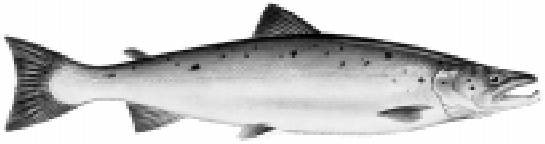
Fisheries and Oceans / Pêches et Océans
Maritimes Region

DFO Science
Stock Status Report D3-13(1998)



Atlantic Salmon
Southwest New Brunswick outer-Fundy SFA 23

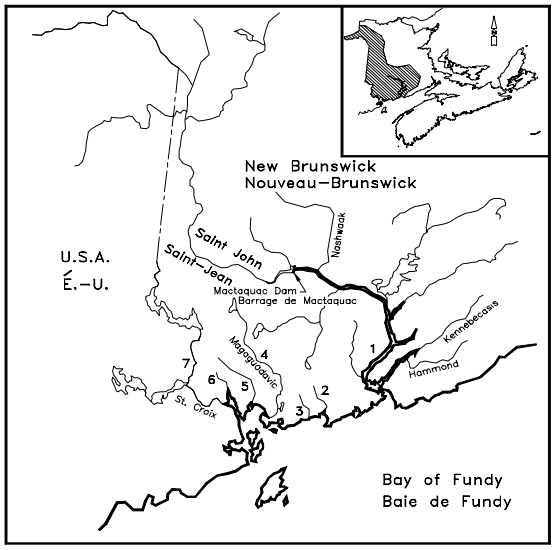
Background

Atlantic salmon inhabit 7 major rivers of the "outer-Fundy" area of southwest New Brunswick. The rivers are bounded by and include the Saint John and St. Croix. Salmon of these rivers are characterized by a maiden MSW (multi-sea-winter; large) component that, unlike inner-Fundy stocks, migrates to the Labrador Sea and a 1SW (one-sea-winter; small) component that is known to venture to the south and east coasts of insular Newfoundland. This report summarizes the status of salmon stocks of the Saint John River above Mactaquac, the Nashwaak, Kennebecasis and Hammond rivers below Mact-aquac and the Magaguadavic and St. Croix rivers.

Stock characteristics vary between outer-Fundy rivers, e.g., wild MSW fish comprise about 40% of total wild returns to above Mactaquac, the Nashwaak and the Magaguadavic rivers and 70% of wild returns to the St. Croix River. MSW salmon are 75-95% female on the Saint John and 60% female on the St. Croix and provide most of the egg deposition. Wild 1SW salmon are 15% female above Mactaquac, 40% female in the Nashwaak and 50% female in the St. Croix. About 20% of MSW salmon in the Nashwaak are repeat spawners; only 5-10% of MSW salmon returning to Mactaquac are repeat spawners.

Conservation requirements are established for individual rivers based on 2.4 eggs per m^2 of river habitat. The object is to obtain the egg depositions from the large salmon component.

Hatcheries at Saint John and at Mactaquac have been important to stock enhancement/development and, in the case of Mactaquac, for replacing salmon production lost to hydroelectric development.



Releases in 1997 numbered about 310,000 smolts, 700,000 fry and 422,000 age 0+ fall parr.

The New Brunswick Atlantic salmon aquaculture industry is concentrated in the Passamaquoddy Bay (Fundy Isles) area. Growers produced an estimated 18,500t of Atlantic salmon in 1997. An outbreak of ISA (Infectious Salmon Anemia virus), a causative agent of HKS (Hemorrhagic Kidney Syndrome) mostly affected fish that were to have been harvested in 1998. Escapes in 1997 were not reported but believed to have been insignificant relative to guesstimated losses of 20,000-40,000 salmon in 1994. Escapes in 1997 comprised 58% of 141 salmon at the St. George fishway on the Magaguadavic River and 39% of 70 salmon counted at Milltown on the St. Croix River.

Summary

- Returns of 1SW and MSW salmon in 1997 were generally fewer than expected and continued a downward trend.
- Only 35% or less of conservation requirements were met.
- No improvements are forecast for 1998.

Canada

The Fishery

Aboriginal Peoples of southwest New Brunswick were allocated 3,700 1SW fish, mostly from stocks returning to Mactaquac. Estimated harvests were 361 1SW and 265 MSW fish, down from those of 1996. The fishery opened on June 17 and early closure effective August 12.

