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Notes on Collections of Sea Trout Scales from Lewis and Harris and from North Uist

With Appendix on Salmon Scales from Lewis and Harris
With Four Plates

By

G. Herbert Nall, M.A., F.R.M.S.

This Paper may be referred to as
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PREFACE

THE sea trout scales, with which this paper deals, were read and measured by me, but a few doubtful ones were referred for a second opinion to Mr P. R. C. Macfarlane, Assistant Inspector of Salmon Fisheries of Scotland. Mr Macfarlane read and measured the salmon and grilse scales, and made the photomicrographs of sea trout scales used as illustrations. I am responsible for analysing the results and writing the paper. To Mr W. J. M. Menzies, Inspector of Salmon Fisheries of Scotland, I am indebted for reading the typescript and for making valuable suggestions.

Thanks are due to Dr D. Macdonald of Uig, and to the various other Owners and Tenants of Fisheries in Lewis and Harris, who gave permission for scale collection, and to their Head Keepers who made the collections ; also to Mr C. J. Raymond and the Proprietor of the Loch Maddy Hotel for their help in collecting material from North Uist.

G. H. NALL.

December 1931.

TECHNICAL TERMS

Parr are young fish from the fry stage till they become *Smolts* at migration. For about one year after migration they are called *Finnock, Whitling, Herling, Lammas Trout,* or by other names of purely local and limited use.

In the second summer after migration the fish become *Adult Sea Trout.*

Maiden fish are those, whether males or females, which have not spawned. At first spawning they become *mature.* The *Age at Maturity* is the age at which they first spawn. *Ripening* fish are those in which the ova and milt are developing in the season immediately prior to spawning, *ripe* fish are those ready for spawning. After spawning they are called *kelts* till they have recovered condition and begun new growth ; meanwhile they are *mending* and then *mended* kelts. In describing age, *years* is usually confined to the period before migration and to the total age reckoned from hatching ; and *winters* to the period after migration, which is often called for short the *sea life,* though it may include repeated visits to fresh water. Thus a 1-winter fish is one in its second year after migration.

Lengths are given in centimetres. The inch and fractions of an inch are too cumbrous for the measurements required in sea trout investigations. A reduction table is given on p. 36. For rough calculations, to reduce centimetres to inches, multiply by four and divide by ten, *i.e.* move the decimal point one place to the left. Thus 11·1 cm. = 4·44 inches approximately ; for more precise calculations multiply by 100 and divide by 254.

In the notation employed in the tables, and occasionally elsewhere, a figure before the first full stop denotes years of parr life ; a figure, if any, after the stop, years of maiden post-migration life ; SM is spawning mark ; + denotes a period of time to be added less than one year. Thus : 2· is a 2-year old smolt ; 3·+ is a finnock or whitling with three parr years ; 2·1+ is a maiden adult sea trout with two parr years and about one and a half post-migration years ; 3·2 is a maiden adult sea trout which had been a 3-year old smolt, and has survived two sea winters but not yet started growth in the third sea summer ; 4·+SM+ is a fish with four parr years which spawned as a whitling and made further growth ; 3·2+2SM+ is a fish which, after three parr years and two maidens sea years, spawned in the next two winters and then made additional growth, total age about seven and a half years.

NOTES ON COLLECTIONS OF SEA TROUT SCALES FROM LEWIS AND HARRIS AND FROM NORTH UIST.

I.—INTRODUCTION.

THE Hebrides form a chain of islands 120 miles in length, extending with a westerly trend from a point about 10 miles south of the most northerly portion of the mainland of Scotland to the latitude of Fort William. The mean distance from the mainland is about 40 miles. Lewis and Harris, names given to the northern and southern parts of the same island, occupy half the length and much more than half the area of the whole group. Then to the south come North Uist, Benbecula, South Uist and Barra, with its cluster of islets.

The district is well known to anglers and other sportsmen, but, since there is now no commercial netting and the water systems are numerous, complicated in character and divided among a large number of proprietors and tenants, it has not been an easy task to obtain material for investigating the lives of the salmon and sea trout.

In January 1927 Mr Menzies published a paper on the salmon of the Grimersta District, Lewis, 1925 (List 1).*

In 1927, 1928, and 1929 investigations were conducted into the sea trout stock of South Uist, the results of which were embodied in two papers published in 1928 and 1929 (Lists 2 and 3). Each of these two papers had a short appendix on the Howmore and Loch à Bharp salmon. The sea trout material obtained from systematic scale collection spread over several years and from netting and marking was adequate to work out the average growth rates in the Howmore and the Kildonan systems of South Uist and to establish that both of these produce a vigorous type of fish, which make good growth during fresh water life before migration and sea life after migration, and reach a large size. The heaviest obtained from Howmore was 12 lb. in weight. The sea trout of Bharp were found to be less rapid in growth, but the material obtained for their study was inadequate.

In 1929, 1930, and 1931 Mr C. J. Raymond, an angler who is especially interested in the scales of fresh water trout and of grayling, very kindly promised, with the help of the proprietor of the Loch Maddy Hotel, to collect sea trout scales in the Loch Maddy district of North Uist. But the number of sets thus obtained was small, they came from many different centres, and there was a tendency to select the larger fish. So far as they go, they indicate that growth rate during fresh water life before migration is quite good in most districts of North Uist, almost reaching the high standard of the Howmore and Kildonan, and that sea growth after migration falls little short of that ascertained for these two districts of South Uist. Though numbering only 78 sets, the collection contains 17 fish between $9\frac{3}{4}$ lb. and 4 lb. in weight.

Since so few fish came from each centre, the North Uist collection has been treated as a whole, and details are given in Section III of the text and in the tables at the end of this paper, under the heading " North Uist (Loch Maddy)."

Early in the present year, 1931, Dr D. Macdonald, of Uig, offered his help to obtain material for studying the sea trout stock of Lewis and Harris. At his suggestion, scale envelopes and directions for collecting scales were sent to thirteen different centres. The result has been disappointing. Though the head keepers at these various centres promised to carry out their share of the work, sea trout scales

* For this and similar references see List of Papers, page 20.

have been received from eight centres only, and the total thus obtained amounts to no more than 393 sets. Owing to drought, 1931 was a lean season.

The samples from these several centres in Lewis and Harris differ appreciably from one another in growth rate and in the average size of the fish. Growth rate was best in the collections from the River Laxay and the River Laxdale ; but, for Lewis and Harris taken as a whole, the figures fall a little below those from North Uist and distinctly below those from the Howmore and Kildonan of South Uist. Indeed the average lengths at the finnock stage, the second sea summer stage, and the third sea summer stage are almost identical with the corresponding figures from Bharp, which produces, for the Hebrides, a distinctly slow growing type of sea trout.

On the whole these collections from North Uist and from Lewis and Harris, though defective in some directions and though there has undoubtedly been a tendency to omit smaller fish, give, when added to the more ample collections from South Uist, a very fair idea of the Hebridean stock of sea trout at the present day. Fifty years ago sea trout of 5 lb. weight and upward are said to have been plentiful throughout the Hebrides. During the last half century the number of large sea trout has gradually decreased, and at the present time such fish are comparatively scarce, except in the Howmore and in Kildonan, and apparently especially scarce in Lewis and Harris. The total stock of sea trout also, large and small fish alike, seems to have diminished in most, if not all, districts.

Local opinion ascribes this decline, at any rate in some water systems, to the increase in the number of salmon. These are undoubtedly more numerous in many of the rivers and they are said nowadays to penetrate further inland than was their former wont, and to cut up the redds of the sea trout, which on the average spawn a few weeks earlier than the salmon. It may be doubted whether this explanation is sufficient. The two species do undoubtedly interfere with one another when overnumerous, but, save in the Grimersta, the stock of salmon is by no means large. It is more probable that there is a natural rhythm, a periodic rise and fall, in the abundance of the stock, wherein the maxima are separated by a considerable span of years ; and that the increase or decline is also affected at shorter intervals by periodic variations in the food supplies off the coast.

Though the total numbers and the number of large fish may have declined throughout the Hebrides, growth rate during parr life is quite good at the present day and compares favourably with the growth rate in all except the most vigorous of the mainland races. Growth during sea life also is very good in some districts, such as Howmore and Kildonan, and throughout the islands quite up to or above the standard of most Scottish mainland districts. The lack of very big fish is apparently due to the fact that so few reach a high age. It is difficult to see the reason for this in a district where there is no commercial netting.

It must be remembered, however, that our collections, except in the case of the Howmore and Kildonan, are derived entirely from rod caught sea trout, unsupplemented by the aid derived from netting and marking fish. Older and heavier sea trout are notoriously difficult to catch with the fly rod, the only method of angling practised in this district. It may be that there is a much larger proportion of elderly and heavy fish in the waters of Lewis and Harris than our samples indicate. But local opinion seems to be distinctly pessimistic on this point.

In the sections which follow, the details are given first of the collections from the eight centres in Lewis and Harris, from which scales were received, arranged in order, north to south, first east coast, then west coast ; second of collections from North Uist as a whole. This is followed by a section on the Age at Maturity in Lewis and Harris as a whole and in North Uist as a whole. A similar order is adopted for the tables at the end of the paper, but in Tables XVIII-XXI figures are added for comparison from South Uist.

A short Analysis of small samples of salmon and grilse scales from Lewis and Harris is given in the Appendix.

II.—EIGHT DISTRICTS IN LEWIS AND HARRIS.

1. The River Laxay and Loch Valtos (Soval).

Soval Lodge is on the easterly side of the island, about nine miles south-west of Stornoway.

The principal fishings are the Laxay River and its lochs. The river proper is about four miles in length. It descends from a group of upper lochs ; about a mile from its mouth it expands into Loch Valtos, the most important loch from an angling point of view, and then discharges into the north side of Loch Erisort, a long and narrow arm of the sea, which opens into the Minch.

From this centre I have received 24 sets of sea trout scales. The details are :—

(1) Finnock, number 7 ; heaviest 15 oz., lightest 6 oz., average weight 10½ oz., average length 29·4 cm., slightly over 11½ in.

(2) ·1+ group, number 12 ; heaviest 1 lb. 13 oz., lightest 13 oz., average weight 1 lb. 6 oz., average length 38·2 cm., slightly over 15 in.

(3) Previously Spawned or SM fish, number 5, of various age groups and ranging in weight from 7¾ lb. to 2¼ lb. Particulars are given in Table I. Three had spawned once, one three times, and one four times.

