New Series IX.

DOVE MARINE LABORATORY,

Cullercoats, Northumberland.

REPORT

For the year ending June 30th, 1920.

Edited by ALEXANDER MEEK,

Professor of Zoology, Armstrong College, in the University of Durham,

and

Director of the Dove Marine Laboratory.

Published by the Marine Laboratory Committee of Armstrong College on behalf of the Northumberland Sea Fisheries Committee and other contributing authorities.

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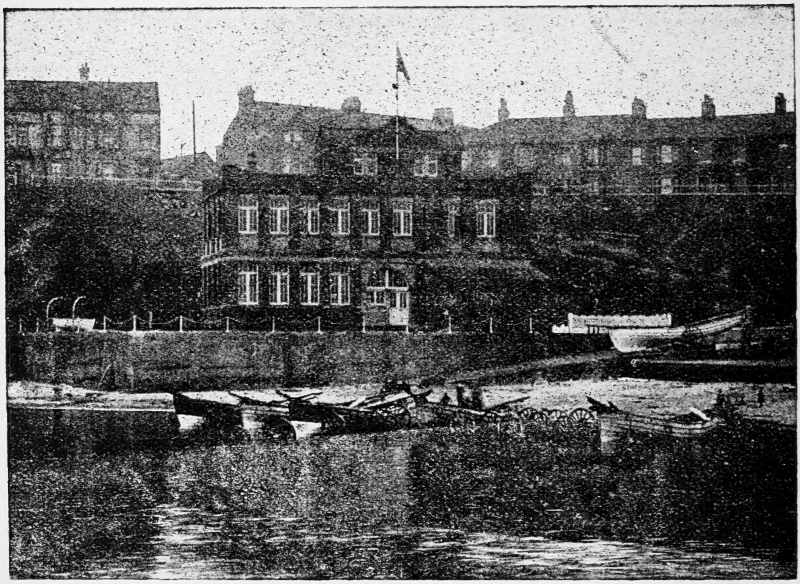


Dove Marine Laboratory Cullercoats.

SUMMARY AND GENERAL REPORT.

The present report, like that of last year, deals mainly with the investigations relating to the herrings.

Our previous investigations referred for the most part to the Northumberland shoals and the trawled herrings of the Dogger Bank region. Last year we found that the Northumberland herring was related to the Firth of Forth spring spawning shoals. On approaching the work, which is the subject of the present report, we thought it desirable therefore to obtain samples from a much wider area, and we are now dealing with the results of the examination of material from Stornoway, Lerwick and other ports along the East Coast to Yarmouth. Altogether, the number of herring investigated with respect to size, age, degree of development and growth amounted to 6,848.

Over the greater part of this wide area we found that the summer shoals were young fish, the greater number of them with three winter rings, and thus similar to the summer herrings of Northumberland. The shoals to the east of the Shetlands differed in that they did not contain so many young fish. In autumn the grounds frequented by the young fish were invaded by spawning shoals of older fish, and it was interesting to note that these spawning assemblages included such of the summer fish as had become mature. The winter shoals consisted of older fish with six and seven rings as a rule, but presented a scarcity of herrings with five winter rings.

With regard to maturity a wide variation was exhibited. Virgin fish at stage I. were found with six winter rings in summer shoals, and spawning fish with two winter rings in both autumn and spring shoals. Early maturity accompanies rapid growth in length. From a consideration of the growth made up to the formation of the first winter ring it has been concluded that the summer shoals of comparatively young herring are the products of both spring and autumn spawners, and the same data has lead to the opinion being expressed by

Mr. Storrow that these join spawning shoals as they mature independently of their origin.

The spring spawners grow more rapidly after maturity. This is probably due to the gonads being developed after the annual growth season.

In the last report we submitted evidence as to immigration into the summer feeding shoals of the Northumberland Coast. Further evidence from other shoals points to these immigrations taking place generally. Probably the last change which takes place in September or late August is brought about by fish leaving the feeding shoals to join the spawning shoals.

There is evidence to show that during the early part of 1920 the Firth of Forth was visited by more than one shoal of spring spawners, and also herrings were present in these shoals which on account of their stage in development could not become spring spawners this year. From a general consideration of the fishing grounds and the currents it is evident that the young are spread over a wide area. These young fish form the summer feeding shoals, and the feeding shoals give rise to recruits for the spawning shoals. The larvae resulting from the spawning shoals undergo denatation, and may ultimately join other spawning shoals, with the result that there is a relationship between the various schools.

With regard to the size of the fish, Mrs. Cowan has given, as in former years, an analysis of the age in relation to size. She found that the northern samples consisted of much larger fish than the southern when compared age for age. The autumn spawning shoals were found also to be larger fish than summer feeding shoals when contrasted in this manner.

With respect to the statement made in the above summary, Mrs. Cowan's analysis shows plainly that the first sample which came from the Firth of Forth was smaller in relation to age than the succeeding samples. It appears to be generally true that the herrings are large in the north and gradually become smaller on the successive fishing grounds towards the south when compared age for age.

Mr. Peacock, Lecturer in Zoology, has described changes in the larvae of *Ophryotrocha puerilis* which appeared in the tanks at Cullercoats, and has made note also of the occurrence of *Dinophilus gyrociliatus* in the same tanks.

A list of Marine Ciliates, by Mr. Craigie, from a jar of sea water sent to Dundee is given under Faunistic Notes.

There is only one point which I would like to take this opportunity of referring to, it is the difficulty of obtaining lodging accommodation for workers who wish to take advantage of our Marine Laboratory for work, especially in the long vacation. Cullercoats and the adjacent villages are so taken up with the summer visitors that I have had repeatedly to put off intending workers on account of the difficulty in obtaining accommodation. One way out of the trouble is opened up by making use of Easton Hall, which is a hostel connected with Armstrong College, and is conveniently situated near Jesmond Station, Newcastle, and practically only half-an-hour by train from the Laboratory. Arrangements could be made perhaps during the college session, but at all events at Easter and in July and September, for the acccmmodation of workers at the Laboratory. I still feel, however, that a necessary adjunct to such an institution as ours is to have accommodation in the immediate neighbourhood of the Laboratory. We can perhaps make some arrangements of the kind even under present conditions, but in any case I beg to ask those who would wish to come to work at Cullercoats to give as long a notice as possible.

ALEXANDER MEEK.

28*th September*, 1920.

HERRING INVESTIGATIONS.

I.—HERRING SHOALS.

By B. STORROW.

A general survey of our investigations of the herrings of the Northumberland Coast* showed that there was a connexion between the summer feeding shoals of our district and the winter spawning shoals of the Firth of Forth. An extension of the area from which our herring samples were obtained was therefore necessary. At the same time it was felt that the opportunity should not be missed of examining samples from as many shoals as possible in order to obtain a knowledge of their composition after such a period of comparative rest as that produced by the war. A scheme of work was drawn up and, with the approval of Professor Meek, arrangements were made for sampling shoals as landed at the ports of Stornoway, Lerwick, Wick, Peterhead, North Shields, Scarborough, Grimsby and Great Yarmouth, and also the sampling of the shoals of the Firth of Forth.

Through the kindness of the Editor, I was put into communication with "Viking" of the *Fish Trades Gazette*, and he gave me valuable suggestions which helped me to obtain samples from the different ports. It gives me much pleasure to record here my appreciation of the help I have received and the information I have obtained about herrings and herring shoals from Mr. Duncan MacIver of Stornoway, Mr. Alex. McKenzie and Mr. Thomas Brown of Lerwick, Mr. Robt. H. Johnston of Kirkwall, Mr. A. Wood of Wick, Mr. James Ritchie and Mr. John Sutherland of Peterhead, Messrs. J. Sellers & Son of Scarborough, Mr. H. H. Jay and Mr. Beazor of Yarmouth, and Mr. Fred. Frazer and Mr. Walker of Newhaven. Owing to the state of the herring fishery, Mr. H. Gruby of Grimsby was unable to arrange for the sending of samples of the herrings landed at that port. As in previous years, we are indebted to our many friends at North Shields.

* Report, 1919, New Series VIII.

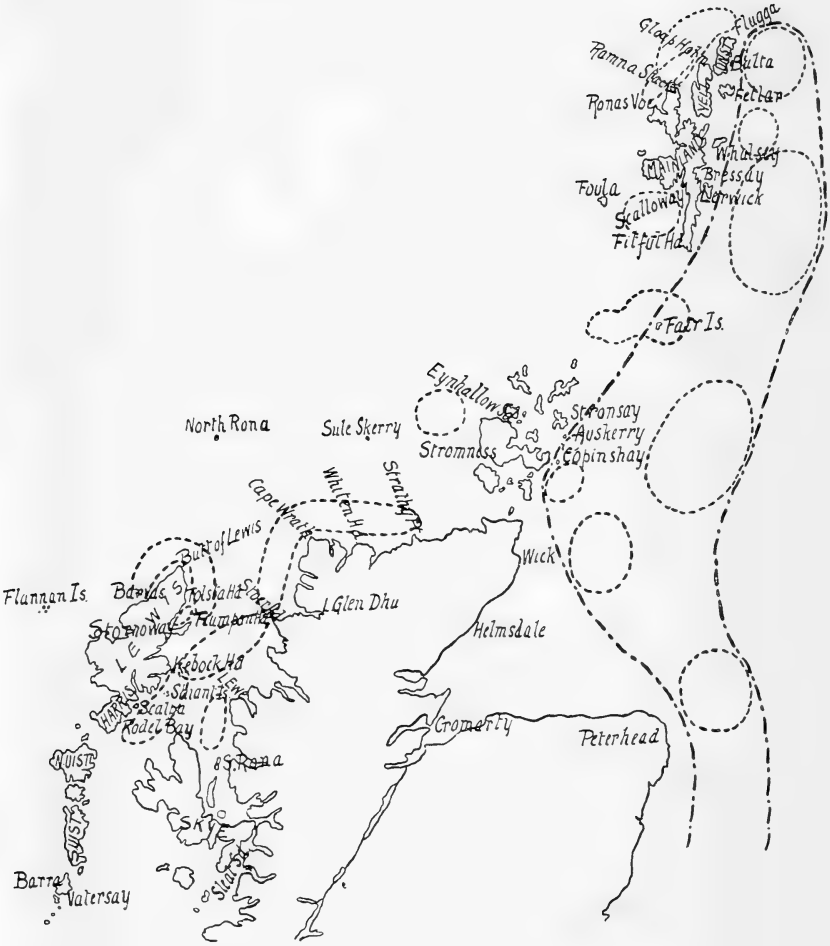
By the examination of samples taken at the beginning and about the middle of the summer fishery, of full or spawning fish, and also of spent fish, it was hoped to get sufficient evidence to show if there was any connexion between the summer shoals and the shoals of spring spawners, which it was intended to sample in the early part of 1920.

The samples consisted of a quarter of a cran of herrings taken without selection from the catch of the vessel, and the condition of the herrings on their arrival at Cullercoats gave evidence of the care taken in packing the fish.

Below is given a list of the samples examined. For each fish the length, sex, state of gonads and age have been recorded, and from the records of the scales the yearly growth, the position of the winter rings expressed in terms of the length of the fish, has been calculated. But for Mrs. Cowan's help and her capacity for steady and consistent application to work which, at times tended to become monotonous, it would have been impossible to deal with so much material.

SAMPLES.

Port.	Date of Capture.	Origin.	Catch.	Number Examined.
Stornoway	27th May, 1919	20 miles north of Butt of Lewis ...	25 crans ...	226
	22nd July, 1919	10 miles off Scalpa, Harris	15 crans ...	239
	23rd Sept., 1919	West side of Minch	10 crans ...	201
	10th Feb., 1920	Off Tiumpan Head	10 crans ...	212
	9th March, 1920	Broad Bay	3 to 4 crans	262
Lerwick ...	28th May, 1919	20 miles S.E. of Bressay	50 crans ...	174
	5th July, 1919	14 miles E. of Lerwick	60 crans ...	200
	16th Aug., 1919	14 miles S.S.E. of Lerwick	60 crans ...	199
	21st Feb., 1920	10 miles west of Shetlands	35 crans ...	151
	13th Mar., 1920	20 miles N.N.E. of Flugga	ca. 80 crans	176
Wick ...	8th July, 1919	49 miles E.½S. of Wick	18 crans ...	250
	14th Aug., 1919	9 miles S.E. by E. of Wick	12 crans ...	168
Peterhead	19th June, 1919	30 miles E. by N. of Peterhead ...	10 crans ...	180
	29th July, 1919	23 miles E. of Peterhead	8 crans ...	250
	20th Aug., 1919	28 miles E.N.E. of Peterhead ...	12 crans ...	249
	9th Sept., 1919	14 miles E. of Peterhead	60 crans ...	177
	13th Feb., 1920	12 miles off north coast of Sutherland	100 crans ...	176
	20th Feb., 1920	Off north coast of Sutherland ...	50 crans ...	183
North Shields .	24th July, 1919	20 miles N.E. byN.¼N. of Tyne ...	18 crans ...	250
	6th Aug., 1919	25 miles N.E. of Tyne	50 crans ...	250
	27th Aug., 1919	20 miles E. of Tyne	ca. 3 crans	250
	26th Sept., 1919	70 miles E.S.E. of Tyne (trawled) ...	5 to 6 crans	242
	8th Oct., 1919 ...	101 miles E.¾S. of Tyne (trawled) ...	3 crans ...	229
Scar-borough	12th Aug., 1919	15 miles N.E. of Scarborough ...	3 crans ...	200
	11th Sept., 1919	18 miles N.E. of Scarborough ...	2 crans ...	250
	25th Sept., 1919	10 miles E.N.E. of Scarborough ...	10 crans ...	245
Great Yar-mouth	6th Nov., 1919...	9 miles from North Haisborough Light Vessel	47½ crans ...	211
	20th Nov., 1919	3 miles N. of North Haisborough Float	14¼ crans ...	286
Firth of Forth	22nd Jan., 1920	Off St. David's	9 crans ...	220
	17th Feb., 1920	Off Aberdour (seine net)	ca. 60 crans	266
	10th Mar., 1920	Large, off Cramond Island	(?)	177
	(A)	Small, off Bo'ness	(?)	99
		Total examined		6,848



HERRING INVESTIGATIONS.

FISHING GROUNDS.

Fishing Grounds.—It was thought desirable to obtain information relating to the more distant fishing grounds. The data obtained is here placed on record. Whilst the details may be lacking in some respects, it is felt that a general view of the grounds has been arrived at without which it is impossible to consider the various herring shoals and their probable relationship to each other.