The recreational fishery for salmon in outer-Fundy rivers in 1997 was restricted to catch-and-release only between July 15 and early closure on August 12.

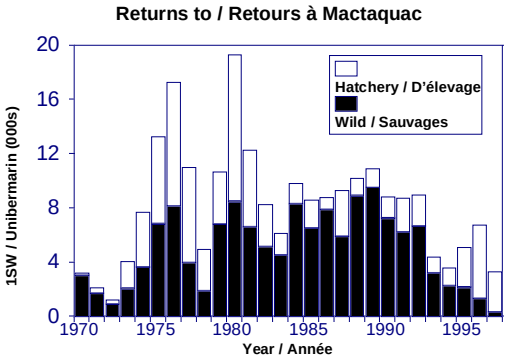
Resource Status

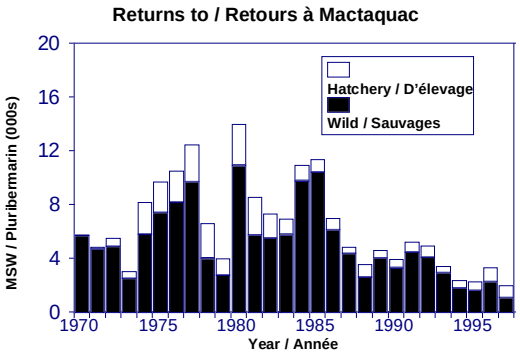
Assessment of outer-Fundy stocks is based on counts of fish in the Saint John River at Mactaquac Dam (DFO), at the Nashwaak River fence (operated by Kingsclear and Oromocto First Nations with assistance from DFO) and at the Kennebecasis River headwater fence (operated by the NB Cooperative Fish and Wildlife Research Unit). Redds were counted on the Hammond River (NBDNRE). Counts of fish were also made on the Magaguadavic River at St. George (operated by the Atlantic Salmon Federation) and on the St. Croix River at Milltown (operated by the St. Croix International Waterway Commission). In 1997, all counts were complete. Fish of sea-cage origin were identified by fin erosion, especially on the upper and lower lobes of the caudal fin. Sea survival was assessed on the basis of 1SW and MSW returns to Mactaquac from known numbers of hatchery-reared and released smolts.

Status of stocks

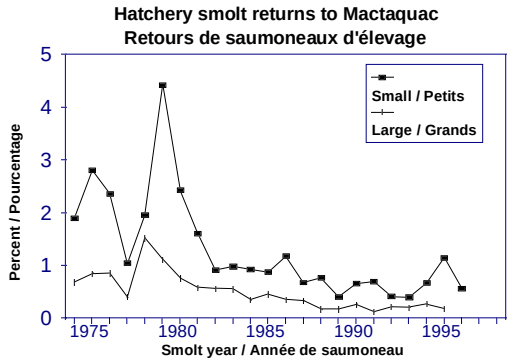
Saint John River (Mactaquac): Total estimated 1SW returns destined for Mactaquac (3,255; 89% of hatchery origin) were the lowest since 1972. Wild returns continued a 9-year downward trend.

MSW returns destined for Mactaquac (1,971; 43% of hatchery origin) were the lowest of the 28-year record. Wild MSW returns continued a 13-year downward trend.