Parr Life.

Age at Migration, see Table XVIII.

54·2 per cent. were 2-year smolts, 41·7 per cent. 3-year smolts, and 4·1 per cent. 4-year smolts.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 19·3 cm., of the 3-year smolts 22·3 cm., of the 4-year smolts 26 cm. These are the highest smolt lengths obtained from the Lewis and Harris collections, but it is probable that smaller fish were deliberately omitted.

Sea Life.

See Table XX.

Post-migration Ages. Of the 24 fish, approximately 29 per cent. were in their first post-migration summer, *i.e.* were finnock ; 50 per cent. were in their second post-migration summer (the ·1+ group) ; and 21 per cent. were mature fish which had spawned in one or more previous winters (the several SM groups).

The *growth rate* is stronger than in our other samples from this island, but the number of fish measured is small.

Heaviest and Oldest Fish.

The heaviest weighed 7¼ lb., the next heaviest 3¾ lb. The former, the oldest in the sample, had survived eight and a half years since hatching. The next oldest are one of six and a half years and one of five and a half years.

2. The River Grimersta and Lochs.

In his paper on Grimersta Salmon, Mr Menzies wrote :—

" The River Grimersta itself is short, little more than a mile in length, rocky and of little account except as a passage way for salmon and sea trout from the sea loch,

Loch Roag, to the first of the four lochs which form the major part of the district. . . . The four fresh water lochs are connected by quite short streams; the uppermost and largest loch, Loch Langavat, 7½ miles long, is not of great account from an angling point of view, and the great majority of the fish are taken in the other three, of which the first is the best." (List 1.)

The system drains into the head of what is usually known as East Loch Roag, which lies to the east of Loch Roag proper, with which it is connected by a salt water channel separating the island of Great Bernera from the mainland of Lewis.

In 1931 10 sets of sea trout scales were obtained from the Grimersta. I had in hand 18 sets collected in earlier years. The total, therefore, is 28 sets.

The details are :—

(1) Finnock, number 11; heaviest 12 oz., lightest 6 oz., average weight just under 8 oz., average length 27·8 cm., 11 in.

(2) ·1+ group, number 14; heaviest 1¾ lb., lightest ½ lb., average weight 1 lb. 3 oz., average length 35·2 cm., nearly 14 in.

(3) ·2+ group, number 2; weights 2½ lb. and 1 lb., average length 41·2 cm., nearly 16¼ in.

(4) Previously Spawned or SM fish, one only : weight 6 lb., length 61 cm., 24 in.

This last fish, the heaviest and oldest in this small Grimersta sample, is the only representative from this river of the large sea trout, which at one time were plentiful in it.

Parr Life.

Age at Migration, see Table XVIII.

21·4 per cent. migrated after two years of parr life, 71·4 per cent. after three years and 7·2 per cent. after four years.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 17 cm., of the 3-year smolts 20·7 cm., of the 4-year smolts 22 cm.

The 3-year smolts are a little longer than the average for the whole district, the 2-year and 4-year smolts a small fraction shorter.

Sea Life.

See Table XX.

Post-migration Ages. Of the 28 fish, approximately 39 per cent. were in their first post-migration summer (finnock), 50 per cent. in their second post-migration summer (the ·1+ group), 7 per cent. in their third post-migration summer (the ·2+ group), and 4 per cent. in the seventh post-migration summer.

The *growth rate* during sea life is a little more rapid than the average for the whole district (Table XX). But the sample is far too small to yield trustworthy averages.

Heaviest and Oldest Fish.

The heaviest weighed 6 lb., the next heaviest 2½ lb. The former of these was in its ninth summer since hatching; no others exceeded in age five and a half years.

3. River and Loch Drobhinish and Loch Suirstabhat (Scaliscro).

Scaliscro Lodge lies on the eastern or right bank of Little Loch Roag, which opens into Loch Roag or, as it is sometimes called, West Loch Roag. The principal fishings are the small loch, Suirstabhat, which drains by a stream about a mile in

length into the eastern side of Little Loch Roag, and the small River and Loch Drobhinish, which discharge into Loch Roag a little outside and to the east of the entrance to Little Loch Roag. Suirstabhat and Drobhinish, therefore, form two distinct water systems.

I have received 15 sets of sea trout scales from Drobhinish and 14 from Suirstabhat. The collection also contained a few sets from fresh water trout, which had been feeding in salt water. The details are :—

(*a*) *Drobhinish*, 15 fish.

(1) Finnock, number 4 ; heaviest 9 oz., lightest 7 oz., average weight 8 oz., average length 27·7 cm., 10·9 in.

(2) ·1+ group, number 9 ; heaviest 1½ lb., lightest 14 oz., average weight 1 lb. 2 oz., average length 34·7 cm., 13·7 in.

(3) SM fish, number 2 ; both of the 2·1+SM+ group, weights 2 lb. and 1 lb. 13 oz., average length 41·2 cm., 16·2 in.

(*b*) *Suirstabhat*, 14 fish.

(1) Finnock, 1 fish ; 8 oz., 26·7 cm., 10½ in.

(2) ·1+ group, 6 fish ; heaviest 1 lb. 1 oz., lightest 9 oz., average weight just over 15 oz., average length 33·9 cm., 13·3 in.

(3) Previously Spawned or SM fish, number 7 ; of various age groups and ranging in weight from 5¼ lb. to 1 lb. 7 oz. Particulars are given in Table III. Six had spawned once and one twice.

Parr Life.

Age at Migration, see Table XVIII.

(*a*) Drobhinish. 40 per cent. were 2-year smolts and 60 per cent. 3-year smolts. (*b*) Suirstabhat. 28·6 per cent. were 2-year smolts and 71·4 per cent. 3-year smolts.

Length at Migration, see Table XIX.

(*a*) Drobhinish. The average length of the 2-year smolts is 17·9 cm., of the 3-year smolts 19·1 cm. (*b*) Suirstabhat. The average length of the 2-year smolts is 14·7 cm., of the 3-year smolts 18 cm.

The Drobhinish fish are rather larger for their age than those of Suirstabhat and Drobhinish has a larger proportion of the fast growing, *i.e.* the 2-year smolts. The Drobhinish lengths are a little above, the Suirstabhat lengths a little below the average for the whole district.

Sea Life.

See Table XX.

Post-migration Ages. In the two samples taken together, out of 29 fish approximately 17 per cent. were finnock, 52 per cent. in their second post-migration summer, 28 per cent. in their third, and 3 per cent. in their fourth post-migration summer.

As at the smolt stage (see above), so also at the finnock stage and in the following summers, the Drobhinish average lengths are a little above, the Suirstabhat average lengths a little below, the average lengths at the corresponding stage of growth for the whole district. But the samples are too small to yield trustworthy averages.

Heaviest and Oldest Fish.

The heaviest weighed 5¼ lb. (see Fig. 2) ; no others attained the weight of 2½ lb. This 5¼ pounder was also the oldest in the sample. It had survived six and a half years since hatching. Four others had reached the age of five and a half years. All these five came from Suirstabhat.

4. River and Loch Morsgail (Morsgail).

Morsgail Lodge lies on the left bank and at the lower end of Loch Morsgail, which drains by a stream, called the Morsgail River, about a mile in length, into the head of Little Loch Roag. Loch Morsgail is fed by an upper chain of small lochs and streams into which the migratory fish penetrate. Its watershed is shut off from that of Scaliscro by the Caltraseal Mountain.

From this centre I have received 85 sets of sea trout scales, 24 from the river and 61 from the loch, captured between 27th June and 17th September.

The details are :—

(1) Finnock, number 40 ; heaviest 1 lb., lightest 6 oz., average weight 8½ oz., average length 27·4 cm., 10¾ in.

(2) ·1+ group, number 36 ; heaviest 1½ lb., lightest 11 oz., average weight 1 lb. 2 oz., average length 35·2 cm., nearly 14 in.

(3) Previously Spawned or SM fish, number 9 ; of various ages and ranging in weight from 2½ lb. to 14 oz. Particulars are given in Table IV. Eight had spawned once, and one three times.

Parr Life.

Age at Migration, see Table XVIII.

52·9 per cent. were 2-year smolts, 42·4 per cent. 3-year smolts, and 4·7 per cent. 4-year smolts.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 18 cm., of the 3-year smolts 20·5 cm., of the 4-year smolts 24·6 cm.

The lengths are about one centimetre above the average for the whole district.

Sea Life

See Table XX.

Post-migration Ages. Of the 85 fish, approximately 47 per cent. were in their first post-migration summer, *i.e.* finnock, 47 per cent. in their second post-migration summer, 4 per cent. in the third, 1 per cent. in the fourth, and 1 per cent. in the fifth post-migration summer.

The lengths at first and second post-migration summer are slightly above the average for the whole district.

Heaviest and Oldest Fish.

The sample contained no large or old fish. The two heaviest each weighed 2½ lb. The oldest had survived six and a half years since hatching ; next in age come three aged five and a half years.

Two fish, both captured in Morsgail Loch, are of special interest. One, weighing 1¼ lb., was taken on 13th July ; the other, weight 1¼ lb., on 10th August. In each case the scales bore at the margin a spawning mark in course of formation. The scale formula for the former is 2·1+SM+SM (forming), for the latter 2·1+SM (forming). They had spawned in the last, or 1930-31, winter, descended to salt water and, after partly recovering condition and making a very little growth, had run up again to such a distance from brackish water that it is hardly probable they would have fallen back again to the sea loch before the coming winter, when presumably they would have spawned once more. The condition figure is very low in each case, namely, K·72, but they may have been some while in fresh water.

5. River Gisla and Loch Croistean (Uig).

Uig Lodge is situated on the Bay of Uig (Traigh Uige), a bight of the Atlantic. The fishings in this district fall under three headings. (*a*) Loch Suainabhat and Loch Slacsabhat, which discharge by the short Fors River and a series of tidal pools into Uig Bay. No sea trout run into Slacsabhat, only salmon. (*b*) A chain of three lochs emptying into Loch Croistean, which drains into West Loch Roag by the Caryshader River. This is about seven miles from the Lodge and provides their best sea trout fishing, but salmon are said now to be ousting the sea trout. (*c*) The Gisla River (Gisladh), which receives the outflows of Lochs Grunnabhat and Crogabhat and enters the west side of Little Loch Roag, one and three-quarter miles from the mouth of the Morsgail River. It is being re-stocked with salmon and sea trout.

