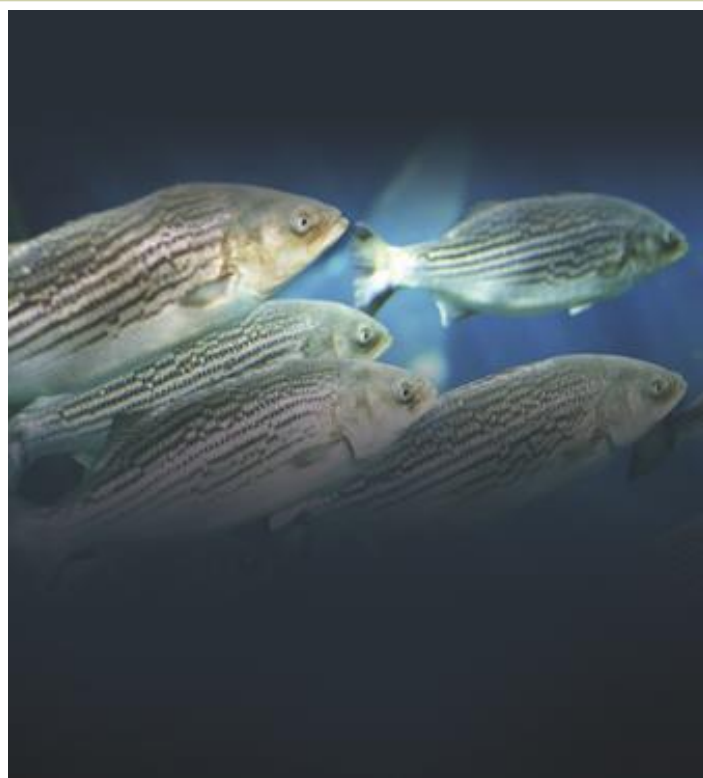


Report on the Progress of Recovery Strategy Implementation for the Striped Bass (*Morone saxatilis*) St. Lawrence River Population in Canada for the Period 2011-2016

Striped Bass



2017

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Preface

The federal, provincial, and territorial government signatories under the [Accord for the Protection of Species at Risk \(1996\)](#) agreed to establish complementary legislation and programs that provide for effective protection of species at risk throughout Canada. Under Section 46 of the *Species at Risk Act* (S.C. 2002, c.29) (SARA), the competent ministers are responsible for reporting on the implementation of the recovery strategy for a species at risk, and on the progress towards meeting its objectives within five years of the date when the recovery strategy was placed on the Species at Risk Public Registry and in every subsequent five-year period, until its objectives have been achieved or the species' recovery is no longer feasible.

Reporting on the progress of recovery strategy implementation requires reporting on the collective efforts of the competent minister(s), provincial and territorial governments and all other parties involved in conducting activities that contribute to the species' recovery. Recovery strategies identify broad strategies and approaches that will provide the best chance of recovering species at risk. Some of the identified strategies and approaches are sequential to the progress or completion of others and not all may be undertaken or show significant progress during the timeframe of a Report on the Progress of Recovery Strategy Implementation (Progress Report).

The Minister of Fisheries and Oceans Canada is the competent minister under SARA for the St. Lawrence River Striped Bass population and has prepared this Progress Report.

As stated in the preamble to SARA, success in the recovery of species at risk depends on the commitment and cooperation of many different constituencies that will be involved in implementing the directions set out in the recovery strategy and will not be achieved by Fisheries and Oceans Canada, or any other jurisdiction alone. The cost of conserving species at risk is shared amongst different constituencies. All Canadians are invited to join in supporting and implementing the Recovery Strategy for the Striped Bass, St. Lawrence River population for the benefit of the species and Canadian society as a whole.

Acknowledgements

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Executive Summary

When it was first assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) in 2004, the Striped Bass (*Morone saxatilis*) population in the St. Lawrence Estuary was designated as Extirpated. In 2011 it was listed as Extirpated in Schedule 1 of the *Species at Risk Act* (SARA). The Recovery Strategy for the Striped Bass (*Morone saxatilis*), St. Lawrence Estuary population was published in the Species at Risk Public Registry in 2011. In 2012, COSEWIC reassessed the Striped Bass population, which has been reintroduced in the St. Lawrence River. This population, renamed the St. Lawrence River population, was designated as Endangered; the new name will be used throughout the report. This Report details the progress towards the recovery of the St. Lawrence River Striped Bass population.

According to the 2011 Recovery Strategy, the main threats to the St. Lawrence River Striped Bass population include:

- Threats to habitat, i.e.:
 - Disturbances caused by dredging;
 - Disturbance and destruction;
 - Contamination;
 - Obstacles to migration;
 - Eutrophication;
 - Climate change;
 - Discharges from the Gentilly 2 nuclear station were of concern in the past, but the station is now closed (since December 2012).
- Harvesting of individuals, i.e.:
 - Sport fishing bycatch;
 - Commercial fishing bycatch;
 - Poaching.
- Biological threats, i.e.:
 - Invasive species;
 - Parasites and pathogens.

The population and distribution objectives for the St. Lawrence River Striped Bass are:

1. Increase the number of Striped Bass;
2. Identify habitats used by the Striped Bass population;
3. Monitor the status of the Striped Bass population;
4. Monitor the status of various members of the fish community (prey, predators and competitors) in relation to the Striped Bass;
5. Protect the Striped Bass population and its most important habitats.

During the period covered by this Progress Report, the following improvements were made:

- Reintroduction of the species in the St. Lawrence River;
- Confirmation that the species' abundance and range has increased;
- Determination of important habitats for various life stages of the species;

- Better understanding of population dynamics and determination of migratory contingents¹;
- Protection of individuals and habitats;
- Increased awareness and engagement among sport and commercial fishermen.

Important efforts have been made and are ongoing to monitor the reintroduction of the species in the St. Lawrence River, understand its dynamics, and protect individuals and important habitats. Tangible results have been achieved through a significant commitment from governments and academic experts and have been noted by fishermen and the public. However, we must continue our outreach, protection and monitoring efforts and work to better understand the dynamics of the population. Significant efforts must be made to increase awareness of the St. Lawrence River Striped Bass among a generation that is not familiar with it.

COSEWIC (2012) designated the St. Lawrence River Striped Bass as an Endangered Species. The reintroduced population remains vulnerable, as suggested by its disappearance in the past and its recruitment, which is characterized by significant interannual variations. Also, based on a Science Advisory Report published by DFO in 2017, various threats are likely to affect the species' critical habitat, such as habitat loss and degradation (sediment dredging and disposal, infrastructure development), invasive species or oil leaks and spills.

¹ A migratory contingent includes individuals following a common migration pattern.

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1. Introduction

This Progress Report outlines the progress made toward meeting the objectives listed in the Recovery Strategy for the St. Lawrence River Striped Bass from 2011 to 2016 and should be considered as a one in a series of documents for this species that are linked and should be taken into consideration together, including the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) Status Report (COSEWIC 2004 and 2012), the Recovery Potential Assessment (DFO 2006) and the Recovery Strategy (Robitaille et al. 2011).

