

Observations of Sea Lampreys, attached to Humpback whales, off Saint Pierre and Miquelon archipelago (Northwestern Atlantic)

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Abstract: We report the two first observations of Sea Lampreys *Petromyzon marinus* attached to Humpback whales *Megaptera novaeangliae* during two whales surveys by boat the 5th September 2012 and 8th July 2020. Their size and marbled coloration certified their species identification. However, the lack of scarring does not allow to affirm a parasite/host relationship. These observations are also the first occurrences of this lamprey species in the exclusive economic zone of the French territory of Saint Pierre and Miquelon archipelago, and will be helpful for French managers.

Résumé : Observations de lamproies marines fixées à des baleines à bosse, au large de l'archipel de Saint-Pierre-et-Miquelon (Atlantique Nord-Ouest). Nous rapportons les deux premières observations de lamproies marines *Petromyzon marinus* fixées à des baleines à bosse *Megaptera novaeangliae* durant deux observations de baleines en bateau les 5 septembre 2012 et 8 juillet 2020. Leur taille et leur coloration marbrée certifient l'identification de l'espèce. Cependant, l'absence de cicatrice ne permet pas de constater une éventuelle relation hôte/parasite. Ces deux observations sont également les premières occurrences de cette espèce de lamproie dans la zone économique exclusive du territoire français de Saint-Pierre-et-Miquelon, et seront utiles pour les gestionnaires français.

Keywords: *Petromyzon marinus* • *Megaptera novaeangliae* • First observation

Introduction

The Sea Lamprey, *Petromyzon marinus* (Linnaeus, 1758) (Cephalaspidomorphi, Petromyzontiformes), is one of the largest parasitic lamprey species, with a size up to 1200 mm (Keith et al., 2011). This species is native in Europe as well as in North America along the coasts from Florida to Newfoundland, and invasive in the Laurentian Great Lakes, with a negative impact on the breeding of the native fish (Hansen et al., 2016).

It has an anadromous life cycle. Larvae or ammocoete live in freshwater (3-10+ years), burrowed in river sediments. After the metamorphosis, sub-adults migrate to seawater from September to May. They have then a marine parasitic life for 12 to 18 months, during which lampreys grow until their adult size. Finally, adults migrate into streams from March to July for reproduction and die after spawning (Hansen et al., 2016).

The metamorphosis occurs when the larvae are 3-5 years old, at an average length of about 130-140 mm. This important event allows them to develop functional eyes, marbled pigmentation, well developed fins and a toothed buccal disc (Hardisty & Potter, 1971; Hansen et al., 2016). Having migrated to seawater, sub-adult and adult lampreys start to prey on other marine organisms. They attach to their host with their buccal disc and rasp through tissue with a piston-like tongue endowed with denticles in order to feed on blood (Hardisty & Potter, 1971).

The parasitic sea lamprey is known to feed on teleost fish and selachians (Silva et al., 2014). But some observations of attachment on cetaceans were also recorded, such as to *Eubalaena glacialis* (Müller, 1776), *Balaenoptera acutorostrata* Lacépède, 1804, *Balaenoptera borealis* Lesson, 1828, *Balaenoptera physalus* (Linnaeus, 1758), *Grampus griseus* (Cuvier, 1812), *Orcinus orca* (Linnaeus, 1758), *Tursiops truncatus* (Montagu, 1821), *Phocoena phocoena* (Linnaeus, 1758), *Kogia breviceps* (Blainville, 1838), *Kogia sima* (Owen, 1866), *Physeter macrocephalus* Linnaeus, 1758, *Mesoplodon bidens* (Sowerby, 1804) and *Ziphius cavirostris* Cuvier, 1823 (Silva et al., 2014; Miočić-Stošić et al., 2020). Concerning humpback whales *Megaptera novaeangliae* (Borowski, 1781) (Balaenopteridae), there is only one mention of an unpublished observation of sea lampreys attached to individuals from Pacific populations (Nichols & Tschertter, 2011). But as *P. marinus* does not occur in the Pacific Ocean, they might correspond to the Pacific lamprey *Entosphenus tridentatus* (Richardson, 1836) (Pike, 1951).