The Stornoway shoals, or rather those found in the waters between the Mainland and the Outer Hebrides, are many in number, and vary in the time fished and the class of herrings they yield. This is a peculiar area yielding herrings of all ages and different spawning periods, and the peculiarity of the area probably arises from the currents there found. "Round the north end of the Island of Lewis, the (tidal) stream bends into the Minch and meets the stream from the southward, the course of both streams being nearly the same as if there was an embankment from Loch Shell in the Island of Lewis to RuRea on the coast of Ross-shire. At the same time, another branch of the stream which has rounded Ardnamurchan Point flows through Sleat Sound, and being an hour earlier than the tide which has rounded the north end of Skye, it pours with great velocity through Kyle Rea, but owing to the undulations round Skye meeting near Kyle Akin there is little stream through that narrow opening; the flood stream, as it is stated, sometimes flowing in one direction and sometimes in the other, according to the prevailing winds."*

From information supplied by Mr. Duncan MacIver the herring grounds are as follows :—

1. From the Shiant Isles northward to Stoer Head. June, July and August, mostly mattie herrings; September, spawning herrings and spents; winter months, full herrings.
2. From Loch Ewe southward to Rona Head. August, mostly mattie herrings; January and February, full herrings; March, spawning fish and spents.
3. From Kebock Head southward to Rodel (Harris). July, August and early September, mattie herrings. Seldom fished in winter months.

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* Ainsley's Nautical Almanac, 1920, page 162.

4. From Stoer Head round Cape Wrath to Strathy Point. Winter fishing only. January and February, full herrings; March, spawning herrings and spents.
5. From Tiumpan Head round the Butt of Lewis to Barvas. June, July and August, mostly mattie herrings; September, spawning herrings and spents; January and February, full herrings; March, spawning herrings and spents.
6. From Tiumpan Head, including Broad Bay, to Tolsta Head. June, July and August, mostly mattie herrings; September, spawning herrings and spents; January and February, full herrings; middle of March, spents. Winter months are January, February and March.

There is also a winter fishing and other fishings to the south of Skye,* and at one time the waters off Barra, Atlantic side, and known as the Castle Bay fishing, were fished during May and June.† Fishermen tell me the herrings on these latter grounds were nice, well fed, fat fish, not so long as the winter herrings, but plump and well grown, and without much roe or milt, and that the herrings to the east of Castle Bay were smaller than those from the Atlantic side of Barra. The waters here, especially the channels between the islands, contain many unbuoyed rocks, which are a great danger to navigation.

From the vicinity of the Flannan Islands good catches of winter herrings have been obtained.‡

Only occasionally are herrings caught by Stornoway vessels between Cape Wrath and Strathy Point; usually the catches are taken between Stoer Head and Cape Wrath. Large catches of spawning herrings were taken from the vicinity of Cape Wrath towards the end of February and the beginning of March of this year (1920).

A fishing of what are termed "Loch" herrings is generally looked for from the different lochs of the Mainland and Skye from October to December. The bulk of these fish usually take to one loch, and it is rarely that herrings are caught in any quantities in different lochs at the same time. From the middle of October to

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* Letter from Mr. Ritchie, Peterhead.
† Rept. Fish. Board for Scot., 1883, page xlii.
‡ Rept. Fish. Board for Scot., 1900, pp. xiv and xv.

December of last year huge catches of herrings were continually caught in Loch Glen Dhu, north of Stoer Head. A big fleet of boats fished there, and the herrings did not once "take off" until the end of December. The fish are usually of the mattie class, and have an average length of about nine inches, but often full and large herrings are caught amongst them. The general belief amongst the fishermen is that the herrings are immature and weak, and take to the narrow waters for protection. From the size (Table III., page 59) they are probably fish, the majority of which are at the end of their second year, and their presence is due to an inshore or loch migration, similar to that which gives a fishing for young herrings in the Firths of Forth and Tay at about the same time of the year.

From Mallaig quantities of herrings are generally sent away during December. A number of these were seen in the curing house of Messrs. Woodger & Son, of North Shields. The fish had the general appearance of recovering spents. There was a small number of filling fish amongst them, and a few too small for curing, being about 20 cm. long. An examination of the gonads whilst splitting was in progress showed the majority of the herrings to be at stage II. of development. Very few were at stages III. and IV., and the smaller fish were, without exception, virgins at stage I. These fish were therefore recovering from an autumn spawning. Apart from the time of the year they are similar to the herrings caught off North Shields in April and May, which have doubtless come from the spring spawning shoals of the Firth of Forth, and to the herrings caught off the Butt of Lewis in May, a sample of which was examined in 1919, and consisted chiefly of fish with gonads at stage II. As a rule these shoals of recovering spents are said by the fishermen to be very "spotty" or "patchy," and one vessel may get a very good catch, whilst vessels on either side have practically nothing in their nets.

Mr. Thomas Brown of Lerwick, has given the information about the herring shoals around the Shetlands.

The winter fishery is pursued in the waters about the north of Unst and Yell, localities of fishing grounds being referred to generally from Flugga and the Ramna Stacks. The usual duration is from February, when the herrings are mostly la-fulls and mat-fulls, to about the end of March, during which months more and

more spents are taken in the catches, the first appearing about 5th March. Catches from these grounds were very heavy this year, 80 to 140 crans being taken by vessels with 25 and 36 nets, but the severe winter weather greatly hindered the fishing.

The next shoals are expected in the vicinity of the Bergen Bank, 60 to 100 miles east of Lerwick, or from the grounds between Fitful Head, Foula and Scalloway, called by the fishermen the Burra Half. This latter ground, Burra Half, gives a fishing similar to that between Ronas Voe and Gloup Holm in the early summer months. The Bergen Bank herrings are probably recovering spents from the spring spawners of the northern waters. The first of these herrings this year, 1920, were caught by a Dutch lugger, which had 100 barrels of large spents from two shots, and came into Lerwick Harbour on 12th May. Off the Ramna Stacks heavy shots of spent herring are occasionally taken in April, and during the same month herrings are taken from a large area, chiefly by drifter liners, sometimes from the Viking Bank or even as far as 112 miles away in that direction from Lerwick. The herrings from these northern and distant grounds are of large size, whether they be full or spent. It is evident that after the period of spring spawning the herrings are scattered over a considerable area in these northern waters. To what extent the Shetland herrings may mix with the recovering spents from the Norwegian shoals of spring spawners is difficult to say, but there appear to be great possibilities for such a mixture to take place.

Summer feeding shoals give rise to fishings along the east coast, and these are joined in autumn by spawning shoals, the first spawning herrings being caught generally east and south-east of Bressay. The herrings from Fetlar to as far south as Fair Isle are, during May and June, smaller and more mixed than the spring shoals, and do not keep so well. They are evidently shoals containing many young fish, and the youngest of them, or the shoals where the young fish predominate, are in the vicinity of Fair Isle, the herrings from these grounds being described as smaller and tenderer than the Unst, Fetlar, Whalsay or Bressay caught fish.

The waters to the west of the islands, between Ronas Voe and Gloup Holm, yield an early summer fishing. Catches may be taken as early as the end of April, but it is generally the middle of May before the herrings are present in any great numbers, and

they continue on the grounds till about the 20th of July, when they disappear. At this date the fishing vessels are accustomed to leave the west coast and move to Lerwick, where herrings of a finer and larger quality are obtained. The herrings are small and immature till the middle of June ; they then begin to fill and improve in quality till the middle of July, after which they disappear. Mr. Brown has been connected with the Shetland herring fishery since 1882, and never saw ripe spawning fish caught from these shoals. These herrings are smaller than the Lerwick fish, and they make very fine mattie herrings—nice, fat, thick fish. Mattie herrings when cured must be not less than 9 inches long, or 9¼ inches when caught, the extra length allowing for shrinkage in curing. They are therefore a shoal or shoals of young herrings, the bulk of them being probably in their third and fourth years. (See growth data, pages 60 and 68.)

Mr. R. H. Johnston, Kirkwall, has furnished information relating to the herring grounds of the Orkneys, which are as follows :—

1. Stronsay grounds, 28 to 65 miles E. by N. to S.E. by S. from Stronsay. May and June, matties and mediums, small and usually tender ; July and August, large fulls, fulls and matfulls, spents towards end of August. The most important fishing ground.
2. Fair Isle grounds. July and August, mostly fulls and matfulls, spents towards end of August.
3. Copinshay grounds, 3 to 10 miles S.E. to S. by W. of Copinshay. June, small matties ; July and August, fulls and matfulls. The fish are generally tender.
4. Auskerry grounds, E. to S.E. of Auskerry, a small and unimportant area. June, small matties ; July and August, fulls ; spents towards end of August.
5. West of Orkney grounds, 12 to 20 miles W. of Eynhallow Sound. May, June and early July, fine large mattie herrings. Few fish are caught after the end of June. The area is not extensively fished as large shoals are seldom found.
6. Strathy Point to Whiten Head grounds, 3 to 12 miles off the coast. January and February, large full fish, spents in March.

Previous to 1911 there was a winter fishing from 1 to 10 miles S.E. to S.S.E. of Copinshay. During the past two years shoals of spawning herrings have been located in the vicinity of Sule Skerry in the beginning of March

From Mr Wood of Wick, and Mr Ritchie of Peterhead, information has been received relating to the fishing grounds near these ports. Summer shoals occur to the east of Wick and Peterhead, and from the samples examined it is known that spawning shoals visited the Peterhead grounds last year. Similar shoals of autumn spawners are known to have been taken from the Wick grounds in previous years, and on the 12th August, 1919, a heavy shoal of spent herrings was located inshore off Clythness. Winter herrings have been taken from the grounds to the east of the Orkneys previous to 1914, but most of the winter herrings landed at Wick and Peterhead come from the Cape Wrath grounds. An early summer fishing takes place in May and June, from 3 to 8 miles off the north coast between Strathy Point and Cape Wrath. From the period of the fishing it is probable, although no data are to hand as to the class of fish here caught, that the fish giving this fishery are young fish somewhat similar to those caught during the same months to the west of both the Shetlands and Orkneys.

Considerable change has taken place in the herring fishery between Wick and Peterhead. From 1883 to 1887 the winter herring fishery of the East Coast of Scotland became an important industry, and large catches were landed at various ports from Montrose to Wick, large shoals being fished off the Aberdeen coast and from the Moray Firth in 1886.* Summer shoals in years of abundance gave a fishing in the Moray Firth for herrings of the quality of matfulls.† Mr. Brown of Lerwick informs me that in his boyhood days the herrings spawned in heavy shoals between Helmsdale and Port Mahomack. He has known of the nets being so full of herrings that they could not be got on board, and they had to be left until the fish rotted out of them.

Age and Maturity, Tables I. and II.—The particulars as to the age composition of the samples set forth in Table I. show that the chief wealth of the summer fishery depends upon the

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* Repts. Fish. Bd Scot. † Rept. Fish. Bd. Scot., 1892.

abundance of young herrings, fish with three winter rings on their scales. The grounds frequented by the shoals of herrings of this class are invaded in the autumn by spawning shoals of older herrings. The winter samples coming from shoals of herrings which are spring spawners, are predominately old fish, the chief year classes being fish with six and seven winter rings. These fish are of great interest, for their presence is of importance in the samples from all the grounds, Stornoway, Lerwick, north coast of Sutherland and the Firth of Forth. They are fish which during the years of the war have been protected to a large extent by less intensive fishing than obtained in pre-war days.

For all samples of winter herring caught in 1920 the last winter ring has been considered to coincide with the edge of the scale. Fish in these samples with five winter rings are assumed to be similar, therefore, from the standpoint of age to those with four winter rings caught in 1919. Herrings of this age become poorly represented in the sample of 20th November from Yarmouth, and their occurrence in comparatively small numbers is a general feature of the samples of winter herrings.

Stornoway Samples.—The first of the samples from Stornoway, caught 20 miles north of the Butt of Lewis, 27th May, consisted of fish varying in age. Young fish with three winter rings were fairly abundant, and amongst the older fish herrings with five winter rings were not well represented. These fish were practically all at stage II. of maturity. It will be shown later that there is reason for supposing that this sample contained a large number of recovered spents from a spring spawning shoal. The samples of 22nd July and 23rd September were from the summer shoals of young herring and the autumn spawning fish respectively. The former shows the abundance of young fish, mostly virgins and developing herrings, present in the shoal, and the latter illustrates the influx of older spawning herrings and the presence amongst the spent fish of a number of young herrings which had spawned probably for the first time. There was also in the September sample a small number of young fish which had not spawned, some virgin fish and others at stage II. which could not have become autumn spawners in the year of capture.

The winter samples both show how poorly the herrings with five winter rings were represented, but they differ much in age

composition. The sample of 10th February was taken off Tiumpan Head. It contained a high number of fish with three and four winter rings, and the fish with six and seven winter rings were an important part of the sample. Of the younger fish the greater part were sufficiently developed to allow of them being spring spawners, only 5 and 28 being at stages II. and III. respectively. The sample from Broad Bay contained more younger fish than that from off Tiumpan Head, and whilst spawning and spent herrings were found with from three to nine winter rings the number of young fish at a low stage of development was higher. The locality of capture had doubtless much to do with the age composition of this sample, and accounted for the high number of young fish.

Lerwick Samples.—The sample of 28th May from Lerwick consisted of fish of many different ages. The majority of the herrings were at stage II. of development. The shoal from which the sample was taken probably consisted of fish which would become autumn spawners, and fish which had not yet joined the spawning shoals. Whilst the July sample did not contain a high percentage of young fish, it is evident from information supplied by Mr. Brown (page 14) that young fish do occur in the waters east of the Shetlands and south to Fair Isle in the summer months, and Bjerkan* gives details of samples from Shetland waters in June and July, 1912, as follows :—

WINTER RINGS (Percentages).

Sample.	3	4	5	6	7	8	9	10	11	12
18	43·5	13·0	18·5	8·7	2·2	3·2	7·6	1·1	—	2·2
20	33·0	29·5	20·4	12·5	2·3	2·3	—	—	—	—
21	31·4	12·4	20·0	10·4	12·4	6·7	2·9	3·8	—	—

Sample 18.—July 1912,. 15 miles S.S.E. Bressay.
Sample 20.—20th June, 1912, 30 miles S.S.E. Fair Isle.
Sample 21.—12th June, 1912, 5 miles S.S.E. Skerries, Fetlar.

Fish with three winter rings are not so plentiful as they are further south.

The August sample consisted chiefly of spent fish, and contained a large number of old fish. Herrings with six, seven, eight and nine winter rings were common and in greater numbers than in any of the other samples from autumn spawning shoals.

* Age, Maturity and Quality of North Sea Herrings. Rept. Nor. Fish. and Mar. Invest. vol. III., No. 1, p. 116.

The winter samples, representing the shoals from the Ramna Stacks to N.N.E. of Flugga, and consisting of spring spawning fish, were marked by the high numbers of herrings with six and seven winter rings, and the small number of fish with five winter rings.

