biomass estimates between 4X and 4VW. It was also suggested that biomass trend plots could include a line denoting 40% of the long-term or high productivity as an indicator of stock status.

### **Fishery Catch-at-Size Based on at-sea Observer Sampling**

It was questioned whether changes in observer coverage impacted the size distribution of the stock. Previously, observer coverage was 100% and spread over the duration of the 6-week fishery. Currently, observer coverage is <20% and occurs over the last 4 weeks of the fishery. It was suggested that size distribution in years of 100% coverage be compared to years with 4 weeks coverage to determine if changes in observer coverage might coincide with changes in size distribution.

Changes in distribution of Longhorn Sculpin within St. Mary's Bay were noted. In years of high abundance, Longhorn Sculpin moved inshore from deeper water as water temperatures started to rise and remained in shoal waters as temperatures warmed; however, due to fishing pressure and stock declines, sculpin are not migrating from deeper to shoal water. Smaller fish remain offshore while mature fish migrate to shoal water. It was suggested that the data be analyzed to determine if there are monthly differences in size that reflect changes in the location of the fishery.

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It was questioned if the catch-at-size data is representative of the whole fishery. Size composition within the tows can be quite variable and is determined by fishing method. Likewise, if a tow contained a large portion of small fish, then another area may be fished as the industry is trying to avoid small fish in their catches. The data suggest that small fish are not being recorded. The collection of this information would indicate whether recruitment pulses were occurring. The standard protocol for observers is to sample Longhorn Sculpin from at least two tows per day (up to 200 fish per sample) from the directed fishery, and to obtain one bycatch length-frequency sample for the most abundant bycatch species. Fishing industry participants indicated that if they were aware of how the data would be used, they would have ensured that all tows were getting measured since the tow that is sampled can impact the results. It was suggested that the protocol for collecting catch-at-size data be discussed as there is no small fish protocol for the fishery.

There were concerns about potential management scenarios in response to the declining trends in stock health indicators. There were also questions about the plan to accommodate the decline in the fishery, as sculpin could be caught as bycatch in other fisheries. It was noted that management scenarios were outside the scope of the meeting; however, license holders suggested that if the fishery was closed, a sentinel survey should be considered to collect baseline data. This survey could provide information on the timing of Longhorn Sculpin migration to shoal waters in the absence of a fishery and on the impact of a fishery closure in relation to stock status.

It was noted that the size of fish collected in the DFO Summer RV Survey are smaller than fish collected in the fishery. This difference likely reflects the difference in fishing gear. It is difficult to compare the size of fish because of differences in gear selectivity.

### **Directed Fishery Bycatch**

Bycatch in the directed Longhorn Sculpin fishery was discussed. Logbook data from the Maritimes region landings database (MARFIS) indicate increases in Winter Flounder and Haddock landings despite declining Longhorn Sculpin catches. It was questioned whether the number of Winter Flounder or the percentage caught in the fishery has increased. It was suggested that amount rather than the percentage of bycatch be included in meeting documentation. To prevent Winter Flounder bycatch, the fishing industry uses separator panels in their nets to allow for the escapement of small fish and only tow in shoal waters <15 fm for an hour. Small Winter flounder are not retained, and the license holders try to operate close to the 10% bycatch threshold.

Differences in the reported catches of Winter Flounder were noted between the 2008 and the current Longhorn Sculpin assessment. Catches reported in the current assessment are prorated to estimate the total bycatch in the fishery, which could account for the differences between the assessments.

### **Fishery Exploitation Estimates**

A depletion model was used to estimate in-season exploitation rates of the directed fishery. For this method to work, the model assumes a closed population; however, the potential of fish migration and its impact on the model were noted. Depletion studies are effective when fishing occurs in the same area over a short time period; however depletion will not be evident when fisheries are expanding their search area since this can affect CPUE. Within St. Mary's Bay, the Longhorn Sculpin fishery is restricted within the Bay. It was suggested that the assessment documentation include information on geographic extent of the fishery.

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Several suggestions for improvements and clarification to depletion estimates included: 1) plotting the CPUE and cumulative catch data on the same scale to examine interannual variability, 2) reporting biomass estimates in a table to show how these align with the fishery closure and the fishing up and fishing down trends and, 3) to evaluate removing the early period of the fishery (1999-2006) from the analysis and focus on the recent time period for the analysis.

### **Stock Status Indicators**

The primary indicator for assessing stock status was discussed. In the absence of direct survey coverage of St. Mary's Bay, Catch Per Unit Effort was selected as the primary indicator. It was questioned whether there was another proxy that could be used since resources may not be available in the future to calculate the CPUE index and to annually assess it against reference points.