Section 2 of the Progress Report reproduces or summarizes key information on the threats to the species, population and distribution objectives for achieving its recovery, approaches to meeting the objectives, and performance indicators to measure the progress of recovery. For more details, readers should refer back to the [Recovery Strategy for the Striped Bass \(*Morone saxatilis*\), St. Lawrence Estuary Population, Canada](#) (Recovery Strategy) (Robitaille et al. 2011). Section 3 reports the progress of activities identified in the Recovery Strategy, to support achieving the population and distribution objectives. Section 4 summarizes the progress toward achieving the recovery objectives.

2. Background

2.1 COSEWIC Assessment Summary

The Striped Bass (*Morone saxatilis*) was listed as Extirpated under the Species at Risk Act (SARA) in 2011. The listing of the St. Lawrence River Striped Bass population in 2011, which led to the development and publication of the Recovery Strategy in 2011, was based on the information provided in the [COSEWIC Assessment and Status Report on the Striped Bass \(*Morone saxatilis*\) in Canada](#) (COSEWIC 2004). This information is also included in Section 1.1 of the Recovery Strategy.

COSEWIC Assessment Summary – 2004

Common name (population): Striped Bass (St. Lawrence Estuary population²)

Scientific name: *Morone saxatilis* (Walbaum, 1792)

Assessment date: November 2004

COSEWIC Status: Extirpated

Reason for designation: The population from the St. Lawrence Estuary has disappeared as a consequence of illegal fishing, with the last record dating from 1968.

Distribution: Quebec

Status history: Designated Extirpated in November 2004. Assessment based on a new status report.

² Former name of the St. Lawrence River population.

In 2012, COSEWIC re-examined and modified the status of the St. Lawrence River Striped Bass population and designated it as Endangered (COSEWIC 2012).

COSEWIC Assessment Summary – 2012

Assessment date: November 2012

Common name (population): Striped Bass - St. Lawrence River population

Scientific name: *Morone saxatilis*

Status: Endangered

Reason for designation: This population was assessed as Extirpated in 2004 and is the subject of a re-introduction effort, using fish from the Miramichi River, that has resulted in natural spawning, some increase in abundance, and an increase in distribution. It is, however, unclear if the population is self-sustaining without continued supplementation. The population is susceptible to by-catch in commercial fisheries, and although the threat of dredging has been reduced, it is still operating.

Distribution: Quebec, Atlantic Ocean

Status history: Designated Extirpated in November 2004. Status re-examined and designated Endangered in November 2012.

2.2 Threats

This section summarizes the information, found in the Recovery Strategy, on threats to survival and recovery of the St. Lawrence River Striped Bass population and threats to its critical habitat.

2.2.1 Threats to the St. Lawrence River Striped Bass population

Table 1 summarizes the population-level threats to the St. Lawrence River Striped Bass population. Striped Bass may be exposed to additional limiting factors because they are at the northern limit of their range. Please refer to Section 1.5 of the Recovery Strategy for more information on these threats.

Table 1. Summary of the population-level threats identified for the St. Lawrence River Striped Bass population, based on the 2011 Recovery Strategy.

Threat	Population-level Threat Risk	Description
Threats to habitat		
Habitat disturbances caused by dredging	High	In the 1950s, disturbances from dredging and maintenance work in Traverse du Nord (a section of the waterway) coincided with a radical change in the distribution of immature Striped Bass before the species disappeared. Dredging and disposal of materials could lead to changes in the aquatic environment.
Habitat disturbance and destruction	High	Habitat loss and destruction (e.g., shoreline hardening, construction of walls, roads and docks, and infilling of floodplains and wetlands) can significantly modify the habitat of aquatic species. Practices such as these are still common and may be detrimental to the recovery of Striped Bass. Cumulative encroachment on the riparian environment and loss of these important habitats for juvenile development could reduce the estuary's carrying capacity.
Discharges from the Gentilly 2 nuclear station (thermal attraction and decompression of gases)	Moderate ³	Before its closure in December 2012, the Gentilly 2 nuclear station discharged hot water saturated with gas, whose heat may have attracted Striped Bass during the cold season. It was a two-fold threat. First, there were concerns about possible physiological effects caused by excessive gas (e.g. embolism); second, it was feared that eggs and larvae in this spawning area would undergo thermal shock in adjacent colder waters. There could have been serious repercussions if a high percentage of Striped Bass spawners in the reintroduced population had been attracted to the hot water discharged in this area.
Contamination	Moderate	Several industrial, municipal or agricultural contaminants from the St. Lawrence and Great Lakes watershed reach the estuary. They are able to accumulate in the food chain, and through bioamplification, reach high levels in the flesh of organisms at the top of the food chain, such as the Striped Bass.
Obstacle to migration	Low	Obstacles to the free movement of fish can fragment the habitat used annually by the Striped Bass and isolate populations from one another. The introduction of obstacles or construction work could affect the migration of the population. However, the level of concern is low because there are currently no major barriers impeding the movement of Striped Bass within its range.

³ This is no longer considered a threat, since the water is no longer being heated since the station was decommissioned (Hydro-Québec 2016).

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St. Lawrence River Population in Canada for the 2011–2016 Period

Eutrophication	Low	Spreading manure and agricultural fertilizers and domestic sewer systems contribute to eutrophication of aquatic environments. This can disrupt local biological communities in various ways, including: development of stringy algae and cyanobacteria, habitat degradation (e.g. smelt spawning grounds), prevalence of tolerant species, episodes of anoxia, etc. Eutrophication can alter aquatic habitats in tributaries that drain agricultural lands and in the alluvial fans where they empty into the river. However, this factor does not appear to pose a serious threat to the recovery of the Striped Bass throughout its range.
Climate change	Low	In the medium and long term, the St. Lawrence Estuary may undergo numerous changes brought on by climate warming, including: decreased freshwater flows, rising sea level, advance of the brackish water transition zone, longer growing season, changes in the biological community within the estuary, etc. These changes should affect aquatic habitats in the estuary in the long term, but their real impact on Striped Bass remains unknown and difficult to assess.
Harvesting of individuals		
Sport fishing bycatch	Low	Sport fishermen may accidentally catch Striped Bass in the estuary, but they must immediately release them. When the Recovery Strategy was being developed, a fisheries impact review found that, given the catch and release requirement and the awareness campaign, sport fishing should not affect the survival and recovery of the Striped Bass (DFO 2010).
Commercial fishing bycatch	Low	The risk of bycatch in commercial fishing gear varies with location and season. The highest risk seems to involve fixed gear designed to trap American Eels in the upper estuary. The number of eel traps has decreased sharply in the St. Lawrence Estuary since the 1950s. A fisheries impact review found that all freshwater and marine commercial fisheries had little if any impact on survival and recovery, with the exception of fyke nets and eel traps whose impacts on survival and recovery were considered low and moderate respectively (DFO 2010). However, trials with fishermen are underway to test the effectiveness of release bins designed to reduce mortality in these fisheries.
Poaching	Low	This activity is harder to assess because there are no reliable data available to measure its actual scope. Moreover, because the abundance and range of the population has increased, the situation has changed in recent years.

