



UPDATE OF SPAWNER ABUNDANCE AND BIOLOGICAL CHARACTERISTICS OF STRIPED BASS (*MORONE SAXATILIS*) IN THE SOUTHERN GULF OF ST. LAWRENCE TO 2019

Context

The Striped Bass population of the southern Gulf of St. Lawrence had declined to less than 5,000 spawners in the late 1990s and subsequently increased to over 900,000 spawners by 2017. Due to conservation concerns, the commercial fishery closed in 1996 and the recreational and aboriginal fisheries for Striped Bass were closed in 2000. A small number of food, social, and ceremonial (FSC) fisheries were reinstated in 2012 and allocations of Striped Bass to Indigenous groups have gradually increased since then. The recreational fishery reopened in 2013 and a pilot Indigenous commercial fishery began in 2018. With continued requests for additional access to southern Gulf Striped Bass, Fisheries and Oceans Canada (DFO) Gulf Ecosystems and Fisheries Management branch requested an update on the size of the spawning stock and information on biological characteristics to 2019.

This Science Response Report results from the Science Response Process of January 8, 2020 on the Update of indicators for the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, in 2019.

Background

Southern Gulf of St. Lawrence Striped Bass (*Morone saxatilis*) are distributed in near shore waters and estuaries from the eastern tip of the Gaspé Peninsula in Quebec to the northern tip of Cape Breton Island, Nova Scotia. The only spawning location known to produce annual recruitment in the southern Gulf of St. Lawrence is the Northwest Miramichi River (NW); consequently, this was the location chosen to develop annual abundance indices. Since 1994, monitoring of the bycatch in the commercial gaspereau trapnets of the Miramichi River has been the principal source of information for assessing the Striped Bass spawning population of the southern Gulf. The spawner abundance was usually estimated from mark and recapture experiments in which adult Striped Bass were tagged early in May and monitored throughout June as they were captured and released as bycatch in the gaspereau fishery of the Northwest Miramichi estuary (Bradford and Chaput 1996; Douglas and Chaput 2011). Catch per unit effort (CPUE) from this fishery has been used as an index of abundance for Striped Bass (Douglas and Chaput 2011). Biological characteristics (e.g. fork length, age, sex, and spawning stage) were recorded from fish captured in commercial gaspereau trapnets (May-June) and at index trapnet monitoring facilities operated by DFO Science (May-October).

Analysis and Response

Spawner abundance

For the purpose of the 2019 Striped Bass assessment program, one trapnet was operated in the Northwest Miramichi River (NW) between 13 May and 7 June specifically to tag Striped Bass and collect biological information on the population. In 2019, the regular gaspereau season in the NW was scheduled from 6 pm on 1 June to 6 pm on 29 June. Commercial fishing effort for gaspereau in the NW in 2019 was delayed because of small catches of gaspereau at downstream locations in the Miramichi River (Loggieville and Chatham) and also because of large catches of Striped Bass. The first gaspereau trapnet in the NW was not set until 10 June which resulted in the first date to monitor for Striped Bass bycatch on 12 June. Gaspereau catches were monitored regularly throughout the fishing season with 46 of a possible 192 (24%) trapnet hauls sampled for Striped Bass bycatch in the NW.

Striped Bass bycatch data collected between 12 June and 17 June was considered to be the most appropriate information to use for estimating the abundance of Striped Bass spawners in the NW. Similar to previous years, the bycatch of Striped Bass was highest early in the season and decreased to low levels by mid-June (Appendix 1). The first report of spawning Striped Bass in 2019 was in the Cassilis area (Northwest Miramichi) on 1 June (Appendix 1).

The Bayesian hierarchical model used in previous Striped Bass assessments was applied to the 2019 CPUE information from the gaspereau fishery (Chaput and Douglas 2011) (Appendix 2). Since 2014, an adjustment to the model has been made to account for the observed spawning behaviour of Striped Bass carrying internal acoustic tags (DFO 2015, 2016, 2017, 2018, 2019). The movements of 67 Striped Bass carrying acoustic transmitters were monitored with receiver arrays anchored throughout the Miramichi during May and June 2019. The tracking of acoustically tagged Striped Bass provided information on the daily distribution of spawners in the Miramichi system and therefore their availability (or not) to the capture in the gaspereau trapnets of the NW.

