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Abstract

Brook trout (Salvelinus fontinalis) are the most popular native sport fish in Nova Scotia. The annual catch of brook trout has declined since the early 1980s and may reflect a change in the brook trout resource. Nova Scotia's relatively short river systems are believed to facilitate anadromy in many brook trout populations and these trout are important to the sport fishery.

Moser River is located (N 44°58'34.9'' W 62°15'11.6'') on the Eastern Shore in Halifax County, Nova Scotia. Live release traps were used to assess brook trout population parameters in the same locations as in the historical studies conducted on the Moser River by White (1940 and 1941). Wilder (1952) described growth and age of the anadromous trout population from Moser River. In general the pattern of movement of anadromous brook trout was similar in 2006 compared to White (1940 and 1941), as downstream migration to the sea occurred in May and most of the upstream migration to freshwater occurred in July. However, a greater proportion of upstream migrating brook trout were detected in June in 2006 compared to June of 1939 to 1941. Anadromous populations in southern regions of the distribution of brook trout migrate earlier to and from salt water.

The level of precipitation in June 2006 was well above the 40 year mean and the resultant high water conditions created difficulties in maintaining live traps in the main river site. The number of migrating trout counted from the 2006 Mill Brook site was compared to fish counts from 1939 to 1941. The number of brook trout trapped per day in Mill Brook, a major tributary of Moser River, suggests that the number of anadromous brook trout had declined in 2006 compared to 1939 to 1941. The mean number of brook trout caught per day in July was 5.7 ±5.8 (mean, SD) in 1939, 11.5 ±8.5 (mean, SD) in 1940, 21 ±13.1 (mean, SD) in 1941, and 1.8 ±1.9 (mean, SD) in 2006. The size structure of brook trout with a fork length longer than 200 mm indicated that the proportion of large trout in the 2006 population was less than historical levels. The proportion of large (fork length >300 mm) brook trout captured migrating upstream in July was 26% in 1940 (N=114), and 27% in 1941 (N=149), and 3% in 2006 (N=2). In 2006, fork length of anadromous brook trout was 198 mm ±25 (mean, SD) at two years of age and 259 mm ±34 (mean, SD) at three years of age and was similar to mean fork length at age data from 1939 to 1943. The oldest brook trout aged was four years from 2006 and was six years from 1939 to 1943. A maximum age of four years, for the 2006 study, was consistent with the results from other recent studies on anadromous brook trout populations in Nova Scotia.

Paleolimnological techniques and direct YSI meter measures indicate that water acidity increased and acid neutralizing capacity decreased in the Moser River. In 2006, mean pH was 5.5 (0.2, SD) in Mill Brook and in the main river. In 1939, pH was 6.1 in Mill Brook and 6.7 in the main river. Diatom-inferred pH from a paleolimnological assessment of Mill Lake, located

upstream of the Mill Brook trapping site, indicated an increase in acidity by a decline of 0.7 pH units from about 6.8 in the 1930s. Diatom-inferred Gran-alkalinity changed from a pre impact range of 4.1 - 7.2 mg/L to a present day 0.6 mg/L (Ginn, Personal communication). Water temperature was warmer in 1939 compared to water temperature in 1940, 1941 and 2006. Hunstman (1945) recorded mortality of salmon trout in Moser River and St Mary's River during warm low flow conditions in August. Mean monthly air temperature records indicate that August of 1939 was one of the warmest on record for Nova Scotia (Environment Canada). Warming has occurred over the past 150 years in the Halifax region and water temperatures in Moser River were warmer in 2006 compared to 1940 and 1941 and the frequency of warm summer temperatures in Nova Scotia have increased since 1980.

Habitat changes are believed to have reduced trout production in many regions. Environmental conditions and exploitation may have influenced the size and age structure of the Moser River anadromous brook trout population. The short duration of our study and issues related to high flow conditions warrants additional study to fully assess the current status of the anadromous brook trout population in Moser River.

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References

"Climate Data Online." Environment Canada Weather Office. 11 April 2005. Environment Canada 01 November 2007. < http://www.climate.weatheroffice.ec.gc.ca/climateData/canada_e.html >

Ginn, B.K, Personal communication. Post-doctoral Research Fellow. Paleoecological Environmental Assessment and Research Lab. Department of Biology, Queen's University, Kingston, Ontario, Canada.

Huntsman, A.G., 1945. Death of salmon and trout with high temperature. Journal of the Fisheries Research Board of Canada. 5:485-501.

White, H.C. 1940. Life History of sea running brook trout (Salvelinus fontinalis) of Moser River, N.S., Journal of the Fisheries Research Board Canada. 5:176-186.

White, H.C. 1941. Migrating behaviour of sea running Salvelinus fontinalis. Journal of the Fisheries Research Board of Canada. 5:258-264.

Wilder, D.G. 1952. A comparative study of anadromous and freshwater populations of brook trout (Salvelinus fontinalis Mitchill). Journal of the Fisheries Research Board Canada. 9:169:197.