Biological threats		
Invasive alien species	Low	Alien species have been introduced in the St. Lawrence River and Estuary. Alien species can alter ecosystems and their ecological functions. The introduction of non-native organisms seems to have started in the 19th century and has accelerated dramatically in recent decades. The impact of invasive species on the new Striped Bass population has not yet been demonstrated and is unknown.
Parasites and pathogens	Low	Autopsies performed on Striped Bass from the former population revealed that several specimens had unidentified parasitic worms in their digestive tract or in their abdominal cavity. No diseases were detected in the current population.

2.2.2 Threats to Critical Habitat

Critical habitat for the St. Lawrence River Striped Bass population has been identified, to the extent possible, in Section 2.7 of the 2011 Recovery Strategy. Table 2 provides examples of activities likely to result in destruction to critical habitat (i.e. threats to critical habitat). The list of activities provided in this table is neither exhaustive nor exclusive, and their inclusion has been guided by the relevant threats to habitat described in the Recovery Strategy. For more details on activities likely to result in the destruction of critical habitat, consult the Recovery Strategy.

Table 2. Threats to critical habitat of the Striped Bass (St. Lawrence River population), extracted from the Recovery Strategy.

Threat	Activities	Effect-Pathway
Destruction - disturbance	Dredging	<ul style="list-style-type: none"> • Modification of the bottom and circulation patterns • Increased turbidity levels
	Shoreline modifications	<ul style="list-style-type: none"> • Physical loss of habitat • Modification of terrestrial nutrient inputs • Changes in turbidity levels • Loss of riparian vegetation
	Infilling	<ul style="list-style-type: none"> • Physical habitat loss and loss of oceanographic processes

Critical habitat for the St. Lawrence River Striped Bass has been partially identified. Section 2.7 of the Recovery Strategy includes a Schedule of Studies that outlines the research required to identify critical habitat to achieve the species' population and distribution objectives. Progress in undertaking the Schedule of Studies is reported in Section 3.2 of this document.

2.3 Recovery

This section summarizes the information, found in the 2011 Recovery Strategy, on the population and distribution objectives that are necessary for the recovery of the St. Lawrence River Striped Bass and on performance indicators that provide a way to define and measure progress toward achieving the population and distribution objectives.

2.3.1 Population and Distribution Objectives

Section 2.3 of the 2011 Recovery Strategy identified the following population and distribution objectives necessary for the recovery of the species. When the Recovery Strategy was being developed, the reintroduction program was in its early stages, and there was very little knowledge about the new population that had been reintroduced. The Recovery Strategy's objective was to restore a Striped Bass population over the next 10 years. This population was intended to reproduce and thrive in the St. Lawrence Estuary, and integrate itself into the biological community without disrupting it. The qualitative population objective was to re-establish a viable, thriving population. In terms of range, the objective was that all suitable habitats would be used again.

2.3.2 Performance Indicators

To assess the implementation and progress of the Recovery Strategy, a list of key performance indicators was prepared for each recovery objective. It is described in Section 2.6 of the 2011 Recovery Strategy. These performance indicators help determine whether the recovery approaches are having a positive impact on the species. They also assist in assessing whether recovery objectives have been met and in reporting on the progress made.

Table 3. Population and distribution objectives and corresponding performance indicators for the St. Lawrence River Striped Bass population, found in the 2011 Recovery Strategy.

Population and Distribution Objective	Performance Indicator
1. Increase the number of Striped Bass.	<ul style="list-style-type: none"> • Increase the number of Striped Bass in the St. Lawrence River and Estuary after stocking: <ul style="list-style-type: none"> - Prepare a breeding plan to optimize the genetic diversity of stocked Striped Bass; - Chemically tag larvae: assess the effectiveness of tagging; - Labelling (fry to adults): verify the effectiveness of labelling, related mortality and percentage of losses; - Estimate the survival of artificially produced Striped Bass based on their stage of development at the time of stocking; - Determine the percentage of the population increase attributable to fry stocking.
2. Identify habitats used by the Striped Bass population.	<ul style="list-style-type: none"> • Delineation and characterization of: <ul style="list-style-type: none"> - Spawning, incubation, larval life; - Juvenile habitats; - Habitats of Striped Bass one year and older; - Migration routes;

Population and Distribution Objective	Performance Indicator
	<ul style="list-style-type: none"> - Wintering habitats. • Determination of the main threats to habitat; • Develop a geomatics tool.
3. Monitor the status of the Striped Bass population.	<ul style="list-style-type: none"> • Develop an abundance index of autumn fry, distinguishing between naturally- and artificially-produced individuals; • Maintain a network to monitor Striped Bass caught with fixed gear in the St. Lawrence Estuary and standardize the protocol; • Facilitate Striped Bass reporting by the Centre de données sur le patrimoine naturel du Québec (CDPNQ); • Availability of a database on the biological characteristics and abundance of Striped Bass one year and older; • Develop a Striped Bass population status indicator.
4. Monitor the status of various members of the fish community (prey, predators and competitors).	<ul style="list-style-type: none"> • Availability of a database on the biological characteristics and abundance of fish species that may be Striped Bass prey, predators and competitors, particularly species at risk; • Develop a useful indicator of the status of their populations and changes in abundance that may be attributable to the presence of Striped Bass.
5. Protect the Striped Bass population and its most important habitats.	<ul style="list-style-type: none"> • Do not incur any additional losses or degradation in any important Striped Bass habitat, if necessary using: <ul style="list-style-type: none"> - The provisions of various federal statutes, including the <i>Species at Risk Act</i> (SARA), the <i>Fisheries Act</i>, the <i>Canadian Environmental Assessment Act</i>, as well as Quebec legislation, including the <i>Environmental Quality Act</i> and the <i>Act respecting the conservation and development of wildlife</i>; - The <i>Quebec Fishery Regulations</i>; - The support of organizations with an interest in aquatic environments and the general public; - Outreach to organizations involved in environmental assessments in aquatic environments.

3. Progress towards Recovery

The Recovery Strategy for the St. Lawrence River Striped Bass (Robitaille et al. 2011) divides the recovery effort into 5 objectives: 1) increase the number of Striped Bass, 2) identify habitats used by the Striped Bass population, 3) monitor the status of the Striped Bass population, 4) monitor the status of various members of the fish community (prey, predators and competitors) in relation to the Striped Bass, and 5) protect the Striped Bass population and its most important habitats. Progress in carrying out these recovery objectives is reported in Section 3.1.

