



UPDATE OF SPAWNER ABUNDANCE AND BIOLOGICAL CHARACTERISTICS OF STRIPED BASS (*MORONE SAXATILIS*) IN THE SOUTHERN GULF OF ST. LAWRENCE TO 2018

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 was conducted 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 2018. This Science Response Report results from the Science Response Process of December 12, 2018 on the update of indicators for the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, in 2018.

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 that has produced 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 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). Selected biological characteristics (e.g. fork length, age, sex, and spawning stage) were recorded from fish captured in commercial gaspereau trapnets (May) and at index trapnet monitoring facilities operated by DFO Science (May-October).

Analysis and Response

Spawner abundance

For the purpose of the 2018 Striped Bass assessment program, one trapnet was operated in the Northwest Miramichi River (NW) between 22 May and 8 June to tag Striped Bass and collect biological information on the population. In 2018, 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 2018 was delayed because of small catches of gaspereau at downstream locations in Loggieville and Chatham and also because of large catches of Striped Bass. The first gaspereau trapnet in the NW was not set until 4 June which resulted with first catches to monitor for Striped Bass bycatch on 7 June. Gaspereau catches were monitored regularly throughout the season with 46 of a possible 115 (40%) trapnet hauls sampled for Striped Bass bycatch in the NW.

Striped Bass bycatch data collected between 7 June and 22 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 the Cassilis area (Northwest Miramichi) was on 29 May (Appendix 1).

The Bayesian hierarchical model used in previous Striped Bass assessments was applied to the 2018 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). The movements of 69 Striped Bass carrying acoustic transmitters were monitored with receiver arrays anchored throughout the Miramichi during May and June 2018. 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 gaspereau trapnets of the NW.

The median of the estimated spawner abundance in 2018 was 333,000 with very wide confidence intervals (5th and 95th percentiles of 154,000 and 623,000) (Fig. 1). The catch rates on individual sampling dates were assumed to be proportional to the abundance of adult Striped Bass in the NW. 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 NW. Based on acoustically tagged bass data in 2018, the percentages declined from 35% on 7 June to 4% on 22 June.

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 2018, the trapnet at Cassilis operated between 22 May and 26 October while the trapnet at Millerton operated between 4 June and 26 October. Catches of Striped Bass at these facilities in 2018 were the highest of the May/June time series ($n = 22,116$), comparable to the spring catches in 2017. Catches of Striped Bass at index trapnets ($n = 13,047$) in September/October 2018 increased significantly compared to 2017 levels but of the same order of magnitude as in 2016. The high catches in the fall of 2018 were largely the result of a single day's catch of approximately 7,000 bass at Millerton on October 22, 2018 (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 2018 was sufficient to meet the RPA recovery limit and recovery target for the eighth consecutive year (2011 to 2018) (Fig. 1).