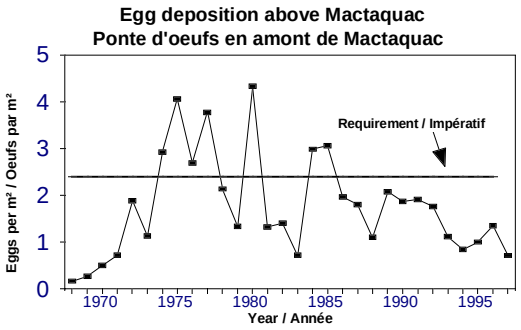




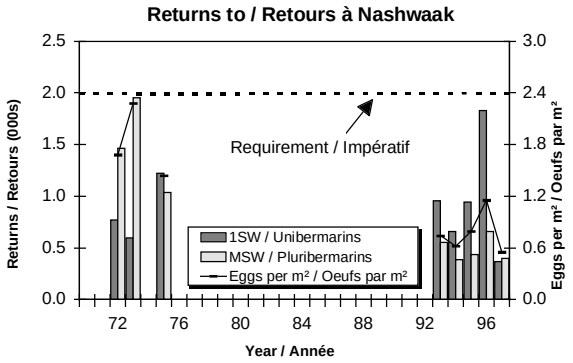
No fish sorted at Mactaquac were of aquaculture origin. Fifty-seven percent of 1SW and 56% of MSW hatchery returns originated from hatchery smolts released at Mactaquac. A return rate of 0.56% in 1997 for 1SW fish from hatchery smolts released in 1996 was one-half the return rate of 1996. Hatchery MSW returns decreased to 0.19% of smolts released in 1995, one of the lower values of record.



Conservation requirements above Mactaquac are 4,900 1SW and 4,900 MSW fish. Escapement in 1997 numbered 2,742 1SW and 1,340 MSW spawners, 56% and 27% of conservation requirements. Egg deposition was 30% of requirement (wild 16%; hatchery 14%). Conservation has not been met since 1985.



Nashwaak River: The count (and complete returns) at the Nashwaak River fence numbered 370 1SW and 366 MSW salmon. Hatchery-origin fish comprised only 9% of the total. Escapement was estimated at 363 1SW and 362 MSW fish and represented 18% of 1SW and MSW requirements above the fence. Egg depositions were 23% of requirement, the lowest of any year that the fence was operated.



Kennebecasis River: Total returns counted to the Kennebecasis River headwaters were 76 1SW and 45 MSW fish. Estimated egg depositions were 35% of the 1.1 million egg requirement, two-thirds of the 1996 deposition.

Hammond River: A redd count of 157 large redds on 11.75 km of spawning habitat on the Hammond River was 87% of a 14-year mean, and down 39% from the value for 1996. Egg depositions were estimated to have exceeded 2.4 eggs per m^2 but are unlikely to be representative of depositions through the lower reaches of the system.

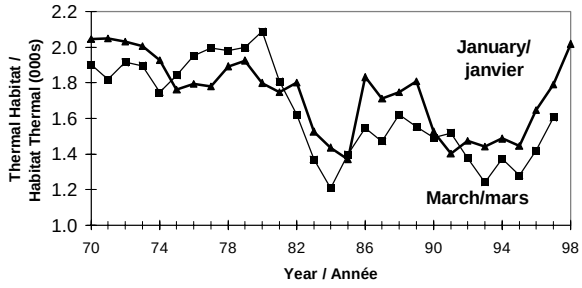
Magaguadavic River: Of 141 salmon trapped in the Magaguadavic River fishway, external and scale characteristics revealed that only 35 1SW and 24 MSW salmon were of wild origins. The wild fish count was down 14% from that of 1996, and the lowest in the 10-year record. No aquaculture fish were passed above the fishway. River escapement was 32 1SW and 17 MSW fish. Egg deposition was 12% of the conservation requirement. This was down one-third from the 1996 deposition.

St. Croix River: Returns to the St. Croix River were 15 wild, 28 hatchery and 27 aquaculture-origin fish. This river is being restored with St. Croix-origin fish. This followed many years of stocking with Penobscot-origin (U.S.A.) and to a lesser

extent, Saint John River origin fish. Total counts were the second lowest of those made in the last decade. Egg deposition was about 1% of requirement although an additional 0.6% of requirement is being incubated at Mactaquac Fish Culture Station.

Environmental Considerations

Indices of winter habitat in the North Atlantic (used to estimate pre-fishery abundance and allocations for the Greenland fishery) have been implicated in returns of Saint John River salmon. That is, abundance/survival decreases with decreasing values of habitat indices. Significant relationships exist between the March index of habitat and i) return rates to Mactaquac for hatchery-origin 1SW salmon, ii) return rates to Mactaquac of MSW hatchery salmon and iii) the length of wild 1SW returns destined for Mactaquac. Length and proportion of 1SW salmon from a smolt class (Mactaquac) are also related to winter habitat and have been previously interpreted as an expression of environmentally induced "cross-over" of potential non-maturing 1SW fish to maturing 1SW fish. The 1996 March index of habitat increased over that of 1995, but expected increases in returns of salmon to homewaters that were noted in 1996 did not continue in 1997. Thermal indices have continued to increase in both 1997 and 1998.