Northwestern Atlantic Ocean is situated along the migration route of several cetacean species including the humpback whale. This species is present in this area from May to November before swimming 9,000 km to the Caribbean for breeding (Zellhuber, 2009). Humpback whale is distinguished from other whale species by the presence of a hump on the dorsal fin and long flippers (e.g. Zellhuber, 2009). Adult reaches a length about 15.6 m for a weight about 34 tons (Johnson & Wolman, 1985).

Here, we report two observations of sea lampreys attached to humpback whales off Saint Pierre and Miquelon archipelago.

Material and Methods

Saint Pierre and Miquelon archipelago is a self-governing territorial overseas collectivity of France, located in the northwestern Atlantic Ocean near the Canadian province of Newfoundland and Labrador in the Gulf of St. Lawrence (Fig. 1). Its exclusive economic zone represents 12,348 km² with an extension of around 370 km on the continental shelf to the South.

Annual surveys off Saint Pierre and Miquelon archipelago are organized since 1983. They are conducted by individual volunteers that communicate their observation to the French minister of environment represented by the "Direction des Territoires, de l'Alimentation et de la Mer" (DTAM) in Saint Pierre. The DTAM collects the annual data and brings them to the public interest. 1183 individuals have been identified and assigned with a unique identifier (e.g. SPM0001). Ninety individuals were seen in 2020 and some of them have been observed every year (Zellhuber, 2009).

The first sea lamprey observation was on the 5th September 2012 at 10:43 am, GPS coordinates: 47.23368N-56.34563W. The second observation was on the 8th July 2020 at 6:37 pm, GPS coordinates: 46.485N-56.48667W (Fig. 1).

These observations were done on a 7.2 m Osprey boat. The surface water temperatures were respectively 15 and 12°C measured on the Garmin chart plotter. Animals were photographed with a Canon 7D fitted with a EF70-200 mm f/2.8L USM lens and a Nikon D5200 with a Canon 70-200 mm lens. Pictures were taken at a distance of 10 to 15 m aside the animal. Humpback whales lengths were estimated comparing to the boat length whereas the sea lamprey lengths were estimated on the pictures comparing to the whales sizes.