Wick and Peterhead Samples.—These samples, with the exception of that from Peterhead in September, consisted chiefly of young fish, the majority with three winter rings. There was over 20 per cent. with four winter rings, and a very small number with two winter rings. They were in June chiefly at stages I. and II., and developed during the season. August samples from both Wick and Peterhead contained a number of fish sufficiently developed to become autumn spawners. Only one sample representing the autumn spawners was obtained, and it came from 14 miles east of Peterhead. It was a sample of spent fish, with a small number of young, virgin fish at stage I. and two fish at stage IV. Herrings varying in age from fish with two winter rings to those with twelve winter rings were found amongst the spents, but the number of older fish was not so great as was found for the Shetland sample of autumn spawners.

The samples of winter herring coming from the north coast of Sutherland were composed chiefly of fish with six and seven winter rings. These herrings were present in sufficient numbers to amount to over 60 per cent. of the samples, there being about 41 per cent. with six winter rings and 22 per cent. with seven winter rings. Herrings with five winter rings were poorly represented. The fish which had given the greater part of the wealth of the summer fishing before the advent of the spawning shoals and now had four winter rings, the last being at the edge of the scale, were present in fair numbers. There was a small number of fish with three winter rings. The two samples contained together 359 fish, and of these only three were at stage III., the others were either very near to spawning or were spawning fish or spents.

North Shields Samples.—Whilst only three samples were analysed from the North Shields drift net herring, these do not represent fully the number of fish examined. During the whole of the herring season I was at North Shields Fish Quay at least once a week, generally twice, and often three times. On these

visits the samples displayed for sale were inspected, and the age of a large number of fish was determined. There is no doubt that throughout the season, after the recovering spents arising from spring spawning shoals had disappeared and the summer fishery had commenced, that the greater part of the herrings from the shoals of this district consisted of fish with three winter rings. The August sample was examined because I found the catch from which it was taken to contain a number of fish with two winter rings. It will be seen by referring to Table I. that the conclusion arrived at on the Fish Quay from a rough examination of the sample at the sale ring was borne out by detailed examination at the Laboratory. Catches of this quality were not frequent, but were landed occasionally during August and the beginning of September. The fishing was practically finished by 24th September, and during the whole of the season I had not seen one sample of spawning fish. Two boats landed spawning herring the week before the end of the fishing, and the catches during September contained a few spent fish. There is therefore no evidence of herrings spawning in our local waters in any great quantity, and, again, the district has not been visited by large shoals of autumn spawners. The little spawning which did take place probably arose from those young fish of the summer shoals which had developed on the grounds and not from any immigration of spawning shoals.

The samples of trawled herring contained a number of young herrings, but differed from the Northumberland shoals, having a larger number of older fish. The two samples were practically alike for herrings with winter rings up to five, but the Dogger Bank sample differed from that from 70 miles E.S.E. of the Tyne in the number of fish with six and seven winter rings, and on the whole the gonads were at a little higher stage of development. Herrings at all stages of development from virgin fish to spents were found in the samples, and the possibility of maturing herrings from these areas, where the samples were obtained, joining a spawning assembly which afterwards invades the grounds of the summer shoals of young herring is worth consideration.

Scarborough Samples.—The samples from the Scarborough grounds show, as have those from practically all other grounds, that the wealth of the greater part of our summer fishery arises

from fish in their fourth year. These samples contained a high percentage of fish with two winter rings, and the percentages are so high as to make the samples differ from any of the others. Whilst the North Shields sample of 27th August was a selected sample, taken on account of the number of fish observed with two winter rings, it cannot be said that there was any selection in connexion with the Scarborough samples. All those who sent samples were asked to send the herrings without any selection, so that the sample would represent the catch.

Spawning herrings are represented by the sample of 25th September from 10 miles E.N.E. of Scarborough. The sample contained a number of young herrings of the same age as those of the earlier samples, and the older fish were very similar in age to those found in the samples of North Shields trawled herrings. Of the 245 herrings in the sample, 226 were at stage VI., fish actually spawning, the roe and milt running, and only two were at stage IV.

Yarmouth Samples.—The two samples from Yarmouth differed greatly from one another, both as regards age and stage of development. The first sample contained more older fish, and they were not from a spawning shoal as was the sample of 20th November. It is worthy of notice that the sample of spawning fish contained a high percentage of fish at the end of their fourth year, fish with three winter rings, and that the greater part of these fish, together with some with two winter rings, were actually spawning. But it is doubtful if all the fish of this sample, particularly those at stage III., would have become spawners during the time the shoals abounded off Yarmouth, and it is far from likely that the herrings at stage II. in the sample of 6th November would spawn in Yarmouth waters.

The sample of 20th November is of special interest, as it gives the first indication of the low percentage of fish with four winter rings. Fish of similar age and found in the samples of winter herrings of 1920 are counted as having five winter rings.

Firth of Forth Samples.—Together with our knowledge of the young herring, fish at the end of the first and second growth periods, the samples from the Firth of Forth point to this area containing shoals of herrings of all ages during the winter months.

The first sample, taken in January, contained a number of herring belonging to the same year classes as were found in the trawled herrings landed at North Shields and also in the Yarmouth samples. From the condition of the gonads the greater portion of these fish would become probably spring spawners. The second sample, 17th February, was caught in a seine net. Whilst every year class found in the January sample was here represented there was a greater number of young fish, and, as was found in the winter samples from Stornoway, Lerwick and the north coast of Sutherland, fish with five winter rings were in comparatively small numbers. The sample of 10th March contained herrings from two catches, one a catch of large herrings, the other of small. The large were caught off Cramond Island and the small off Bo'ness. They were packed carefully in the same box, but during transit they became mixed and had to be sorted on arrival. It is possible that some of the largest of the small herrings have been examined with the larger fish. Whilst this may be the case, it does not affect the general results, for the sample indicates that in the vicinity of Cramond Island on 10th March the herrings were considerably younger than the shoals supplying the two previous samples. Although some were spawning and spent fish there was a considerable number of fish at stages II. and III., which considering the date, 10th March, could not have become spring spawners this year.

An examination of Table II. will show considerable difference in the age when first maturity is reached. In the Stornoway and Lerwick samples virgin fish with six winter rings, the gonads being at stage I., will be found, and similar fish with four and five winter rings were amongst the samples from Wick, Peterhead and North Shields drift net herrings. The oldest fish at stage I. amongst the trawled herrings from North Shields had four winter rings, and the samples from Scarborough and Yarmouth had fish with three winter rings at stage I. The youngest fish found to be full, stage V., spawning or spent were those with two winter rings in the samples from Stornoway, Peterhead, Scarborough and Yarmouth. From the Shetlands herrings with three winter rings were found as spawners in both autumn and spring shoals.

It will be seen later, when growth is considered, that a herring spawning in spring with two winter rings on its scales, the edge

being counted as the second winter ring, is probably two-and-a-half years old, and that fish with two winter rings and spawning in the autumn shoals are probably three years old.

Such a variation in age for the reaching of first maturity is of interest, especially for the herrings from the Shetlands and Stornoway. But the feature is not without parallel amongst other fish, for various writers have drawn attention to the age when salmon and trout may reach first maturity. Some of the young males may spawn before their first descent to the sea, and other fish spend four or five years in the sea before ascending the rivers for their first spawning.

Growth, Table III.—In this paper the term growth is to be taken as meaning the expression of the position of the winter rings of the scale in terms of the length of the herring ; first year growth and second year growth refer to the length of the fish as calculated from the position of the first and second winter rings. The growth is expressed to the nearest centimetre, 7·6 to 8·5 cm. being taken as 8 cm.

In last year's Report, page 25, it was stated that the growth up to the formation of the first winter ring would vary according to the period between birth and the formation of the first winter ring, or, expressed in other words, there would be a difference between the first year growth of young fish arising from spring and autumn spawners. Whilst other factors, such as potentiality for growth, habitat and abundance of suitable food for the young fish, will doubtless have considerable influence on this first year growth, the time factor appears to be the most important. It is on account of this difference of spawning times that herrings have not been referred to year classes in the tables. Such a method of classification has much to recommend it for herrings arising from undoubted spring spawning shoals, but in British waters, especially those yielding the samples here considered, we have both spring and autumn spawners. It has not yet been proved that young herrings born in the spring and autumn of the same year form their first winter ring at the same time. Indeed, it is more than probable that the first winter ring of herrings arising from autumn spawners is not formed until the end of the following year. Growth after September cannot but be very slow, and it is doubtful in some cases if by the end of the year the young herring

has grown large enough to have any scales. In the case of fish, the products of October and November spawners, the formation of a winter ring on the scales at the end of that year is impossible. We have no evidence from herring samples of there being fish having such a small first year growth as would allow us to state that they were born towards the end of the year and came from spawning shoals similar to those which occur in October and November. Fish with the largest first year growth are considered therefore as arising from autumn spawning shoals.

It has been shown, under a consideration of age and maturity, that as an almost general rule fish with three winter rings are present in greatest abundance in our summer shoals. An examination of the first year growth made by these fish shows that the shoals contain fish arising from both spring and autumn spawning shoals, and that by the time the fourth summer zone of growth is being made on the scales a considerable amount of mixing has taken place and the shoals not only contain fish born at different seasons of the year, but also fish of varied growth potentiality for the first year and probably also fish which have spent their early life in various localities. Below are given particulars of first year growth from summer shoals from Stornoway (SY) and North Shields (SN).

NUMBERS AT CENTIMETRES.

Sample.	Winter Rings.	6	7	8	9	10	11	12	13	14	15	Total.
SY., 22/7/19 ...	3	3	5	6	6	9	9	13	24	10	1	86
S.N., 24/7/19 ...	3	4	15	45	50	17	23	7	7	4	1	173

It is not advisable to consider in this respect the early sample from Stornoway nor the samples from spawning shoals, autumn or spring, for it will be seen later that these samples are influenced by maturity.

A similar range for first year growth is to be found in the other North Shields samples and those from Lerwick, Wick, Peterhead, Scarborough and Yarmouth.

The mixing of the products of different spawning shoals is a general occurrence from the data available, and a consideration of the facts given under the heading "Fishing Grounds" will show that physical conditions, tides and currents do much to bring it about. Whilst it may be argued that the shoaling of the young herrings according to size would tend to separate

the young of spring spawners from those of autumn spawners, the same argument can be used to support the mixing of these young fish. If the young herrings shoal according to size there will be a tendency for the largest of the young from spring spawners to join the shoals of young from autumn spawners of the previous year. This tendency would arise as soon as there was enough variation in growth and the shoaling instinct was in force, and would continue as long as variation in growth existed and was not affected by maturity. The result would be such a mixing of the young fish as is evident from the first year growth data.

That size is a factor with regard to shoaling is supported by the growth of fish with two winter rings found in the Stornoway sample of 22nd July, the two samples from Wick, the first three samples from Peterhead, the North Shields and Scarborough samples. Details will be found in Table III., and are most striking for growth up to the formation of the second winter ring.

The immigration of herrings into our local shoals was shown in last year's Report, and was arrived at from a consideration of the first year growth. It was found that herrings with a comparatively small first year growth came into the shoals during the latter part of June and early July. Towards the end of July and in August fish with a comparatively large first year growth were more abundant, and in September the samples were marked by the number of fish with a comparatively small first year growth. Similar changes in other shoals apparently take place.

From the Peterhead samples it will be seen that towards the end of July there was present a number of fish with a larger first year growth than was found in the sample of 19th June, and that by 20th August the fish with a comparatively small first year growth were more abundant. The particulars are as follows for fish with three winter rings.:—

NUMBERS AT CENTIMETRES.

Date.	6	7	8	9	10	11	12	13	14	15	16	Total.
19/6/19 ...	2	11	12	21	11	10	9	6	7	—	—	89
29/7/19 ...	2	5	20	30	29	14	6	15	5	4	1	131
20/8/19 ...	5	15	20	24	19	21	10	5	3	—	—	122

The two samples from Wick show a slight change, and indicate the herrings with a comparatively large first year growth joining the shoals in August. The particulars are as follows :—

NUMBERS AT CENTIMETRES.

Date	6	7	8	9	10	11	12	13	14	15	Total.
8/7/19 ...	1	8	36	34	24	19	13	4	3	1	143
14/8/19 ...	4	5	11	14	18	16	8	7	3	--	86

The North Shields samples of 24th July and 6th August are larger as regards first year growth than the sample of 27th August. The particulars here follow :—

NUMBERS AT CENTIMETRES.

Date.	4	5	6	7	8	9	10	11	12	13	14	15	Total.
24/7/19 ...	—	—	4	15	45	50	17	23	7	7	4	1	173
6/8/19 ...	—	—	3	13	30	35	30	13	10	6	—	1	141
27/8/19 ...	1	1	3	17	33	26	11	7	1	2	—	—	102

There is little difference between the Scarborough samples of 12th August and 11th September, but it is noticeable that in the latter sample fish with a first year growth more than 10 cm. are not so plentiful as in the August sample. The data are as follows :—

NUMBERS AT CENTIMETRES.

Date.	5	6	7	8	9	10	11	12	13	14	Total.
12/8/19	1	3	23	33	17	10	13	1	—	1	102
11/9/19	—	6	25	37	31	10	5	1	—	—	115

It would appear from the above that summer feeding shoals of fish with three winter rings receive immigrants throughout the season, and that the time of joining the shoals bears some relationship to growth as expressed for the first year, *i.e.*, up to the formation of the first winter ring.

It has already been shown that there is considerable variation in the age at which first maturity is reached. This variation will be seen to accompany a variation in growth. Below are given particulars relating to the Stornoway samples for fish with three winter rings :—

THIRD YEAR GROWTH.

NUMBERS AT CENTIMETRES.

Date	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	Total.
10/2/20	3	—	—	—	—	—	—	9	16	19	5	—	—	49
9/3/20	3	—	—	—	—	1	6	13	36	52	14	2	—	124
27/5/19	3	—	—	—	—	2	11	7	10	10	13	5	3	61
22/7/19	3	1	1	2	10	20	23	13	6	8	2	—	—	86
23/9/19	3	—	—	—	5	8	12	13	8	5	4	—	—	55

The fish with three winter rings in the samples of February and March, 1920, have a considerably larger growth up to the third winter ring than have those found in the sample of July, 1919, and they are very like those found in the sample of May, 1919. The February and March samples are from spring spawning shoals, and it will be seen in Table II. (maturity) that a large number of the fish with three winter rings were either spawning or spent fish, or were likely to become spring spawners. The May sample of 1919 came from a shoal of fish caught on grounds frequented by recovering spents at that time of year. We have therefore in the first three samples given above a large number of fish which can be classed as spring spawning fish. They resemble one another very much with regard to third year growth, and are considerably larger than the fish of similar age found in the feeding shoals in July. The sample of 23rd September contained 55 fish with three winter rings, and of these 37 were spents; they were autumn spawners. The growth of these fish is greater than the growth of those in the July sample, which consisted chiefly of developing fish, but is not so great as that of the spring spawners, which have come to maturity when some six months younger.