Section 3.2 reports on the progress on meeting the performance indicators and other commitments (e.g., Action Plan and Critical Habitat Order) identified in the Recovery Strategy and information obtained through implementing the Recovery Strategy.

3.1 Activities supporting Recovery

Table 4 provides information on the implementation of activities undertaken to address the approaches and recovery objectives identified in the Recovery Planning Table of the Recovery Strategy.

Table 4. Details of activities supporting the recovery of the St. Lawrence River Striped Bass from 2011 to 2016.

Activity	Approach	Description and Outcomes	Participants ⁴
Objective #1: Increase the number of Striped Bass			
<p>Implement the production plan proposed by the Advisory Committee (2001):</p> <ul style="list-style-type: none"> • Stock individuals produced in hatcheries. • Optimize the genetic diversity of stocked fish, based on individuals available for breeding in captivity. • Mark stocked specimens to distinguish wild and farmed individuals when monitoring in the wild. 	Artificial production and stocking; Inventory and monitoring.	<p>Between 2002 and 2016, 2,695 spawners, and over 34,500,000 larvae and 18,000 juvenile Striped Bass, initially produced using spawners from the southern Gulf population, were stocked in the St. Lawrence River. Genetic analyses conducted at the larval stage confirmed that different families contribute to recruitment. Since 2014, spawners have been produced in captivity to avoid the risk of contamination by the viral hemorrhagic septicemia (VHS) virus observed in the Miramichi River Striped Bass. The stocking program should be reassessed, given this new issue of domesticity in spawners.</p> <p>A reliable index of stocked individuals' contribution to a population increase could not be developed by tagging individuals in hatcheries (fluorescence in larvae; tags for the other stages). Tagging was abandoned, pending review.</p> <p>It is still difficult to determine the relative contributions of stocking and natural breeding to population increases. However, young-of-the-year fish (0+) were caught during the 2008 standardized recruitment survey, confirming that Striped Bass were breeding in the wild since no larvae or juveniles 0+ were stocked in 2008. The survey also suggests that Striped Bass abundance has increased and new areas have been colonized since 2013.</p> <p>Given the natural variability in recruitment, stocking could continue in the coming years to increase the number of spawners, as required. However,</p>	MFFP

⁴ The lead participants are at the top of the list; the other participants are listed in alphabetical order. Specific participants have not been identified for all the activities. Acronyms are defined in Annex 1.

		the number of stocked bass may be reduced if monitoring of the wild Striped Bass population or some of its prey species were to indicate that stocking hindered the natural breeding of Striped Bass or significantly affected its prey.	
Objective #2: Identify habitats used by the Striped Bass population			
<p>Identify, delineate and characterize the areas where the early stages of Striped Bass development occur:</p> <ul style="list-style-type: none"> • Spawning and incubation • Larval life • Juvenile 	<p>Inventory and monitoring; Knowledge acquisition.</p>	<p>Between 2011 and 2015, 14 sites (river deltas; areas of the river) were sampled between May and June, mainly by net, for a total of 1389 hours. The 14 sites were selected for their abiotic features suitable for Striped Bass breeding or because concentrations of mature Striped Bass had been reported by fishermen.</p> <p>There were high concentrations of mature Striped Bass in the mouth of Rivière du Sud in Montmagny, the Québec port area and the downstream section of the Ouelle River. Consequently, these three sites were sampled more intensively and on a recurring basis (at least two years).</p> <p>At the same time, a fixed telemetry network was deployed. It documented the use of the Montmagny, Québec and Ouelle River areas by mature adult individuals (tagged with acoustic transmitters), during the breeding period.</p> <p>Sampling campaigns were also conducted with zooplankton nets in the Montmagny (MFFP 2011) and Québec (MFFP 2016) areas and throughout the river estuary and upper estuary (UQAC 2014), to find Striped Bass eggs and larvae. Sampling conducted by UQAC included the characterization of habitat variables (e.g., temperature, salinity, turbidity) to identify the characteristics of habitats suitable for larvae.</p> <p>Since 2012, the MFFP has been sampling juvenile Striped Bass with beach seines throughout the river estuary and upper estuary. Sampling has been standardized since 2013 and is conducted in September. The primary purpose of this standardized survey is to provide an abundance and recruitment index, but it also monitors the range of juveniles.</p> <p>In 2014 and 2015, UQAC participated in MFFP's standardized sampling campaign and conducted additional sampling of juvenile Striped Bass. Sampling included habitat characterization to identify the characteristics of habitat associated with optimal juvenile growth.</p> <p><i>Outcomes</i></p> <p>The combined analysis of the various samples and data sources described above identified several habitats used by the Striped Bass</p>	<p>MFFP UQAC Fishermen</p>

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		<p>during the early stages of its development.</p> <p>Two spawning sites were identified, Rivière du Sud and the Québec port area (Valiquette et al. 2017). Fish harvested at these sites combine all the characteristics associated with spawning (fish condition, water temperature, and presence of nurseries downstream). Since the presence of eggs and larvae was confirmed in the Montmagny area in 2011, the mouth of Rivière du Sud was formally recognized as a spawning ground. Scientific consensus has also been reached to consider the far end of the Québec Port area (in Beauport) as a spawning site (DFO 2017 and references included). This consensus is validated by the recent confirmation of the presence of Striped Bass larvae in the Québec area in 2016 (Eliane Valiquette, MFFP, pers. comm.). The Ouelle River was not identified as a spawning area; its breeding role remains uncertain.</p> <p>Two larval concentration areas were identified in the St. Lawrence Estuary (Côté et al. 2012; UQAC work in progress): the first in the Montmagny area and the second in the area around the northeastern tip of Île d'Orléans. Analysis of the habitat parameters that characterize these areas is underway at UQAC.</p> <p>An area with a potential young-of-the-year fish habitat was defined (Valiquette et al. 2017). It is the 0-5 meter intertidal area between Lévis and Rivière-du-Loup along the south shore, and between Neuville and Petite-Rivière-Saint-François along the north shore, including the islands between these areas. Within this vast area, the standardized MFFP survey identified areas of higher concentrations. Compared to larvae, juveniles are more tolerant of variations in salinity and temperature. UQAC is continuing its work to identify the preferred characteristics for juvenile growth.</p>	
<p>Identify, delineate and characterize the other habitats used by the Striped Bass:</p> <ul style="list-style-type: none"> • Feeding areas • Migration corridors • Wintering areas 	<p>Inventory and monitoring; Knowledge acquisition.</p>	<p>A fixed telemetric network was used to monitor the movements of adult Striped Bass tagged with acoustic transmitters. Monitoring in open water (from May to October between 2011 and 2015) revealed migration patterns across a wide area that includes the river estuary and upper estuary and the Saguenay. The results also identified two areas of higher concentration. The main area extends between Québec and the Ouelle River along the south shore; the second, narrower area is located on the North Shore, in the Île aux Coudres area.</p> <p>Winter telemetric monitoring (November to April, winter 2014–2015) identified two wintering areas for adults, the Québec port area and the</p>	<p>MFFP DFO</p>