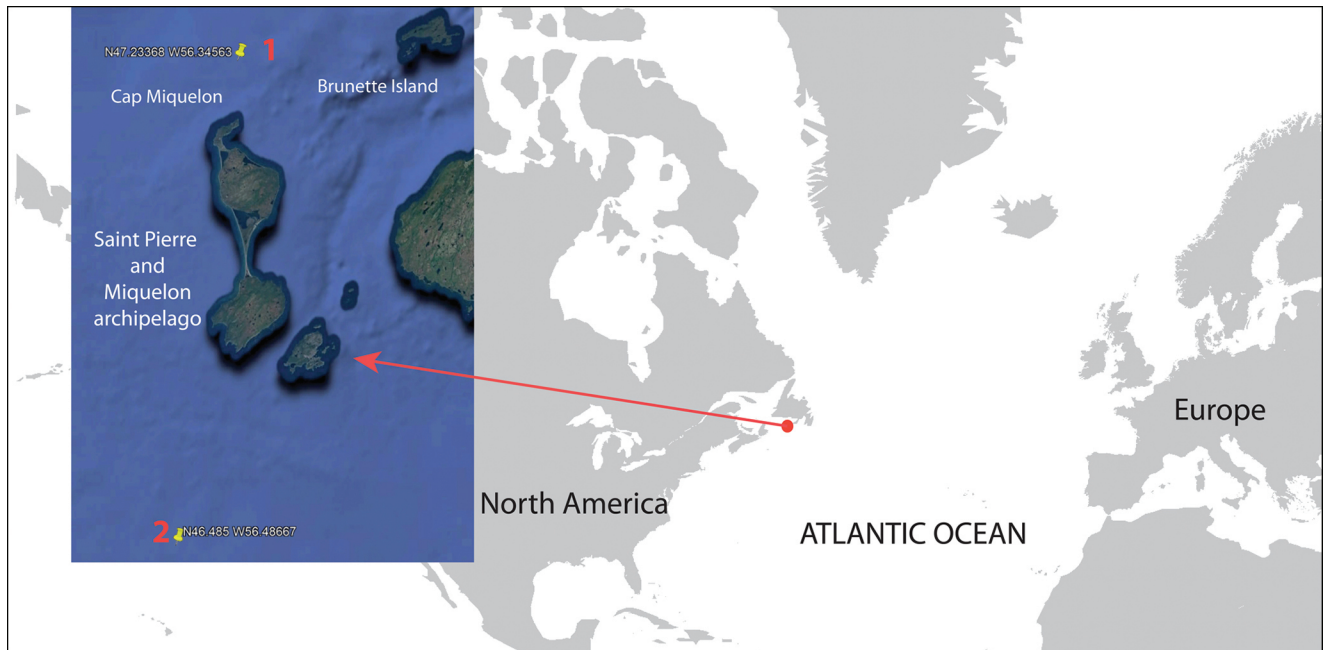


Figure 1. The Saint Pierre and Miquelon archipelago with the location of the sea lampreys' observations the 5th September 2012 (1) and the 8th July 2020 (2); picture credit: Google Earth.

Results and Discussion

During the first observation, whale watchers observed two Humpback whales: an adult (unmatchable with the ID database) of 15 m, along with a younger juvenile whale SPM0620, probably a mother and its young. This last individual is a female estimated about 12 m. They might have come from the Estuary of the gulf of St Lawrence and heading towards Cape Race, probably to follow their migrating route pattern, up towards Labrador and then Greenland waters. While approaching and photographing the fluke female whale, a sea lamprey attached to its left side appeared, just under its dorsal fin (Fig. 2A & B). This sea lamprey was marbled yellowish and dark brown. Its size was estimated at about 50 to 60 cm long for 7 cm round.

The second observation concerned a single young adult SPM1311 with a length estimated about 12 m too. The individual was following a group of humpback whales that was feeding just over the bottom of the sea which is about 60 m deep. A sea lamprey, with a grey marbled coloration and measuring about 40 cm, was attached to the left side of its tail (Fig. 2C). For both observations, the encounter lasted approximately 20 minutes and the whales didn't show any behavioral effect of the attachment.

The identification of the observed lamprey individuals as *Petromyzon marinus* is not doubtful as

their coats are marbled and it is the only species living in sea water in North East Atlantic (e.g. Scott & Crossmann, 1988). This occurrence of sea lamprey in the exclusive economic zone of the French territory of Saint Pierre and Miquelon archipelago, is now recorded in the naturalist database Nature spm (<http://www.naturespm.com/>) as well as in the next version of the French taxonomic register TAXREF v.15.0 (<https://inpn.mnhn.fr/programme/referentiel-taxonomique-taxref>), expected at the end of 2021.

These are also the first observations of sea lampreys attached to humpback whales.

Humpback whales swim with an average speed from 2 km.h⁻¹ (0.6 m.s⁻¹) to 6.0 km.h⁻¹ (1.7 m.s⁻¹), and a maximum speed recorded at 15.6 km.h⁻¹ (4.2 m.s⁻¹) and 27 km.h⁻¹ (7.5 m.s⁻¹) if injured (Noad & Cato, 2007). Sea lamprey generally swims at speeds < 1 m.s⁻¹ (Beamish, 1974; Stier & Kynard, 1986; Quintella et al., 2009). But this speed can easily double for 100 seconds of effort (Bengstedt et al., 1981; McAuley, 1996) and reach 3.9 m.s⁻¹ during an instantaneous acceleration (Hunn & Youngs, 1980; Hoover & Murphy, 2018). Thus, a sea lamprey can easily touch a humpback whale.

