

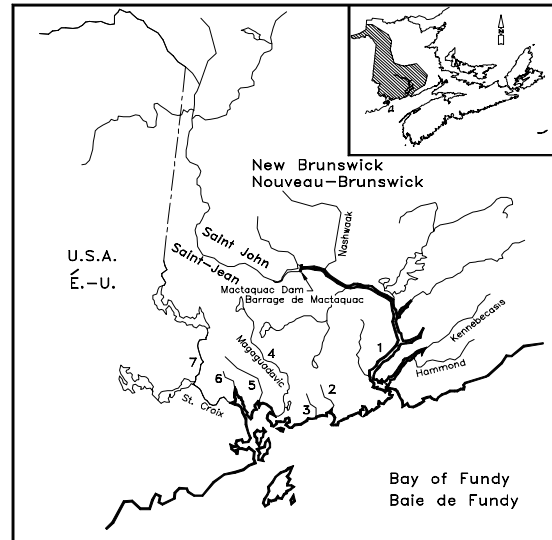
Atlantic Salmon Southwest New Brunswick outer Fundy SFA 23

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 stocks 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 tributaries below Mactaquac 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- 85% 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 spawning fish; only 5-10% of MSW salmon returning to Mactaquac are repeat spawners.

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 1996 numbered about 360,000 smolts, 980,000 6-week age 0+ and 512,000 20-week age 0+ parr. The New Brunswick Atlantic salmon aquaculture industry is concentrated in the Passamaquoddy Bay (Fundy Isles) area. Growers produced an estimated 16,000t of Atlantic salmon in 1996; growers in the Eastport area of Maine (west Fundy Isles) produced another 15-16,000t. New Brunswick escapees in 1996 were not reported but believed to have been significantly less than the rumored 20,000-40,000 salmon lost in 1994. Nevertheless, escapees in 1996 comprised 74% of 263 salmon at the St. George fishway on the Magaguadavic River and 13% of 152 salmon counted at Milltown on the St. Croix River.



The Fishery

Within southwest New Brunswick, Aboriginal peoples, including five First Nations, were allocated 3,795 1SW fish, mostly from stocks returning to Mactaquac. Estimated harvests were 675 1SW and 285 MSW fish. In 1995, a fall harvest after a summer-long closure was estimated at only 75 fish.

The recreational fishery for salmon in outer Fundy rivers in 1996 was restricted to catch-and-release only, i.e., there was no harvest. In 1995 the recreational fishery for salmon had been closed.

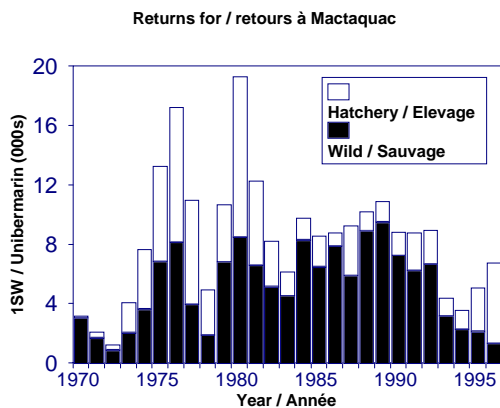
Resource Status

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, Oromocto and St. Mary's First Nations with assistance from DFO) and Kennebecasis River fence (instigated this year in the

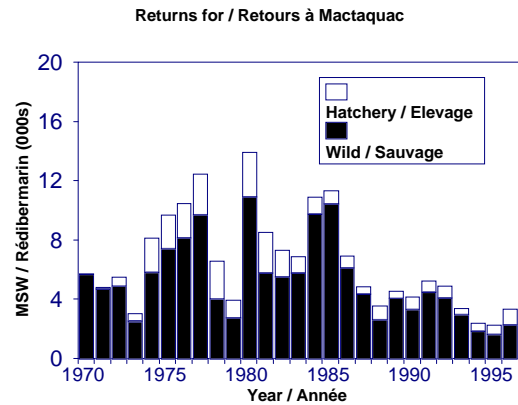
headwaters by the UNB Cooperative Fish and Wildlife Research Unit), and counts of redds on the Hammond River. Counts of fish were also made on the Magaguadavic River at St. George (operated by the Atlantic Salmon Federation) and on the St. Croix River at Milltown (operated by the St. Croix International Waterway Commission). The counts on the Nashwaak and Kennebecasis rivers were incomplete; returns to the fence sites were estimated by mark-and-recapture techniques. 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

