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Notes on Spawning and Recruitment in a Tributary
of a Scottish River System

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This short report outlines the information available on the strength of the spawning stock and the subsequent production of juvenile migrants (parr, silvering parr and smolts) for the River Meig (Ross-shire). This river is one of the main tributaries of the Conon River system, which runs into the Cromarty Firth (see Fig.1).

The Conon River system has four main tributaries, the Orrin, the Meig, the Conon (which becomes the Bran further upstream) and the Blackwater. During the fifties this river system became the site of a hydro-electric scheme, which involved the construction of dams (a) at the lower end of Loch Luichart, (b) in the lower reaches of the River Meig and, (c) at Tor Achilty on the River Conon, below the confluence of the River Meig and the River Conon. Power stations were built (i) at Tor Achilty dam and (ii) on the River Conon a short distance below Luichart dam. The damming of the River Meig created a small loch (the Meig impoundment) in the Meig valley and a tunnel was built to carry the water from this impoundment into Loch Luichart and thence to Luichart power station (see Fig.1).

When the hydro-electric scheme was constructed, it was suggested that the two principal tributaries affected, the Conon and the Meig, would be a suitable site for comparing smolt production following planting of hatchery-reared fry and natural spawning because, initially, no adult fish were to pass upstream at Luichart dam whereas all fish migrating up the River Meig were allowed to pass upstream at the dam to spawn in the streams above the Meig impoundment. Traps were therefore constructed (a) on the River Conon, a short distance below Luichart dam and, (b) on the River Meig, a short distance below the Meig dam. For various reasons, which are not relevant to these notes, it proved impossible to carry out this proposal as envisaged, but records of the migrants at the Meig trap have been maintained from 1957 onwards and these form the subject of these notes.

Details of the counts of smolts and ascending adults at the Meig trap are given in Table 1. It is believed that adult counts are reasonably accurate but the smolt counts have been affected by two factors which can, on occasion, have a significant effect on their accuracy. These are:

(a) Though the entrance to the tunnel leading from the Meig impoundment was screened to prevent migrants from the Meig passing into the Luichart branch of the river system, there was evidence, particularly in 1958 and 1959, that migrants from the Meig were penetrating these screens (perhaps because of imperfect bedding). This situation is described more fully in Pyefinch and Mills (1963) and the figures given in Table 1 for the smolt runs over the period 1957-60 are the adjusted figures quoted in that paper. It is believed that losses from this cause have been less since 1960 but, although the screens may be smolt-proof, fry and young parr could, presumably, penetrate these screens. Loss of migrants for this reason may well have occurred over the whole period, but it is not known whether it is sensibly constant from year to year.

(b) The incidence of spills at Meig dam. Though, in a hydro-electric scheme, every effort is made to avoid wasting water by spillage, the Meig impoundment has only a moderate capacity and spills occur from time to time. As the Meig trap is put out of action by a modest increase in river flow, spills at the dam upstream have interfered with the smolt counts. Details of the spills which occurred during April, May and June are given in Table 2 and these suggest that (i) the counts for 1963, 1967, 1968 and 1969 were uninterrupted, (ii) those for 1961, 1964, 1965 and 1966 were affected to some extent and, (iii) that for 1962 was probably seriously incomplete.

The evidence available (Menzies, 1928; Mills, 1964; Pyefinch and Mills, 1963) indicates that most of the smolts in the Conon River system are either two or three years old when they migrate and that these two year classes are present in roughly equal proportions. For a first assessment, therefore, the spawning stock can be assumed to contribute equally to the smolt production in two successive years, so that the upstream migrating stock in 1957 should be linked, in equal proportions, with the smolt runs in 1960 and 1961. The results of this adjustment are given in Table 3 and are plotted in Fig. 2.

Because of the incidence of spills, which make most of the smolt counts (in varying degrees) incomplete, it would be unwise to attempt to draw fundamental conclusions from these records. Nevertheless, they do suggest that the spawning stock can be reduced by about one-half without a serious effect on smolt production but that a greater reduction than this (i.e. to about one quarter or less) seems to have an effect on smolt production. In this connection, it will be interesting to see the effect of the considerable reduction on the strength of the spawning stock which took place in 1968 (Table 1).

As the fish migrating upstream through the Meig trap are classified as grilse or salmon, information is available to relate strength of the smolt runs to the corresponding upstream runs, but this calculation has not been made largely because, as the Meig is only one of the main tributaries of the Conon River system, some of the smolts it produces may, on their return, migrate into the Blackwater, the Conon or the Orrin.

References

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Table 1 Counts of Smolts and Adult Salmon, Meig Trap, 1957-69

<u>Year</u>	<u>No. of Smolts</u>	<u>No. of Adults</u>
1957	14,000 ^a	613
1958	10,000 ^a	254
1959	13,200 ^a	246
1960	7,250 ^a	220
1961	4,637 ^b	149
1962	1,118 ^c	231
1963	3,483 ^d	375
1964	4,264 ^b	479
1965	3,094 ^b	829
1966	6,912 ^d	549
1967	5,561 ^d	835
1968	5,413 ^d	160
1969	6,951 ^d	277

a - adjusted figures, see text.
 b - some effect of spills.
 c - seriously affected by spills.
 d - unaffected by spills.