The median of the estimated spawner abundance in 2019 was 314,000 with a very wide confidence interval (5th to 95th percentiles range of 141,000 to 663,000) as in previous years (Figure 1). The catch rates on individual sampling dates were assumed to be proportional to the abundance of adult Striped Bass in the NW Miramichi. Spawner abundance for those dates was estimated as the product of the total spawner abundance at the beginning of the spawning period and the proportion of the acoustically tagged bass still in the Miramichi. Based on acoustically tagged bass data in 2019, the percentages declined from 42% on 12 June to 15% on 17 June (Appendix 1).

Catches of Striped Bass at DFO index trapnets at Millerton on the Southwest Miramichi River and at Cassilis on the Northwest Miramichi River provide fishery-independent indices of the southern Gulf Striped Bass population (Appendix 3). In 2019, the trapnet at Cassilis operated between 27 May and 24 October while the trapnet at Millerton operated between 3 June and 25 October. Counting individual Striped Bass at index trapnets when catches are large is impractical so estimation of the catch is sometimes required. The combined catch of Striped Bass at these facilities in May and June 2019 ($n = 13,700$) was lower than in 2017 and 2018 whereas the combined catch ($n = 16,900$) in September and October 2019 was the highest of the time series which begins in 1998 (Appendix 3).

The Recovery Potential Assessment (RPA) for Striped Bass, which was conducted to support the Species at Risk Act listing decision process, proposed a recovery limit and a recovery target for the southern Gulf Striped Bass spawning population in the Northwest Miramichi estuary

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(DFO 2006; Douglas et al. 2006). The proposed recovery limit was at least 21,600 spawners in five of six consecutive years. Once that was achieved, then the proposed recovery target for considering fisheries access was $\geq 31,200$ spawners in three of six consecutive years. It was also suggested that the 5th percentile of the spawner abundance estimate be used to assess status relative to these recovery objectives (DFO 2006; Douglas et al. 2006). The abundance of Striped Bass spawners in the Northwest Miramichi in 2019 exceeded the RPA recovery limit and recovery target for the ninth consecutive year (2011 to 2019) (Figure 1).