However, other changes are occurring at sea which may be contributing to the decadal decrease in returns. These include intrusion of cold water species such as Arctic cod and Greenland halibut in more southern waters of Newfoundland and Labrador, decrease in diversity of fish species in overwintering areas of salmon, and significant increases in potential predators such as large sea birds (gannets) and seals.

Outlook

Short term

1SW

Saint John River (Mactaquac): Total 1SW returns destined for Mactaquac in 1998 are forecast to be 5,800 (2,400-9,700) fish or 49 to 198% of the 4,900 1SW salmon conservation requirement. Wild 1SW returns are forecast to be 2,200 (300-3,200) of the 4,900 fish conservation requirement. Hatchery 1SW returns are forecast to number 3,600 (2,100-6,500) fish. About 55% of hatchery 1SW fish will originate from smolts released at Mactaquac in 1997. About 45% will originate from age-0^+ fish released upriver of Mactaquac in 1994-1995.

Nashwaak River: Returns of 1SW fish to the Nashwaak River fence in 1998 may be 320 (110-1,200) fish or 5-60% of the conservation requirement of 2,040 1SW fish. The contribution by hatchery fish will be minor relative to the returns expected at Mactaquac.

Kennebecasis River: There is no forecast of 1SW returns to the Kennebecasis River headwater fence in 1998. Juvenile densities which will contribute to returns in 1998 are 37% lower than those that contributed to returns in 1997. Although smolt releases were about the same as in 1996, total 1SW returns to the fence are expected to be fewer than in 1997.

Hammond River: There is no available method to forecast 1SW returns to the Hammond River in 1998. Densities of age 1^+, 2^+ parr in 1996 which will contribute to 1SW returns in 1998 and stocking of hatchery smolts in 1997, suggest that returns could be lower in 1998. These decreases could be in the same order as those of the Kennebecasis River.

Magaguadavic and St. Croix rivers: 1SW returns to the Magaguadavic and St. Croix rivers are expected to remain well below conservation requirements as they were in 1997. Hatchery returns are expected to be low in 1998 since no smolts were stocked. Conservation requirements are not expected to be met in the short term.

MSW

Saint John River (Mactaquac): Estimates of total MSW salmon to Mactaquac in 1998 are forecast to be 1,500 (700-2,100) fish or, 14%-43% of the 4,900 MSW conservation requirement. Wild MSW returns destined for Mactaquac are forecast to be 400 (100-700) fish. Hatchery MSW returns are forecast to be 1,100 (600-1,300) fish.

MSW returns to the Nashwaak River fence are forecast to be 100 (50-130) MSW fish and are unlikely to exceed 10% of the conservation requirement. Returns of MSW salmon to the Kennebecasis and Hammond rivers are not expected to be fewer than those in 1997 and are unlikely to meet conservation requirements. MSW returns to the Magaguadavic and St. Croix rivers will be well below conservation requirements.

Long term

The unexpected low returns in 1997 and the current inability to identify the mechanism in declining returns prevents quantitative derivation of long-term forecasts. However, a decadal decline in returns of wild fish, low return rates of hatchery fish and low juvenile densities in many of the salmon producing rivers of Southwestern New Brunswick, provide a pessimistic outlook for improved returns and achievement of conservation requirements.

Management Considerations

Egg deposition requirements were generally not met in outer-Fundy rivers in 1997. In 1998, returns to area rivers, in the absence of fishing mortality, are not expected to contribute more than 35% of the conservation requirements. Returns of predominantly male 1SW salmon to Mactaquac in 1998, however, may approach and possibly exceed 1SW requirements because of the forecast contribution of hatchery-origin fish.

Fishing mortality should be minimized prior to in-season assessments. Adjustments to exploitation should be considered after July 15-29 assessments of end-of-season returns. For rivers below Mactaquac, adjustments could await end-of-August assessments of end-of-season returns to the Nashwaak, Kennebecasis or Hammond rivers. Similarly, adjustments could be considered on Bay of Fundy rivers west of the Saint John River after in-season assessments of end-of-season returns to Magaguadavic and St. Croix rivers.

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References

Anon. MS 1997. Report of the Working Group on North Atlantic Salmon. ICES C.M. 1997/Assess:10 Ref:M 239p.

Anon. MS 1998. Atlantic salmon abundance overview for 1997. DFO Stock Status Report CSAS D0-02.

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