If the fish with three winter rings in the five samples be traced back in the growth tables the same features are noticeable for the second year growth. The first year growth is of particular interest. In the summer feeding shoal, 22nd July, the fish have a first year growth ranging from 6 to 15 cm., in the autumn spawning shoal, 23rd September, a range of from 6 to 14 cm., and in the sample of 9th March, 1920, a range from 7 to 15 cm. Fish in both spring and autumn spawning shoals have a range for first year growth similar to that found in the summer feeding shoals. It has been pointed out already that the summer feeding shoals contain young fish arising from both spring and autumn spawners. The particulars are as follows for the first year growth of the three samples.:—

Date.	Winter Rings.	NUMBERS AT CENTIMETRES. 6	7	8	9	10	11	12	13	14	15	Total.
9/3/20	3	—	1	1	6	6	21	34	26	21	8	124
22/7/19	3	3	5	6	6	9	9	13	24	10	1	86
23/9/19	3	1	3	3	6	9	13	9	9	2	—	55

The sample of 9th March, 1920, has a higher first year growth than the other samples, but in this connexion it must be remembered

that these fish are some six months younger. They have their third winter ring at the edge of the scale, and the others have a summer zone of growth between the third winter ring and the edge of the scale.

Both the sample of 9th March, 1920, and that of 23rd September, 1919, contained fish which were not actually spawning. The March sample had 51 fish at stages VI., VII. and VII.—II., and the September sample had 37 fish, which were spents. These fish were spring and autumn spawners, and their first year growth was as follows :—

Date.	Winter Rings.	NUMBERS AT CENTIMETRES. 6	7	8	9	10	11	12	13	14	15	Total.
9/3/20	3	—	—	—	3	2	6	13	15	8	4	51
23/9/19 ...	3	—	1	3	4	7	7	6	7	2	—	37

This first year growth is so scattered that if the period between hatching and the formation of the first winter ring be considered the chief factor in determining the first year growth, we have spring spawners arising from the young of both spring and autumn spawners, and autumn spawners arising in the same way.

Very few fish younger than those under consideration have been found actually spawning, and these are the youngest spawning fish in sufficient numbers in the samples to allow of comparison. The fish spawning at the time when the third winter ring is at the edge of the scale have, on the whole, a greater first year growth than those in the September sample. They are younger fish, and are probably made up of a large number of fish born in the autumn, and a small number, which have had a great potentiality for growth and early development, born in spring. That is, the majority are about three-and-a-half years old, and the remainder three years old. It has been pointed out that it is considered autumn born fish do not form their first winter ring at the end of the year of birth. In the September sample the fish are older by some six months, the third winter ring being inside the edge of the scale, and from the first year growth consist of individuals three-and-a-half years old, those with the smallest first year growth, and four years old.

Older groups of fish, with more than three winter rings on their scales, probably contain individuals which have joined the spawning shoals in different years, and which have spawned more

than once, but their first year growth is also great in range and gives support to the above possible origin of spring and autumn spawning shoals. Below are given particulars of the first year growth of the older fish found in spawning shoals in the vicinity of Stornoway :—

NUMBERS AT CENTIMETRES.

Date.	Winter Rings.	5	6	7	8	9	10	11	12	13	14	15	Total.
23/9/19 ...	3	—	1	3	3	6	9	13	9	9	2	—	55
10/2/20 ...	4	—	2	4	4	6	3	11	11	5	6	1	53
9/3/20 ...	4	—	—	—	8	8	8	12	18	4	1	—	59
23/9/19 ...	4	1	1	6	5	7	9	8	9	5	—	—	51
10/2/20 ...	5	—	1	3	1	3	—	7	7	3	1	—	26
9/3/20 ...	5	—	1	—	—	1	2	3	2	5	4	—	18
23/9/19 ...	5	1	2	2	6	4	4	6	5	6	1	—	37
10/2/20 ...	6	—	—	—	1	2	5	6	13	5	—	—	32
9/3/20 ...	6	—	—	2	—	1	2	6	7	8	2	—	28
23/9/19 ...	6	—	1	3	4	—	4	6	7	1	2	—	28
10/2/20 ...	7	—	2	1	2	2	5	9	6	11	6	1	45
9/3/20 ...	7	—	—	3	—	4	2	1	2	4	—	—	16

The maturity data, Table II., show that practically the whole of the above fish may be dealt with as spawning fish or fish about to spawn. From the above particulars it is evident they originate from summer feeding shoals which have been shown to consist of young born in both spring and autumn, and it is also evident that the first year growth gives no reason for concluding that spring spawners give rise to young which, without exception, will become spring spawners, or that autumn spawners give young which will all become autumn spawners. The facts point to what has been stated, and that is that spring spawners may come from young fish born either in spring or in autumn, and autumn spawners may originate in the same way.

Further data similar to that given above, and supporting the conclusion here expressed, will be found in the growth table for herrings from the Shetlands.

This relationship between spring and autumn spawning herrings is opposed to Heincke's* conclusions. But Matthews† was unable to find any racial difference between spring and autumn spawners from Scottish waters, and the small differences which he noted would probably have disappeared had the data been examined

* Die Naturgeschichte des Herings, 1898.

† Report as to Variety among the Herrings of the Scottish Coasts. Repts. Fish. Bd. Scot., 4th and 5th.

by Matthews from the standpoint of age. Jenkins,* in a criticism of Heincke's work, states that Heincke failed to establish definite racial characters for spring and autumn spawning herring. By using Heincke's data, Jenkins illustrates that so-called autumn spawners may have the characters stated by Heincke to belong to spring spawners and vice versa ; that a group of autumn spawners may resemble a group of spring spawners more than the latter group resembles another group of spring spawners, and also that in a sample of 21 herrings having the average formula for autumn spawners, the first 10 fish have the average formula for spring spawners.

Further evidence of growth accompanying early maturity will be found in the samples of summer feeding and spawning shoals from Peterhead and Scarborough. The Peterhead samples of 20th August and 9th September differ as regards maturity. The August sample had, for herrings with three winter rings, only seven fish out of 122 as far developed as stage IV., and the September sample contained 30 spents out of a total of 32. Of the fish with four winter rings the August sample contained 14 out of 58 as far developed as stage IV., and in the September sample 37 out of 38 were spent fish. The third year growth of these fish here follows :—

NUMBERS AT CENTIMETRES.

Date.	Winter Rings.	18	19	20	21	22	23	24	25	26	27	28	Total.
20/8/19 ...	3	—	—	3	21	26	43	18	8	2	1	—	122
9/9/19 ...	3	—	1	—	—	2	5	7	8	8	—	1	32
20/8/19 ...	4	2	1	6	14	14	8	6	6	1	—	—	58
9/9/19 ...	4	—	—	—	3	3	4	9	11	7	1	—	38

The Scarborough sample of 11th September had 115 fish with three winter rings, and of these 107 were below stage IV. All the fish of this age were spawners, stage VI., in the sample of 25th September. The third year growth of these fish is here given :—

NUMBERS AT CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	Total.
11/9/19 ...	3	5	15	46	28	14	4	3	—	115
25/9/19 ...	3	—	—	—	8	14	13	6	1	42

* The Difference between Spring and Autumn Herring. Repts. Lanc. Sea Fish. Laby, 1902.

The first year growth of herrings with three winter rings was on the whole greater for the fish in the spawning shoals than in the feeding shoals for both the Peterhead and Scarborough samples.

Attention has been drawn to the change which takes place in the shoals throughout the summer feeding, and it was stated that these changes were considered to be due to immigrations into the shoals. Whilst changes up to the end of August and early September may be due to immigration, the last change which takes place, and causes fish with a comparatively small first year growth to be so abundant in the samples, may be due to fish leaving the shoals for the purpose of joining a spawning shoal. The first year growth for herrings with three winter rings from the Peterhead samples was as follows :—

Date.	Winter Rings.	NUMBERS AT CENTIMETRES. 6	7	8	9	10	11	12	13	14	15	16	Total.
19/6/19 ...	3	2	11	12	21	11	10	9	6	7	—	—	89
29/7/19 ...	3	2	5	20	30	29	14	6	15	5	4	1	131
20/8/19 ...	3	5	15	20	24	19	21	10	5	3	—	—	122
9/9/19 ...	3	—	2	5	4	3	3	9	5	1	—	—	32

Practically the whole range of first year growth is represented in the 32 fish of 9th September, and 30 of them were spents. The figures appear to form two groups, one about 8 and 9 cm., and the other about 12 cm., and point to these fish having originated from both spring and autumn spawners.

From the growth calculations it appears that spring and autumn spawners differ from one another as regards growth after reaching maturity. The oldest fish which occur in sufficient numbers in the samples to allow of comparison are those with six winter rings in the autumn spawning shoals, and those with seven winter rings in the spring spawning shoals of Stornoway and the Shetlands.

These fish are, except for the date of capture, of the same age, for the sixth winter ring is immediately inside the edge of the scale of the autumn spawners, and in the spring spawners the edge has been counted as the seventh winter ring. The maturity data will show that the fish can be taken as spring and autumn spawning fish. The growth attained at the formation of the first and

fifth winter rings for both the Stornoway (SY.) and Shetland (LK.) fish here follows :—

FIRST YEAR GROWTH.

NUMBERS AT CENTIMETRES.

Date.	Port.	Winter Rings.	5	6	7	8	9	10	11	12	13	14	15	16	Total.
23/9/19	... SY.	6	—	1	3	4	—	4	6	7	1	2	—	—	28
10/2/20	... SY.	7	—	2	1	2	2	5	9	6	11	6	1	—	45
9/3/20	... SY.	7	—	—	3	—	4	2	1	2	4	—	—	—	16
16/8/19	... LK.	6	—	1	3	6	1	8	4	7	3	1	1	1	36
21/2/20	... LK.	7	—	1	3	1	1	6	1	10	9	6	—	—	38
13/3/20	... LK.	7	1	—	3	—	4	6	5	5	13	3	2	—	42

FIFTH YEAR GROWTH.

NUMBERS AT CENTIMETRES.

Date.	Port.	Winter Rings.	22	23	24	25	26	27	28	29	30	31	Total.
23/9/19	SY.	6	—	—	1	6	9	7	5	—	—	—	28
10/2/20	SY.	7	—	—	—	—	—	6	17	11	9	2	45
9/3/20	SY.	7	—	—	—	—	2	—	5	7	2	—	16
16/8/19	LK.	6	1	—	2	7	6	9	8	3	—	—	36
21/2/20	LK.	7	—	—	—	—	1	—	6	16	12	3	38
13/3/20	LK.	7	—	—	—	—	1	5	7	16	13	—	42

Although there are differences between the first year growth as regards the numbers found under different centimetres the range is practically the same. In the Lerwick samples the largest fish at the end of the first year is found amongst the autumn spawners and the smallest amongst the spring spawners. The fifth year growth shows considerable difference, the spring spawners being much bigger fish on the whole than the autumn spawners. For the purpose of tracing the growth made in different years the table on the opposite page has been prepared for the Stornoway herrings here considered, and the growth for the sixth year has been added. It will be observed that no fish amongst the spring spawners is longer than an autumn spawner at the end of the second year. By the end of the third year certain of the spring spawners have exceeded the autumn spawners, and these fish are probably those which arrived at maturity early in life. The difference in growth gradually becomes more marked with age, and the fifth year growth of the spring spawners is better than the sixth year growth of the autumn spawners.

Lea* states that growth begins in April, and that by the end of August 92 per cent. of the yearly growth has been attained.

* A Study on the Growth of Herrings. Pub. de Circ., No. 61, p. 41.

GROWTH OF STORNOWAY AUTUMN AND SPRING SPAWNERS (Fish with 6 and 7 Winter Rings respectively).

NUMBERS AT CENTIMETRES.

Date.	Year's Growth	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	Total
23/9/19 ...	1	—	—	1	3	4	—	4	6	7	1	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	28
10/2/20 ...	1	—	—	2	1	2	2	5	9	6	11	6	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	45
9/3/20 ...	1	—	—	—	3	—	4	2	1	2	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	16
23/9/19 ...	2	—	—	—	—	—	—	—	—	—	1	3	3	1	2	5	2	4	6	1	—	—	—	—	—	—	—	—	—	—	28
10/2/20 ...	2	—	—	—	—	—	—	—	—	—	—	3	1	—	1	5	6	10	14	5	—	—	—	—	—	—	—	—	—	—	45
9/3/20 ...	2	—	—	—	—	—	—	—	—	—	—	—	1	1	3	2	2	3	3	1	—	—	—	—	—	—	—	—	—	—	16
23/9/19 ...	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	7	3	4	9	2	—	—	—	—	—	—	—	28
10/2/20	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	1	9	14	9	7	2	—	—	—	—	—	45
9/3/20 ...	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	3	2	4	5	—	—	—	—	—	—	—	16
23/9/19 ...	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	4	5	6	9	2	—	—	—	—	—	28
10/2/20 ...	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2	15	12	10	4	—	—	—	45
9/3/20 ...	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	1	4	6	3	—	—	—	—	16
23/9/19 ...	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	6	9	7	5	—	—	—	—	28
10/2/20 ...	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	17	11	9	2	—	45
9/3/20 ...	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	5	7	2	—	—	16
23/9/19 ...	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	5	9	7	6	—	—	—	28
10/2/20 ...	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	14	15	9	2	45
9/3/20 ...	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	—	7	5	2	—	16

After maturity is reached the summer feeding of the herring is responsible for not only growth in length but also the development of the gonads. In the autumn spawning fish the gonads are fully developed by the end of August, when spawning may take place, or in early September. In spring spawning fish the gonads are not fully developed until some six months later, and a considerable amount of the material needed for their development may be derived from the tissues of the body.

The data here given is considered to indicate that spawning for the fourth, fifth and sixth years takes place annually.

The growth made by the fish of the Stornoway sample of 27th May is greater on the whole than the growth of fish of similar age found in the autumn spawning shoal, and points to the greater portion of the May sample consisting of fish recovering from a spring spawning. The Shetland sample of 28th May is different from the spring spawning samples as regards growth, and appears to consist as far as the older fish are concerned of herrings which are autumn spawners. These differences are most noticeable from a comparison of the fifth year growth, which will be found in Table III.