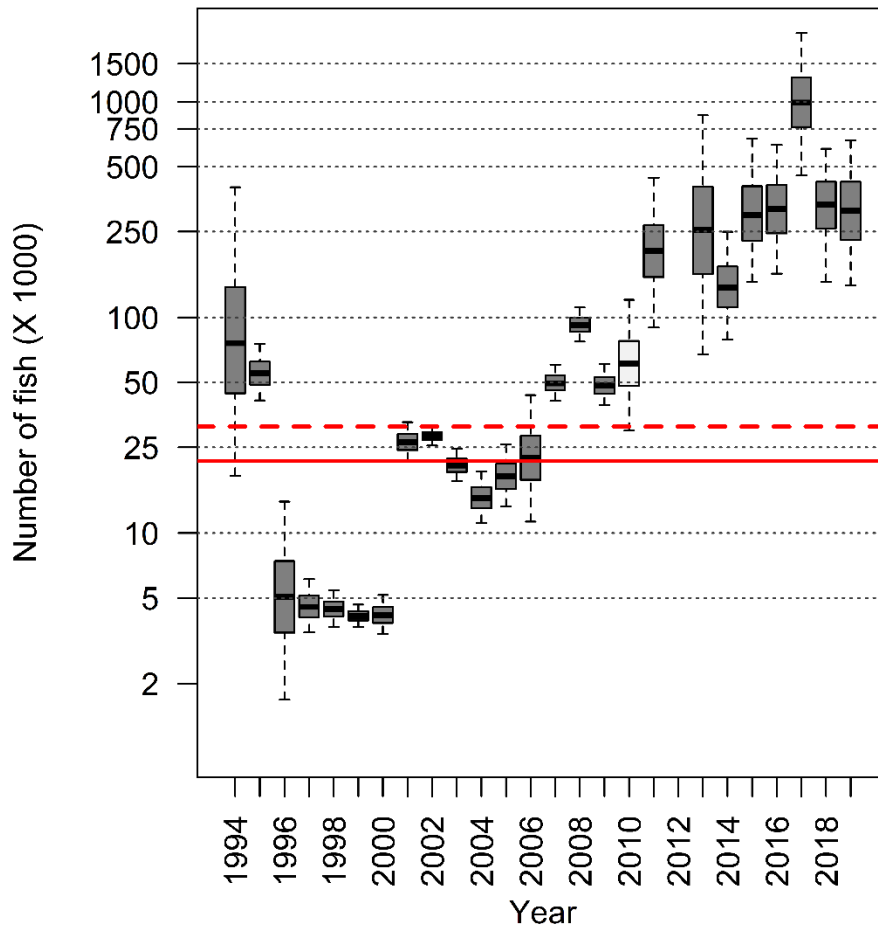


Figure 1. Estimated abundance of adult Striped Bass spawners in the Northwest Miramichi estuary between 1994 and 2019. The estimates are shown on a logarithmic scale for visibility of the full range of abundance values over the time series, from low abundances of approximately 5,000 spawners during 1996 to 2000 to the 2017 high value of approximately 1 million fish. The estimate for 2010 (unshaded interquartile box) is considered to be an underestimate due to the earlier timing of the spawning events (Douglas and Chaput 2011). There is no estimate for 2012 because spawning was very early and bass left the sampling area prior to monitoring activities, however based on indicators of abundance, it was concluded that the abundance exceeded the RPA recovery objectives for that year (DFO 2013). Box plots are interpreted as follows: dash is the median, boxes are the interquartile range, and the vertical dashes are the 5th to 95th percentile ranges. The solid and dashed horizontal lines show the recovery objectives defined in the Recovery Potential Assessment in support of the Species at Risk Act listing decision process (DFO 2006).

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Biological characteristics

The mean fork length (FL) of adult Striped Bass (assumed to be fish > 30 cm) measured in May and June 2019 was 50.5 cm (range 32.6 to 88.0 cm; n > 3,900). Twenty-eight percent of Striped Bass sampled had fork lengths between 30 and 45 cm, 62% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm total length (TL)), and 10% were 62 cm or greater (Figure 2).

For adult Striped Bass sampled during the months of September and October 2019, the mean fork length was 50.7 cm (range 30.2 to 87.0; n > 2,500). Nineteen percent of Striped Bass sampled had fork lengths between 30 and 45 cm, 72% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm TL), and 9% were 62 cm or greater (Figure 2).

