The Ocean Pout, *Zoarces americanus,* and the Ocean Sunfish, *Mola mola*: Additions to the Marine Ichthyofauna of the Lower Saint John River System, New Brunswick, with a Summary of Marine Fish Reported from the Estuary

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Recent records for the Ocean Pout, *Zoarces americanus* (collected 11 February 2011), and the Ocean Sunfish, *Mola mola* (photograph taken 24 June 2012), in the lower Saint John River system, New Brunswick, add to the list of marine fishes reported from this oceanographically unique estuary system. A total of 62 species of strictly freshwater, anadromous, catadromous, and marine fishes have now been recorded in the Saint John River system, with 49 of these in the Saint John River *sensu stricto*. The Acadian Redfish, *Sebastes faciatus*, a species assessed as threatened by the Committee on the Status of Endangered Wildlife in Canada, appears to be among these. While strictly marine fishes may contribute relatively little to the over-all biomass of fishes in the Saint John River system, marine species account for 30.6% of the biodiversity of fishes in the river to date. This suggests that marine fishes may be a more significant component of the ichthyofauna of the lower Saint John River system than is generally recognized.

Key Words: Ocean Sunfish, *Mola mola,* Ocean Pout, *Zoarces americanus,* marine fishes, Saint John River, Kennebecasis River, Kennebecasis Bay, estuary, New Brunswick.

The Saint John River, 673 km in length, drains a basin of 55,110 km^2 and discharges into the Atlantic Ocean (Bay of Fundy) at a rate of 1110 m^3/second (Cunjak and Newbury 2005). It is the longest river in Atlantic Canada. Matthew (1894) was one of the earliest to comment scientifically on the peculiarities of this river, particularly at its outlet. The oceanographic features of the Saint John River estuary and the estuary of its tributary, the Kennebecasis River, are unique. Rock sills at the mouth of each river control the flow of water in and out of the estuaries (Trites 1960). In Kennebecasis Bay (maximum depth 62 m) (Metcalfe et al. 1976) this produces a two-layered system with brackish water at the surface and a deep saline layer. In the Saint John River estuary, a well-mixed body of brackish water is present near the mouth and downstream of the confluence of the Kennebecasis River and the Saint John River. The salinity of the deep layer in the Kennebecasis River estuary remains relatively constant at 21–23 ppt, while the surface layer is reported to vary from 0–10 ppt (Trites 1960). Exceptional tidal amplitude in the adjacent Bay of Fundy produces strong currents at the mouth of the Saint John River that alternate in direction daily at ~6 hour intervals.

These unique conditions and high estuarine salinities have allowed fishes normally restricted to marine waters to penetrate the river mouth either permanently or periodically. Among previous reports are 17 fishes normally considered to be strictly marine. This list does not include essentially marine species considered estuarine-dependant (Scott and Scott 1988; Day et al. 1989), such as the Atlantic Silverside, *Menidia menidia*, or the Atlantic Tomcod, *Microgadus tomcod*, both not uncommon in the lower river (Huntsman 1922; Squires and Gorham 1967; Meth 1971). Here I add recent observations of the Ocean Pout, *Zoarces americanus,* and the Ocean Sunfish, *Mola mola*, to the list of marine fishes reported from the estuary of the lower Saint John River system. I also summarize marine fish records from the Saint John River system to date and comment on the contribution of marine fishes to the over-all ichthyological diversity of the estuary.

On 11 February 2011 Joanne Lambert and Herb Loeman, using shrimp as bait, took an Ocean Pout, *Zoarces americanus*, of 293 mm total length, by hook and line while ice fishing adjacent to the Millidgeville ferry terminal on Kennebecasis Bay, Saint John (45.33°N, -66.07°W) (Figure 1). Hydrographic charts show water depth in the area of capture as 4–9 m. The specimen is now deposited in the New Brunswick Museum fish collection (catalogue no. 2324).

