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A Revised Estimate of the Rate of Growth between Greenland and Home Waters of Salmon from the Miramichi River, New Brunswick, Canada

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In a paper submitted to the first meeting of the ICES/ICNAF Joint Working Party on North Atlantic Salmon (ICES/ICNAF Salmon Doc. 66-9) a preliminary estimate was made of the rate of growth of Atlantic salmon from the Miramichi River over the period between their presence on the Greenland coast during their second autumn in the sea, and their return to their home rivers in the following summer. The estimated instantaneous rate of growth in weight on a monthly basis was 0.04.

Since preparation of that paper, additional data have become available enabling a more soundly based estimate to be obtained. As before, the most satisfactory estimate is obtained by determining the mean length of fish at both stages of their lives, and using data on the weight-length relationship to estimate the corresponding weights. For this report, larger samples have been available for determining mean lengths, and better data on the weight-length relationship at each stage have been collected.

In 1966 the number of salmon tagged as smolts in the Miramichi River and caught at Greenland was much greater than in any previous year. The largest homogeneous group was composed of naturally produced smolts which had been tagged as they passed through the counting fence on the lower Northwest Miramichi River. The mean total length to maximum extension of the caudal fin for the group of 48 fish recaptured

in Greenland was 64.5 cm. Other studies (Saunders and Allen, in press) have shown that tagging reduces the size of Miramichi fish at the time of return by about 2.3% in length. Applying this correction also to fish taken at Greenland raises the estimated true mean length to 66.0 cm. The mean date of capture of these fish was 10 October.

Examination of data accumulated in scale studies between 1952 and 1964 has greatly increased the records of 2-sea-year maiden fish taken in the Miramichi River and its vicinity. Most of the data refer to fish caught in the Miramichi estuary and further upstream in the river itself or its tributaries, and nearly all these fish would be Miramichi natives. The data also include, for the period prior to August 16, some fish caught in the commercial drift-net fishery outside the estuary. Belding and Prefontaine (1939) studied this fishery and concluded that, at that time, the catch consisted about equally of Miramichi fish and fish bound for the Bay of Chaleur further north. They also showed that there was no significant difference in length between 2-sea-year fish caught in the drift-net fishery and 2-sea-year Miramichi fish. Use of the entire sample will therefore have little effect on the present result. This included 1,268 fish with a mean total length of 76.6 cm and mean capture date of 29 August. Most of the drift-net-caught fish may be eliminated by using only fish caught after 31 July; this leaves a sample of 810 fish with a mean length of 78.0 cm and mean capture date of 30 September.

In 1966 total weights and total lengths were carefully recorded for 19 fish taken at Greenland and examined during parasitological studies. A logarithmic regression leads to the relation

$$W = 10^{-5} \times 4.15\ L^{2.67}$$

where W is in kg and L in cm. At about the mean length of the fish taken at Greenland, this corresponds to a condition factor

of about 106. Applying this relationship gives a weight of 3.04 kg for Miramichi fish of average length caught at Greenland.

Total lengths and weights were also recorded for samples of salmon taken in the Miramichi area in 1966. For a sample of 52 2-sea-year maiden fish caught at the counting fence on the lower Northwest Miramichi River the weight-length relationship was

$$W = 10^{-6} \times 2.50\ L^{3.28}$$

This corresponds at the mean length to a condition factor of about 84. These fish had ceased feeding and commenced their upstream journey, and a sample was therefore also examined from the catch of the drift-net fishery. The mean condition factor of a sample of 186 fish judged by their size to be 2-sea-year fish was found to be 104. This value, although very different from that for the upstream sample, corresponds closely with figures obtained by Hoar (1940) for salmon from the commercial catch at several different points on the New Brunswick and Nova Scotia coasts. Since the purpose of the present studies is to examine the effect of the Greenland fishery on the weight of the catch of salmon in home waters, it is appropriate to use the condition factor of fish caught in the home-water fishery and not that for fish which have begun their upriver journey. Using a condition factor of 104, the estimated weights of fish of mean length were

Total sample - mean length 76.6 cm weight 4.67 kg

Late-run sample - mean length 78.0 cm weight 4.94 kg

The time intervals (t) between the mean date of capture at Greenland and in the total and late-run Miramichi samples are 10.6 and 11.3 months respectively. The instantaneous growth rate may be calculated as

$$\frac{\log_e W_2 - \log_e W_1}{t}$$

where W_1 and W_2 are weights at Greenland and home waters respectively.

The estimates of instantaneous growth rate on a monthly basis are then

Total sample - .040

Late-run sample - .043

These values are almost identical with, and thus confirm, the tentative estimates made in the previous report.

The Joint Working Party, in its first report, pointed out that on the data then available the ratio between the weights of fish at Greenland and at the time of return to the Miramichi was 1:1.46 and this led to the conclusion that "if more than about 70% of the fish present in West Greenland waters were, in the absence of the Greenland fishery, caught in home waters, then a West Greenland fishery would reduce the total world catch."

The mean date of the Greenland sample was 10 October, while the mid-date of the commercial fishing season in the Maritimes area is approximately 1 July. Thus the time interval is about 8.6 months. At an instantaneous growth rate of .04, the weight at the time of the Canadian fishery is $e^{8.6x.04}$ times that at the time of the Greenland fishery. This ratio equals 1.41, which corresponds exactly to the value of 70% suggested by the Working Party as being the critical percentage in determining whether or not the Greenland fishery leads to an increase in the total world catch of Atlantic salmon.

References

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