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Notes on the Relationship between the West Greenland  
Salmon Fishery and Salmon Stocks in Scottish Home Waters

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1. Since 1963, the salmon catch in West Greenland waters has averaged just over 1300 metric tons/annum which is of the order of 10-15% of the annual world catch of Atlantic salmon over the period before the Greenland salmon fishery assumed significant proportions (i.e., pre-1964).
2. It would be expected that an additional catch of this order might have had an effect on home water catches yet, over the three seasons which could have been affected by the large Greenland catches (1965, 1966 and 1967), Scottish salmon catches do not show any marked effects of the Greenland salmon fishery. The average salmon catch for the period 1952-66 is 230,333 fish and the annual catches made over this period range from 178,886 (in 1961) to 269,566 (in 1964). The salmon catches for 1965, 1966 and 1967 have been 226,708, 220,363 and 261,040 respectively. Further, recaptures in home waters of salmon tagged in Greenland have been few as, from the 951 fish tagged in Greenland in 1965 and 1966, only 5 (about 0.5%) have been recaptured in home waters (3 in Scotland and 2 in Canada).
3. Superficially, the two pieces of evidence quoted above are in agreement but, because many of the fish tagged in Greenland were not in first-class condition, the evidence from recaptures in home waters must be regarded as untrustworthy. Nevertheless, for what it is worth, it supports the evidence from home catches and, because home recaptures of Greenland-tagged fish may have been few for some reason other than the poor condition of the tagged fish, it is perhaps worth examining the situation a little further.
4. An examination of the Scottish catches shows, in general terms, three salient features:
  - (a) The stock of one-sea-winter fish (grilse) is much smaller than the estimated stock of migrating smolts (the annual smolt run from Scottish rivers may be of the order of 10,000,000 fish, but the stock of grilse (assuming that the stock is approximately double the catch) is about 500,000 fish).
  - (b) The stock of one-sea-winter and two-sea-winter fish is roughly similar.
  - (c) The stock of three-sea-winter (and older) fish is much smaller (of the order of 50,000 fish) than that of either the one-sea-winter and two-sea-winter fish.
5. These points suggest that there are two periods of high mortality during the sea phase in the life history of Atlantic salmon, (a) between the smolt and the grilse stages and, (b) after the second winter in the sea. Predation may be an important factor during (a) but this factor is unlikely to be important during (b). There are, however, other possibilities, e.g., (a) the physiological effects of the onset of maturity which might increase with increasing age or, (b) a limited life span or, perhaps, a combination of the two. There are hints that the physiological effects of maturity may be severe (e.g., the large proportion of male kelts which die after spawning) and that these effects are more severe later in life (e.g., the higher proportions of previous spawners in the salmon runs of west coast rivers in which, because their salmon stocks contain a high proportion of grilse, spawning takes place early in the life history of many of the fish).
6. It has been assumed that the salmon on the west coast of Greenland form at least part of the salmon runs in Scottish home waters the following season but if the west Greenland fish were predominantly those which would not return to fresh water until the end of the third winter in the sea and which would, therefore, be subject to the mortality postulated in the previous paragraph, then the present anomaly in the relationship between Greenland catches and home water catches would be largely resolved. Further, if this explanation were true, if the Greenland fishery continued to grow it would not necessarily have a significant effect on Scottish home water catches.

7. If the stock of salmon off the Greenland coast is similar to that inshore, the explanation suggested above might apply also to the former stock, i.e., if the catches offshore continued to increase (without a corresponding decrease in the inshore catch) this might also not have much effect on home catches.
8. These suggestions enhance the importance of catching salmon on the west Greenland coast in a suitable state for tagging and in numbers large enough to improve the significance of the results. One of the disadvantages of this explanation, however, is that the evidence in its favour would be the absence of recaptures in home waters and it would be very difficult to be reasonably certain that a negative result had been due to natural mortality and not to some other cause.
9. These notes are submitted in the hope that they will stimulate discussion. The theory put forward is very tentative and has been advanced in relation only to Scottish catches. Information about home water catches from other parts of the Atlantic salmon area may well demonstrate its fallibility.