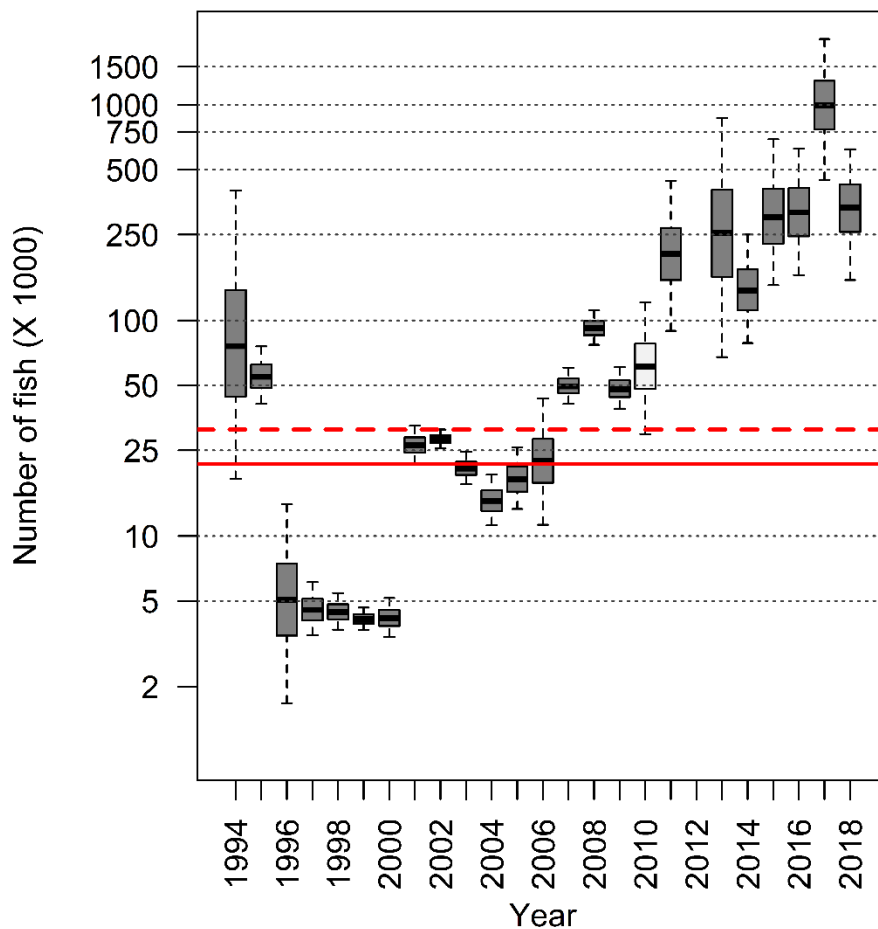


Figure 1. Estimated abundance of adult Striped Bass spawners in the Northwest Miramichi estuary between 1994 and 2018. The estimates are shown on a logarithmic scale for visibility of the full range of abundance values over the time series, from low abundances of approximately 5,000 spawners during 1996 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 (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).

Distribution of bass in 2017 and 2018

Evidence from tag returns indicated that southern Gulf Striped Bass extended their historic distribution by migrating north to southern Labrador during the summer of 2017 (DFO 2018).

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While some reports of Striped Bass along the Labrador coast continued in 2018, there was no evidence of a repeat summer migration to that area (Corey Morris; DFO NL Region, pers. comm.). To date, no tags from Striped Bass from Labrador and the north shore were returned to DFO during 2018. The reason for the extended summer migration in 2017 remains unknown.

Many Striped Bass that migrated beyond their historic range in 2017 overwintered in northern areas not traditionally known to be used by overwintering bass. Exceptional observations of Striped Bass were noted overwintering during 2017-2018 in areas along the north shore of the Saint Lawrence River east of the Saguenay River (M. Legault; MFFP Québec, pers. comm.)¹. Bass that remained in southern Labrador for the 2017-2018 winter period appear to have incurred significant loss as numerous bass carcasses were observed in shallow areas of rivers and river mouths as the ice began to melt in April (Corey Morris; DFO NL Region, pers. comm.). Mortalities of Striped Bass in the winter and spring were also reported in a number of estuaries and barachois in the Gaspé region (M. Legault; MFFP Québec, pers. comm.)². While the exact cause of these mortalities is unknown, it is expected that the northern habitat and/or environmental conditions during the winter were not favorable to the wintering physiology of many Striped Bass.

The combined fishing and natural mortality on Striped Bass that migrated further north in 2017 is unknown but believed to be significant (DFO 2018). Whether this mortality is sufficient to account for the reduction in spawner abundance estimates between 2017 and 2018 is unknown.

Biological characteristics

The mean fork length (FL) of adult Striped Bass (assumed to be fish > 30 cm) measured in May and June 2018 was 48.7 cm (range 30.4 to 89.2 cm; n > 4,200). Thirty-six percent of Striped Bass sampled had fork lengths between 30 and 45 cm, 56% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm total length [TL]), and 8% were 62 cm or greater (Fig. 2).

For adult Striped Bass sampled during the months of September and October 2018, the mean fork length was 57.3 cm (range 33.0 to 91.5; n > 1,000). Five percent of Striped Bass sampled had fork lengths between 30 and 45 cm, 67% between 46 and 61 cm (equivalent to the retention slot regulation of 50 to 65 cm TL), and 28% were 62 cm or greater (Fig. 2).

¹ Erratum: March 2019, corrected the information cited and rearranged paragraph.

² Erratum: March 2019, corrected the information cited.