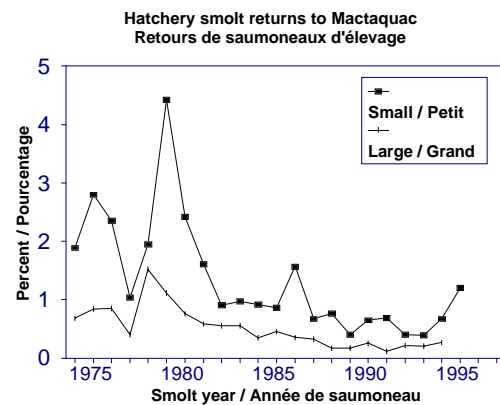
Saint John River (Mactaquac): Total estimated 1SW returns destined for Mactaquac (6,273; 80% of hatchery origin) were the highest since 1992.



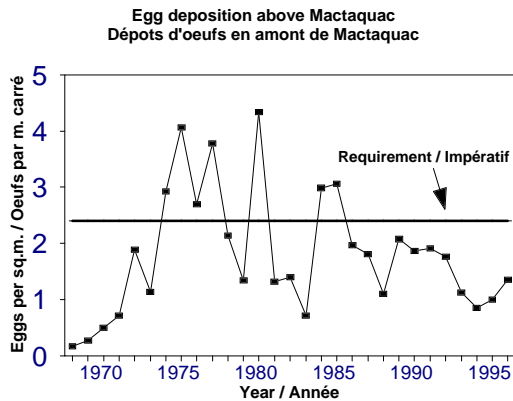
MSW returns destined for Mactaquac (3,321; 30% of hatchery origin) were more than those of 1994 and 1995 but the third lowest of the last 26 years.



Only 13 fish at Mactaquac were identified as being of aquaculture origin. Fifty-four percent of 1SW and 60% of MSW returns originated from hatchery smolts released at Mactaquac. A return rate of 1.2% in 1996 for 1SW fish from hatchery smolts released in 1995 was double the return rate for 1995. Hatchery MSW returns increased to 0.27% of smolts released in 1994, up from 0.21% in 1995.



Revised estimates of production area, updated biological characteristics and the requirement for all eggs to come from MSW salmon increased conservation requirements above Mactaquac from 3,200 1SW and 4,400 MSW fish to 4,900 of each. Escapement in 1996 numbered 5,476 1SW and 2,518 MSW spawners, 112% and 51% of the respective conservation requirements. Egg deposition was 57% of requirement (wild 35%; hatchery 22%); conservation has not been met since 1985.



Nashwaak River: Counts at the Nashwaak River fence of 940 1SW and 429 MSW salmon contributed to an estimated return of 1,829 1SW and 657 MSW salmon above the fence. Hatchery origin fish comprised only 11% of the total. Escapement was estimated at 1,804 1SW and 641 MSW fish and represented 88% of 1SW and 31% of MSW revised requirements above the fence. Requirements increased to 2,040 of each of 1SW and MSW fish from 1,530 1SW and 1,620 MSW salmon because of revised area and biological data and analyses similar to that of above Mactaquac. Egg depositions were estimated at 48% of requirement or 18% more than the mean value, 1993-1995.

Kennebecasis River: Total returns to the Kennebecasis River headwaters were estimated to be 115 1SW and 66 MSW fish [counts were 82 1SW and 47 MSW fish]. Estimated egg depositions were 52% of the 1.1 million egg requirement.

Hammond River: Redd counts on 11.75 km of prime spawning habitat on the Hammond River were the 4th highest in 16 years of counts and the highest since 1992. Egg depositions were estimated to have exceeded 2.4 eggs per m² but are not known to be representative of depositions through the entire drainage.

Magaguadavic River: Of 263 salmon trapped in the Magaguadavic River fishway, external and scale characteristics revealed that only 48 1SW and 21 MSW salmon were of wild origins. The wild fish count was the lowest of 9 years of data but excludes some early-run fish known to have ascended the fishway before the usual early-July installation of the trap. The sexually mature escapement was estimated at 44 wild 1SW, 41 aquaculture 1SW, 18 wild MSW and 4 aquaculture MSW fish. All aquaculture fish were passed above the dam but the remainder were considered to be immature. The minimum egg deposition was estimated at 18% of conservation requirement; 41% of total eggs were of aquaculture origin fish.