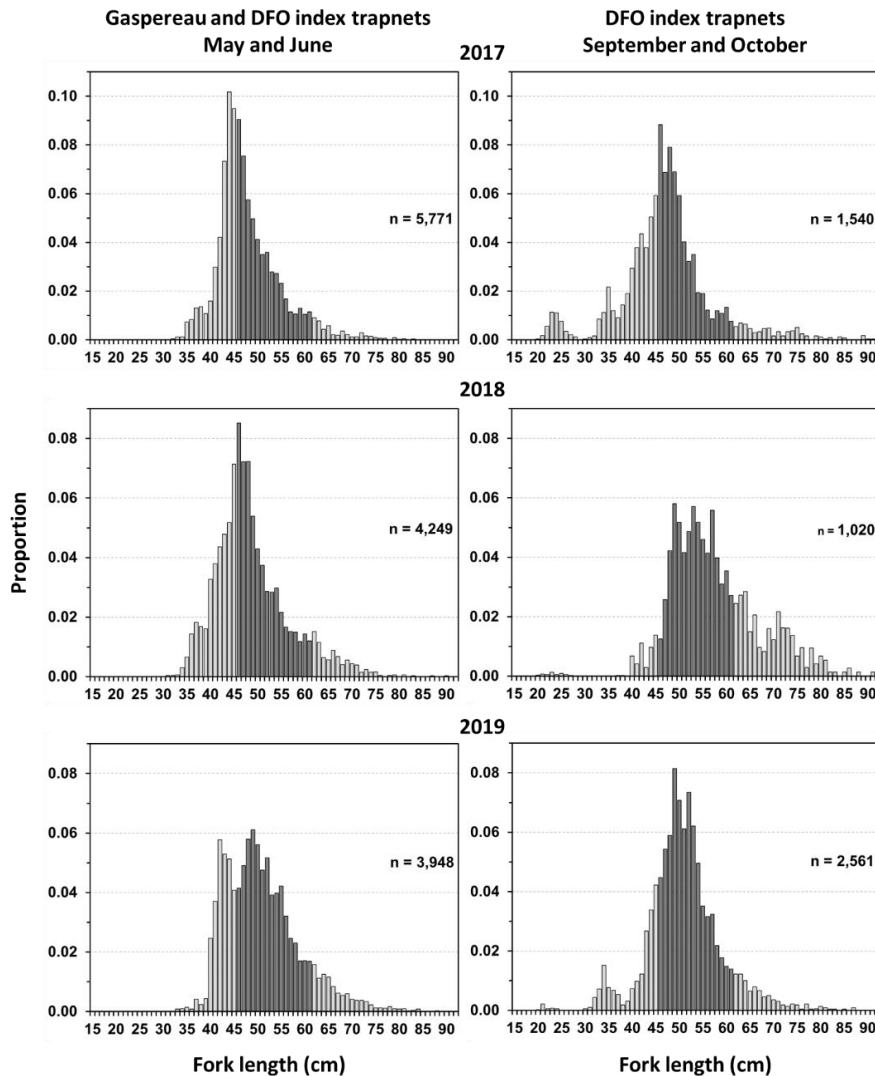


Figure 2. Relative fork length (cm) frequency distributions of Striped Bass sampled in May and June (left panel) and in September to October (right panel) from the gaspereau trapnet in the Northwest Miramichi and DFO index trapnets in 2017 (upper row), 2018 (middle row), and 2019 (lower row). The dark grey shading represents Striped Bass between 46 and 61 cm fork length which is equivalent to the current regulation slot size of 50 to 65 cm total length.

Conclusions

Spawner abundance in 2019 was estimated at 314,000 fish but with very large uncertainty (5th and 95th percentile range of 141,000 to 663,000), as in previous years. The recovery objectives outlined in the Recovery Potential Assessment for the southern Gulf Striped Bass population were met for the ninth consecutive year in 2019.

In 2019, Striped Bass that measured within the recreational fishery retention size slot of 50 to 65 cm TL (equivalent to 46 to 61 cm FL) was the most abundant size group in the spring (62%) and remained the same in the fall (72%).

The collection of the Striped Bass bycatch data used in this assessment is subject to the particulars of the Northwest Miramichi gaspereau fishery and the fishery only begins when there are sufficient numbers of gaspereau available to catch. The effective gaspereau fishing dates have been later in recent years than at the start of the time series. The monitoring of the movements of Striped Bass onto and away from the spawning grounds using acoustic telemetry provides a method of estimating the total spawning population by correcting for the proportion of spawners that were available to capture in the bycatch monitoring program of the gaspereau fishery in the Northwest Miramichi. The correction for the proportion of spawners in the area adds uncertainty to the population estimates. The Striped Bass catch rate data collected in 2019 were largely from the end of the spawning migration when over half of the acoustically tagged bass had migrated out of the Northwest Miramichi by the first sampling date of the gaspereau fishery. All the known females with acoustic tags had left the Northwest Miramichi by the first date of sampling. Female Striped Bass are known to leave the spawning area first whereas males stay longer (Douglas et al. 2009).

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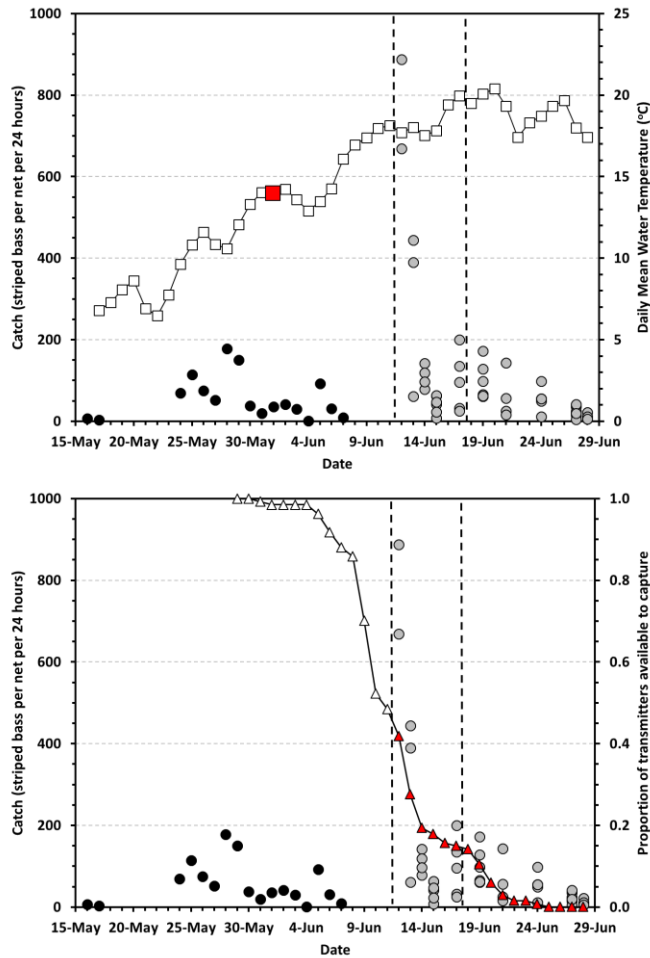
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Sources of information