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		<p>southern part of Île-aux-Grues. The Grands Voiliers channel could be used as a winter corridor between these areas.</p> <p>In 2016, the MFFP conducted a review of the literature on subadults. This review should provide information on habitat use by the fish in this life stage and should permit to increase sampling efficiency and monitoring capacity for this early stage.</p>	
Conduct studies on priority threats to Striped Bass habitat.	Inventory and monitoring; Knowledge acquisition.	<p>In 2011, a Science Advisory Report was produced, which assessed the quality of Striped Bass habitat as well as the threats to which it is exposed.</p> <p>An assessment of spatial-temporal habitat use by the Striped Bass was published by Valiquette et al. (2017). This assessment is based on the results of various studies outlined below under objective 2, described above. Based on this information, a Science Advisory Report was prepared to support the identification of critical habitat (DFO 2017). This report highlighted the same threats as those previously identified in the 2011 DFO Science Advisory Report.</p> <p>In 2016, the Striped Bass recovery team reviewed and re-assessed threats to Striped Bass habitat in order to prepare recovery plans for the next few years. The new Recovery Strategy is scheduled to be published in 2017. This Strategy will provide an up-to-date review of threats to the Striped Bass.</p>	MFFP DFO UQAC
Develop a geomatics tool to give consultants, proponents, project development analysts, etc. access to the information on Striped Bass habitats.	Protection, restoration and stewardship; Outreach.	No steps were taken in this regard; this measure is less strategic because the experts expect the Striped Bass population and distribution to grow.	
Objective #3: Monitor the status of the Striped Bass population			
Maintain the commercial fishing gear catch monitoring network.	Inventory and monitoring.	<p>A bycatch monitoring network was created in 2004. It is mainly based on bycatch reported by commercial fishermen.</p> <p>The observations reported by fishermen have helped identify sites where test fishery efforts (scientific) should be focused. Individuals harvested by fishermen (Quebec's Ministère des Ressources naturelles et de la Faune [MRNF] licence holders) were used to determine the biological</p>	MFFP Commercial fishermen

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		parameters used to characterize the population.	
Facilitate the recording of Striped Bass bycatch	Inventory and monitoring; Knowledge acquisition.	Since 2004, CDPNQ has been collecting Striped Bass observations from the public, allowing experts to focus on unusual observations. Striped Bass concentration areas were located, including the mouth of Rivière du Sud in Montmagny, which has been recognized as a spawning ground since 2011.	MFFP
Extend the geographic coverage of test fisheries monitoring in the Striped Bass range.	Inventory and monitoring; Knowledge acquisition.	<p>Before 2011, monitoring of Striped Bass by scientific fisheries depended on the Réseau de suivi ichtyologique [Fish Monitoring Network] (RSI; since 1995; river section; gillnet and beach seine) and the Réseau de suivi des poissons de l'estuaire [Estuary Fish Monitoring Network] (RIPE; since 2006; upper estuary; eel trap) deployed by the MFFP. Since 2011, several sampling campaigns have been conducted, as described below.</p> <p>Experimental sampling effort has intensified since 2011, especially to find prospective spawning sites. Between 2011 and 2015, 14 sites (river deltas; river areas) were sampled, mainly by net, for a total of 1389 hours, between May and June. Two spawning sites have been confirmed. Additional sampling could be conducted in some target areas if a significant number of individuals were reported during the breeding period.</p> <p>Since 2011, a vast fixed-station passive hydroacoustic telemetry system was used between May and October in the St. Lawrence system and its main tributaries to monitor adult Striped Bass tagged with acoustic transmitters. A similar network was deployed during the winter of 2014-2015, between November and April. Telemetric monitoring is used to determine the range of the population. However, the total range extends beyond these boundaries and includes an area of overlap with the neighbouring population of the southern Gulf of St. Lawrence (MPO 2017). The telemetric network also provides interesting information on seasonal movements of individuals. Striped Bass congregate in limited areas in the winter and disperse to cover large areas in the spring and summer. Individuals start to return to wintering sites in the fall.</p> <p>Since 2013, standardized sampling (100 stations) with beach seines has been conducted annually by the MFFP in September, between Trois-Rivières and Île-Verte along the south shore and La Malbaie along the north shore. This network is used to obtain a young-of-the-year fish abundance index to monitor the evolution of the new population and</p>	MFFP DFO

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		<p>assess interannual variations in breeding success. Recruitment monitoring showed a sharp increase (except for 2013) in the abundance of young-of the-year fish in the estuary since 2009, but also variability in recruitment and the species' precarious status. It was also determined that the Striped Bass has been colonizing new habitats since 2013 (Dussureault et al. 2014a). UQAC has been performing academic work since 2012 to more accurately describe habitat use by young-of the-year fish in the intertidal zone of the river estuary and upper estuary. In future years, recruitment monitoring will describe the success and interannual variations in the range of young-of the-year fish and refine management procedures.</p>	
Develop a Striped Bass population status index regarding the estuary's carrying capacity.	Inventory and monitoring; Knowledge acquisition.	<p>Since 2010, the monitoring networks (scientific sampling and bycatch) have kept Striped Bass for laboratory analysis of various biological and morphometric parameters. Biological reference points have been established such as the condition index, growth rate or recruitment indicator.</p> <p>Since 2013, standardized sampling conducted in September by the MFFP has provided a young-of the-year fish abundance index. This index is used to identify interannual variations in reproductive success and monitor the evolution of the new population. The increase in the abundance index and the percentage of stations harbouring Striped Bass indicate that Striped Bass has been colonizing new environments since 2013.</p> <p>Since 2014, UQAC has been conducting research on the ecology of early life stages, including abiotic conditions and zooplankton. It will help assess the St. Lawrence's carrying capacity for the Striped Bass and establish a quantitative target for annual comparisons of abundance indices.</p> <p>Research is ongoing to better characterize important habitats for various life stages, including larvae and habitats where juveniles feed and grow. Also see 3.2.</p>	MFFP DFO UQAC
Develop an autumn fry abundance measurement as a recruitment index.	Inventory and monitoring; Knowledge	<p>Since 2013, the sampling network operating between Trois-Rivières and Île-Verte, on both shores, has been providing a young-of the-year fish abundance index to monitor the evolution of the new population and</p>	MFFP DFO