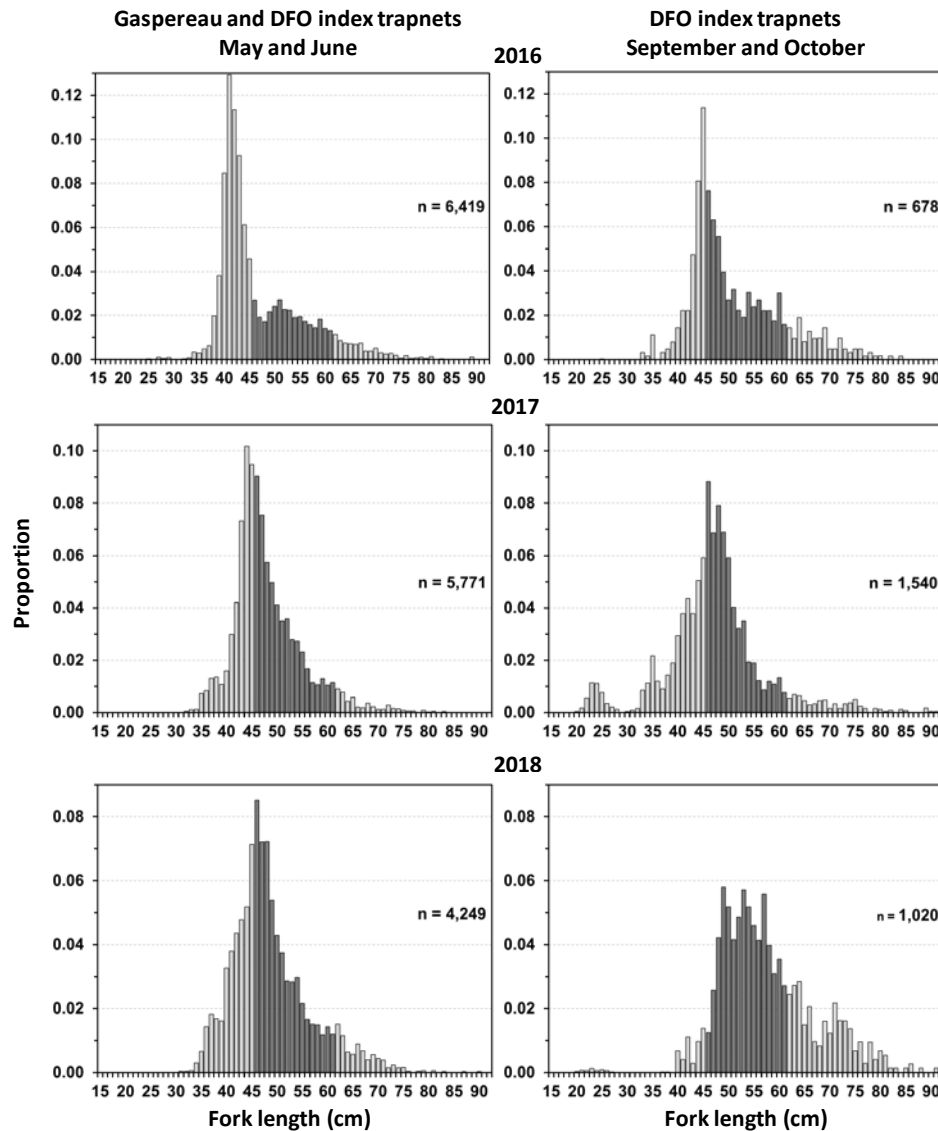


Figure 2. Fork length (cm) distributions of Striped Bass sampled in May and June from the gaspereau trapnet in the Northwest Miramichi and DFO index trapnets (left panels) in 2016 (upper row), 2017 (middle row), and 2018 (lower row). The right panels summarize the frequency by fork length of Striped Bass sampled at DFO index trapnets in September and October for 2016 (top row), 2017 (middle row), and 2018 (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 between 50 and 65 cm total length.

Conclusions

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. Spawner abundance in 2018 was estimated at 333,000 fish but with very large uncertainty (5th and 95th percentile range of 154,000 to 623,000), as in previous years.

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The recovery objectives outlined in the Recovery Potential Assessment for the southern Gulf Striped Bass population were met for the eighth consecutive year in 2018.

Losses of Striped Bass that had migrated outside the historic range to the Quebec north shore and Labrador in summer and fall 2017 may in part explain the reduced abundance of Striped Bass spawners in 2018 relative to 2017. From reported observations, the extended distribution of bass outside its historic range did not occur in 2018.

In 2018, 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 (56%) and remained the same in the fall (67%).

Contributors

Name	Affiliation
Butruille, Frédéric	DFO Ecosystems and Fisheries Management, Gulf Region
Biron, Michel	DFO Science Gulf Region
Chaput, Gérald	DFO Science Gulf Region
Daigle, Abby	DFO Science Gulf Region
Dauphin, Guillaume	DFO Science Gulf Region
Douglas, Scott	DFO Science Gulf Region
Underhill, Kari	DFO Science Gulf Region
Vienneau, Mathieu	DFO Ecosystems and Fisheries Management, Gulf Region

Approved by

Doug Bliss
Regional Director, Science Branch
Gulf Region

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Sources of information

This Science Response Report results from the Science Response Process of December 12, 2018 on the update of indicators of the Striped Bass (*Morone saxatilis*) population of the southern Gulf of St. Lawrence, DFO Gulf Region, for 2018. No additional publications from this process will be produced.

Bradford, R.G. and Chaput, G. 1996. [The status of striped bass \(*Morone saxatilis*\) in the southern Gulf of St. Lawrence](#). DFO Atl. Fish. Res. Doc. 96/62: 36 p.