The samples from the north coast of Sutherland have, for fish with six winter rings, a growth which up to the fifth year increases like that of the spring spawners of Stornoway and the Shetlands. There is a small difference between the Stornoway and the Lerwick samples, the latter being slightly larger fish for their age, and the samples from the north coast of Sutherland are nearer in growth to the Shetland fish. Whether a difference would be found to exist for these shoals were an examination of them made throughout the winter fishery cannot be said, but there is a possibility of the shoals of the Shetlands and the north coast of Sutherland being more oceanic in habitat than those of the Stornoway area, where the Minch affords a large feeding ground. From the growth data here given and what is already known from Hjort's* samples there is sufficient evidence to show that oceanic life gives a greater and quicker growth than does life in the waters of narrow seas such as the southern part of the North Sea. See also page 83.

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* Pub. de Circ., No. 53.

Another point which is not without interest with regard to these northern shoals is that whereas the third year growth of fish with four winter rings is chiefly under 25, 26 and 27 cm., the third year growth of fish with six winter rings is, for a considerable number of fish, under 23 and 24 cm. Whilst these smaller grown fish may come from the younger slow growing fish of the northern area, their numbers for the north coast of Sutherland and the Shetlands probably point to their origin further west and south respectively. Fish with a similar growth up to the third year can be found in the samples of the east coast as far south as North Shields and even Scarborough.

The condition of the gonads of the herrings from the trawled samples of North Shields suggested the possibility of these fish joining the Yarmouth shoals for the purpose of spawning. With the object of comparing the growth of the fish from the two areas the table on the following page has been prepared. It will be seen that there is a difference between the first year growth, the Yarmouth shoals containing a large number of fish with a comparatively small first year growth. Further the Yarmouth herrings by the end of the sixth year have reached a growth equal to that of the North Shields trawled herrings. From the number of samples examined from these trawled herrings and the fish seen as landed on North Shields Fish Quay, the shoals fished by the trawlers have been considered for some years now as autumn spawners. The Yarmouth shoals do not spawn until later in the year.

If the difference in growth, as observed between the spring and autumn spawners of Stornoway and the Shetlands, exists between other shoals having a difference in spawning times, it would appear that the difference in spawning time between the trawled and Yarmouth shoals accounts for the comparatively quicker growth of the latter with increasing age.

The material available does not allow of a detailed examination of the data from the standpoint of age, maturity and growth, and a comparison being made in this way between the two shoals. It is thought, however, that the general view of the difference in growth, as shown above, is sufficient to indicate a difference between the two shoals, and that the samples examined give no support to the trawled shoals joining the Yarmouth shoals for spawning purposes. It is thought also that growth after maturity

NORTH SHIELDS (Trawled) AND YARMOUTH SAMPLES (Fish with 6 Winter Rings).

NUMBERS AT CENTIMETRES.

Date.	Port.	Year Growth.	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	Total.
26/9/19	S.N.	1	—	—	3	5	11	11	6	4	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	42
8/10/19	S.N.	1	—	—	2	3	4	3	3	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	17
6/11/19	YH.	1	—	4	10	14	13	2	4	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	50
20/11/19	YH.	1	1	—	5	15	17	5	1	3	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	48
26/9/19	S.N.	2	—	—	—	—	—	—	—	—	1	2	3	10	11	7	4	2	2	—	—	—	—	—	—	—	—	42
8/10/19	S.N.	2	—	—	—	—	—	—	—	—	1	1	—	3	7	3	—	1	1	—	—	—	—	—	—	—	—	17
6/11/19	YH.	2	—	—	—	—	—	—	—	—	6	8	9	7	7	7	3	2	1	—	—	—	—	—	—	—	—	50
20/11/19	YH.	2	—	—	—	—	—	—	—	—	2	5	11	11	8	5	4	1	1	—	—	—	—	—	—	—	—	48
26/9/19	S.N.	3	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	6	11	14	4	2	1	—	—	—	—	42
8/10/19	S.N.	3	—	—	—	—	—	—	—	—	—	—	—	—	—	1	2	1	7	4	—	2	—	—	—	—	—	17
6/11/19	YH.	3	—	—	—	—	—	—	—	—	—	—	—	—	—	5	8	12	14	7	2	2	—	—	—	—	—	50
20/11/19	YH.	3	—	—	—	—	—	—	—	—	—	—	—	—	—	3	6	7	16	10	5	1	—	—	—	—	—	48
26/9/19	S.N.	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	7	8	18	4	3	1	—	—	42
8/10/19	S.N.	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	5	6	2	1	—	—	—	17
6/11/19	YH	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	12	18	11	3	1	—	—	—	50
20/11/19	YH.	4	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	6	16	18	6	1	—	—	—	48
26/9/19	S.N.	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	9	21	6	4	1	—	42
8/10/19	S.N.	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	5	7	2	2	—	—	17
6/11/19	YH.	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	5	20	18	5	1	—	—	50
20/11/19	YH.	5	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	9	23	10	3	1	—	48
26/9/19	S.N.	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	7	21	7	5	1	42
8/10/19	S.N.	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	10	1	1	—	17
6/11/19	YH.	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	6	14	25	4	—	1	50
20/11/19	YH.	6	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	5	23	15	2	1	48

may be of use in determining differences between shoals which have different spawning times.

In last year's Report it was stated there were good reasons for holding that the summer feeding shoals off the Northumberland Coast supplied spring spawning shoals in the Firth of Forth. From the work of last year, the Firth of Forth is an area which receives more than one shoal of herrings as spring spawners, and they come from different summer feeding shoals. The best material for showing the presence of different herrings consists of fish with four winter rings. Although the number of these fish was small in the sample of 22nd January there is considerable difference between them and fish of the same age in the February and March samples. This is best seen in the third year growth, which is here given :—

NUMBERS AT CENTIMETRES.

Date.	20	21	22	23	24	25	26	27	28	29	Total.
22/1/20 ...	—	2	5	5	3	2	—	—	—	—	17
17/2/20 ...	1	3	4	5	8	15	9	8	—	1	54
10/3/20 ...	2	5	4	7	18	24	18	6	—	1	85

The fish in the January sample, considering the growth they have made, may have come from any of the shoals to the south of the Firth of Forth or may have spent their lives in the Firth, but there is no evidence of fish with such a large third year growth as those found in the February and March samples being present in any of the shoals south of the Firth of Forth, with the exception of a small number in the North Shields samples. These large grown fish are more like the larger fish found in the Peterhead samples of July and September. Fish with six winter rings in the February sample also agree more with the Peterhead sample of September than they do with more southern fish, and are probably also northern in origin. They are, as will be seen from the tables, fish with a larger growth for their age than the North Shields trawled, Scarborough or Yarmouth herrings.

The Firth of Forth is now the only area on the east coast giving a fishing for full herrings in spring. No sample of spring herrings from Yarmouth or Lowestoft has been examined, but all the fish from the Yarmouth spring fishery seen on North Shields Fish Quay have been spent fish, and the information obtained from

herring curers and fishermen does not point to full or spawning fish being present in any great numbers in these waters in spring.

It has been pointed out that there were present in the waters off Yarmouth a number of fish which could not become spawners during the time the shoals there abound, and the possibility of these fish joining a shoal migrating to the Firth of Forth is worthy of consideration. There is not sufficient data to hand to allow of any comparison between these fish and the Firth of Forth shoals.

General.—From the whole of the waters from which the samples under consideration have been obtained, the most northerly and westerly shoals of herrings are the shoals of spring spawners to the north of the Shetlands and in the vicinity of the Flannan Islands. To the southward and eastward of these shoals are found the summer feeding shoals of the east of the Shetlands to Fair Isle, and those round the northern portion of Lewis. The Shetland summer shoals have been shown to contain a number of fish with three winter rings, and from the vicinities of Fair Isle, Auskerry and Copinshay young fish are more numerous, if, as is thought, trade descriptions can be taken to indicate roughly the age of the fish. The summer shoals about the Butt of Lewis are mostly mattie herrings, which, from the data now available, are considered to be chiefly fish with three winter rings. These summer feeding grounds, later in the season, become autumn spawning grounds for older herrings and those of the young fish sufficiently developed to take part in the spawning. Other spring spawning shoals may be found to the south and east, off the Orkneys, the Butt of Lewis and the north coast of Sutherland, but again to the southward and eastward are found young fish in summer feeding shoals. From the Pentland Firth southward are found spawning grounds with summer feeding shoals to the south of them, and this persists along the coast until the southern part of the North Sea is reached, which, on account of its narrow waters and currents, cannot be expected to give a summer feeding shoal south of the spawning shoals.

The presence and position of these summer feeding shoals of young fish, the predominant year class of which has three winter rings on the scales, compels a consideration of our herring shoals from the standpoint of denatation,* and the continued existence

* Professor Meek, Migrations of Fish, 1916.

of the most northerly and westerly shoals can be possible only if there is a compensatory contranatant* migration.

The young herring shortly after birth and when the yolk sac has been absorbed, frequents mid-water where it has been taken towards the end of March and in April. About the end of June, after a short sojourn near the surface, migration commences towards the shore. Young from autumn spawners spend less time in the mid-water and the latest of them appear to migrate shorewards without an intermediate journey through the mid-water to the surface.† There is therefore a period of about three months for the young arising from spring spawners, and a shorter period for the young from autumn spawners, during which they are subject to the influence of currents.

The extent of denatation possible can be appreciated only by a consideration of Fulton's experiments.‡ A drift of from 2 to 6 miles per day was found to be common. If the currents of the mid-water are approximately the same as those of the surface the young herring may be carried some hundreds of miles from its place of birth. It is not intended here to give detailed examples of the amount of drift observed, but the following may be of interest as indicating the possibilities of denatation in our local waters. One of the bottles liberated near the mouth of the Firth of Forth, 20th March, was found on the Northumberland coast, having drifted 82 miles south in fifteen days.‖

The post larval stages originating from the more northerly shoals will be drifted south along the east coast of Scotland, which will receive also the products of the spawning shoals of the north coast of Sutherland, and possibly some of the young from the north of Lewis.

Once the young fish come under the influence of the tidal stream running between the Orkney Islands and in the Pentland Firth, which attains a speed varying from 2 to 8 miles per hour, they will be carried quickly into the North Sea, where they will eventually form summer feeding shoals of young fish. It has been shown that these summer feeding shoals give additions to the

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* Professor Meek, op. cit.

† McIntosh and Masterman. British Marine Food Fishes.

‡ The Currents of the North Sea and their Relation to Fisheries. 15th Ann. Rept. Fish Bd. Scot.

‖ Fulton, op. cit., p. 348.

shoals of autumn spawning herrings, the young of which will be drifted south and form other shoals. The result will be that there will be a close relationship between all the shoals found from the most northerly and westerly localities to the most southerly one coming under the influence of the drift of the young.

The southerly drift does not appear to come below the latitude of the Wash, and this may isolate somewhat the shoals of the southern North Sea. But there is a possibility of young herrings coming from the Wash joining the more northerly shoals of young fish of East Anglian waters, and the occurrence of suitable winds may bring additions to the southern part of the North Sea. Fulton* found the influence of wind sufficient to reverse the surface currents. Savage† found young herrings from the Wash having a small first year growth very similar to the first year growth of many of the fish in the Yarmouth samples.

There are three shoals of young herrings which are interesting, and these are those of the west of the Shetlands, the west of the Orkneys, and the Atlantic side of Barra. These shoals fluctuate considerably, and a consideration of their fluctuations and the prevailing winds during their denatation would probably be of great help in determining their origin.

Time has not allowed of a detailed analysis of the herring catches from various areas, and a consideration of the effects of the weather on the fishery in order to produce a large amount of evidence to support the theory of contranatation, but some interesting data have been obtained from various reports of the Fishery Board for Scotland. In 1892 the summer fishery of the East Coast was most productive. For Eyemouth it was stated that never in the memory of the oldest inhabitant had such great shoals continued on the coast. The Cromarty fishing was the most successful for twenty years, and there had been nothing to approach it since 1870. The fishing from Wick and the Orkneys was not so good as that further south, and the Shetland fishing was a failure. Two years afterwards, 1894, the Orkney and Shetland fishing had a remarkable success, the catches being double those for 1893, which were double those for 1892. Six years later, 1900, vast catches were reported from Shetland waters.

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* Op. cit., p. 362.

† Report on Age Determinations from Scales of Young Herrings. Fish Invest, Series II., vol. IV., No. 1, 1919.

If these facts be considered from our present knowledge of the age of the summer feeding shoals, which have been shown to consist chiefly of fish in their fourth year, and the large numbers of fish with six and seven winter rings in the samples of spring spawners, there seem to be good grounds for concluding that by the time the herrings are in their sixth year (1894) they have contranatated from the East Coast to the waters of the Orkney and Shetland Islands, and that an abundance of herrings in these northern waters, as found in 1894, gives another abundant fishing in the same waters six years afterwards.

The accounts given by the fishery officers of the herring fishing for their districts in this year of abundance, 1892, are of interest. For Eyemouth, Leith, Montrose and Stonehaven the herrings were described as being soft and tender, small and immature, and generally smaller or containing a greater proportion of small than in previous years. For the Aberdeen district the herrings improved towards the end of July and in August. Herrings of superior quality and of good size were landed at Peterhead, Fraserburgh and Banff. Further west in the Moray Firth, Buckie and Findhorn, the herrings were small and of inferior quality. An improvement was shown for Cromarty, and this gradually increased through the Helmsdale and Lybster districts until Wick was reached, where the quality was good. The best fisheries, as far as quality was concerned, were those in the vicinity of Peterhead and Wick, where they now exist, and to the south of these fishing grounds were large quantities of younger fish. The amount of contranatation necessary for the abundant shoals of the East Coast, say off Peterhead, to influence the fisheries of the Orkneys and Shetlands two years afterwards, 1894, is from $1\frac{1}{2}$ to 3 degrees of latitude.

In previous reports attention has been drawn to the disappearance of autumn spawning shoals off the Northumberland Coast, and the spawning in these waters has never been of any great extent since herring investigations were commenced at Cullercoats in 1911. From further information autumn spawning shoals have disappeared from the Yorkshire coast, in the vicinity of Skinningrove, and from the Firth of Forth. Some thirty years ago it was a common thing for large shoals to come quite close inshore in the autumn between St. Abb's Head and the mouth of the

Tyne, and catches were made in water so shallow that there was difficulty in keeping the nets off the bottom.

From such evidence it might be taken that our herring shoals are decreasing. But the use of steam and oil power has increased the radius of action of fishing vessels and catches are now taken much further out to sea. These catches show an increase. It is probable that the large fleets of nets which are shot nearly every night of the fishing season, have prevented the fish from coming close inshore, and that spawning grounds have changed for the same reason.

It has been shown that the wealth of our summer fishery depends upon the young fish, the predominant year class of which has three rings, and that these young fish arise from both spring and autumn spawning shoals. With the exception of the Firth of Forth, the chief spawning grounds for spring spawners are in the waters to the north of Scotland, about the Shetlands, the Orkneys, the north coast of Sutherland, the Butt of Lewis and possibly other localities, not frequently fished, such as Sule Skerry. These grounds yield large catches of fish, but the catch is controlled to some extent by weather conditions. During the last spring fishery severe winter weather greatly hindered the fishery in the Firth of Forth and about the north of the Shetlands.