St. Croix River: Returns to the St. Croix River, numbered 42 “wild”, 90 hatchery and 20 aquaculture-origin fish. The stock is being redeveloped with naturalized stock after many years of stocking Penobscot-origin (U.S.) and to a lesser extent, Saint John River fish. Total counts were the third lowest of the last decade. Egg deposition was about 4% of requirement although an additional 2% of requirement was laid down at Saint John 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 yet to be fully implicated in recruitment processes of wild Saint John River salmon. However, 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; values for the last 3 years trend upwards.

Outlook

Short term

ISW

Saint John River (Mactaquac): 1SW returns destined for Mactaquac in 1997 are forecast to number 7,800 - 9,400 fish i.e., 159 -192% of the 4,900 1SW salmon conservation requirement. Wild 1SW returns are forecasted to be only 1,200 - 2,800 of the 4,900 fish conservation requirement. Hatchery 1SW returns are forecast to number 6,600 fish. About 40% of hatchery 1SW fish will originate from smolts released at Mactaquac in 1996; 60% will originate from age-0+ fish released upriver of Mactaquac in 1993-1994.

Nashwaak River: Returns of 1SW fish to the Nashwaak River fence in 1997 cannot be forecast. However, estimated returns to the fence over the four most recent years of operation have yet to meet a conservation requirement of 2,040 1SW fish. The contribution by hatchery fish will be few relative to the returns expected at Mactaquac.

Kennebecasis River: Forecasts of 1SW returns to the Kennebecasis River headwater fence in 1997 are not possible. However, wild returns will be augmented by as many as 60 1SW fish originating from hatchery smolts released above the fence in 1996. A return in 1997 similar to that estimated to have returned in 1996 (115 fish), plus 60

hatchery 1SW fish, will meet the 160 1SW fish conservation requirement.

Hammond River: Similarly, there is no mechanism from which to forecast 1SW returns to the Hammond River in 1997. Densities of age 1⁺, 2⁺ parr in 1995 (contributory to 1SW returns in 1997) and stocking of hatchery smolts in 1996 suggest that returns per unit area should equal or exceed those of the Kennebecasis River.

Magaguadavic and St. Croix rivers: 1SW returns to the Magaguadavic and St. Croix rivers are not expected to exceed the low values of 1996 when conservation requirements were not met. Returns from hatchery fish stocked in the St. Croix will assist in development of the stock but will be few relative to the conservation requirement.

MSW

Saint John River (Mactaquac): Estimates of total MSW salmon to Mactaquac in 1997 are forecast at 3,100 - 3,600 fish, 63%-73% of the 4,900 MSW conservation requirement. Wild MSW returns destined for Mactaquac are forecast from 1SW returns and 1SW fork length with and without the effects of the recent moratoria in distant fisheries. Wild MSW returns are forecast to be 2,000 to 2,300 fish; hatchery MSW returns are predicted to be 1,100 to 1,300 fish.

Data are insufficient to forecast MSW returns to the Nashwaak, Kennebecasis, Hammond, Magaguadavic and St. Croix rivers. Recent returns of MSW fish have not been sufficient to meet conservation requirements.

Long term

Stocking of significant numbers of hatchery juveniles and smolts and increasing return

rates suggest that 1SW returns to Mactaquac, 1998-1999, will range from 130 to 200% of the 4,900 fish conservation requirements. Elevated returns of 1SW fish and significant 1SW:MSW relationships suggest that MSW returns will approach, if not meet, the 4,900 MSW requirement above Mactaquac by the end of the century. These prognoses are contingent upon the continuation of past hatchery production and distribution at/above Mactaquac.

Long-term forecasts of returns to other rivers and tributaries of the Saint John below Mactaquac are not possible. The current status of most stocks examined are about one-half or less of conservation requirements. Modest increases in marine survival, less-than-normal in-stream abundances of juvenile salmon and current levels of hatchery supplementation are unlikely to contribute to the doubling of egg depositions and the attainment of conservation requirements within the next 2 or 3 years.

Management Considerations

Egg deposition requirements were not known to have been met in any outer Fundy rivers in 1996 and are unlikely to be met in 1997. Returns of 1SW salmon to Mactaquac in 1997 should be surplus to conservation requirements but only because of the expected contribution from hatchery-origin fish. Even so, final allocations of 1SW salmon from among fish destined to return to Mactaquac should await end-of-July forecasts of end-of-season returns to Mactaquac Dam. Harvest and catch-and-release strategies should focus on fish of hatchery-origin and minimize the potential for mortality on MSW salmon.

Entry of mature aquaculture-origin salmon to all rivers of outer Fundy is dependent on losses from cage sites. There is need for the

development of a management plan for rivers which have aquaculture escapees and for stocks that may be already genetically compromised.

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