It was questioned whether the whole time series (1999-2006 and 2009-2019) or the later time period of the fishery (2009-2019) should be used to calculate the LRP. An analysis indicated that restricting data to the recent time period (2009-2019) resulted in a time period that was too short to provide a meaningful LRP, so meeting participants agreed that data for the whole time series (1999-2019) should be used when calculating the LRP.

### **DOCUMENTS**

It was agreed that the working paper should be published as a Research Document. A Science Advisory Report (SAR) will also be published. All meeting products will be published on the [Fisheries and Oceans Canada \(DFO\) Canadian Science Advisory Secretariat's \(CSAS\) Website](#) as they become available.

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

### **REFERENCES CITED**

- DFO. 2008. St. Mary's Bay Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) Assessment. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/051.
- Collette, B.B. and G. Klein-MacPhee (Editors). 2002. Bigelow and Schroeder's Fishes of the Gulf of Maine. 3rd Ed. Smithsonian Institution Press, Washington, DC.



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## APPENDICES

### APPENDIX 1. LIST OF PARTICIPANTS

<b>Name</b>	<b>Affiliation</b>
Heath Stone	DFO Science, Maritimes Region
Daphne Themelis	DFO Science, Maritimes Region
Rod Bradford	DFO Science, Maritimes Region
Peter Comeau	DFO Science, Maritimes Region
Lottie Bennett	DFO Science, Maritimes Region
Penny Doherty	DFO Resource Management, Maritimes Region
Jemie Lent	DFO Resource and Aboriginal Fisheries Management, Maritimes Region
Alan Thurber	License Holder
Roy Thurber	License Holder
Edward Theriault	License Holder

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## **APPENDIX 2. TERMS OF REFERENCE**

### **Assessment of the St. Mary's Bay Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) Fishery**

#### **Regional Advisory Process – Maritimes Region**

**March 3, 2020**  
**Dartmouth, NS**

Chairperson: Lottie Bennett

#### **Context**

The Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) is a bottom dwelling fish found in coastal waters of the western North Atlantic ranging from the Strait of Belle Isle, Newfoundland, south to the coast of northern Virginia. Off Nova Scotia, they are found on Banquereau and Sable Island banks and are also common throughout the Bay of Fundy and St. Mary's Bay. A directed fishery for longhorn sculpin in St. Mary's Bay (Nova Scotia) began in 1999. The fishery occurs over a 6 week period in April-May, and is limited to 4 license holders.

An assessment of this fishery occurred in 2008 (DFO 2008). The assessment noted that catch rates declined during the 1999-2006 directed fishery then stabilized at low levels and the abundance of larger sculpin declined during this period as well as the size of sculpin in the adjacent RV survey stratum. Although a precise estimate of the exploitation rate was not available, within season exploitation rates were considered to be high (> 30%) but insufficient information was available at the time to determine what level would be sustainable.

Fisheries and Oceans (DFO) Resource Management has asked DFO Science to review all information available for evaluating the sustainability of this fishery, including fishery and survey indices, commercial fishery catch rates and in-season exploitation rates, and bycatch of non-target species, and to identify indices to monitor the fishery.

#### **Objectives**

The objectives of this meeting are:

- Evaluate abundance trends and current status using fishery indices and surveys
- Estimate exploitation rate
- Evaluate by-catch of non-target species
- Identify indices that could be developed to monitor the sustainability of the St. Mary's Bay sculpin fishery, including a proxy for a Limit Reference Point

#### **Expected Publications**

- Science Advisory Report
- Proceedings
- Research Document

#### **Expected Participation**

- DFO Science
- DFO Resource Management
- Provincial Government
- Fishing Industry

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## References

DFO. 2008. St. Mary's Bay Longhorn Sculpin (*Myoxocephalus octodecemspinosus*) Assessment. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2008/051.

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## APPENDIX 3. AGENDA

### DRAFT AGENDA

#### Assessment of St. Mary's Bay Longhorn Sculpin

#### Regional Peer Review – Maritimes Region

March 3, 2020

Hayes Boardroom  
Bedford Institute of Oceanography  
Dartmouth, Nova Scotia

**Chairperson: Lottie Bennett**

<b>Time</b>	<b>Subject</b>	<b>Presenter</b>
0900	Introductions Housekeeping CSAS Overview and Procedures	Chair
0915	Overview Biological Information and Current Data	Author
1030	<b>Break</b>	
1045	Group Discussion	All
1200	<b>Lunch Break (not provided)</b>	
1300	Review Science Advisory Report	All
1430	<b>Break</b>	
1445	Review Science Advisory Report	All
1630	<b>Adjourn for the Day</b>	