I have received 26 sets from the Gisla and 9 from Loch Croistean. Since there is little appreciable difference in the figures from the two centres, I have treated the two samples as one.

The details are :—

(1) Finnock, number 18 ; heaviest 1 lb., lightest 5 oz., average weight just over 8 oz., average length 27 cm., slightly over 10½ in.

(2) ·1+ group, number 8 ; heaviest 1 lb. 7 oz., lightest 8 oz., average weight 15½ oz., average length 34·2 cm., 13½ in.

(3) ·2+ group, number 3 ; weights 1 lb. 14 oz., 1½ lb., 1¼ lb., average nearly 1 lb. 5¾ oz., average length 39 cm., nearly 15½ in.

(4) Previously Spawned or SM fish, number 6 ; of various ages and ranging in weight from 2¼ lb. to 1 lb. 2 oz. Particulars are given in Table V. Five had one spawning mark on the scales and one had three spawning marks.

Parr Life.

Age at Migration, see Table XVIII.

31·4 per cent. were 2-year smolts, and 68·6 per cent. 3-year smolts.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 16·5 cm., of the 3-year smolts 19·5 cm. These lengths are below the average for the whole district.

Sea Life.

See Table XX.

Post-migration Ages. Of the 35 fish, approximately 51 per cent. were in their first post-migration summer (finnock), 26 per cent. in their second post-migration summer, 20 per cent. in their third and 3 per cent. in their fourth post-migration summer.

The lengths at first, second, and third post-migration summer agree very closely with the averages for the whole district.

Heaviest and Oldest Fish.

None in the sample reached a high weight or age. The heaviest was 2¼ lb. ; the oldest had survived six and a half years since hatching.

6. The Hamnaway River and Lochs.

The Hamnaway River (Amhuinn Thamanabhaidh on the reduced ordnance map) flows from a series of shallow lochs into the eastern side of a sea loch bearing

the same name, which lies on the west side of Harris, about three miles north of Loch Resort. Loch Resort marks the line between Lewis and Harris.

From this centre I have received 99 sets of sea trout scales, covering the period 9th July to 19th September 1931. The lengths only, not the weights, were given by the keeper. In the following notes and in the Hamnaway tables I have calculated the weight from the length at K·95 for finnock and K1 for larger fish.

The details are :—

(1) Finnock, number 48 ; heaviest 10½ oz., lightest 4 oz., average weight 7 oz., average length 26·3 cm., slightly over 10¼ in.

(2) ·1+ group, number 41 ; heaviest 1 lb. 9½ oz., lightest ¾ lb., average weight nearly 15¾ oz., average length 33·7 cm., slightly over 13¼ in.

(3) ·2+ group, one fish, weight 1 lb. 15 oz., length 42 cm., 16½ in.

(4) Previously Spawned or SM fish, number 9 ; of various ages and ranging in weight from 2 lb. 1½ oz. to 15¾ oz. Particulars are given in Table VI. None had spawned more than once.

Parr Life.

Age at Migration, see Table XVIII.

41·4 per cent. were 2-year smolts, 56·6 per cent. 3-year smolts, and 2 per cent. 4-year smolts.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 17·4 cm., of the 3-year smolts 19·4 cm., of the 4-year smolts 21·9 cm.

The 2-year smolts are slightly above, the 3-year smolts slightly below the average for the whole district.

Sea Life.

See Table XX.

Post-migration Ages. Of the 99 fish, approximately 49 per cent. were in their first post-migration summer (finnock), 43 per cent. in their second, and 8 per cent. in their third post-migration summer.

The average lengths at first and second post-migration summer are below the average for the whole district.

Heaviest and Oldest Fish.

The sample contains no large or old fish. The heaviest (at K1) would have weighed 2 lb. 1½ oz. The four oldest had survived five and a half years since hatching.

7. Laxdale River and Lochs (Borve), South Harris.

Borve Lodge lies in the southern part of the island, which is known as Harris. The fishings comprise the Laxdale River and Lochs, which drain into a sandy estuary marked on the ordnance map as Traigh Luskentyre, an inlet from the Sound of Taransay, which separates Harris from the island of Taransay. This river must not be confused with the Laxadale or Laxdale in North Harris, east of Tarbert.

From this centre I have received 94 sets of sea trout scales, covering the period 15th June to 2nd September 1931. The details are :—

(1) Finnock, 1 fish ; weight 12 oz., length 31·7 cm., 12½ in.

(2) ·1+ group, number 36 ; heaviest 2½ lb., lightest 9 oz., average weight 1 lb. 2 oz., average length 36·4 cm., 14½ in.

(3) ·2+ group, number 32 ; heaviest 2¾ lb., lightest 1 lb., average weight 1 lb. 12½ oz., average length 41·9 cm., nearly 16½ in.

(4) ·3+ group, 1 fish, very small for its age, namely 2½ lb., 45·7 cm., nearly 18 in.

(5) Previously Spawned or SM fish, number 24; of various ages and ranging in weight from 7 lb. (see Fig. 1), to 10 oz. Particulars are given in Table VII. Eighteen had spawned once, three twice, two three times, and one six times. This last was a small fish for its age, namely 5 lb.

Parr Life.

Age at Migration, see Table XVIII.

45·7 per cent. migrated as 2-year smolts, 47·9 per cent. as 3-year smolts, and 6·4 per cent. as 4-year smolts.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 16·8 cm., of the 3-year smolts 19 cm., of the 4-year smolts 21·7.

These lengths are a little below the average for the whole district.

Sea Life.

See Table XX.

Post-migration Ages. Of the 94 fish, approximately 1 per cent. were in their first post-migration summer (finnock), 39 per cent. in their second, 45 per cent. in their third, 11 per cent. in their fourth, 1 per cent. in their fifth, 2 per cent. in their sixth, and 1 per cent in their eighth post-migration summer.

The average lengths at first, second, and third post-migration summer are above the average for the whole district; the average lengths at smolt migration below the average (see above). But the number in the sample is too small to give trustworthy figures.

Heaviest and Oldest Fish.

The sample contains a fairly large number of good-sized fish. The heaviest weighed 7 lb. (see Fig. 1). Next in weight come four weighing respectively 6½ lb., 5 lb., 4¼ lb., and 4 lb.

The oldest had survived nine and a half years since hatching; next come one aged eight and a half years, one aged seven and a half years, and six aged six and a half years. All these were mature fish.

8. Loch Steisevat (Rodel).

The small village of Rodel, with its well-known angling hotel, lies at the extreme south of Harris, near Renish Point.

From this centre I have received 17 sets of sea trout scales, all taken by gillies in Loch Steisevat or at its outflow, the Mill Pool, which is near the hamlet of Obe or Leverburgh. No finnock were included in the sample and the weights and lengths given are not very accurate.

The details are :—

(1) ·1+ group, number 6; heaviest 2¼ lb., lightest 10 oz., average weight 1 lb. 5¼ oz., average length 36·8 cm., 14½ in., average figure for condition, K1·02.

(2) ·2+ group, number 2; each weighing 3¼ lb., average length 49·2 cm., 19⅜ in., average figure for condition, K1·05.

(3) Previously Spawned or SM fish, number 9; of various ages and ranging in weight from 6 lb. 9 oz. to 1½ lb. Details are given in TableVIII. Six had one spawning mark on the scales, and three had two spawning marks.

Parr Life.

Age at Migration, see Table XVIII.

41·2 per cent. migrated to the sea as smolts after two years of parr life, 52·9 per cent. after three years, and 5·9 per cent. after four years.

Length at Migration, see Table XIX.

The average length of the 2-year smolts is 17·4 cm., of the 3-year smolts 18·7 cm., of the 4-year smolts 24·7 cm.

The 2-year smolts are a little above, the 3-year smolts a little below, the average for the whole district. But averages based on so few individuals are of slight value.

Sea Life.

See Table XX.

Post migration Ages. No finnock were included in the sample. Of the 17 fish, approximately 35 per cent. were in their second, 35 per cent. in their third, 24 per cent. in their fourth, and 6 per cent. in their fifth post-migration summer.

The average lengths at second and third post-migration summer are above the average for the whole district. But the sample is too small to yield trustworthy averages and apparently scales from larger fish only were sent.

Heaviest and Oldest Fish.

The weight of the heaviest fish was given as 6 lb. 9 oz ; next come one of $5\frac{1}{2}$ lb. and one of $4\frac{1}{4}$ lb.

The oldest individual was seven and a half years of age, reckoned from hatching ; the next oldest are three, each aged six and a half years.

III.—NORTH UIST : LOCH MADDY DISTRICT.

Number of sea trout in the sample, 78.

The details are :—

(1) Finnock, number 27 ; heaviest 1 lb., lightest 3 oz., average weight 6 oz., average length 28·4 cm., *i.e.* nearly $11\frac{1}{4}$ in.

(2) ·1+ group, number 18 ; heaviest 3 lb., lightest $8\frac{1}{2}$ oz., average weight 1 lb. $9\frac{1}{2}$ oz., average length 39·7 cm., *i.e.* $15\frac{3}{4}$ in.

(3) ·2+ group, number 12 ; heaviest $5\frac{1}{2}$ lb., lightest $1\frac{3}{4}$ lb., average weight 3 lb. $6\frac{3}{4}$ oz., average length 51·7 cm., *i.e.* nearly $20\frac{1}{2}$ in.

(4) ·3+ group, 1 fish, $7\frac{1}{2}$ lb., 66 cm., *i.e.* 26 in.

(5) Previously Spawned or SM fish, number 20 ; of various age groups and ranging in weight from $9\frac{3}{4}$ lb. (see Fig. 4) to $1\frac{1}{2}$ lb. Particulars are given in Table IX. Thirteen had spawned once, five had spawned twice, and two had spawned three times.

The sea trout from systems such as Horisary, Carnish and Vallay, which discharge into the Atlantic or the Sound of Harris, had, on the average, a rather stronger growth rate, during both parr life and sea life, than those from the systems which open into the Minch.

Parr Life.

(*a*) *Age at Migration*, see Table XVIII.

50 per cent. migrated to the sea as smolts after two years of parr life, 42·3 per cent. after three years, and 7·7 per cent. after four years.

(*b*) *Length at Migration*, see Table XIX.

The average length of the 2-year smolts is 18·1 cm., of the 3-year smolts 23·9 cm., of the 4-year smolts 25·7 cm.