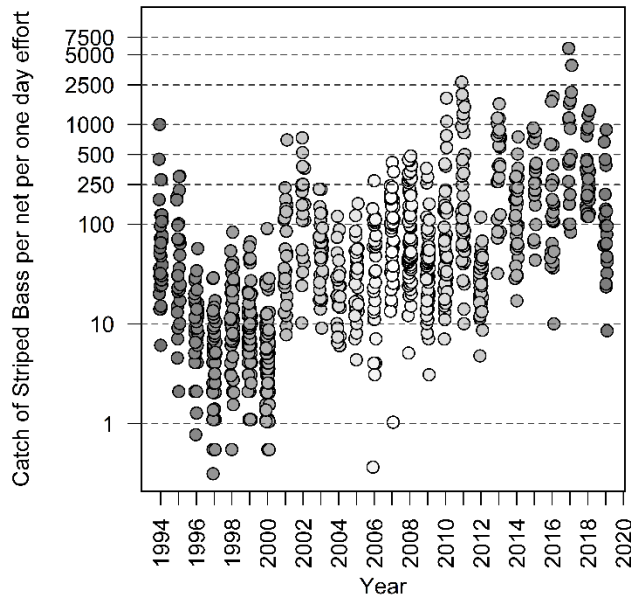
This Science Response Report results from the Science Response Process of January 8, 2020 on the Update of indicators of the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, for 2019. No additional publications from this process will be produced.

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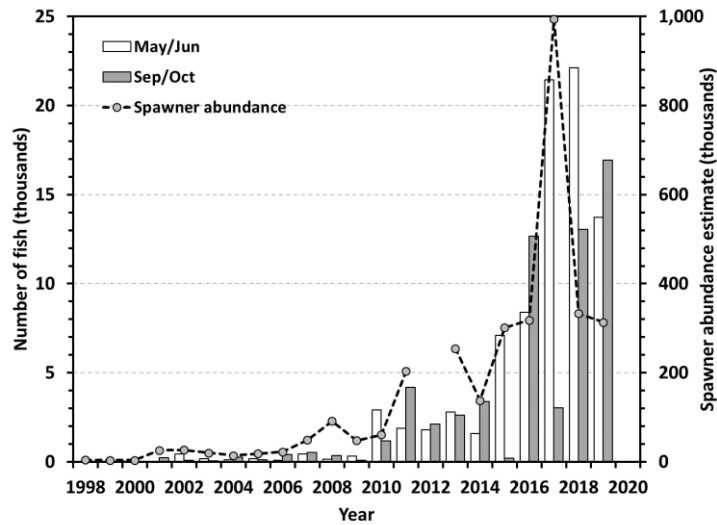
Appendices



Appendix 1. The number of Striped Bass captured per individual net per day for the early part of the season (to collect biological information on the population; black circles) and in the commercial gaspereau fishery trapnets of the Northwest Miramichi estuary in 2019 (grey circles). Vertical dashed lines encompass the Striped Bass bycatch data and the period used in the CPUE analyses. In the upper panel, the squares show the mean daily water temperature at the DFO Cassilis trapnet and the red square represents the temperature on June 1, the date of the initial observation of Striped Bass spawning in the upper Northwest Miramichi estuary in 2019. The bottom panel replicates the daily catch rate data along with the estimated proportion of available acoustically tagged bass present in the Miramichi (upstream of Loggieville) in 2019 (triangles and solid black line).



Appendix 2. The number of Striped Bass captured per net per day of effort from monitoring of the commercial gaspereau fishery in the Northwest Miramichi, 1994 to 2019. The catch rates are not adjusted for the proportion of the spawners available for capture in the fishery. In 2012, the spawning was very early and the majority of the fish was considered to have left the area and were not available to the fishery, hence no estimate was provided for that year. The points within a year are jittered slightly for clarity.



Appendix 3. The combined number of Striped Bass captured in the DFO index trapnets at Cassilis on the Northwest Miramichi River and at Millerton on the Southwest Miramichi River during the spring (May/Jun) and autumn (Sep/Oct) from 1998 to 2019. The catches during the fall season in 2015 are very low due to flood conditions which ended the monitoring program on Sept. 30 for the Southwest Miramichi trapnet and the Northwest Miramichi trapnet was not operating for five days during the first week of October.

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