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	acquisition.	<p>assess interannual variations in breeding success.</p> <p>Juvenile monitoring has highlighted increased recruitment between 2013 and 2016, although a clear trend cannot be established with such a small time series.</p> <p>Recruitment monitoring has also helped identify sites where test fishery efforts (scientific) should be focused.</p> <p>However, Striped Bass bycatch monitoring via the network highlighted a sharp drop in recruitment in 2013, which showed variability in recruitment and the species' precarious status.</p>	
Monitor eggs and juveniles 0+ in spawning grounds, incubation and survival of wild individuals during the summer and fall.	Inventory and monitoring; Knowledge acquisition.	<p>The Rivière du Sud watershed (the first known spawning ground) was characterized in 2011, including eggs, larvae and juveniles between Montmagny and La Pocatière.</p> <p>A search for eggs and larvae was also conducted in 2016 in an area extending from the Québec port area to the western tip of Île d'Orléans. Preliminary results indicate that the Québec port area would be a spawning area.</p> <p>Larvae were also sampled in 2014 virtually throughout the whole range. It included characterization of habitat variables (e.g., temperature, salinity, turbidity) to define parameters conducive to larval survival. The results confirm that there is an area of larval concentration in the Montmagny area and indicate the presence of a second concentration area at the northeastern tip of Île d'Orléans. The habitat variables are being analyzed. No eggs or larvae were found in the Ouelle River.</p>	MFFP UQAC
Objective #4: Monitor the status of various members of the fish community in relation to the Striped Bass			
Monitor the fish species in the area frequented by the Striped Bass during its growing season and beyond.	Inventory and monitoring; Knowledge acquisition.	The Réseau de suivi ichthyologique (RSI) and the Réseau d'inventaire des poissons de l'estuaire (RIPE), including a station at the Ouelle River, monitor the status of fish communities and their habitats.	MFFP Commercial fishermen
Develop indicators to detect changes that could be attributed to the presence of	Knowledge Acquisition	The Striped Bass diet is one of the ecological and environmental factors that have been proposed for consideration. The Striped Bass is deemed opportunistic and some information suggests that it may be influenced by the presence of prey (e.g. smelt in the Rivière du Sud in Montmagny).	MFFP Commercial fishermen DFO

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Striped Bass.			
Gather and analyze data on food species that may be competing with Striped Bass.	Inventory and monitoring; Knowledge acquisition.	Monitoring is ongoing in the Saguenay and the Gaspé on interactions between the Striped Bass and other species.	MFFP
Objective #5: Protect the Striped Bass population and its most important habitats			
Promote the implementation of measures to introduce the Striped Bass and protect its habitat.	Protection, restoration and stewardship	<p>The Striped Bass has been protected under SARA since 2011; all prohibitions under the Act apply⁵. However, some activities are authorized in the Recovery Strategy; therefore, bycatch is authorized as long as the bass is immediately released where it was caught, and fish can also be kept for scientific, educational or wildlife management purposes, subject to applicable conditions.</p> <p>Fishing Striped Bass is also prohibited in the St. Lawrence River, from upstream to Gaspé, under the <i>Fisheries Act</i> (FA). The <i>Quebec Fishery Regulations</i> made under the FA requires anyone who catches a Striped Bass to immediately release it where it was caught without injuring it. A few reminders have been issued regarding this prohibition after a fishery targeting another Striped Bass population was reopened (south of the Gaspé).</p> <p>Protection of species under Quebec's <i>Act respecting threatened or vulnerable species</i> has been under study since 2014.</p> <p>To protect the Striped Bass, fishing for any species of fish is prohibited at any time of year at the mouth of the Ouelle River (downstream of the Route 132 bridge) and until July 1 at the mouth of the Rivière du Sud (downstream of the fall).</p> <p>Dredged sediment disposal practices have been better regulated since 2009.</p> <p>Finally, SARA provides for recovery planning and promotes the implementation of initiatives in this regard.</p>	MFFP DFO

⁵ In particular, SARA states that no person shall kill, harm, harass, capture or take, possess, collect, buy, sell or trade an individual of a wildlife species that is listed in Schedule 1 of SARA as an extirpated species, an endangered species or a threatened species.

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Ensure that environmental assessments take into account potential impacts on the Striped Bass and its habitat, if any.	Protection, restoration and stewardship	Project analyses (federal and provincial) take into account the Striped Bass and its habitats, including its critical habitat in development project assessments.	MFFP DFO
Educate sport and commercial fishermen on measures to protect the Striped Bass and its habitats.	Protection, restoration and stewardship; Outreach	<p>MFFP Wildlife Officers and DFO Fishery Officers have conducted outreach and monitoring activities, especially at sites where Striped Bass congregate.</p> <p>An extensive campaign focused on sport fishermen. Since 2005, about 12,000 permanent posters have been placed in strategic locations at access sites to the river, downstream from Lake St. Pierre. Since 2011, 10,000 stickers have been distributed to fishermen. The main theme is catch-and-release reporting.</p> <p>FédéCP's foundation Héritage faune has helped fund awareness campaigns and supported the reintroduction of Striped Bass.</p> <p>Many new releases and articles are published every year in the media (e.g., about research or the discovery of a spawning area).</p> <p>Bycatch monitoring has increased awareness among commercial fishermen.</p> <p>Trials with commercial fishermen have been organized to test the effectiveness of release bins designed to reduce mortality in these fisheries.</p>	FédéCP MFFP DFO
Educate organizations interested in the aquatic environment and the general public on measures to protect the Striped Bass and its habitat.	Protection, restoration and stewardship; Outreach	<p>Various environmental organizations conduct or are involved in outreach activities.</p> <p>Trade publications and local media report on campaigns, discoveries and research.</p>	FédéCP MFFP DFO
Determine whether habitat restoration projects should be undertaken.	Protection, restoration and stewardship	There have not been any activities. The activity was not considered a priority.	

*The lead participants are at the top of the list; the other participants are listed in alphabetical order. Specific participants have not been identified for all the activities.

3.2 Activities supporting the Identification of Critical Habitat

Table 5 provides information on the implementation of studies outlined in the Schedule of Studies to Identify Critical Habitat of the Recovery Strategy. Each study has been assigned one of four statuses:

- 1) *Completed*: the study has been carried out and concluded.
- 2) *On-going*: the planned activity is underway and has not concluded.
- 3) *Not started*: the activity has been planned but has yet to start.
- 4) *Cancelled*: the planned activity will not be started or completed.

Table 5. Status and details of the implementation of the Schedule of Studies outlined in the Recovery Strategy.

Study	Timeline	Status	Description and Results	Participants ⁶
Locate and characterize spawning habitats (mature individuals in the spring) and incubation period (late spring – early summer)	2016	On-going	<p>Two spawning sites were located and characterized during the spawning period (Valiquette et al. 2017). The sites are Rivière du Sud and the Québec port area. Groups of individuals gathered at these sites, where breeding conditions were optimal (gonads, empty stomach, sex ratio, water temperature, proximity to a recognized fry rearing area). A spawning ground was confirmed in the Rivière du Sud while preliminary results of studies conducted in 2016 also indicated a spawning ground in the Québec port area. A third site, the Ouelle River, was also studied in detail: however, it did not feature the typical characteristics of a breeding area, apart from concentrations of adult fish.</p> <p>Additionally, 1389 hours of sampling were conducted from 2011 to 2015 between Rivière-du-Loup and Bécancour. The data collected were coupled with data from a vast network of telemetric monitoring of movements of mature individuals tagged with transmitters; the 400-km network has been operating since 2011 between Montréal,</p>	MFFP UQAC DFO

⁶ The lead participants are at the top of the list; the other participants are listed in alphabetical order. Specific participants have not been identified for all the activities. Acronyms are defined in Annex 1.

