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SEROLOGICAL AND BIOCHEMICAL STUDIES ON ATLANTIC SALMON

PROGRESS REPORT

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Serological and biochemical studies have continued during 1968 in Scotland and at West Greenland. As in former years, haemoglobins, red cell antigens, serum proteins and various tissue enzymes were investigated with the following results:-

(1) Haemoglobins

The haemoglobins of over 500 individual salmon from Canada, Scotland and West Greenland were analysed by starch gel electrophoresis. No haemoglobin, or complex of haemoglobins, was observed to characterise exclusively the individuals of any one area, nor did the haemoglobins observed differ from those of Scandinavian salmon analysed previously by others. The only possible "racial" differences observed consisted of differences in the rate of development of the haemoglobin patterns of Scottish and Canadian salmon. These differences are not sufficiently pronounced to give a readily usable index of population mixing at West Greenland, and haemoglobin studies in this context have now been discontinued.

(2) Red Cell Antigens

Analyses with reagents produced in 1967 established differences in Scottish, Canadian and West Greenland salmon. From preliminary results it has been estimated that 'Scottish' fish constitute approximately 20% of the fishable stock in the sea near Godthåb. No marked differences in the reactivity of samples collected at West Greenland in 1967 and 1968 has been observed, thereby suggesting no change had occurred in the "racial" composition of the stock at West Greenland between the years of sampling.

New reagents were produced and tested with cells from Scottish salmon during 1968. Subsequent tests at West Greenland indicated little difference in reactivity between Scottish and West Greenland samples using these reagents. Their use was therefore discontinued, and new absorptions of the antisera were made. Over 100 individuals were analysed with these absorbed antisera at West Greenland, but only 24 Scottish fish have been tested to date. Nevertheless the reactions of this small number suggest that the reagents are discriminating between Scottish and West Greenland material. Tests are being continued as samples become available.

(3) Serum proteins

Conditions at West Greenland in 1968 were not satisfactory to allow the previously reported transferrin and pre-albumen variants of the sera to be satisfactorily identified. Since the observed differences are even more difficult to detect in deep frozen samples, little progress has been made with this aspect of the study. Results obtained with the starch-agar electrophoresis technique of Möller have not been as satisfactory as those with starch alone, and further tests using different buffer systems are in progress.

(4) Tissue enzymes

Attention has been concentrated on liver esterases which have shown considerable polymorphism when analysed in starch gel at alkaline pH. Livers of more than 200 salmon have now been analysed and 6 distinct patterns of esterases have been observed. The

Distribution of these patterns in samples from Scotland, England, Canada, West Greenland and Sweden is as follows:-

| Pattern | A | B | C | D | E | F | G | Total |
|--------------|----|----|----|---|----|----|---|-------|
| Canada | 16 | 2 | 3 | 0 | 0 | 2 | 0 | 23 |
| W. Greenland | 22 | 33 | 30 | 0 | 41 | 4 | 0 | 130 |
| Scotland | 0 | 3 | 2 | 2 | 9 | 7 | 0 | 23 |
| England | 0 | 26 | 7 | 1 | 10 | 6 | 0 | 50 |
| Sweden | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 7 |
| Totals | 38 | 64 | 42 | 3 | 60 | 19 | 7 | 233 |

? Politic file

Type A has not been observed in the European material, whereas it is the commonest type in the Canadian samples and is also common in the West Greenland material. The six Swedish smolts analysed were all type G, which was not observed in any of the other areas.

Each liver esterase "type" represents a specific combination of esterase molecules common to the different types. Studies are in progress to elucidate the genetics of the various esterase bands observed.

At the present time, liver esterase polymorphism, and, to a lesser extent, serum protein polymorphisms, represent the most promising biochemical approaches to the problem of identifying salmon of different origin at West Greenland.

The magnitude of any differences expected between salmon of North America and European origin (these representing the geographically most extreme elements in the West Greenland fishery) is, to a large extent, dependent on the lack of genetic interchange between the spawning populations of the two areas. The results of tagging over 200,000 smolts on both sides of the Atlantic (ICNAF Res. Doc. 68/106) indicate that "accidental" genetic interchange - arising through the straying of individuals from one spawning area to the other - is negligible or non-existent, thus allowing the stocks to evolve independently. On the other hand, genetic interchange can be induced through the artificial introduction, in a restocking programme, of ova or fry from one area to the other, with subsequent interbreeding of the introduced and indigenous stocks. The effect of such restocking on a large scale will be to decrease in the long term the genetic diversity between the stocks from the two areas.