The 2-year smolts are half an inch shorter than those of the Howmore and Kildonan, the 3-year smolts two-fifths of an inch longer.

Sea Life.

See Table XX.

Post-migration Ages. Of the 78 fish, approximately 35 per cent. were in their first post-migration summer, that is, were finnock ; 23 per cent. were in their second, 23 per cent. in their third, 12 per cent. in their fourth, 6 per cent. in their fifth, and 1 per cent. in their sixth post-migration summer.

At each stage of post-migration life, the average lengths compare favourably with those from most Scottish mainland rivers, and are only slightly inferior to the lengths ascertained for the Howmore and Kildonan. But it must be remembered that the North Uist averages are based on a small sample and for this reason cannot be regarded as very trustworthy. This caution applies also to the samples from Lewis and Harris.

Heaviest and Oldest Fish.

The sample contains a good proportion of large fish, but none reach double figures. The heaviest is $9\frac{3}{4}$ lb. (see Fig. 4). Next to this come one of $8\frac{1}{4}$ lb., one of $7\frac{1}{2}$ lb., one of $6\frac{1}{4}$ lb., two of $5\frac{3}{4}$ lb., one of $5\frac{1}{2}$ lb., two of $5\frac{1}{4}$ lb., one of $4\frac{1}{2}$ lb., three of $4\frac{1}{4}$ lb., and four of 4 lb.

No individual reached a very high age. The oldest had survived nine winters and was in its tenth summer since hatching. Next come one aged eight and a half years, and nine aged six and a half years since hatching.

IV.—AGE AT MATURITY.

In small collections it is impossible to form a reliable estimate of the percentage of fish which begin their spawning career as finnock or at later stages of post-migration life. For this reason the figures have been worked out only for (*a*) Lewis and Harris, taken as a whole ; and (*b*) the North Uist district (Loch Maddy), taken as a whole.

For comparison these figures are set out in Table XXI, with the corresponding figures for the three centres in South Uist.

(*a*) *Lewis and Harris.*

Seventy-three fish out of 393 had spawning marks on their scales. In addition to these, 41 maiden fish had eroded scales, and, therefore, were ripening to spawn. Of these mature or maturing fish, 8·8 per cent. began or would begin their spawning career in the first winter after migration, *i.e.* as finnock, 67·5 per cent. in the second winter, 21·9 per cent. in the third winter, and 1·8 per cent. in the fourth winter.

(*b*) *North Uist* (*Loch Maddy*).

Of the 78 fish in the sample, 20 had spawning marks on their scales. In addition to these, 21 maiden fish were ripening to spawn and had eroded scales.

Of these mature or maturing fish, 7·3 per cent. (3 fish) spawned or would spawn for the first time in the first winter after migration, *i.e.* as finnock, 46·4 per cent. (19 fish) in the second winter after migration, 39· per cent. (16 fish) in the third winter and 7·3 per cent. (3 fish) in the fourth winter. The small percentage of finnock spawners is noteworthy, but the figure is not much lower than in the samples from Howmore and Kildonan, South Uist, and higher than in Bharp.

V.—APPENDIX.

Salmon.

North Uist. Too few salmon and grilse scales have been collected from this district up to the present to be of value for analysis.

South Uist. An analysis of a very small collection of salmon and grilse scales from the Howmore River and Loch à Bharp was given in the papers on South Uist (List 2 and 3).

(*a*) *Lewis and Harris*: *Introductory.*

In the small collections which have been obtained from Morsgail, Uig, and Laxdale, of which the details are analysed in the following sections, 88 per cent. were grilse, 3 per cent. were "Small Summer" fish, and 9 per cent. were "Previously Spawned" or SM fish.

This overwhelming preponderance of grilse agrees with the figures obtained in the Grimersta by Mr Menzies (List 1), where 81 per cent., out of a total collection numbering 803, were of this class.

The percentage of "Previously Spawned" fish is larger than in Mr Menzies' Grimersta sample (viz. 9 per cent. against 5 per cent.). All had spawned as grilse and none had more than one spawning mark on the scales. Of the nine SM fish, eight had spent a few months only in the sea before returning to the river a second time to spawn, and were of the so-called "short absence" habit. One, a female of 16¼ lb., from Slacsabhat (Uig), had spent a year and a few months between descent as a kelt and second return, the "very long absence" habit.

In the combined collections from Morsgail, Uig and Laxdale, 57 per cent. of the parr migrated to the sea as smolts after two years of river life, 42 per cent. after three years, and only 1 per cent. after four years. In the large Grimersta collection (List 1), the percentage of 2-year smolts was smaller, viz. 34·5, of 3-year smolts much higher, viz. 60·6, and there was a much larger proportion of 4-year and 5-year smolts. Among the grilse alone, the percentages are (*a*) Morsgail, Uig, and Laxdale, 2-year smolts 55·8 per cent., 3-year smolts 43 per cent., 4-year smolts 1·2 per cent.; (*b*) Grimersta, 2-year smolts 31·6 per cent., 3-year smolts 62·5 per cent., 4-year smolts 5·6 per cent., 5-year smolts ·3 per cent. This suggests that the unusually small percentage of 2-year smolts found in the Grimersta is not a characteristic of all Lewis and Harris rivers. But our collections from Lewis and Harris, with the exception of that from the Grimersta, are too small to give trustworthy results.

There is not much difference in the average length of the smolts between Morsgail and Uig, but the figures are a little higher than in the Grimersta. This advantage is maintained at first sea winter; also at return to the river, since the average length of the grilse from Morsgail, Uig, and Laxdale taken together is 64·3 cm., slightly over 25¼ in., which is three-quarters of an inch more than the average length in Mr Menzies' Grimersta sample (24·6 in.), and the average in Mr Macfarlane's sample from the Kirkcudbright Dee (List 4). It is over two inches greater than the average length of the grilse in such east coast rivers as the Aberdeenshire Dee and the Spey.

At first sea winter the fish which return as grilse have a greater average length than the fish at this stage of growth which return as small summer fish. This agrees with the results obtained in the Grimersta by Mr Menzies and in the Kirkcudbright Dee by Mr Macfarlane. On the other hand, in the districts of the east coast of Scotland which have been tested, the younger age groups are invariably shorter at the end of the first sea winter than the older age groups.

Both Mr Menzies and Mr Macfarlane have pointed out that these and other differences in the growth rates of east coast and west coast salmon suggest that the salmon from the two coasts of Scotland resort to different feeding grounds in the sea.

(*b*) *The Grimersta.*

The Grimersta Salmon have been described in another paper, written by Mr Menzies (List I).

In 1931 one set was sent with the small sea trout sample. It came from a small summer fish (2·2+), weight 14½ lb., length 35 in. or 88·9 cm., and was of interest because it was caught on 16th May, an early date for such a fish in this river.

(*c*) *Morsgail.*

Fifty-eight sets were collected, viz. 40 for July, 17 for August, and 1 for September. Of these, 51 (88 per cent.) were grilse, 2 were "Small Summer" fish (the 2·2+ group), and 5 were SM fish (all of the ·1+·SM+ group, *i.e.* they had spawned as grilse in the 1930-31 winter and after a few months in the sea had returned to spawn a second time).

The number, the average weights and lengths in each age group, are :—

	No.	Average Weight.	Average Length.
Grilse	51	5·63 lb.	63·1 cm., 24¾ in.
Small Summer fish . . .	2	13·12 lb.	85·7 cm., 33¾ in.
SM fish	5	7·5 lb.	70·7 cm., 27¾ in.

Range in Weight. The heaviest grilse weighed 8 lb. (July), the lightest 2 lb. (August : it was reported as a sea trout). The two small summer fish weighed 13¼ lb. and 13 lb. respectively. The heaviest of the SM fish was 9 lb., the lightest 5 lb.

Monthly Average Size and Condition of the Grilse.

Month.	No.	Average Weight.	Average Length.	Condition. C.F.*	K.*
July . . .	37	5·76 lb.	63·1 cm., 24¾ in.	39½	1·1
August . .	13	5·33 lb.	63·1 cm., 24¾ in.	35½	·99
September . .	1	4·75 lb.	64·7 cm., 25½ in.	29	·81

Note the slight loss of condition in August and the severe drop in the individual captured in September.

Parr Life.

Age at Migration. Twenty-eight fish, or 48·3 per cent. of the total, migrated to the sea after two years of river life as parr, and 30 fish, or 51·7 per cent., after three years.

* The C.F. column gives the figure for condition by Corbett's formula, which is in common use in England ; the K column gives the figure by the F. B. Scot. formula, in which the standard is K1 for a salmon in good summer condition.

Length at Migration. The average length of the 2-year smolts at last parr winter, that is approximately at migration, was 11·9 cm. or 4·6 in., of the 3-year smolts 13·4 cm. or 5·2 in.

Sea Life.

The average lengths at first and second post-migration winter are given in Table XXII. At first sea winter the grilse average 50 cm., or 19¾ in., in length, the small summer fish 49·2 cm., or 19·4 in. The grilse, therefore, are the longer, but only two summer fish were measured.

(*d*) *Uig* (*Croistean and Slacsabhat*).

Thirty-two sets were collected, viz. 11 for July, 11 for August, 9 for September, and 1 for October. Of these, 27 (84 per cent.) were grilse, 1 was a "Small Summer" fish, and 4 were SM fish (three of the ·1+·SM+ group, and one an older fish of the ·1+·SM·1+ group, which after spawning as a grilse in the 1929-30 winter had spent a year and a quarter in the sea before returning to spawn for the second time).

The average weights and lengths in each age group are :—

	No.	Average Weight.	Average Length.
Grilse	27	6·76 lb.	67·1 cm., 26½ in.
Small Summer fish. . . .	1	13·5 lb.	81·2 cm., 32 in.
SM fish (·1+·SM+) . . .	3	9 lb.	71·6 cm., 28¼ in.
„ (·1+·SM·1+) . . .	1	16·25 lb.	87·5 cm., 34½ in.

Range in Weight. The heaviest grilse was 10 lb. (August), the lightest 3 lb. (August). The small summer fish was 13½ lb. Of the SM fish, the three falling under the ·1+·SM+ group weighed respectively 10 lb., 9 lb. and 8 lb. : the one falling under the ·1+·SM·1+ group was a female, which weighed 16¼ lb.

Monthly Average Size and Condition of the Grilse.