On 24 June 2012 Rebekah Johansson and Gerry McNulty were walking the shoreline area of Indiantown (lower Main Street) in Saint John. The area provides a clear view of the Saint John River estuary above the Reversing Rapids looking towards Milford. They were startled to see a large fin protruding above the water surface about 100 m offshore. The fin remained visible for ~3 minutes while Johansson, equipped with a camera with a 72–300 mm zoom lens took a photograph (Figure 2). The photo shows a single, dull grey, fin in the middle of the estuary channel (45.276°N,

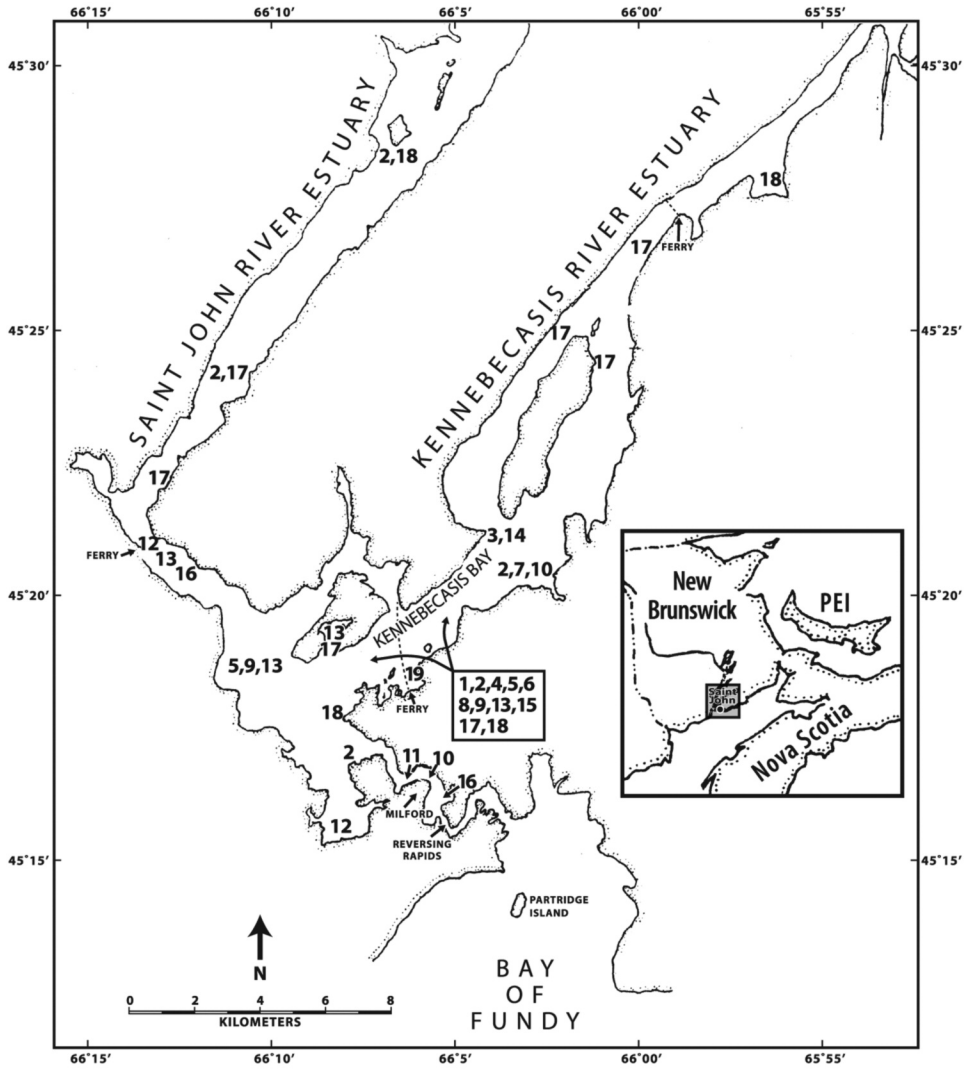

FIGURE 1. The lower Saint John River system. Numbers 11 and 19 mark the locations of the *Mola mola* and *Zoarces americanus* records, respectively, reported in the text. Other numbers correspond to the locations of previous reports of marine fishes listed in Table 1.