Further information about the herring fishery of previous years and the habits of the shoals appears to be desirable.

The most wasteful fishery for herrings at present appears to be the catching of young fish of the O and I groups. Large quantities of young herrings are caught in the Moray Firth, the Firths of Tay and Forth, the coast of East Anglia, the Thames estuary and up to late years in the Wash. Those from the Firth of Forth after sorting, the small being thrown overboard, dead, are worth from 10s. to 15s. a cran. Barrels examined at North Shields and coming from the Firth of Forth contained varying numbers of fish at the end of the first and second year growth periods. A cran of the largest, at the end of the second year, would contain on a low estimate 5,000 herrings. In a year and a half these young would have joined the summer feeding shoals. Their increased size would have been sufficient to make the one cran into four, and their value would have been at least eight times greater. Herrings of this size and age are not of the best quality for canning purposes, and it would be interesting to know the numbers caught and the quantity used as food in this country.

TABLE I.—AGE.

WINTER RINGS (PERCENTAGES).

Port and Date.	1	2	3	4	5	6	7	8	9	10	11	12	13	Total.
1919.														
STORNOWAY—														
27th May ...	—	3	27	20	16	24	7	2	—	1	—	—	—	226
22nd July ...	+	37	36	15	5	4	3	—	—	—	+	—	—	239
23rd September	—	7	28	26	18	14	5	2	—	—	—	—	—	201
LERWICK—														
28th May ...	—	1	19	17	15	16	11	9	3	6	3	—	—	174
5th July ...	—	0·5	16·5	16·5	14·5	15·0	21·0	9·5	3·5	0·5	1·5	1·0	—	200
16th August ...	—	—	1	5	10	18	22	24	13	6	1	1	—	199
WICK—														
8th July ...	—	2	57	27	9	3	2	+	—	—	—	—	—	250
14th August ...	—	12	51	15	9	7	4	1	—	1	—	—	—	168
PETERHEAD—														
19th June ...	—	4	50	22	10	10	2	2	—	—	—	—	—	180
29th July ...	—	9	52	24	7	4	2	1	1	—	—	—	—	250
20th August ...	—	7	49	23	12	4	2	2	+	—	—	—	—	249
9th September	5	7	18	21	10	15	7	10	3	2	1	1	—	177
NORTH SHIELDS (Drift)—														
24th July ...	—	20	69	8	2	1	—	—	—	—	—	—	—	250
6th August ...	—	15	56	17	7	3	2	—	—	—	—	—	—	250
27th August ...	+	50	41	6	2	—	+	1	—	—	—	—	—	250
NORTH SHIELDS (Trawled)—														
26th September	1	3	28	26	16	17	6	2	—	1	—	—	—	242
8th October ...	1	6	20	24	18	7	17	5	1	—	+	—	—	229
SCARBOROUGH—														
12th August ...	—	36	51	10	2	+	+	1	—	—	—	—	—	200
11th September	1	33	46	10	4	2	3	1	—	—	—	—	—	250
25th September	—	8	17	24	23	8	13	5	2	—	+	—	—	245
GREAT YARMOUTH—														
6th November	—	2	13	17	21	24	13	5	4	1	—	—	—	211
20th November	—	4	30	10	21	17	11	3	2	1	—	—	—	286
1920.														
STORNOWAY—														
10th February	—	—	23	25	12	15	21	2	+	1	—	—	—	212
9th March ...	—	4	47	22	7	11	6	2	+	—	—	—	—	262
LERWICK—														
21st February ...	—	—	1	15	8	44	25	5	1	—	—	—	1	151
13th March ...	—	—	1	22	7	42	24	3	+	—	+	—	—	176
PETERHEAD—														
13th February	—	—	1	27	12	30	22	9	—	—	+	—	—	176
20th February	—	—	3	14	5	51	22	3	1	1	1	—	—	183
FIRTH OF FORTH—														
22nd January ...	—	+	1	8	10	25	25	20	7	4	+	—	—	220
17th February	—	2	25	20	13	16	13	7	3	1	+	—	—	266
10th March ..	—	5	40	48	5	2	+	—	—	—	—	—	—	177

TABLE II.—MATURITY.

STORNOWAY SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI.	VII.	VII.-II.	Total.
27/5/19	2	6	—	—	—	—	—	—	—	6
	3	7	54	—	—	—	—	—	—	61
	4	—	46	—	—	—	—	—	—	46
	5	—	37	—	—	—	—	—	—	37
	6	1	52	—	—	—	—	—	—	54
	7 and +	—	21	1	—	—	—	—	—	22
		14	211	1	—	—	—	—	—	226
22/7/19	1	1	—	—	—	—	—	—	—	1
	2	67	18	4	—	—	—	—	—	89
	3	12	46	26	2	—	—	—	—	86
	4	1	6	27	1	—	—	—	—	35
	5	—	5	6	—	—	—	—	—	11
	6	—	2	6	2	—	—	—	—	10
	7 and +	—	1	6	—	—	—	—	—	7
		81	78	75	5	—	—	—	—	239
23/9/19	2	8	1	2	—	—	—	4	—	15
	3	4	7	6	1	—	—	37	—	55
	4	—	1	1	—	—	—	49	—	51
	5	—	—	1	—	—	—	36	—	37
	6	—	—	1	1	—	—	26	—	28
	7 and +	—	—	—	—	—	—	15	—	15
		12	9	11	2	—	—	167	—	201
10/2/20	3	—	5	18	22	3	1	—	—	49
	4	—	—	10	20	14	7	2	—	53
	5	—	—	—	9	8	2	7	—	26
	6	—	—	—	11	20	1	—	—	32
	7	—	—	—	11	25	6	3	—	45
	8 and +	—	—	—	2	3	—	2	—	7
		—	5	28	75	73	17	14	—	212
9/3/20	2	7	3	—	—	—	1	—	—	11
	3	3	4	44	22	—	18	9	24	124
	4	1	1	8	5	1	4	9	30	59
	5	—	—	—	1	—	—	3	14	18
	6	—	—	—	3	—	1	11	13	28
	7 and +	—	—	—	—	2	4	7	9	22
		11	8	52	31	3	28	39	90	262

TABLE II.—*Continued.*

LERWICK SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI.	VII.	VII.-II.	Total.
28/5/19	2	1	—	—	—	—	—	—	—	1
	3	9	24	—	—	—	—	—	—	33
	4	3	26	—	—	—	—	—	—	29
	5	1	25	—	—	—	—	—	—	26
	6	1	26	—	—	—	—	—	—	27
	7	—	20	—	—	—	—	—	—	20
	8	—	14	1	—	—	—	—	—	15
	9 and +	—	23	—	—	—	—	—	—	23
		15	158	1	—	—	—	—	—	174
5/7/19	2	1	—	—	—	—	—	—	—	1
	3	16	10	4	3	—	—	—	—	33
	4	1	16	13	2	1	—	—	—	33
	5	1	14	5	5	4	—	—	—	29
	6	1	16	5	5	3	—	—	—	30
	7	—	22	10	6	4	—	—	—	42
	8 and +	—	14	10	6	2	—	—	—	32
		20	92	47	27	14	—	—	—	200
16/8/19	3	—	—	—	—	—	—	2	—	2
	4	—	—	1	1	—	—	1	6	9
	5	—	—	6	1	—	—	2	10	19
	6	—	—	1	3	2	—	1	29	36
	7	—	—	5	4	2	—	4	29	44
	8	—	2	3	—	—	—	2	40	47
	9	—	1	1	—	3	—	2	19	26
	10 & +	—	—	1	—	1	—	2	12	16
		—	3	18	9	8	—	16	145	199
21/2/20	3	—	—	—	—	—	1	—	—	1
	4	—	—	2	5	10	5	—	—	22
	5	—	—	—	1	5	6	—	—	12
	6	—	—	—	2	37	28	—	—	67
	7	—	—	—	3	17	17	1	—	38
	8 and +	—	—	—	—	5	6	—	—	11
		—	—	2	11	74	63	1	—	151
13/3/20	3	—	—	—	—	—	1	1	—	2
	4	—	—	—	—	—	10	23	5	38
	5	—	—	—	—	—	—	12	1	13
	6	—	—	—	—	—	9	56	9	74
	7	—	—	—	—	—	3	37	2	42
	8 and +	—	—	—	—	—	1	5	1	7
		—	—	—	—	—	24	134	18	176

TABLE II.--*Continued.*

WICK SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV	V.	VI.	VII.	VII.-II.	Total.
8/7/19	2	4	1	1	—	—	—	—	—	6
	3	88	29	19	7	—	—	—	—	143
	4	31	17	10	8	1	—	—	—	67
	5	8	11	2	1	—	—	—	—	22
	6 and +	—	8	1	2	1	—	—	—	12
		131	66	33	8	2	—	—	—	250
14/8/19	2	2	6	13	—	—	—	—	—	21
	3	11	12	57	6	—	—	—	—	86
	4	2	6	15	3	—	—	—	—	26
	5	—	1	9	4	1	—	—	—	15
	6 and +	—	3	8	7	1	—	—	1	20
		15	28	102	20	2	—	—	1	168

TABLE II.—*Continued.*

PETERHEAD SAMPLES.

Date	Winter Rings.	I.	II.	III.	IV.	V	VI.	VII.	VII.-II.	Total.
19/6/19	2	7	1	—	—	—	—	—	—	8
	3	33	48	7	1	—	—	—	—	89
	4	2	35	2	—	1	—	—	—	40
	5	—	18	—	—	—	—	—	—	18
	6 and +	—	19	—	—	—	—	—	6	25
		42	121	9	1	1	—	—	6	180
29/7/19	2	10	5	7	1	—	—	—	—	23
	3	17	54	48	12	—	—	—	—	131
	4	4	10	27	19	—	—	—	—	60
	5	1	10	1	6	—	—	—	—	18
	6 and +	—	2	6	10	—	—	—	—	18
		32	81	89	48	—	—	—	—	250
20/8/19	2	11	4	3	—	—	—	—	—	18
	3	13	47	55	7	—	—	—	—	122
	4	10	20	14	14	—	—	—	—	58
	5	—	9	13	9	—	—	—	—	31
	6 and +	—	4	8	7	—	—	—	1	20
		34	84	93	37	—	—	—	1	249
9/5/19	1	9	—	—	—	—	—	—	—	9
	2	10	—	—	—	—	—	3	—	13
	3	1	1	—	—	—	—	30	—	32
	4	1	—	—	—	—	—	37	—	38
	5	—	—	—	—	—	—	17	—	17
	6	—	—	—	—	—	—	27	—	27
	7	—	—	—	—	—	—	12	—	12
	8	—	—	—	2	—	—	16	—	18
	9 and +	—	—	—	—	—	—	11	—	11
		21	1	—	2	—	—	153	—	177

TABLE II.— *Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI.	VII.	VII.-II.	Total.
13/2/20	3	—	—	1	—	1	—	—	—	2
	4	—	—	—	4	12	31	—	—	47
	5	—	—	—	—	8	13	—	—	21
	6	—	—	—	—	21	30	1	—	52
	7	—	—	—	1	12	25	—	—	38
	8 and +	—	—	—	—	4	12	—	—	16
		—	—	1	5	58	111	1	—	176
20/2/20	3	—	—	1	1	2	1	—	—	5
	4	—	—	1	3	4	13	5	—	26
	5	—	—	—	—	5	3	1	—	9
	6	—	—	—	1	25	39	29	—	94
	7	—	—	—	—	13	11	16	1	41
	8 and +	—	—	—	—	2	4	2	—	8
		—	—	2	5	51	71	53	1	183

TABLE II.—*Continued.*

NORTH SHIELDS SAMPLES (Drift).

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI.	VII.	VII.-II.	Total.
24/7/19	2	20	17	10	1	1	—	—	—	49
	3	27	70	59	17	—	—	—	—	173
	4	3	9	4	5	—	—	—	—	21
	5 and +	—	4	1	2	—	—	—	—	7
		50	100	74	25	1	—	—	—	250
6/8/19	2	8	14	16	—	—	—	—	—	38
	3	17	56	60	8	—	—	—	—	141
	4	6	22	13	1	—	—	—	—	42
	5	2	11	4	1	—	—	—	—	18
	6 and +	—	4	4	3	—	—	—	—	11
		33	107	97	13	—	—	—	—	250
27/8/19	1	1	—	—	—	—	—	—	—	1
	2	26	45	52	2	—	—	—	—	125
	3	7	32	59	2	2	—	—	—	102
	4	2	7	5	—	—	—	—	—	14
	5 and +	—	—	3	3	2	—	—	—	8
		36	84	119	7	4	—	—	—	250

NORTH SHIELDS SAMPLES (Trawled).

26/9/19	1	2	—	—	—	—	—	—	—	2
	2	4	2	1	—	—	—	—	—	7
	3	8	31	24	1	—	—	4	—	68
	4	2	15	33	3	—	—	9	—	62
	5	—	9	22	6	—	—	2	—	39
	6	—	12	22	4	—	—	4	—	42
	7 and +	—	3	15	1	—	—	3	—	22
		16	72	117	15	—	—	22	—	242
8/10/19	1	2	—	—	—	—	—	—	—	2
	2	6	3	2	—	—	—	1	1	13
	3	5	5	25	—	—	—	10	1	46
	4	1	8	35	2	—	—	6	3	55
	5	—	3	27	4	—	—	5	2	41
	6 and +	—	3	37	10	—	—	17	5	72
		14	22	126	16	—	—	39	12	229

TABLE II.—*Continued.*

SCARBOROUGH SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI.	VII.	VII.-II.	Total.
12/8/19	2	10	8	36	18	—	—	—	—	72
	3	1	15	36	43	7	—	—	—	102
	4 and +	—	5	7	9	5	—	—	—	26
		11	28	79	70	12	—	—	—	200
11/9/19	1	3	—	—	—	—	—	—	—	3
	2	7	43	33	—	—	—	—	—	83
	3	1	48	58	1	—	—	7	—	115
	4 and +	—	2	22	24	—	—	1	—	49
		11	93	113	25	—	—	8	—	250
25/9/19	2	—	—	—	—	2	17	—	—	19
	3	—	—	—	—	—	42	—	—	42
	4	—	—	—	1	3	55	1	—	60
	5	—	—	—	—	3	52	1	—	56
	6 and +	—	—	—	1	4	60	3	—	68
		—	—	—	2	12	226	5	—	245

GREAT YARMOUTH SAMPLES.

