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Salmon "Races"

by

F.T.K. Pentelow

Salmon vary greatly and this variation has given rise to much speculation. One individual salmon can take on several very different aspects according to the stage of its life history. Neglecting the juvenile forms, a salmon when it first enters the river from the sea looks very different, and indeed is very different, from the same animal at spawning time and again they are both markedly different from a well-mended kelt if it survives to that stage. These changes have been well described by Tchernavin (1938).

Then adult salmon differ one from another; in size; in the ratio of body length to weight; in the time at which they leave the sea and enter a river; and in the appearance of their scales. Size appears to be mainly a function of age but some of the other characters seem to be associated together fairly consistently. Thus fish entering a river in winter or spring are generally very fat and therefore heavy for their length, have immature gonads and scales which show close rings at the edge. Salmon entering a river in the summer have much less fat, hence weigh less for their length, have gonads which are advanced towards ripening and have scales which show widely spaced rings at the edge.

In the Vistula according to Zarnecki these types are quite distinct and moreover have another marked difference, those fat immature fish which come in from the sea in the winter spawn in the Tatra mountains in the high tributaries of the river while the thinner ripening fish which come in in the summer spawn in tributaries which enter the main river in its lower reaches. Zarnecki, following Berg (1932-33) regards these as distinctive groups.

In the smaller rivers and less extreme climatic conditions of Great Britain and Ireland the runs of fish are not nearly so regular nor distinct but it is nevertheless true that they are still recognisable. In many of our rivers, particularly the larger ones, there is commonly one run of fish early in the year, a summer run and an autumn run and though the modes differ in date they are recognisable over long series of years. Their regularity has given rise to a popular belief in these islands that these runs are genetically distinct and much money has been spent on trying to introduce desirable runs of fish (mainly spring fish) into rivers where they do not occur naturally.

I have no evidence either to prove or disprove this theory but I want to suggest that the balance of probability is against these forms being genetically distinct and that what we distinguish as winter, spring, summer and autumn fish are in fact growth forms and that if we could continuously observe the same fish we should see it pass through all these stages.

I want first of all to suggest that the only discontinuous variation in the characters said to distinguish these runs is in the appearance of the scales; they have either open or close rings at the edge. The others, fatness, condition factor and development of the gonads are continuously variable and interdependent and are consequent upon the use of food reserves for the development and ripening of the sexual products.

This may well not be obvious in rivers like the Vistula where the runs are well separated in time but in Great Britain fish may enter a river in any month of the year, runs commonly overlap and it would be quite easy to collect a continuous series from a fat fish with high condition factor and immature gonads entering the river in January to a thin fish devoid of body fat and with gonads practically ripe entering a river in late October.

As for scale appearances we know that they reflect the growth of the fish; when growth is rapid the circuli are widely spaced; when it is slow they are close together. We assume that the fish grow fast when food is abundant and slowly when it is scarce but it must be remembered that there may be other reasons for periodicity in growth; perhaps if we knew better what salmon feed on in the sea we could test our assumption. At any rate we know that salmon stop feeding and growing before they enter a river on their spawning migration so that, apart from erosion the scales do not alter after they have come into freshwater. So we should expect fish which enter our rivers after a period of rapid growth to have scales of different appearance from those entering during the season of slow growth. It is also noticeable that the change from closely spaced rings to open rings is very abrupt, much more so than the change from open to close; this presumably means that the change from slow to fast growth is fairly sudden, whereas the slowing down of growth in the autumn is a more gradual process.

The factors which determine the time of the year at which salmon enter our rivers are quite unknown to us: some enter many months, and sometimes a whole year before they spawn, others only a few days; some come in when the temperature is low, some when it is high, some when the days are long, others when the days are short. But when they come they shew the scale pattern appropriate to the season, we do not find close rings in fish taken in sea or river in August, nor open ones in February. In April and in the autumn we get a mixture, some have open ridges and some have closed. Moreover, Jones and King (1946) showed that in a collection of fish made in late December, all of which had close rings at the edge of the scale, some would have spawned that season and some the next.

Are not these facts consistent with the hypothesis that the different runs of salmon represent merely progressive stages of growth and development?

The argument will eventually have to be settled by experiment but it will not be easy and much care and thought will have to be devoted to the programme and there will be many dubious results before the answer is clear.

References

Tchernavin, V.	1938	"Changes in the Salmon Skull". Trans. Zoo. Soc. Lond. 24, pp. 1o4-84
Zarnecki, St.		Personal communication
Berg, L.S.	1932-33	"Les poissons des eaux douces de l'USSR et de pays limitrophes", 3rd ed., Leningrad.
Jones, J.W. & King, G.M.	1946	"Winter Salmon and the Dee Salmon". Trout Mag. Lond. No. 117