By the same way, a humpback whale is able to dive until 616 m of depth (Derville et al., 2020) and sea lamprey can be found in depths > 4000 m (Halliday, 1991). Thus, the humpback whales diving is not restrictive for sea lampreys.

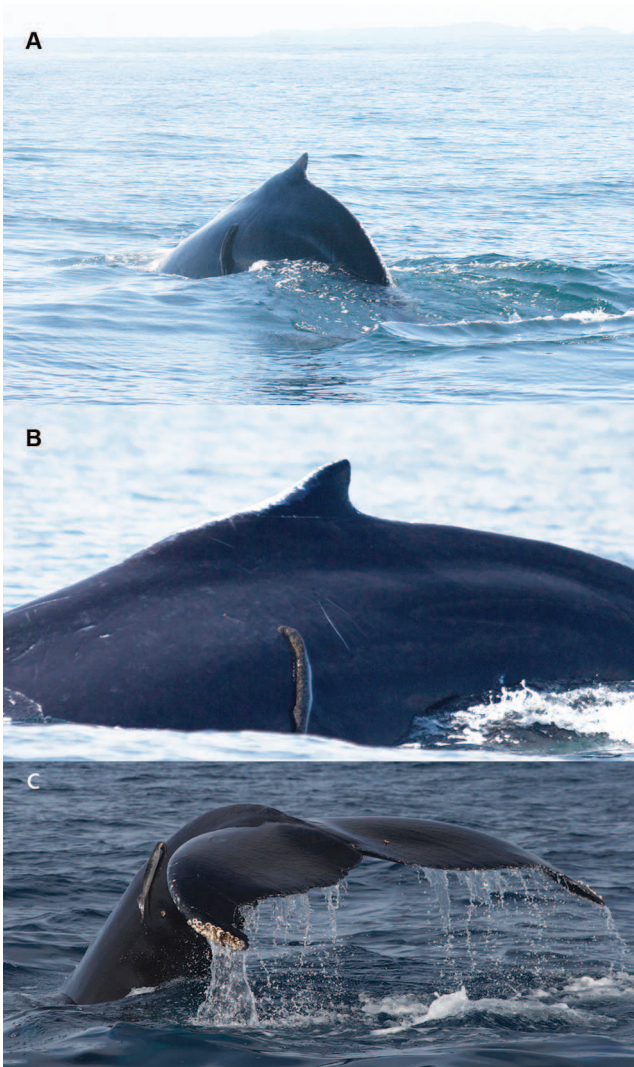


Figure 2: The two observations of sea lampreys on humpback whales: **A & B.** On a young female SPM0620 the 5th September 2012 (GPS coordinates: 47.23368N-56.34563W). **C.** On a single young adult SPM1311 the 8th July 2020 (GPS coordinates: 46.485N-56.48667W). Pictures credit: F. Urtizberea (a) and J. Detcheverry (b and c).

However, there is no observation of any scar nor pierced wounds on the skin, the evidence of feeding is then not confirmed (Silva et al., 2014). However, the darkish coloration of the whale's skin does not allow to well observe the presence of potential scar (Pike, 1951). The humpback whale's epidermis is thicker than those of other whale species and may not allow the attached sea lamprey to pierce the skin for feeding (Pike, 1951). However, Pike (1951) thought that when the humpback whale throws its tail for diving, it would avoid the attachment of the sea lamprey. Our second observation refutes this last hypothesis. A special attention on the presence of pierced scars should be

paid in the future in order to point out a potential parasite/host relationship.

The first observation, the young whale SPM0620 has not been matched with any other pictures in the West and North-West Atlantic till this day. Also no match done for the second observation.

Acknowledgements

We thank the FNE SPM organization and the French minister of environment through the DTAM975. We are also grateful to Roger Etcheberry who matches flukes across the Atlantic, who's SPM's naturalist's magister and « the most powerful system » to match flukes all over the North West Atlantic. We are also thankful for Mélyne Hauteœur for checking the English. And finally, we thank Fabrice Teletchea who supports the highlight of the naturalists work in the archipelago.

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