Table 2 Incidence and Extent of Spills, Meig Dam, during April-June 1961-69

<u>Year</u>	<u>Spill (s)</u>		<u>Comments</u>
	<u>Date</u>	<u>Duration</u> (hrs)	
1961	May 8-9	25	Probably affected count
1962	May 16-22	146	Probably affected count
1963	No spills		
1964	May 6-7	28	Probably affected count
	May 7-9	45	Probably affected count
1965	April 17-18	24	Before main run
	May 9-10	18(App)	Probably affected count
1966	Mar.30-Apr.2	63	Before run
	May 23-24	19	Possibly affected count
1967	April 2-6	69	Before run
1968	No spills		
1969	No spills		

Table 3 Spawning Stock and Smolt Production, River Meig

<u>Spawning Stock</u>	<u>Smolts</u> ^a
149	<u>3700</u>
220	<u>3850</u>
231	<u>5000</u>
246	<u>2300</u>
254	2700
375	6150
479	<u>5500</u>
613	<u>5950</u>
829	<u>6200</u>

a Figures rounded to the nearest 50 fish.

The smolt counts underlined are reasonably complete (i.e. no spills in either of the relevant years); those underlined in broken line are incomplete to some extent (i.e. some spill in at least one of the two relevant years) and those not underlined are known to be seriously incomplete.

FIG. 1 SKETCH MAP OF CONON HYDRO-ELECTRIC SCHEME

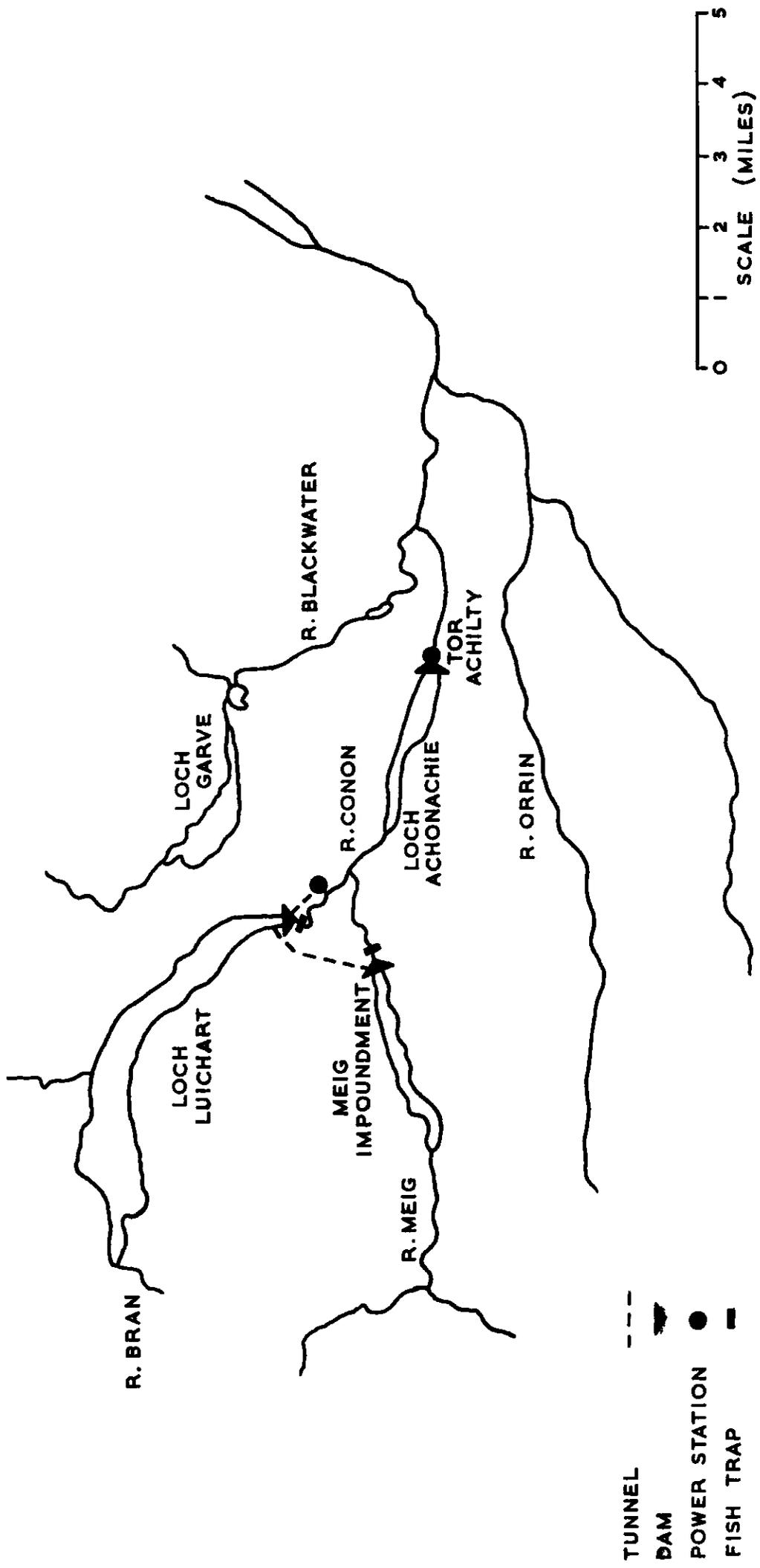


FIG. 2 SPAWNING STOCK AND SMOLT PRODUCTION, RIVER MEIG