Month.	No.	Average Weight.	Average Length.	Condition. C.F.	K.
July . . .	9	6·53 lb.	65·9 cm., 26 in.	37½	1·04
August . .	10	6·5 lb.	66·3 cm., 26⅛ in.	37	1·03
September . .	7	7·4 lb.	68·9 cm., 27¼ in.	37½	1·04
October . .	1	6·75 lb.	72·5 cm., 28½ in.	29½	·82

We see the normal increase in length from month to month. Till September the figure for condition is good. The October individual shows a serious depreciation in fatness.

Parr Life.

Age at Migration. Twenty-five fish, or 78·1 per cent. of the total, migrated to the sea after two years of parr life, 6 fish, or 18·8 per cent., after three years, and 1 fish (3·1 per cent.), after four years.

Length at Migration. The average length of the 2-year smolts at last parr winter, that is approximately at migration, is 11·7 cm., or 4·6 in., of the 3-year smolts 14·1 cm., 5·5 in., of the 4-year smolts, 15·5 cm., 6·1 in.

Sea Life.

The average lengths at first and second sea winters are given in Table XXIII. At first sea winter the grilse average 52·2 cm. (slightly over 19¾ in.) in length ; the

single small summer fish is 41·5 cm. (just over 16¼ in.) at first sea winter, and 73·5 cm. (29 in.) at second sea winter.

(*e*) *The Amhuinnsuidh River (Tarbert).*

Two sets of salmon scales were sent from this river. These fish, weights 10½ lb. and 9 lb., caught on 2nd June 1931, were of local interest because till recent years, the head keeper stated, salmon had not been seen before the end of June ; in the last three years, however, a few had been caught early in May.

The smaller was a " Small Spring " fish, the larger a " Small Summer " fish. The details are (1) 9 lb., 29 in., reading 3·2, that is, 3 parr years and 2 sea years ; (2) 10½ lb., 31 in., reading 2·2+, that is, 2 parr years, 2¼ sea years.

(*f*) *The Laxdale River.*

Eight sets were sent, viz. 2 for June, 4 for July, and 2 for September. All were grilse.

Range in Weight. The heaviest was 6 lb., the lightest 3 lb.

Monthly Average Size and Condition.

Month.	No.	Average Weight.	Average Length.	Condition. C.F.	K.
June . . .	2	5·56 lb.	60·6 cm., 23¾ in.	41½	1·15
July . . .	4	5·56 lb.	59·7 cm., 23½ in.	43	1·19
September . .	2	4·5 lb.	60·9 cm., 24 in.	32	·89

If the measurements sent are correct (but this is doubtful), the figure for condition is remarkably high in June and July, but low in September.

Parr Life.

Age at Migration. Three (or 37·5 per cent.) migrated to the sea after two years of parr life, and five (or 62·5 per cent.) after three years.

Length at Migration. The average length of the 2-year smolts at last parr winter, that is approximately at migration, was 10·2 cm., or 4 in. ; of the 3-year smolts 13·3 cm., or 5¼ in.

Sea Life.

The average length at first sea winter is 48·3 cm., or 19 in. (Table XXIV).

VI.—SUMMARY.

1. This paper may be regarded as a supplement to the two papers which have been issued in this series on the sea trout of South Uist. It deals with small collections of sea trout scales from various centres in Lewis and Harris and in North Uist.

2. Though the total stock of sea trout may have diminished in recent years throughout the Hebrides and very large fish may be more scarce than they are said to have been fifty years ago, these waters still afford excellent opportunities for sport.

3. The collection derived from eight centres in Lewis and Harris numbers 393 sets ; it contains 10 fish between 6 lb. 9 oz., and 4 lb. in weight. The collection from North Uist numbers only 78 sets, but it includes 17 fish between $9\frac{3}{4}$ lb. and 4 lb.

4. In Lewis and Harris, taken as a whole, there is a slight preponderance of 3-year smolts, though in two centres the 2-year smolts are more numerous. In North Uist the 2-year smolts form 51 per cent. of the total. But the samples are too small for such figures to be of much value.

5. At migration the smolts from Lewis and Harris are distinctly shorter than those from North Uist ; the latter are about the same length as those from Howmore and Kildonan in South Uist. Growth rate during parr life throughout the Hebrides compares very favourably with that of sea trout from the Scottish mainland.

6. At first sea summer (the finnock or whitling stage) Lewis and Harris fish are on the average shorter than those of North Uist and the latter distinctly shorter than the finnock of Howmore and Kildonan (South Uist), but longer than Bharp finnock (South Uist).

7. At second and third sea summer there is little difference between North Uist and Howmore and Kildonan. Lewis and Harris still lag behind and now give almost the same lengths as Bharp.

Throughout the Hebrides sea growth is superior to that of all except the fastest growing types of mainland sea trout.

8. Tables giving the percentages, which begin their spawning career in the first, second or later winter after migration, are of little value when based on small samples. In the Lewis and Harris collections, taken together, approximately 9 per cent. matured as finnock, 67 per cent. in the second winter after migration, 22 per cent. in the third winter and 2 per cent. in the fourth winter. In the North Uist samples, taken together, approximately 8 per cent. began spawning as finnock, 46 per cent. in the second winter after migration, 39 per cent. in the third winter and 7 per cent. in the fourth winter. The collections from Howmore and Kildonan (South Uist) contain a somewhat higher percentage of finnock spawners.

9. The Appendix deals with some samples of *Salmo salar* from Lewis and Harris. In the collections from Morsgail, Uig, and Laxdale, taken together, 88 per cent. were grilse, 3 per cent. small summer fish, and 9 per cent. Previously Spawned fish. The heaviest grilse weighed 10 lb. (Uig), the lightest 2 lb. (Morsgail). The latter was included erroneously among the sea trout by the keeper who collected the scales. The heaviest of the small summer class weighed $14\frac{1}{2}$ lb. It was taken in the Grimersta on 16th May. The heaviest in the SM class weighed $16\frac{1}{4}$ lb. ; it had spawned as a grilse and thereafter spent a year and a half in the sea before returning a second time to fresh water. All the SM fish had spawned as grilse. No scales bore more than one spawning mark. In the collections from the several centres taken together, 57 per cent. had migrated to the sea as smolts after two years of river life, 42 per cent. after three years, and one per cent. after four years. The average lengths of the smolts from Morsgail and Uig is a little greater than in Mr Menzies representative collection from the Grimersta, and this advantage is maintained at first sea winter and also at return to the river as grilse. But it must be remembered that the number of salmon and grilse measured from Lewis and Harris is too small to give really trustworthy averages.

VII.—LIST OF PAPERS TO WHICH NUMBERED REFERENCE IS MADE.

1. MENZIES, W. J. M., *Salmon of the Grimersta District, Lewis*, 1925. Fisheries, Scotland, Salmon Fish., 1926, VI.
2. NALL, G. H., *Sea Trout of South Uist*. Fisheries, Scotland, Salmon Fish., 1928, VII.
3. DITTO. DITTO. Part II. Fisheries, Scotland, Salmon Fish., 1929, IV.
4. MACFARLANE, P. R. C., *Salmon of the River Dee (Kirkcudbright) 1928 and 1929*. Fisheries, Scotland, Salmon Fish., 1931, II.

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TABLE I.

ANALYSIS—RIVER LAXAY AND LOCH VALTOS (SOVAL).

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	2·+	2	·5	·37	·43	25·7
	3·+	4	1·	·5	·7	30·4
	4·+	1	·94	·94	·94	33·2
1 Winter	2·1+	8	1·81	1·19	1·48	39·
	3·1+	4	1·44	·81	1·12	36·6
2 Winters	2·1+SM+	2	2·5	2·44	2·47	48·5
	3·1+SM+	1	2·25	2·25	2·25	45·
4 Winters	2·1+3SM+	1	3·75	3·75	3·75	57·
5 Winters	3·1+4SM+	1	7·25	7·25	7·25	67·2
Total . . 24 fish.						

TABLE II.

ANALYSIS—GRIMERSTA.

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	2·+	1	·5	·5	·5	27·2
	3·+	10	·75	·37	·49	27·9
1 Winter	2·1+	4	1·	·5	·75	33·
	3·1+	8	1·75	1·	1·31	35·5
	4·1+	2	1·75	1·25	1·5	38·7
2 Winters	3·2+	2	2·5	1·	1·75	41·2
6 Winters	2·2+4SM+	1	6·	6·	6·	61·
Total . . 28 fish.						

TABLE III.

ANALYSIS—DROBHINISH AND SUIRSTABHAT (SCALISCRO).

	Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
Drobhinish.	0 Winter	2·+	2	·5	·44	·47	27·4
		3·+	2	·56	·5	·53	28·
	1 Winter	2·1+	2	1·25	·87	1·06	34·1
		3·1+	7	1·5	1·	1·14	34·9
	2 Winters	2·1+SM+	2	1·81	1·81	1·81	41·2
Suirstabhat.	0 Winter	3·+	1	·5	·5	·5	26·7
	1 Winter	2·1+	2	1·	·81	·9	33·6
		3·1+	4	1·06	·56	·97	34·
	2 Winters	2·1+SM+	2	1·75	1·56	1·65	39·2
		3·1+SM+	4	2·12	1·44	1·78	42·6
	3 Winters	3·1+2SM+	1	5·25	5·25	5·25	61·
Total: Drobhinish 15; Suirstabhat 14.							

TABLE IV.

ANALYSIS—MORSGAIL.

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	2·+	13	·56	·37	·45	25·9
	3·+	24	·87	·37	·53	27·4
	4·+	3	1·	·5	·75	31·3
1 Winter	2·1+	27	1·5	·69	1·11	34·9
	3·1+	8	1·5	1·	1·17	36·
	4·1+	1	1·25	1·25	1·25	36·2
	2·+SM+	1	·87	·87	·87	33·
	3·+SM+	3	1·25	1·	1·08	35·5
2 Winters	2·1+SM+	2	1·75	1·25	1·5	40·5
	3·1+SM+	1	2·	2·	2·	42·
3 Winters	2·2+SM+	1	2·5	2·5	2·5	47·5
4 Winters	2·1+3SM+	1	2·5	2·5	2·5	45·7
Total . . 85 fish						

TABLE V.

ANALYSIS—GISLA AND CROISTEAN (UIG).