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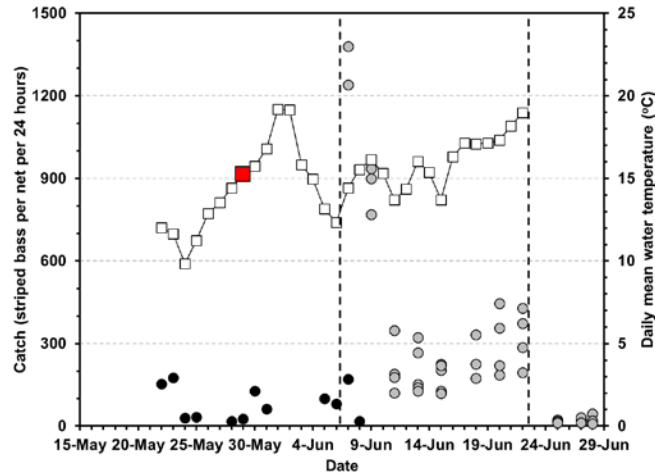
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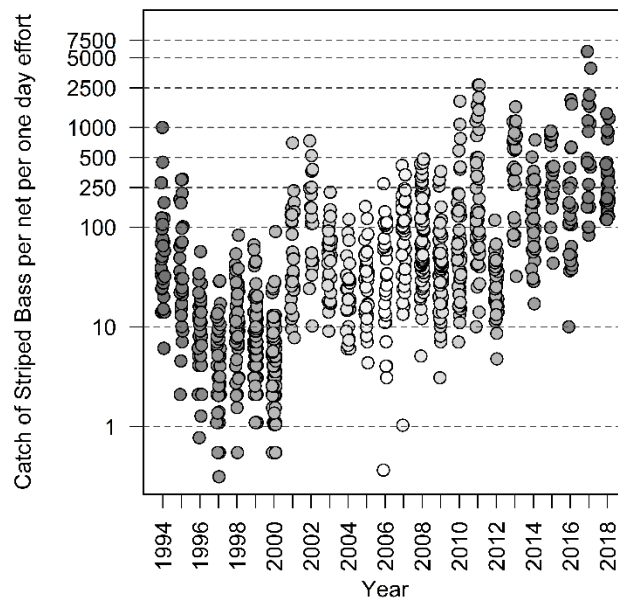
Gulf Region

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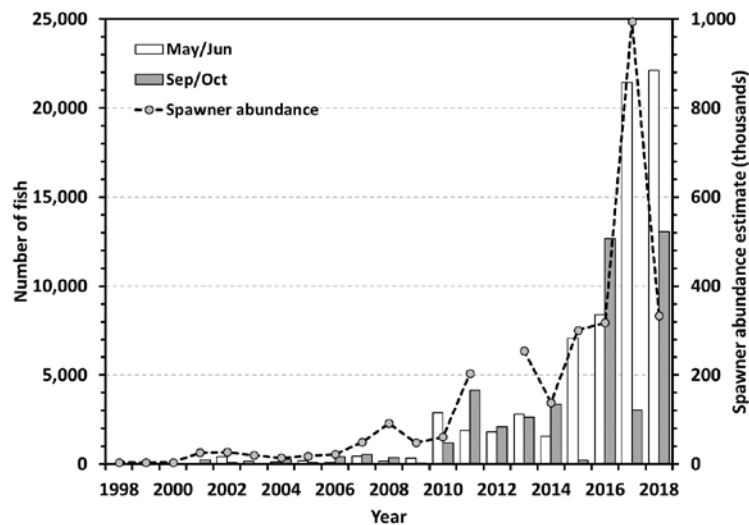
Appendices



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 2018 (grey circles). Vertical dashed lines encompass the Striped Bass bycatch data and the period used in the CPUE analyses. Squares show the mean daily water temperature (at the DFO Cassilis trapnet) and the red square represents the temperature on May 29, the date of the initial observation of Striped Bass spawning in the upper Northwest Miramichi estuary in 2018.



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 2018. 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 2018. The median estimates of spawner abundance are also shown for comparison. 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.

This Report is Available from the

Center for Science Advice (CSA)
Gulf Region
Fisheries and Oceans Canada
P.O. Box 5030, Moncton (NB) E1C 9B6
Telephone: 506-851-6253
E-Mail: csas-sccs@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs

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Aussi disponible en français :

MPO. 2019. Mise à jour de 2018 sur l'abondance de reproducteurs et les caractéristiques biologiques du bar rayé (*Morone saxatilis*) du sud du golfe du Saint-Laurent. Secr. can. de consult. sci. du MPO, Rép. des Sci. 2019/010. (Erratum : mars 2019)