June June -66.097°W). The colour, slow movement (essentially stationary from a distance), and maximum height/width ratio of =1.4 for this fin (taken from the photo) distinguish it as that of an Ocean Sunfish, *Mola mola*.

On the basis of line drawings provided in Castro (1983), Scott and Scott (1988) and Compagno et al. (2005) height to width ratios calculated for large sharks reported from the Atlantic region are much lower (0.55–0.94). Male Killer Whales (*Orcinus orca*) have a high, similarly shaped dorsal fin (the female has a smaller, distinctly falcate dorsal fin), but male Killer Whales are very rare in the Bay of Fundy (Gaskin 1997). While the height to width ratio of the dorsal fin of the Ocean Sunfish may overlap with that of the male Killer Whale, the dorsal fin of the male Killer Whale is black and smooth (not grey and dull) and relatively more broad-based. More significantly, Killer Whales are very active, with surfacing behaviour including a sequence of events — head raised, blow, dorsal fin, and roll of the peduncle (Watson 1981); (L. Murison, personal communication to DFM) — that were noticeably absent in the estuary.

Discussion

Zoarces americanus is a benthic fish of frequent occurrence in the Bay of Fundy from the intertidal to a depth >180 m (Scott and Scott 1988). Clemens and

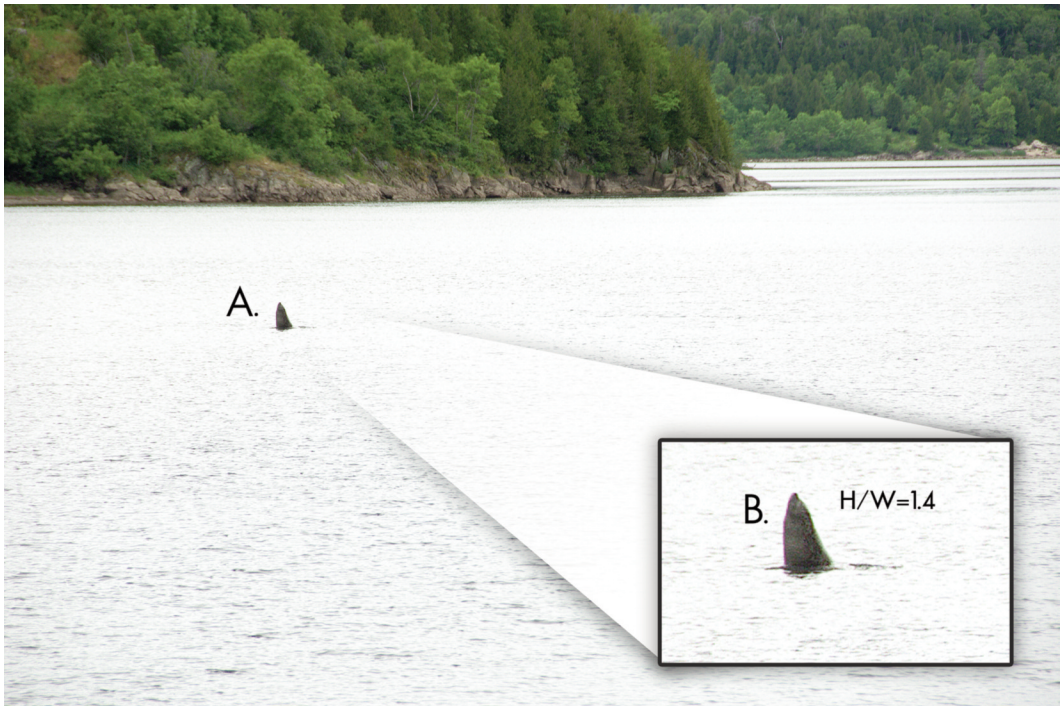

FIGURE 2. Photograph of a *Mola mola* dorsal fin as observed in the lower Saint John River estuary on 24 June 2012. A is the photograph as taken. Inset B has been digitally enhanced only to improve resolution upon enlargement. H/W = ratio of dorsal fin height to width. Photo: courtesy of R. Johansson.