6/11/19	2	2	2	1	—	—	—	—	—	5
	3	2	8	16	1	—	—	—	—	27
	4	—	5	27	2	—	—	1	—	35
	5	—	7	32	6	—	—	—	—	45
	6	—	6	36	7	—	—	—	1	50
	7 and +	—	8	32	7	—	—	—	2	49
		4	36	144	23	—	—	1	3	211
20/11/19	2	1	—	2	—	3	5	—	1	12
	3	3	—	8	3	14	52	4	1	85
	4	—	—	4	2	5	18	1	—	30
	5	—	—	1	2	10	42	5	—	60
	6	—	—	1	2	4	37	3	1	48
	7	—	—	—	2	10	18	2	—	32
	8 and +	—	—	—	—	4	14	1	—	19
		4	—	16	11	50	186	16	3	286

TABLE II.—*Continued.*

FIRTH OF FORTH SAMPLES.

Date.	Winter Rings.	I.	II.	III.	IV.	V.	VI	VII.	VII.-II.	Total.
22/1/20	2	1	—	—	—	—	—	—	—	1
	3	1	—	1	—	—	—	—	—	2
	4	—	—	12	4	—	1	—	—	17
	5	—	—	6	15	—	—	—	—	21
	6	—	—	20	34	—	—	—	—	54
	7	—	1	11	41	1	—	—	—	54
	8	—	—	12	32	—	1	—	—	45
	9 and +	—	—	4	22	—	—	—	—	26
		2	1	66	148	1	2	—	—	220
17/2/20	2	3	1	—	—	—	—	—	—	4
	3	2	4	57	2	—	—	1	—	66
	4	—	1	36	16	—	1	—	—	54
	5	—	1	21	13	—	—	—	—	35
	6	—	—	20	23	—	—	—	—	43
	7	—	—	13	20	1	—	—	—	34
	8 and +	—	—	11	19	—	—	—	—	30
		5	7	158	93	1	1	1	—	266
10/3/20	2	—	7	2	—	—	—	—	—	9
Large ...	3	4	18	34	—	—	11	—	3	70
	4	—	4	23	14	2	26	3	13	85
	5 and +	—	2	3	1	—	—	—	7	13
		4	31	62	15	2	37	3	23	177
10/3/20	1	23	—	—	—	—	—	—	—	23
Small ...	2	67	6	—	—	—	—	—	—	73
	3	—	—	3	—	—	—	—	—	3
		90	6	3	—	—	—	—	—	99

TABLE III.—GROWTH.

STORNOWAY SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
27/5/19	2	—	—	—	—	—	—	—	2	—	1	1	2	—	—	—	6
22/7/19	2	—	—	—	1	1	1	6	10	19	25	17	9	—	—	—	89
23/9/19	2	—	—	—	—	—	—	4	3	1	2	4	1	—	—	—	15
10/2/20	3	—	—	—	1	1	2	6	7	15	6	9	2	—	—	—	49
9/3/20	3	—	—	—	1	1	6	6	21	34	26	21	8	—	—	—	124
27/5/19	3	—	—	—	—	1	2	3	7	21	7	11	7	1	1	—	61
22/7/19	3	—	—	3	5	6	6	9	9	13	24	10	1	—	—	—	86
23/9/19	3	—	—	1	3	3	6	9	13	9	9	2	—	—	—	—	55
10/2/20	4	—	—	2	4	4	6	3	11	11	5	6	1	—	—	—	53
9/3/20	4	—	—	—	—	8	8	8	12	18	4	1	—	—	—	—	59
27/5/19	4	—	—	1	2	1	7	6	4	9	6	5	3	1	—	1	46
22/7/19	4	—	—	—	—	2	2	5	9	9	4	4	—	—	—	—	35
23/9/19	4	—	1	1	6	5	7	9	8	9	5	—	—	—	—	—	51
10/2/20	5	—	—	1	3	1	3	—	7	7	3	1	—	—	—	—	26
9/3/20	5	—	—	1	—	—	1	2	3	2	5	4	—	—	—	—	18
27/5/19	5	—	—	—	3	—	1	5	5	9	11	3	—	—	—	—	37
22/7/19	5	—	—	—	—	—	—	1	2	2	1	2	3	—	—	—	11
23/9/19	5	—	1	2	2	6	4	4	6	5	6	1	—	—	—	—	37
10/2/20	6	—	—	—	—	1	2	5	6	13	5	—	—	—	—	—	32
9/3/20	6	—	—	—	2	—	1	2	6	7	8	2	—	—	—	—	28
27/5/19	6	—	—	—	1	1	4	8	9	15	11	3	2	—	—	—	54
22/7/19	6	—	—	—	—	—	—	—	2	5	2	1	—	—	—	—	10
23/9/19	6	—	—	1	3	4	—	4	6	7	1	2	—	—	—	—	28
10/2/20	7	—	—	2	1	2	2	5	9	6	11	6	1	—	—	—	45
9/3/20	7	—	—	—	3	—	4	2	1	2	4	—	—	—	—	—	16

TABLE III.—*Continued.*

LERWICK SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
28/5/19	3	—	—	1	—	1	4	2	4	6	7	7	—	—	1	—	33
5/7/19	3	—	—	—	2	—	2	2	10	6	7	2	1	1	—	—	33
16/8/19	3	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	2
21/2/20	4	—	—	—	2	4	3	—	3	7	3	—	—	—	—	—	22
13/3/20	4	—	—	—	—	3	5	3	10	8	6	3	—	—	—	—	38
28/5/19	4	—	—	1	—	1	6	7	5	2	3	1	2	1	—	—	29
5/7/19	4	—	—	—	—	3	5	8	5	7	2	1	2	—	—	—	33
16/8/19	4	—	—	—	—	—	3	3	1	—	2	—	—	—	—	—	9
21/2/20	5	—	—	1	2	1	1	—	1	3	2	1	—	—	—	—	12
13/3/20	5	—	—	—	—	—	1	3	3	1	3	1	—	1	—	—	13
28/5/19	5	—	2	—	3	2	2	2	2	2	5	4	1	1	—	—	26
5/7/19	5	—	—	—	2	2	6	5	7	2	1	1	3	—	—	—	29
16/8/19	5	—	—	—	—	2	4	6	2	4	1	—	—	—	—	—	19
21/2/20	6	—	—	—	3	—	3	10	16	15	13	5	2	—	—	—	67
13/3/20	6	—	—	—	—	2	6	8	16	14	23	4	1	—	—	—	74
28/5/19	6	—	2	1	1	5	4	4	5	4	1	—	—	—	—	—	27
5/7/19	6	—	—	—	2	8	6	3	5	4	1	1	—	—	—	—	30
16/8/19	6	—	—	1	3	6	1	8	4	7	3	1	1	1	—	—	36
21/2/20	7	—	—	1	3	1	1	6	1	10	9	6	—	—	—	—	38
13/3/20	7	—	1	—	3	—	4	6	5	5	13	3	2	—	—	—	42
28/5/19	7	—	—	—	2	3	6	7	—	—	2	—	—	—	—	—	20
5/7/19	7	—	—	1	5	9	6	6	3	8	4	—	—	—	—	—	42
16/8/19	7	—	—	2	4	5	10	7	5	5	3	1	2	—	—	—	44
21/2/20	8	—	—	—	—	2	2	1	1	2	—	—	—	—	—	—	8
13/3/20	8	—	—	—	1	1	1	—	1	1	—	—	—	—	—	—	5
16/8/19	8	—	1	1	2	8	11	9	7	8	—	—	—	—	—	—	47
28/5/19	8 and +	—	—	3	3	14	7	4	4	3	—	—	—	—	—	—	38
5/7/19	8 and +	—	—	2	4	9	6	4	3	2	1	—	1	—	—	—	32
16/8/19	9 and +	—	—	1	4	3	11	9	6	5	3	—	—	—	—	—	42

TABLE III.—*Continued.*

WICK SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
8/7/19	2	—	—	—	—	—	—	—	1	3	1	—	1	—	—	—	6
14/8/19	2	—	—	—	—	—	1	3	2	6	6	2	1	—	—	—	21
8/7/19	3	—	—	1	8	36	34	24	19	13	4	3	1	—	—	—	143
14/8/19	3	—	—	4	5	11	14	18	16	8	7	3	—	—	—	—	86
8/7/19	4	—	1	1	7	10	17	11	12	3	4	1	—	—	—	—	67
14/8/19	4	—	1	1	3	4	8	2	3	3	—	1	—	—	—	—	26
8/7/19	5	—	—	—	4	6	5	5	1	1	—	—	—	—	—	—	22
14/8/19	5	—	—	—	2	2	4	3	1	1	1	—	1	—	—	—	15
8/7/19	6 and +	—	—	—	2	2	3	2	2	—	1	—	—	—	—	—	12
14/8/19	6 and +	—	1	—	1	3	5	2	2	2	2	2	—	—	—	—	20

TABLE III.—*Continued.*

PETERHEAD SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
19/6/19	2	—	—	—	—	—	1	—	3	3	—	1	—	—	—	—	8
29/7/19	2	—	—	—	—	—	—	3	1	6	7	2	2	1	1	—	23
20/8/19	2	—	—	—	—	—	—	3	6	4	3	2	—	—	—	—	18
9/9/19	2	—	—	—	1	3	5	1	—	1	1	—	—	1	—	—	13
19/6/19	3	—	—	2	11	12	21	11	10	9	6	7	—	—	—	—	89
29/7/19	3	—	—	2	5	20	30	29	14	6	15	5	4	1	—	—	131
20/8/19	3	—	—	5	15	20	24	19	21	10	5	3	—	—	—	—	122
9/9/19	3	—	—	—	2	5	4	3	3	9	5	1	—	—	—	—	32
19/6/19	4	—	—	—	4	9	8	10	1	3	3	2	—	—	—	—	40
29/7/19	4	—	—	1	1	5	15	9	9	7	4	3	1	5	—	—	60
20/8/19	4	—	—	4	9	15	12	6	3	3	—	2	2	2	—	—	58
9/9/19	4	—	—	—	1	3	8	4	8	8	4	1	1	—	—	—	38
19/6/19	5	—	—	1	3	3	2	1	2	4	1	1	—	—	—	—	18
29/7/19	5	—	—	—	2	1	4	2	3	3	1	1	1	—	—	—	18
20/8/19	5	—	1	3	6	6	5	—	5	2	2	—	1	—	—	—	31
9/9/19	5	—	1	—	1	1	2	2	2	4	3	1	—	—	—	—	17
19/6/19	6	—	—	—	1	6	3	3	1	3	—	—	1	—	—	—	18
29/7/19	6	—	—	—	—	2	1	1	4	1	—	—	—	—	—	—	9
20/8/19	6	—	—	—	3	5	1	1	1	—	—	—	—	—	—	—	11
9/9/19	6	—	—	—	1	2	2	7	3	4	5	1	1	1	—	—	27
19/6/19	7 and +	—	—	—	—	3	2	—	2	—	—	—	—	—	—	—	7
29/7/19	7 and +	—	—	—	1	1	—	1	3	1	2	—	—	—	—	—	9
20/8/19	7 and +	—	—	—	3	2	1	1	2	—	—	—	—	—	—	—	9
9/9/19	7 and +	—	—	—	1	4	8	8	4	8	4	2	2	—	—	—	41

TABLE III.—*Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

13/2/20	4	—	—	—	1	5	7	8	9	8	6	3	—	—	—	—	47
20/2/20	4	—	—	—	—	—	3	3	6	6	5	3	—	—	—	—	26
13/2/20	5	—	1	3	1	1	2	6	1	3	3	—	—	—	—	—	21
20/2/20	5	—	—	—	—	—	—	1	2	3	1	2	—	—	—	—	9
13/2/20	6	—	—	—	—	1	4	8	8	17	7	6	1	—	—	—	52
20/2/20	6	—	—	—	3	1	6	10	15	21	19	13	5	1	—	—	94
13/2/20	7	—	—	2	1	1	2	5	11	8	5	2	1	—	—	—	38
20/2/20	7	—	—	1	—	2	1	2	5	15	9	5	1	—	—	—	41
13/2/20	8 and +	—	—	3	4	2	2	1	3	1	—	—	—	—	—	—	16
20/2/20	8 and +	—	—	1	1	—	—	—	1	2	3	—	—	—	—	—	8

TABLE III.—*Continued.*

NORTH SHIELDS SAMPLES (Drift Net).—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
24/7/19	2	—	—	—	2	—	3	6	6	18	8	5	1	—	—	—	49
6/8/19	2	—	—	—	—	—	—	4	11	7	14	2	—	—	—	—	38
27/8/19	2	—	—	—	3	7	4	27	36	28	18	2	—	—	—	—	125
24/7/19	3	—	—	4	15	45	50	17	23	7	7	4	1	—	—	—	173
6/8/19	3	—	—	3	13	30	35	30	13	10	6	—	1	—	—	—	141
27/8/19	3	1	1	3	17	33	26	11	7	1	2	—	—	—	—	—	102
24/7/19	4	—	—	1	2	3	3	5	7	—	—	—	—	—	—	—	21
6/8/19	4	—	—	—	—	10	10	12	3	3	1	3	—	—	—	—	42
27/8/19	4	—	—	—	1	4	6	—	—	—	2	1	—	—	—	—	14
24/7/19	5 and +	—	—	—	1	4	2	—	—	—	—	—	—	—	—	—	7
6/8/19	5 and +	—	1	—	4	12	3	3	3	3	—	—	—	—	—	—	29
27/8/19	5 and +	—	—	—	1	3	1	—	1	1	1	—	—	—	—	—	8

NORTH SHIELDS SAMPLES (Trawled).—FIRST YEAR GROWTH.