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			<p>Rimouski and La Baie in the Saguenay. Larvae sampling campaigns have also been conducted in various areas since 2011. Striped Bass eggs and larvae were found in the Montmagny area along the south shore in 2011 (Côté et al. 2012). In 2014, a more extensive sampling campaign confirmed the presence of Striped Bass larvae in this area as well as in the northeast tip of Île d'Orléans (work in progress at UQAC).</p> <p>Habitats used during the breeding period still need to be characterized, particularly in the Québec port area, beyond the intertidal riparian area. The planned focus is on hydrodynamics, which is considered an essential parameter for the transportation of eggs and young larvae to suitable feeding habitats located downstream. Further studies are planned over the next few years to finalize this work and possibly detect other spawning habitats.</p>	
Locate and characterize larval development habitats (late spring – early summer)	2016	On-going	<p>Two larval concentration areas were identified in the St. Lawrence Estuary (Côté et al. 2012; UQAC work in progress). The first is in the area between Montmagny and L'Islet-sur-Mer, and the second is around the northeastern tip of Île d'Orléans. The literature indicates that these two areas share environmental similarities, in particular the presence of a brackish water transition zone associated with an area of high turbidity rich in potential prey. Work is underway to identify the characteristics that make these areas preferred larvae habitat (e.g., zooplankton composition and distribution, environmental conditions). The results will be available in the coming years.</p>	MFFP UQAC DFO
Locate and characterize juvenile growth habitats ⁷ (summer – fall)	2016	On-going	<p>An area with potential habitat for young-of-the-year fish was defined (Valiquette et al. 2017). This is the 0-5 meter intertidal area between Lévis and Rivière-du-Loup along the south shore, and between Neuville and Petite-Rivière-Saint-François along the north shore, including the islands between these areas. This area was defined</p>	MFFP UQAC DFO

⁷ “Juveniles” refers to the young-of-the-year fish (age 0+)

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			<p>based on knowledge of juvenile habitat requirements (according to the literature). Additional studies are required to better define areas of particular importance for these early stages of development. For the time being, the standardized recruitment survey, conducted annually by the MFFP since 2013, provides initial information on juvenile concentration areas.</p> <p>Work is underway (at UQAC) to identify habitat characteristics that promote optimal juvenile growth (e.g., zooplankton composition and distribution, environmental conditions). The results will be available in the coming years.</p>	
<p>Locate and characterize habitats used in winter for all stages of development (late fall – winter)</p>	2016	On-going	<p>Two adult Striped Bass wintering areas and a travel corridor between them were characterized (Valiquette et al. 2017). They are respectively the Québec and south Île-aux-Grues areas and the Grands Voiliers channel linking them. This information was obtained by installing telemetry receivers between Portneuf and Rivière-du-Loup during the winter of 2014 – 2015. Passage of individuals through the Grands Voiliers channel is still hypothetical (although likely), because Striped Bass who used both areas were not detected during their transit. No Striped Bass were detected upstream from Québec or downstream from Île-aux-Grues.</p> <p>Additional studies are required to enhance the information and consolidate knowledge, because the available data represent only one year, a limited number of individuals and limited spatial resolution.</p> <p>These new studies are especially relevant because telemetric monitoring conducted during the winter of 2014 did not detect any individuals upstream from Québec. However, since that time, fishermen have reported Striped Bass in winter between Québec and Montréal.</p> <p>There is very little if any information on habitats frequented by subadults in winter. A literature review conducted by the MFFP in 2016 indicated that subadults probably winter in the mesohaline area of the estuary, but recent studies conducted at UQAC (Morissette et al.</p>	<p>MFFP DFO</p>

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			2016) do not rule out the possibility that subadults winter further upstream in less salty waters. Efforts will have to be made to address this gap in the coming years, but logistical constraints related to winter conditions will have to be taken into account.	
Locate and characterize habitats used by immature individuals ⁸ (spring – summer – fall)	2018	On-going	A literature review was conducted by the MFFP in 2016. There is very little if any information on habitats frequented by immature individuals (subadults). The literature review (Morrissette, in prep.) will enhance sampling efficiency and monitoring capacity for this early fish stage. Additional efforts will need to be made in the coming years to complete this knowledge.	MFFP UQAC DFO
Locate and characterize habitats used by mature individuals (summer – fall)	2018	On-going	In late spring, Striped Bass adults spread out into a large area to feed (the river estuary and upper estuary, as well as the Saguenay). Parts of this area are used more intensively. In the fall, they start returning to their wintering sites (Valiquette et al. 2017). This information was obtained from the network of hydroacoustic receivers installed between 2011 and 2015 along the north and south shores of the St. Lawrence, from May to October.	MFFP DFO

⁸ “Immature” means the “subadult” stage; this stage does not include young-of the-year fish, which are considered separately in line three of this table.

3.3 Summary of Progress towards Recovery

3.3.1 Status of Performance Indicators

Performance indicators, as appearing in the Recovery Strategy, and corresponding results are described below.

1- Increase the number of Striped Bass in the St. Lawrence River and Estuary:

So far, the reintroduction of the species in the St. Lawrence River has produced good results. The abundance of the Striped Bass population and its range have both increased and natural breeding has been confirmed. However, the species' status is still precarious and needs to be monitored (Dussureault et al. 2014a). Since efforts to reintroduce the Striped Bass started relatively recently, we will have to confirm whether habitats currently used by the population will continue to be used in the future. Secondly, it is difficult to predict whether currently identified habitats will be sufficient to support a re-established population, particularly since there is currently no quantitative recovery target for the St. Lawrence River Striped Bass population (DFO 2017). Some parts of the reintroduction program could not be finalized due to several issues, for example, at the level of leveraging genetic diversity, of larvae chemical marking, and of early stage marking (fry). It is not yet possible to determine the contribution of artificial reproduction compared to natural reproduction. Nevertheless, stocking of Striped Bass continues, but it could be reevaluated in the future.

2-Identify and characterise important habitats and main threats:

With respect to important habitats, Anse Saint-Anne was the first critical habitat to be recognized and is identified in the Recovery Strategy for the Striped Bass (DFO 2011). It is a site where juveniles congregate. Since then, other habitats considered to be important for the Striped Bass have been located and characterized (DFO 2017; Valiquette et al. 2017), including two breeding areas, Rivière du Sud and the Québec port area. Two larval concentration areas have been identified (Montmagny area, northeast area of Île-d'Orléans). With respect to young-of-the-year fish, it has been shown that they frequent the intertidal and shallow (0-5 m) part of the river estuary and upper estuary, probably to feed and grow. Adult wintering (Québec area, southern Île-aux-Grues) and summer feeding areas (vast area that includes the river estuary and upper estuary, as well as the Saguenay) have also been defined. There is still little information on habitat use by subadults; nevertheless a literature review was conducted (Morrissette, in prep.), and determined that subadults are found in intermediary habitats, relative to larvae and adults. This information will help enhance sampling efficiency and monitoring capacity for this early life stage. Additional studies are required to clearly define the functions of important habitats that have already been identified or to characterize new habitats. Some studies are planned or already underway, while others still need to be defined.