Clemens (1921) reported *Z. americanus* (as *Z. anguillaris*) from 9.7 km (6 miles) up the St. Croix River. The growth curve presented in Clemens and Clemens (1921) suggests that the specimen captured in the Saint John River estuary on 11 February 2011 was a juvenile of ~4.5 years of age. The species is most abundant on hard and semi-hard substrates, rather than mud (Scott and Scott 1988), suggesting that the mud-bottomed estuary may provide only marginal habitat for Ocean Pout or is perhaps most attractive to juveniles. Whether the Saint John River estuary supports a resident population of this species is unknown, although in the Bay of Fundy the Ocean Pout is reported to occupy deeper waters during the winter months, normally leaving rivers and bays and returning in late April (Clemens and Clemens 1921).

Considered a pelagic species, the Ocean Sunfish is a summer visitor to eastern Canadian waters, where it is believed to feed mainly on jellyfish, comb-jellies, crustaceans, molluscs and brittlestars (Scott and Scott 1988), but see Syväranta et al. (2012). Migrations inshore are unpredictable, but in 2012 the species was observed with unusual frequency from whale-watching boats in the Bay of Fundy (L. Murison, personal communication to DFM) and a juvenile individual (< 1 m total length) became fatally stranded on coastal mud flats near Saint John (New Brunswick Museum fish collection no. 2344).

Fraser-Brunner (1951) and Schwartz and Lindquist (1987) have suggested that individual Ocean Sunfish observed at the surface or inshore are ill or stressed. More recent hypotheses explaining surface activity by this species propose thermal recharging and/or symbiotic parasite removal by fishes or birds (Abe and Sekiguchi 2012). Health status of the *M. mola* observed in the Saint John River estuary on 24 June 2012 is unknown. Although the Ocean Sunfish is an active swimmer capable of highly directional movement (Pope et al. 2010) the individual reported here from the Saint John River may have been swept into the estuary with the rising tide. Prey species that might attract *M. mola* are not believed to be present in the estuary. Examination of the shoreline in the background of Figure 1 suggests the photo was taken at near-high tide or high tide.

Although Adams (1873) noted the presence of the White Hake, *Uroyphycis tenuis* (incorrectly reported as *Merluccius albidus*); (also reported as *U. chuss* by Trites 1960 and Meth 1971) in the lower Saint John River system, Huntsman (1922) appears to have been the first to comment on the unique conditions leading to the presence of otherwise marine fishes in the lower

part of the river. Since then, Squires (1967) and Meth (1971) have provided compendia of the marine fishes observed in the Saint John River estuary and such can also be extracted from Gorham (1970). Table 1 lists all records of marine fishes recorded to date from the Saint John River estuary system. Cunjak and Newbury (2005) and Curry and Munkittrick (2005) report that 36 fish species occur in the [middle and upper] Saint John River, but as early as 1936 Rogers reported 47 fish species as present in the Saint John and tributaries (plus two species now considered to be in error). Meth (1971) reported 54 species in the lower river system.

Currently, including the new records reported here, 62 species of strictly freshwater, anadromous, catadromous and marine fishes have been assessed as occurring in the Saint John River system, with 49 of these in the Saint John River *sensu stricto* (Rogers, 193; Meth 1971; Burns 1976*; Stocek et al. 1999; Hood and Stocek 2005). While strictly marine fishes may contribute relatively little to the over-all biomass of fishes in the Saint John River system, marine species account for 30.6% of the biodiversity of the fishes reported from the river to date

The known distribution of marine fish records in the estuary has been significantly influenced by the location of (past) commercial fishing operations, scientific interest in the oceanographic features of Kennebecasis Bay, and a concentration of ice-fishing activities at public wharves. Since the 1970s there has been a significant decline in commercial fishing activity in the Saint John River system and very limited commercial fisheries continue (Cunjak and Newbury 2005).

Unfortunately, only half of the marine fish reports from the estuary summarized here can now be verified by reference to specimen material. Rogers (1936), Trites (1960) and Squires (1967) all reference unidentified marine fishes from the estuary. Rogers (1936) relates (with some skepticism) a fisherman reporting taking a specimen of the Barndoor Skate, *Dipturus laevis*, measuring "about six feet [1.8 m] across the wings" in Kennebecasis Bay.