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	2·+	5	·62	·31	·42	24·5
	3·+	13	1·	·37	·54	27·7
1 Winter	2·1+	3	1·12	·69	·85	33·
	3·1+	5	1·44	·5	1·05	34·9
	3·+SM+	1	1·25	1·25	1·25	40·
2 Winters	2·2+	1	1·87	1·87	1·87	42·
	3·2+	2	1·5	1·25	1·37	37·7
	2·1+SM+	2	2·	1·12	1·56	39·7
	3·1+SM+	2	2·12	1·75	1·93	42·9
3 Winters	3·+3SM+	1	2·25	2·25	2·25	45·7
Total . .		35 fish.				

TABLE VI.

ANALYSIS—HAMNAWAY.

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.*	Minimum Weight. lb.*	Average Weight. lb.*	Average Length. cm.
0 Winter	2·+	20	·55	·25	·41	25·4
	3·+	27	·64	·32	·48	26·9
	4·+	1	·62	·62	·62	29·2
1 Winter	2·1+	17	1·24	·74	·94	33·
	3·1+	23	1·59	·77	1·	34·1
	4·1+	1	1·01	1·01	1·01	34·2
	3·+SM+	2	1·12	·98	1·06	34·4
2 Winters	2·2+	1	1·94	1·94	1·94	42·
	2·1+SM+	3	1·51	1·29	1·44	38·1
	3·1+SM+	4	2·09	1·69	1·83	41·2
Total . .		99 fish.				

* In the Hamnaway sample lengths only were measured : weights have been calculated at K·95 for finnock and K1· for older fish.

TABLE VII.

ANALYSIS—LAXDALE.

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	3·+	1	·75	·75	·75	31·7
1 Winter	2·1+	15	1·5	·56	1·01	35·5
	3·1+	17	2·5	·62	1·16	36·4
	4·1+	4	2·5	·75	1·44	39·6
	4·+SM+	1	1·	1·	1·	35·
2 Winters	2·2+	15	2·37	1·	1·65	41·2
	3·2+	16	2·75	1·12	1·9	41·5
	4·2+	1	1·5	1·5	1·5	38·
	2·1+SM+	5	2·25	1·25	1·67	39·9
	3·1+SM+	5	3·	·62	1·89	41·2
3 Winters	2·3+	1	2·5	2·5	2·5	45·7
	2·2+SM+	3	2·75	2·	2·25	44·8
	3·2+SM+	3	4·	1·5	2·62	46·5
	2·1+2SM+	1	2·5	2·5	2·5	47·
	3·1+2SM+	1	2·5	2·5	2·5	44·5
	3·+3SM+	1	2·5	2·5	2·5	44·5
4 Winters	2·3+SM+	1	4·25	4·25	4·25	54·5
5 Winters	2·3+2SM+	1	6·5	6·5	6·5	62·2
	3·2+3SM+	1	7·	7·	7·	64·7
7 Winters	2·1+6SM+	1	5·	5·	5·	57·
	Total . .	94 fish.				

TABLE VIII.

ANALYSIS—STEISEVAT (RODEL).

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
1 Winter	2·1+	3	2·25	·62	1·37	36·4
	3·1+	3	1·75	·75	1·29	37·2
2 Winters	2·2+	1	3·25	3·25	3·25	49·5
	4·2+	1	3·25	3·25	3·25	49·
	2·1+SM+	1	1·5	1·5	1·5	40·5
	3·1+SM+	3	4·25	1·75	2·79	46·1
3 Winters	2·2+SM+	1	5·5	5·5	5·5	59·
	3·2+SM+	1	2·5	2·5	2·5	45·7
	2·1+2SM+	1	3·5	3·5	3·5	49·5
	3·1+2SM+	1	3·	3·	3·	48·2
4 Winters	3·2+2SM+	1	6·56	6·56	6·56	63·
Total . . 17 fish.						

TABLE IX.

ANALYSIS—NORTH UIST (LOCH MADDY).

Winters since Migration.	Age Group.	No. of Fish.	Maximum Weight. lb.	Minimum Weight. lb.	Average Weight. lb.	Average Length. cm.
0 Winter	2·+	14	·75	·19	·47	27·
	3·+	10	1·	·25	·61	29·
	4·+	3	·75	·5	·67	31·3
1 Winter	2·1+	8	2·	·97	1·45	38·8
	3·1+	10	3·	·53	1·7	40·4
2 Winters	2·2+	6	4·	1·75	3·08	51·3
	3·2+	5	5·5	2·	3·65	51·7
	4·2+	1	4·25	4·25	4·25	54·7
	2·1+SM+	2	2·25	2·25	2·25	44·9
	3·1+SM+	4	4·25	1·5	2·61	46·7
3 Winters	3·3+	1	7·5	7·5	7·5	66·
	2·2+SM+	3	6·25	2·25	4·17	56·5
	3·2+SM+	1	2·	2·	2·	45·
	2·1+2SM+	2	5·75	2·5	4·12	55·5
	3·1+2SM+	2	4·	3·25	3·62	51·7
4 Winters	2·3+SM+	3	5·75	5·25	5·42	61·3
	2·2+2SM+	1	4·5	4·5	4·5	55·9
	4·1+3SM+	1	8·25	8·25	8·25	64·7
5 Winters	4·2+3SM+	1	9·75	9·75	9·75	64·7
Total . . 78 fish.						

TABLE X.

CALCULATED LENGTHS—RIVER LAXAY AND LOCH VALTOS (SOVAL).

Age Group.	No. of Fish Measured.	River Life.				Sea Life.
		1	2	3	4	1
		cm.	cm.	cm.	cm.	cm.
2·+	2	7·6	19·2	—	—	—
3·+	4	6·5	17·1	23·7	—	—
4·+	1	5·2	11·5	20·	26·	—
2·1+	8	8·2	19·3	—	—	32·
3·1+	4	6·2	15·7	20·8	—	31·
Total .	19 fish.					

TABLE XI.

CALCULATED LENGTHS—GRIMERSTA.

Age Group.	No. of Fish Measured.	River Life.				Sea Life.	
		1	2	3	4	1	2
		cm.	cm.	cm.	cm.	cm.	cm.
2·+	1	6·9	16·9	—	—	—	—
3·+	10	5·8	15·3	20·	—	—	—
2·1+	4	7·1	17·	—	—	28·1	—
3·1+	8	5·9	15·6	21·6	—	32·	—
4·1+	2	4·7	11·	17·	22·	33·	—
3·2+	2	5·8	15·2	21·	—	31·	37·2
Total .	27 fish.						

TABLE XII.

CALCULATED LENGTHS—DROBHINISH AND SUIRSTABHAT (SCALISCRO).

Age Group.	No. of Fish Measured.	River Life.			Sea Life.
		1	2	3	1
		cm.	cm.	cm.	cm.
2·+ Drobhinish	2	7·5	18·	—	—
3·+ Drobhinish	2	6·2	14·2	21·	—
3·+ Suirstabhat	1	4·7	12·	19·	—
2·1+ Drobhinish	2	7·9	17·9	—	29·5
2·1+ Suirstabhat	2	6·5	14·7	—	26·9
3·1+ Drobhinish	7	6·1	13·5	18·6	28·8
3·1+ Suirstabhat	4	6·	12·6	17·8	28·4
Total : Drobhinish 13 ; Suirstabhat 7.					

TABLE XIII.

CALCULATED LENGTHS—MORSGAIL.

Age Group.	No. of Fish Measured.	River Life.				Sea Life.
		1	2	3	4	1
		cm.	cm.	cm.	cm.	cm.
2·+	13	7·5	17·8	—	—	—
3·+	24	5·	14·	20·2	—	—
4·+	3	4·8	13·	19·1	25·5	—
2·1+	26	7·7	18·	—	—	29·7
3·1+	8	6·2	15·1	21·3	—	31·5
4·1+	1	3·7	11·	17·	22·	32·2
Total . 75 fish.						

TABLE XIV.

CALCULATED LENGTHS—GISLA AND CROISTEAN (UIG).

Age Group.	No. of Fish Measured.	River Life.			Sea Life.	
		1	2	3	1	2
		cm.	cm.	cm.	cm.	cm.
2·+	5	7·1	16·5	—	—	—
3·+	13	5·7	13·7	19·6	—	—
2·1+	3	7·	16·5	—	28·1	—
3·1+	5	5·6	13·6	19·3	29·1	—
2·2+	1	7·	16·2	—	28·	38·
3·2+	2	5·9	13·7	19·5	28·5	37·
Total .	29 fish.					

TABLE XV.

CALCULATED LENGTHS—HAMNAWAY.

Age Group.	No. of Fish Measured.	River Life.				Sea Life.	
		1	2	3	4	1	2
		cm.	cm.	cm.	cm.	cm.	cm.
2·+	20	7·2	17·4	—	—	—	—
3·+	27	5·4	12·9	19·5	—	—	—
4·+	1	4·5	11·	17·	22·2	—	—
2·1+	17	7·	17·4	—	—	28·5	—
3·1+	23	5·3	12·7	19·3	—	28·9	—
4·1+	1	4·2	10·5	16·7	21·5	29·7	—
2·2+	1	7·5	17·5	—	—	28·5	36·5
Total .	90 fish.						

TABLE XVI.

CALCULATED LENGTHS—LAXDALE.

Age Group.	No. of Fish Measured.	River Life.				Sea Life.		
		1	2	3	4	1	2	3
		cm.	cm.	cm.	cm.	cm.	cm.	cm.
3·+	1	5·5	16·	26·	—	—	—	—
2·1+	15	7·	16·5	—	—	29·1	—	—
3·1+	17	5·7	13·	19·	—	30·6	—	—
4·1+	4	4·7	10·8	17·5	22·9	33·6	—	—
2·2+	15	7·3	17·1	—	—	28·7	36·7	—
3·2+	16	5·2	12·5	18·5	—	29·4	37·9	—
4·2+	1	3·5	7·5	12·75	17·	25·5	33·5	—
2·3+	1	8·	17·5	—	—	28·9	37·	42·
Total .	70 fish.							

TABLE XVII.

CALCULATED LENGTHS—NORTH UIST (LOCH MADDY).