The threat reassessment by COSEWIC (2012) reiterated that dredging and disposal are still the main threat to Striped Bass habitat in the St. Lawrence River, especially for juveniles and immature individuals, even if the sediment disposal is now more closely regulated. Habitat disturbance and destruction (including harbour development and dredging activities), oil exploration and transportation, as well as contamination are all threats to important Striped Bass habitat (DFO 2017). Although bycatch is still a concern, outreach, monitoring and federal and local prohibitions are mitigating its impact. Finally, variations in water flow are still a concern (COSEWIC 2012).

3-Monitor the status of the Striped Bass population:

The Quebec Ministry of Forests, Wildlife and Parks (MFFP), DFO, academic experts and commercial fishermen are all working hard to monitor the Striped Bass population from Montreal to Gaspé and in the Saguenay. Observation reports, bycatch monitoring, telemetric monitoring and test fisheries (scientific) are used to identify the areas inhabited by the species and to study their functions. Population trends are documented and population dynamics are now better understood. Current deploying efforts aim at developing indicators from standard protocols and data gathered to assess the condition of the Striped Bass population. The range of the species still needs to be more clearly defined along the north shore downstream from the Saguenay and upstream from Québec, and along the Gaspé's north shore (recognized as an area overlapping with the southern Gulf population). There is also a need to better document the dynamics of migratory contingents and their relative contribution to the St. Lawrence River population (Morissette et al. 2016; DFO 2017).

4-Monitor the status of the fish community and interaction with Striped Bass:

Ongoing projects studying Striped Bass interaction with some components of fish communities (salmon, sea trout) have recently started. However, the development of a general indicator for the condition of the fish communities, related to Striped Bass reintroduction, could not be completed. As well, database development for biological characteristics and fish species abundance was not completed as it was not considered a priority at the moment.

5-Protect the Striped Bass population and its most important habitats:

No additional habitat loss or degradation were reported in any important habitat. Critical habitat will be officially identified in an updated Recovery Strategy and Action Plan that are under development. It is anticipated that this protection will be accomplished through a critical habitat Order made under SARA subsections 58(4) and 58(5), which will invoke the prohibition in subsection 58(1) against the destruction of the identified critical habitat. Also, a geomatic tool, which concerns species at risk and their critical habitats, was developed to facilitate protection.

The St. Lawrence River Striped Bass population is protected under SARA and the Quebec Fishery Regulations' catch-and-release requirements. In order to protect individuals, fishing for any species of fish is prohibited (specific locations and times) in Striped Bass concentration areas in Rivière-du-Sud and the Ouelle River. To support these protection measures, governments can continue to organize monitoring and outreach activities; campaigns are conducted and news releases are published by governments and various organizations, including the Fédération des chasseurs et pêcheurs du Québec and commercial fishermen's associations. Communications initiatives are largely covered by specialized media or mass media that help raise awareness among the public and fishermen.

3.3.2 Completion of Action Plan

The Action Plan for the Striped Bass (*Morone saxatilis*) St. Lawrence River population in Canada is currently being developed. It will outline the steps to be taken to support the recovery of the species.

3.3.3 Critical Habitat Identification and Protection

The 2011 Recovery Strategy for the St. Lawrence River Striped Bass partially identified critical habitat for Striped Bass based on the best available information. Since then, other studies have been conducted to complete the identification of critical habitat needed to achieve the population and distribution objectives for the species. Important habitats have been located and characterized, which could help in the identification of new critical habitat. The updated Recovery Strategy and Action Plan will soon report on critical habitat identification. A critical habitat protection Order is also currently in preparation.

3.3.4 Recovery Feasibility

The reintroduction program has produced tangible results. The Striped Bass is now breeding in the wild in the St. Lawrence River. Its population is recovering and experts anticipate that the Striped Bass population will grow and its range will increase (DFO 2017). The recovery of the St. Lawrence River population is therefore underway. Current monitoring efforts, the identification of important habitat, as well as the mitigation and protection measures that have been introduced all suggest that recovery can be achieved.

4. Conclusion Statement

As a result of efforts to reintroduce the species, the status of the St. Lawrence River Striped Bass has improved over the years. The evaluation of the species' recovery and long-term viability monitoring indicates that the status of the river population is improving and its abundance is still increasing. The range (defined as the area frequented by at least 10% of the Striped Bass tagged for telemetric monitoring) of the formerly extirpated population now extends from Gentilly upstream of the St. Lawrence River to Rivière-Ouelle on the south shore and upstream of the Saguenay along the north shore (Valiquette et al. 2017). Recently, numerous Striped Bass observations have been reported by the public in all areas of the St. Lawrence River.

Knowledge about the use of habitat in the St. Lawrence by various developmental stages of the Striped Bass has greatly increased in recent years. A vast network for tracking the movements of mature individuals has enabled us to target winter concentration areas, identify spawning areas, define the area used during the summer feeding and growth period, and highlight previously unknown seasonal migration patterns. These data, coupled with field data, have provided a better understanding of how specific areas are used in spring and have enabled us to identify spawning sites. Since the abundance of young-of-the-year fish is a good indicator of the population's annual recruitment success, young-of the-year fish monitoring tracks changes over time in this segment of the population.

The critical habitat from Anse Sainte-Anne to La Pocatière was formally identified in 2011. Other important habitats, which include a group of geographic locations where the Striped Bass completes its life cycle functions (breeding, growth, feeding, wintering) were also located.

Extensive campaigns were conducted, particularly to educate fishermen on catch-and-release requirements. New players (First Nations and environmental organizations) became interested and involved in Striped Bass recovery. As a result of newly acquired knowledge, outreach and protection needs have increased.

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An update of the 2011 Recovery Strategy, as well as an Action Plan, are currently in development; threats and priorities are being reassessed based on the current situation. There is a solid base to support the recovery of this population in the coming years.

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Appendix 1

Acronyms:

CDPNQ:	Centre de données sur le patrimoine naturel du Québec
COSEWIC:	Committee on the Status of Endangered Wildlife in Canada
DFO:	Fisheries and Oceans Canada
FA:	<i>Fisheries Act</i>
FédéCP:	Fédération québécoise des chasseurs et pêcheurs
MFFP:	Quebec Ministry of Forests, Wildlife and Parks
PCA:	Parks Canada Agency
SARA:	<i>Species at Risk Act</i>
UQAC:	Université du Québec à Chicoutimi