Table 1. Species of marine fishes recorded from the Saint John River and Kennebecasis River estuaries. Locations are plotted on Figure 1. Where records are supported by specimens, New Brunswick Museum fish catalogue numbers are provided.

Species[1]	Estuary	Month or season	Source and specimen no.
1. *Amblyraja radiata*	Kennebecasis River	?	Gorham (1970)
2. *Cyclopterus lumpus*	Kennebecasis River/ Saint John River	January–February; June	Squires (1967); 23, 356, 621, 1078, 1090, 1091, 1092, 2102
3. *Enchelyopus cimbrius*	Kennebecasis River	June	Burns (1976*)
4. *Dipturus laevis*	Kennebecasis River	?	Rogers (1936)
5. *Gadus morhua*	Kennebecasis River/ Saint John River	May–December	Rogers (1936), Trites (1960); 1121
6. *Hemitripterus americanus*	Kennebecasis River	Winter	Rogers (1936)
7. *Hippoglossus hippoglossus*	Kennebecasis River	March	Squires (1967); 97
8. *Leucoraja ocellata*	Kennebecasis River	?	Huntsman (1922)
9. *Limanda ferruginea*	Kennebecasis River/ Saint John River	August–October	Meth (1971)
10. *Lophius americanus*	Kennebecasis River/ Saint John River	?	Squires (1967), Gorham (1970); 568
11. *Mola mola*	Saint John River	June	This note
12. *Peprilus triacanthus*	Saint John River	August/summer	Gorham (1970); 558, 1059
13. *Pseudopleuronectes americanus*	Kennebecasis River	May–August	Burns (1976*); 107, 411, 970, 990
14. *Scophthalmus aquosus*	Kennebecasis River	July	Burns (1976*)
15. *Sebastes fasciatus*	Kennebecasis River	May–January	Rogers (1936),Trites (1960), Squires and Gorham (1966); 106
16. *Squalus acanthias*	Saint John River/ Kennebecasis River	?/November	Huntsman (1922), Rogers (1936), Gorham (1970); 734
17. *Syngnathus fuscus*	Saint John River/ Kennebecasis River	January–September	Squires and Gorham (1967); 275, 1042, 1131, 1808, 1809, 2278, 2345
18. *Urophycis tenuis*	Saint John River/ Kennebecasis River	March–December	Adams (1873), Meth (1971), Burns (1976*); 560, 861
19. *Zoarces americanus*	Kennebecasis River	February	This note; 2324

[1]Numbers refer to locations on Figure 1.

Rogers (1936) and Trites (1960) reported the Redfish, *Sebastes marinus,* at a time when a single name was applied to a group of fishes now considered to consist of at least three species: *S. fasciatus*, *S. norvegicus*, and *S. mentella*. Squires and Gorham (1966) report *S. marinus mentella* from the estuary, but Scott and Scott (1988) suggested it was "doubtless" the Acadian Redfish*, S. fasciatus*, a shallow-water inshore species and the only *Sebastes* recorded in the Bay of Fundy (Committee on the Status of Wildlife in Canada 2010*). I have assigned the name *S. fasciatus* to all *Sebastes* from the estuary, but it is worth noting that in some areas off eastern Canada all three species can be taken together in the same trawl net (Scott and Scott 1988); that a morphologically and genetically distinct population of *S. fasciatus* is present in fiord-like Bonne Bay, Newfoundland (Committee on the Status of Wildlife in Canada 2010*); and the specimens of *Sebastes* from the Saint John River estuary have not been examined in the light of current nomenclature. *Sebastes fasciatus* has been designated as a threatened species by the Committee on the Status of Endangered Wildlife in Canada (Committee on the Status of Wildlife in Canada 2010*).

While rising sea-levels predicted for eastern Canada (Shaw et al. 1998) may increase the frequency of marine fishes in the lower Saint John River in the future, the occurrences summarized here suggest that marine fishes have been, and continue to be, a more significant component of the current ichthyofauna of the lower Saint John River than is generally recognized.

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