Age Group.	No. of Fish Measured.	River Life.				Sea Life.		
		1	2	3	4	1	2	3
		cm.	cm.	cm.	cm.	cm.	cm.	cm.
2·+	14	8·	18·	—	—	—	—	—
3·+	10	7·1	16·	24·	—	—	—	—
4·+	3	5·7	13·1	20·2	25·6	—	—	—
2·1+	8	8·4	18·3	—	—	32·2	—	—
3·1+	10	6·9	15·8	23·7	—	33·8	—	—
2·2+	6	8·2	18·1	—	—	32·1	44·4	—
3·2+	5	7·	15·7	23·9	—	34·	45·8	—
4·2+	1	5·8	13·3	20·5	26·	36·	48·	—
3·3+	1	7·	16·2	24·	—	38·	51·5	62·5
Total .	58 fish.							

TABLE XVIII.

AGE OF SEA TROUT SMOLTS AT MIGRATION.

PERCENTAGE ONLY (5-YEAR AND 6-YEAR SMOLTS OMITTED FROM SOUTH UIST).

District.	No. in Sample.	2-Year Smolts. Per cent.	3-Year Smolts. Per cent.	4-Year Smolts. Per cent.
Lewis and Harris, whole district .	394	42·9	53·3	3·8
Laxay and Loch Valtos (Soval) .	24	54·2	41·7	4·1
Grimersta	28	21·4	71·4	7·2
Drobhinish (Scaliscro) . .	15	40·	60·	—
Suirstabhat (Scaliscro) . .	14	28·6	71·4	—
Morsgail	85	52·9	42·4	4·7
Gisla and Croistean (Uig) . .	35	31·4	68·6	—
Hamnaway	99	41·4	56·6	2·
Laxdale (Borve) . . .	94	45·7	47·9	6·4
Steisevat (Rodel) . . .	17	41·2	52·9	5·9
North Uist, Loch Maddy district .	78	50	42·3	7·7
South Uist, Howmore . .	1833	27·3	56·8	14·4
South Uist, Kildonan . .	453	24·3	60·9	14·1
South Uist, Bharp . . .	189	40·7	50·8	8·5

TABLE XIX.

LENGTH OF SEA TROUT SMOLTS AT MIGRATION.

THE AVERAGE LENGTHS IN CENTIMETRES AT THE END OF THE LAST PARR WINTER, *i.e.* APPROXIMATELY AT MIGRATION, FROM ALL AGE GROUPS COMBINED.

District.	2-Year Smolts.	3-Year Smolts.	4-Year Smolts.
	cm.	cm.	cm.
Lewis and Harris, whole district .	17·1 (137)	19·7 (178)	22·9 (14)
Laxay and Loch Valtos (Soval) .	19·3 (10)	22·3 (8)	26· (1)
Grimersta	17· (4)	20·7 (20)	22· (2)
Drobhinish (Scaliscro) . . .	17·9 (4)	19·1 (9)	——
Suirstabhat (Scaliscro) . .	14·7 (2)	18· (5)	——
Morsgail	18· (40)	20·5 (32)	24·6 (4)
Gisla and Croistean (Uig) . .	16·5 (9)	19·5 (20)	——
Hamnaway.	17·4 (38)	19·4 (50)	21·9 (2)
Laxdale (Borve)	16·8 (31)	19· (34)	21·7 (5)
Steisevat (Rodel). . . .	17·4 (4)	18·7 (3)	24·7 (1)
North Uist, Loch Maddy district .	18·1 (28)	23·9 (26)	25·7 (4)
South Uist, Howmore . . .	19·8 (432)	22·8 (908)	25·7 (249)
South Uist, Kildonan . . .	20·1 (90)	22·9 (230)	25·9 (58)
South Uist, Bharp . . .	17·3 (67)	19·4 (90)	22·8 (16)

Figures in brackets denote the number measured.

TABLE XX.

THE ACTUAL AVERAGE LENGTH AND THE CALCULATED AVERAGE WEIGHT, AT K·95 FOR FINNOCK AND K1· FOR ADULT FISH, AT FIRST, SECOND, AND THIRD SUMMERS AFTER MIGRATION: ALL MAIDEN.

District.	Finnock.			Second Sea Summer, ·1+			Third Sea Summer, ·2+		
	No.	Av. Wt.	Av. Lgth.	No.	Av. Wt.	Av. Lgth.	No.	Av. Wt.	Av. Lgth.
		lb. oz.	cm.		lb. oz.	cm.		lb. oz.	cm.
Lewis and Harris, whole district	129	0 7¾	27·1	164	1 0	34·1	38	1 12¾	40·9
Laxay and Loch Valtos (Soval)	7	0 10	29·4	12	1 7	38·2	—	—	—
Grimersta	10	0 8½	27·8	14	1 2¼	35·2	1	1 13¼	41·2
Drobhinish (Scaliscro)	4	0 8½	27·7	9	1 1½	34·7	—	—	—
Suirstabhat (Scaliscro)	1	0 7½	26·7	6	1 0	33·9	—	—	—
Morsgail	40	0 8	27·4	36	1 2¼	35·2	—	—	—
Gisla and Croistean (Uig)	18	0 7½	27·	8	1 0	34·2	3	1 8½	39·
Hamnaway	48	0 7	26·3	41	0 15½	33·6	1	1 15	42·
Laxdale (Borve)	1	0 12½	31·7	36	1 4	36·4	32	1 13½	41·3
Steisevat (Rodel)	—	—	—	6	1 5	36·8	2	3 2	49·2
North Uist, Loch Maddy district	27	0 9	28·4	18	1 10	39·7	12	3 9½	51·7
South Uist, Howmore	473	0 12½	31·6	396	1 12½	40·9	167	3 9	51·6
South Uist, Kildonan	147	0 12¾	31·8	145	1 14½	41·8	76	3 5½	50·5
South Uist, Bharp	40	0 8	27·1	78	1 1	34·4	45	1 12	40·7

TABLE XXI.

AGE AT MATURITY.

PERCENTAGE OF FISH ATTAINING MATURITY AS FINNOCK OR AFTER 1-3 WINTERS OF SEA LIFE.

District.	No. of Fish.	After 0 Winter.	After 1 Winter.	After 2 Winters.	After 3 Winters.
		Per cent.	Per cent.	Per cent.	Per cent.
Lewis and Harris, whole district	114	8·8	67·5	21·9	1·8
North Uist (Loch Maddy)	41	7·3	46·4	39·	7·3
South Uist, Howmore	592	10·3	55·6	28·	6·1
South Uist, Kildonan	155	11·6	35·5	47·8	7·1
South Uist, Bharp	73	1·4	47·9	41·1	9·6

TABLE XXII.

SALMON: CALCULATED LENGTHS—MORSGAIL.

Age Group.	No. of Fish Measured.	River Life.			Sea Life.	
		1	2	3	1	2
		cm.	cm.	cm.	cm.	cm.
2·1+	23	4·6	11·8	—	51·5	—
3·1+	26	3·7	8·7	13·6	50·7	—
2·2+	1	5·	14·5	—	49·5	80·5
3·2+	1	5·	9·5	18·	49·	82·5
Total .	51 fish.					

TABLE XXIII.

SALMON: CALCULATED LENGTHS—UIG.

Age Group.	No. of Fish Measured.	River Life.				Sea Life.	
		1	2	3	4	1	2
		cm.	cm.	cm.	cm.	cm.	cm.
2·1+	20	4·1	11·9	—	—	52·3	—
3·1+	5	3·1	8·2	14·1	—	51·7	—
4·1+	1	3·5	7·5	11·5	15·5	54·	—
2·2+	1	4·	8·5	—	—	41·5	73·5
Total	27 fish.						

TABLE XXIV.

SALMON: CALCULATED LENGTHS—LAXDALE.

Age Group.	No. of Fish Measured.	River Life.			Sea Life.
		1	2	3	1
		cm.	cm.	cm.	cm.
2·1+	3	4·2	10·2	—	48·3
3·1+	5	3·6	9·	13·3	48·3
Total .	8 fish.				

TABLE XXV.

CENTIMETRES TO INCHES.

Centimetres.	Inches.	Centimetres.	Inches.
1	·39	26	10·2
2	·79	27	10·6
3	1·18	28	11·
4	1·57	29	11·4
5	1·97	30	11·8
6	2·4	31	12·2
7	2·8	32	12·6
8	3·1	33	13·
9	3·6	34	13·4
10	3·9	35	13·8
11	4·3	36	14·2
12	4·7	37	14·6
13	5·1	38	15·
14	5·5	39	15·4
15	5·9	40	15·7
16	6·3	41	16·1
17	6·7	42	16·5
18	7·1	43	16·9
19	7·5	44	17·3
20	7·9	45	17·7
21	8·3	46	18·1
22	8·7	47	18·5
23	9·1	48	18·9
24	9·5	49	19·3
25	9·8	50	19·7

NOTES ON THE ILLUSTRATIONS.

Fig. 1.—Loch Laxdale. 7 lb., 64·75 cm., 25½ in., 18th July 1931. The heaviest sea trout in the Laxdale sample (Borve). Reading, 3·2+3SM+. Figure for condition, K·99. In the photograph the three spawning marks are difficult to distinguish ; they show better on a few other scales from the same fish which had unfortunately very bad centres. The approximate lengths at each winter are : (parr life), 8·5 cm., 18 cm., 24 cm. ; (sea life), 30·5 cm., 48·5 cm., 56 cm. (SM), 59·5 cm. (SM), 62·5 cm. (SM), plus 2·25 cm. Growth was poor in the first sea or finnock year, but thereafter good. [Ref. No., Laxdale 38.]

Fig. 2.—Suirstabhat (Scaliscro). 5¼ lb., 61 cm., 24 in., Male, 8th September 1931. The heaviest sea trout in the sample from this centre. Reading, 3·1+2SM+. Figure for condition, K·89. Erosion 3°. The ridge formation at first sea winter is rather broken on this particular scale and suggests the possibility of a spawning mark, but examination of the other scales from this individual does not confirm this. The approximate lengths at each winter are : (parr life), 6 cm., 14 cm., 21 cm. ; (sea life), 37·5 cm., 47·5 cm. (SM), 54·5 cm. (SM), plus 6·5 cm. Growth was vigorous until spawning began. [Ref. No., Scaliscro 23.]

Fig. 3.—Gisla (Uig). 2 lb. 2 oz., 43·75 cm., 17¼ in., Female, 29th August 1931. Reading, 3·1+SM+. Figure for condition, K·99. Erosion 1°. An example of a clear and definite scale from a well-grown fish. The approximate lengths at each winter are : (parr life), 4·75 cm., 11·5 cm., 19·5 cm. ; (sea life), 28·5 cm., 38·25 cm. (SM), plus 5·5 cm. [Ref. No., Gisla-Uig 24.]

Fig. 4.—Horisary (North Uist). 9¾ lb., 73·75 cm., 29 in., 17th October 1931. The heaviest fish in the sample from North Uist. Reading, 4·2+3SM+. Figure for condition, K·94. Erosion 3°. In this photograph the first parr year is ill-defined and the first sea winter rather indefinite. Other scales, however, from the same fish, and measurements of several of the scales confirm the reading given. The approximate lengths at each winter are : (parr life), 6·5 cm., 13·5 cm., 18 cm., 24·5 cm. ; (sea life), 44 cm., 57 cm., 62 cm. (SM)., 67 cm. (SM)., 72 cm. (SM), plus 1·75 cm. [Ref. No., North Uist, 86.]

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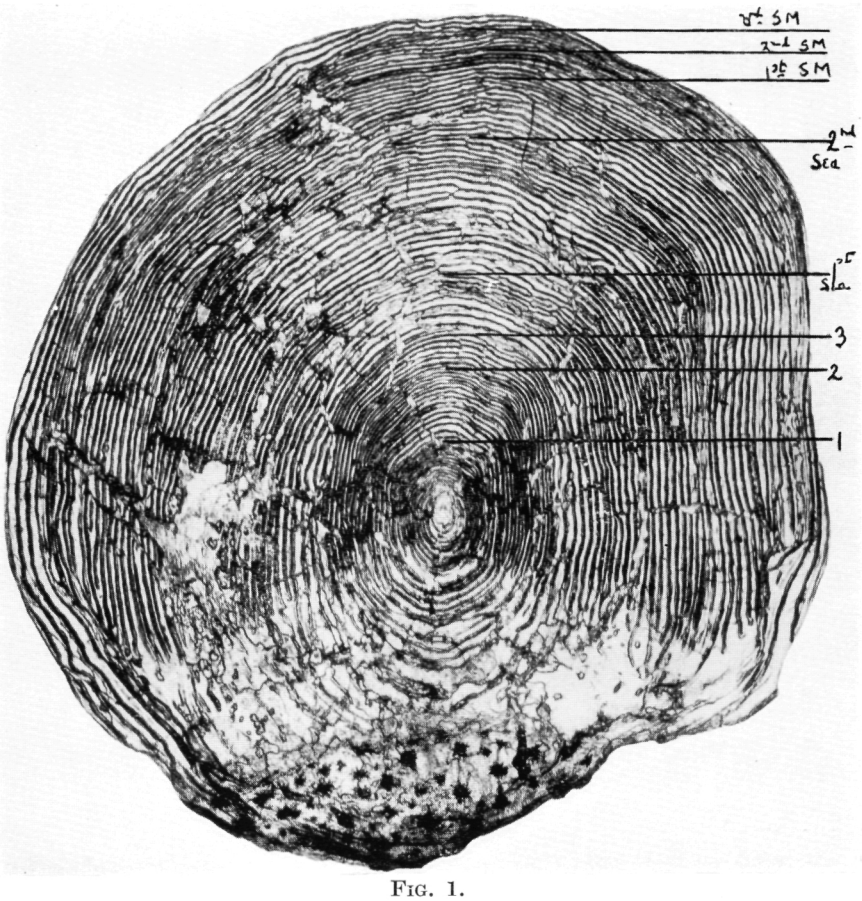
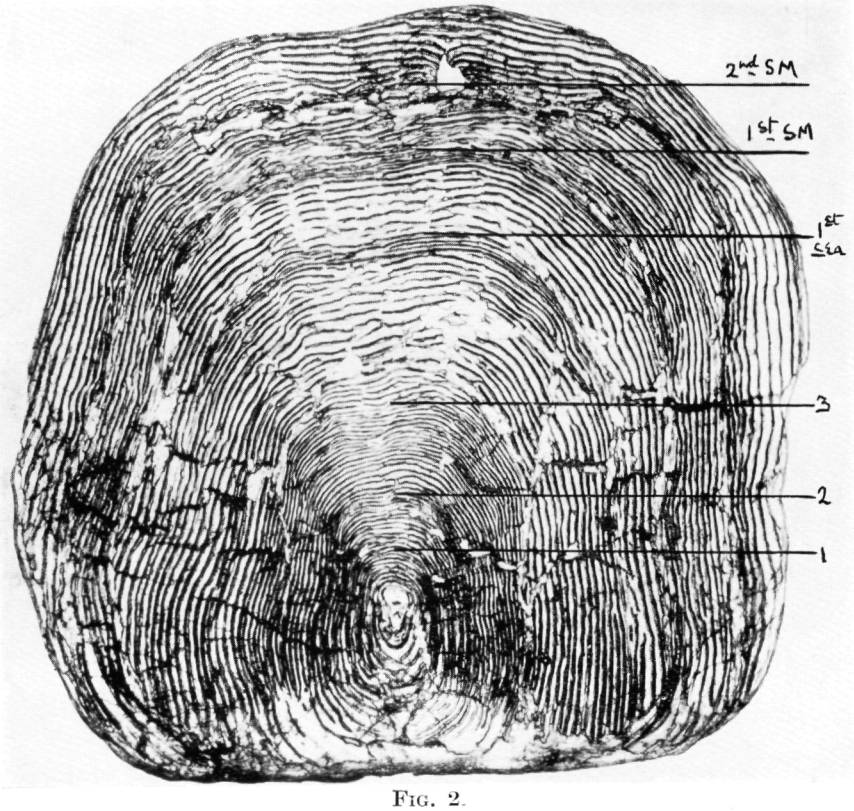


FIG. 1.



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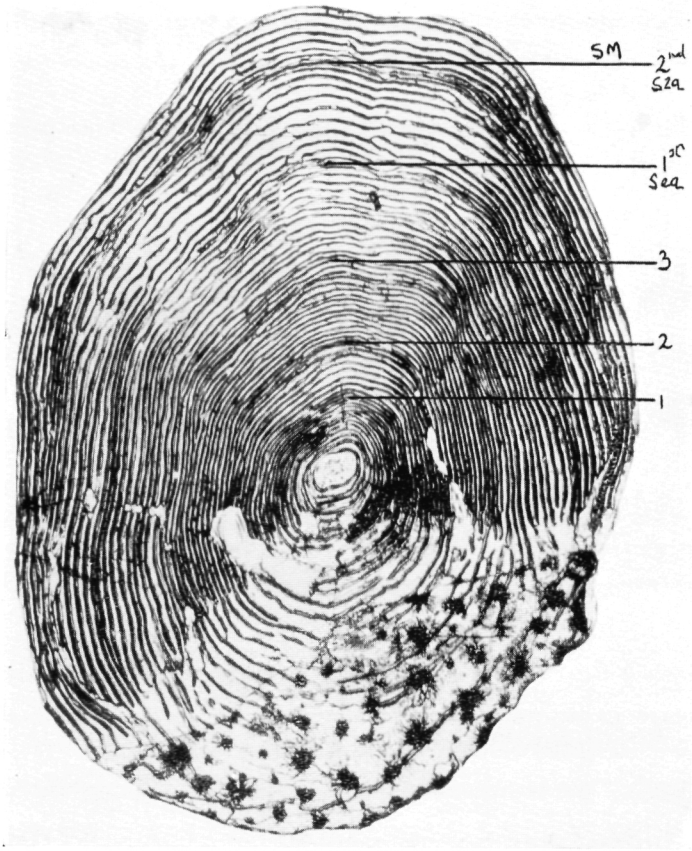

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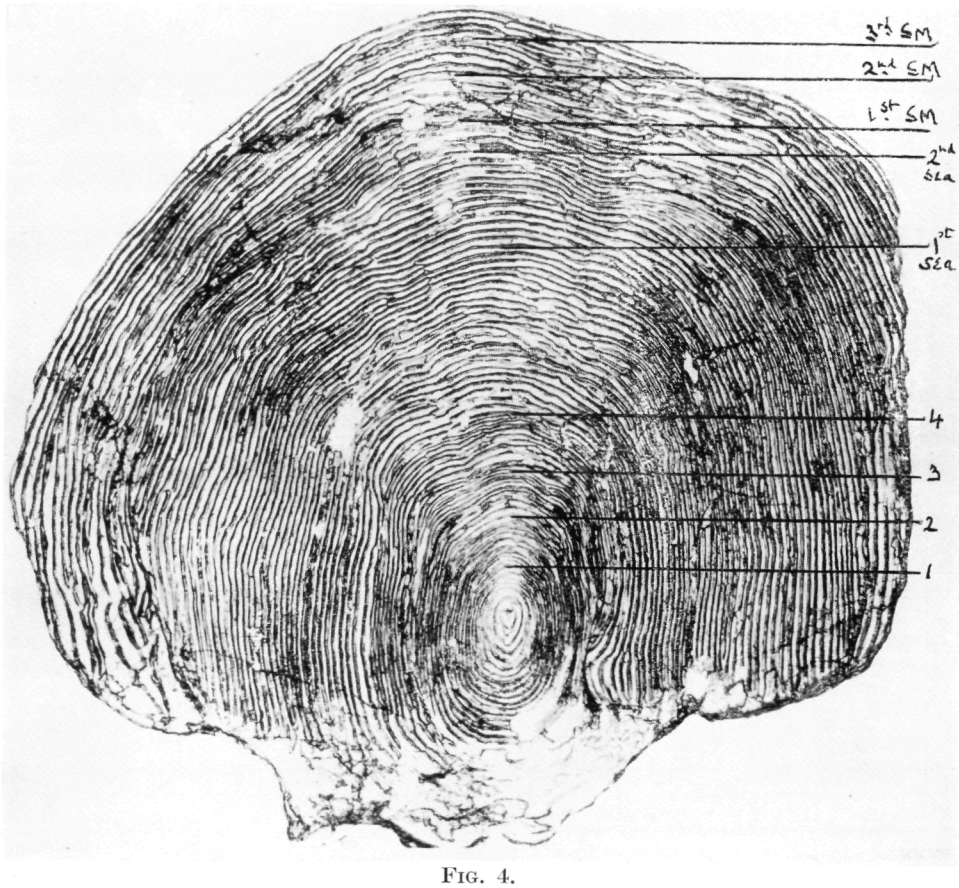

FIG. 4.

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