26/9/19	2	—	—	—	—	—	—	1	2	2	1	1	—	—	—	—	7
8/10/19	2	—	—	—	1	1	3	1	2	2	2	1	—	—	—	—	13
26/9/19	3	—	—	1	3	6	12	19	12	8	6	1	—	—	—	—	68
8/10/19	3	—	—	1	5	7	7	10	5	6	1	3	1	—	—	—	46
26/9/19	4	—	—	—	3	7	16	17	9	6	2	2	—	—	—	—	62
8/10/19	4	—	1	1	6	6	14	12	8	4	1	1	1	—	—	—	55
26/9/19	5	—	—	—	3	4	12	8	4	4	4	—	—	—	—	—	39
8/10/19	5	—	—	1	2	7	10	12	4	4	—	—	1	—	—	—	41
26/9/19	6	—	—	—	3	5	11	11	6	4	1	1	—	—	—	—	42
8/10/19	6	—	—	—	2	3	4	3	3	2	—	—	—	—	—	—	17
26/9/19	7	—	—	—	2	2	4	4	2	—	—	—	—	—	—	—	14
8/10/19	7	—	1	1	5	9	11	6	3	2	2	—	—	—	—	—	40
26/9/19	8 and +	—	—	—	5	1	—	—	2	—	—	—	—	—	—	—	8
8/10/19	8 and +	—	—	—	3	3	6	1	2	—	—	—	—	—	—	—	15

TABLE III.—*Continued.*

SCARBOROUGH SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
12/8/19	2	—	—	—	—	4	5	8	12	23	17	3	—	—	—	—	72
11/9/19	2	—	—	3	1	2	5	17	24	22	7	2	—	—	—	—	83
25/9/19	2	—	—	—	—	—	—	4	5	4	5	1	—	—	—	—	19
12/8/19	3	—	1	3	23	33	17	10	13	1	—	1	—	—	—	—	102
11/9/19	3	—	—	6	25	37	31	10	5	1	—	—	—	—	—	—	115
25/9/19	3	—	—	1	2	7	3	10	10	4	2	3	—	—	—	—	42
12/8/19	4	—	—	1	1	6	3	1	5	—	1	1	—	—	—	—	19
11/9/19	4	—	1	—	—	2	11	5	3	3	—	—	—	—	—	—	25
25/9/19	4	—	—	—	8	7	14	7	13	7	3	—	1	—	—	—	60
12/8/19	5 and +	—	—	—	4	—	2	—	—	—	—	1	—	—	—	—	7
11/9/19	5 and +	—	—	—	4	6	5	1	6	1	—	1	—	—	—	—	24
25/9/19	5	—	—	4	4	7	11	14	3	7	3	2	1	—	—	—	56
25/9/19	6	—	—	2	2	4	3	2	4	—	1	1	—	—	—	—	19
25/9/19	7	—	—	—	8	4	6	8	2	1	1	2	—	—	—	—	32
25/9/19	8 and +	—	—	1	1	5	5	1	3	—	1	—	—	—	—	—	17

GREAT YARMOUTH SAMPLES.—FIRST YEAR GROWTH.

6/11/19	2	—	—	—	—	1	1	2	1	—	—	—	—	—	—	—	5
20/11/19	2	—	—	—	1	—	—	4	3	3	1	—	—	—	—	—	12
6/11/19	3	—	—	1	4	10	1	3	6	—	2	—	—	—	—	—	27
20/11/19	3	—	—	—	5	32	32	10	—	4	1	—	1	—	—	—	85
6/11/19	4	—	—	—	6	9	10	4	1	3	2	—	—	—	—	—	35
20/11/19	4	—	—	3	4	10	8	3	1	1	—	—	—	—	—	—	30
6/11/19	5	—	—	1	8	12	9	9	2	3	1	—	—	—	—	—	45
20/11/19	5	—	—	5	19	9	12	9	3	1	2	—	—	—	—	—	60
6/11/19	6	—	—	4	10	14	13	2	4	3	—	—	—	—	—	—	50
20/11/19	6	—	1	—	5	15	17	5	1	3	1	—	—	—	—	—	48
6/11/19	7	—	—	—	8	12	3	1	2	—	—	—	—	—	—	—	26
20/11/19	7	—	—	2	7	11	6	5	—	1	—	—	—	—	—	—	32
6/11/19	8 and +	—	—	2	3	10	7	1	—	—	—	—	—	—	—	—	23
20/11/19	8 and +	—	1	1	4	9	2	2	—	—	—	—	—	—	—	—	19

TABLE III.—*Continued.*

FIRTH OF FORTH SAMPLES.—FIRST YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total.
22/1/20	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
17/2/20	2	—	—	—	—	1	1	—	—	2	—	—	—	—	—	—	4
10/3/20	2	—	—	—	—	—	—	1	—	—	—	3	4	1	—	—	9
22/1/20	3	—	—	—	—	1	1	—	—	—	—	—	—	—	—	—	2
17/2/20	3	—	—	1	4	3	12	18	16	7	5	—	—	—	—	—	66
10/3/20	3	—	—	—	—	9	12	14	15	12	7	—	1	—	—	—	70
22/1/20	4	—	—	—	1	2	1	7	5	1	—	—	—	—	—	—	17
17/2/20	4	—	—	3	3	2	10	7	11	9	6	3	—	—	—	—	54
10/3/20	4	—	—	1	2	7	9	18	19	21	6	2	—	—	—	—	85
22/1/20	5	—	—	—	—	3	4	7	7	—	—	—	—	—	—	—	21
17/2/20	5	—	1	2	—	6	10	3	12	—	1	—	—	—	—	—	35
10/3/20	5 and +	—	—	—	—	3	4	2	2	2	—	—	—	—	—	—	13
22/1/20	6	—	—	3	2	8	12	17	8	1	2	1	—	—	—	—	54
17/2/20	6	—	—	—	1	8	9	6	11	5	2	1	—	—	—	—	43
22/1/20	7	—	—	3	9	6	13	14	5	4	—	—	—	—	—	—	54
17/2/20	7	—	1	—	3	2	6	5	8	7	2	—	—	—	—	—	34
22/1/20	8	—	3	2	8	6	11	4	8	3	—	—	—	—	—	—	45
17/2/20	8	—	—	—	—	4	8	3	1	2	1	—	—	—	—	—	19
22/1/20	9 and +	—	1	2	6	7	3	2	3	1	1	—	—	—	—	—	26
17/2/20	9 and +	—	—	2	—	1	1	3	2	2	—	—	—	—	—	—	11
10/3/20	1	—	—	—	—	—	—	3	5	9	5	1	—	—	—	—	23
Small	2	—	—	—	2	6	16	26	11	6	3	1	1	1	—	—	73
	3	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	3

TABLE III.—*Continued.*

STORNOWAY SAMPLES.—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total.
27/5/19	2	—	—	—	—	—	—	—	—	—	—	1	2	3	—	—	6
22/7/19	2	—	—	—	—	—	—	1	3	13	26	26	18	2	—	—	89
23/9/19	2	—	—	—	—	—	—	—	1	—	2	6	4	1	1	—	15
10/2/20	3	—	—	—	—	—	—	—	—	4	11	17	10	6	1	—	49
9/3/20	3	—	—	—	—	—	—	1	2	11	23	40	39	8	—	—	124
27/5/19	3	—	—	—	—	—	—	1	3	11	8	10	11	10	3	4	61
22/7/19	3	—	—	1	2	4	4	13	16	16	15	7	6	2	—	—	86
23/9/19	3	—	—	—	1	3	3	7	6	12	11	6	3	3	—	—	55
10/2/20	4	—	—	—	3	2	2	2	6	13	9	6	9	1	—	—	53
9/3/20	4	—	—	—	1	—	2	10	7	17	11	9	2	—	—	—	59
27/5/19	4	—	—	—	1	—	4	3	7	8	7	9	5	1	1	—	46
22/7/19	4	—	—	—	1	1	3	3	7	8	8	2	2	—	—	—	35
23/9/19	4	—	1	4	2	6	—	1	12	14	9	2	—	—	—	—	51
10/2/20	5	—	—	—	1	4	1	3	6	7	2	1	1	—	—	—	26
9/3/20	5	—	—	—	—	1	—	1	2	3	6	4	1	—	—	—	18
27/5/19	5	—	—	—	—	1	—	2	3	7	11	11	2	—	—	—	37
22/7/19	5	—	—	—	—	—	—	1	3	2	1	3	1	—	—	—	11
23/9/19	5	1	2	1	6	3	1	3	6	9	4	—	1	—	—	—	37
10/2/20	6	—	—	—	—	2	2	2	4	12	5	3	2	—	—	—	32
9/3/20	6	—	—	1	—	1	4	2	7	2	7	3	1	—	—	—	28
27/5/19	6	—	—	—	1	4	4	5	5	20	12	3	—	—	—	—	54
22/7/19	6	—	—	—	—	—	1	2	3	1	2	1	—	—	—	—	10
23/9/19	6	—	1	3	3	1	2	5	2	4	6	1	—	—	—	—	28
10/2/20	7	—	—	3	1	—	1	5	6	10	14	5	—	—	—	—	45
9/3/20	7	—	—	—	1	1	3	2	2	3	3	1	—	—	—	—	16

TABLE III.—*Continued.*

LERWICK SAMPLES.—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total.
28/5/19	3	—	—	—	—	—	2	2	6	5	8	9	—	1	—	—	33
5/7/19	3	—	—	—	—	—	1	6	6	9	5	3	2	1	—	—	33
16/8/19	3	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	2
21/2/20	4	—	—	1	1	—	5	2	—	3	7	2	1	—	—	—	22
13 3/20	4	—	—	—	—	1	2	3	6	10	6	5	2	3	—	—	38
28/5/19	4	—	—	—	—	2	4	4	8	2	5	4	—	—	—	—	29
5/7/19	4	—	—	1	1	2	4	5	12	3	2	2	1	—	—	—	33
16/8/19	4	—	—	—	1	—	4	—	1	2	1	—	—	—	—	—	9
21/2/20	5	—	—	1	—	—	4	1	1	1	3	—	1	—	—	—	12
13/3/20	5	—	—	—	—	—	1	3	2	2	1	2	1	1	—	—	13
28/5/19	5	1	1	—	2	3	5	1	3	4	2	4	—	—	—	—	26
5/7/19	5	—	1	—	3	3	4	7	2	8	—	—	1	—	—	—	29
16/8/19	5	—	—	—	—	3	6	6	1	1	2	—	—	—	—	—	19
21/2/20	6	—	—	1	—	4	11	11	15	11	7	7	—	—	—	—	67
13/3/20	6	—	—	—	—	4	5	9	12	20	11	12	1	—	—	—	74
28/5/19	6	—	—	4	3	4	6	5	2	2	1	—	—	—	—	—	27
5/7/19	6	—	—	3	4	6	4	3	6	2	2	—	—	—	—	—	30
16/8/19	6	—	2	2	2	2	9	1	8	3	3	4	—	—	—	—	36
21/2/20	7	—	—	—	3	—	6	3	6	7	6	6	1	—	—	—	38
13/3/20	7	—	—	2	1	1	6	6	4	10	6	3	2	1	—	—	42
28/5/19	7	—	—	2	3	4	5	4	1	—	1	—	—	—	—	—	20
5/7/19	7	—	—	4	5	5	4	8	6	7	2	1	—	—	—	—	42
16/8/19	7	—	2	3	3	4	10	9	8	3	1	1	—	—	—	—	44
21/2/20	8	—	—	—	2	2	—	1	3	—	—	—	—	—	—	—	8
13/3/20	8	—	—	—	1	—	1	2	1	—	—	—	—	—	—	—	5
16/8/19	8	2	1	2	3	10	4	12	7	4	2	—	—	—	—	—	47
28/5/19	8 and +	1	1	6	3	9	8	6	3	—	1	—	—	—	—	—	38
5/7/19	8 and +	—	2	3	8	2	7	5	5	—	—	—	—	—	—	—	32
16/8/19	9 and +	—	2	2	3	7	11	10	3	4	—	—	—	—	—	—	42

TABLE III.—*Continued.*

WICK SAMPLES.—SECOND YEAR GROWTH

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total.
8/7/19	2	—	—	—	—	—	—	—	—	2	2	2	—	—	—	—	6
14/8/19	2	—	—	—	—	—	—	2	2	13	3	1	—	—	—	—	21
8/7/19	3	—	—	3	8	17	37	36	22	9	8	2	1	—	—	—	143
14/8/19	3	—	2	1	1	11	16	24	7	13	11	—	—	—	—	—	86
8/7/19	4	1	1	4	3	7	19	11	12	9	—	—	—	—	—	—	67
14/8/19	4	1	1	3	1	2	9	3	2	1	2	1	—	—	—	—	26
8/7/19	5	—	—	2	—	4	11	3	1	1	—	—	—	—	—	—	22
14/8/19	5	—	1	—	2	3	4	3	—	1	1	—	—	—	—	—	15
8/7/19	6 and +	—	—	—	3	2	3	2	1	1	—	—	—	—	—	—	12
14/8/19	6 and +	1	1	3	3	2	2	1	2	4	1	—	—	—	—	—	20

TABLE III.—*Continued.*

PETERHEAD SAMPLES.—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total.
19/6/19	2	—	—	—	—	—	—	—	—	2	3	3	—	—	—	—	8
29/7/19	2	—	—	—	—	—	—	—	1	2	8	9	3	—	—	—	23
20/8/19	2	—	—	—	—	—	—	1	3	6	6	1	1	—	—	—	18
9/9/19	2	—	—	—	3	3	2	2	—	—	1	1	1	—	—	—	13
19/6/19	3	—	—	1	3	14	17	19	18	12	4	1	—	—	—	—	89
29/7/19	3	—	—	1	8	16	24	26	14	15	17	7	3	—	—	—	131
20/8/19	3	—	—	1	7	14	23	30	25	13	7	2	—	—	—	—	122
9/9/19	3	—	1	—	2	1	6	4	2	5	3	5	1	2	—	—	32
19/6/19	4	—	1	1	7	5	10	6	6	2	1	1	—	—	—	—	40
29/7/19	4	—	1	—	6	7	8	7	10	6	8	3	2	2	—	—	60
20/8/19	4	—	3	2	6	9	17	7	3	4	2	5	—	—	—	—	58
9/9/19	4	—	—	1	—	4	1	4	5	13	4	3	3	—	—	—	38
19/6/19	5	—	1	1	2	2	3	1	4	1	3	—	—	—	—	—	18
29/7/19	5	—	1	1	—	3	2	—	2	4	3	—	2	—	—	—	18
20/8/19	5	—	3	4	3	6	4	2	1	1	6	1	—	—	—	—	31
9/9/19	5	1	—	—	—	3	1	3	1	1	4	—	2	1	—	—	17
19/6/19	6	—	—	1	3	1	6	3	2	1	1	—	—	—	—	—	18
29/7/19	6	—	—	—	—	3	1	2	1	1	—	—	1	—	—	—	9
20/8/19	6	—	1	—	6	1	—	—	3	—	—	—	—	—	—	—	11
9/9/19	6	—	—	—	—	3	2	4	5	6	4	—	2	1	—	—	27
19/6/19	7 and +	—	—	1	1	3	1	—	—	1	—	—	—	—	—	—	7
29/7/19	7 and +	—	—	—	1	1	1	1	3	2	—	—	—	—	—	—	9
20/8/19	7 and +	—	—	1	2	2	1	1	2	—	—	—	—	—	—	—	9
9/9/19	7 and +	—	—	3	3	4	4	7	7	3	4	5	1	—	—	—	41

TABLE III.—*Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total.
13/2/30	4	—	—	—	—	1	3	2	6	6	11	12	5	1	—	—	47
20/2/20	4	—	—	—	—	—	1	1	2	6	6	7	3	—	—	—	26
13/2/20	5	—	—	1	2	—	3	4	—	5	2	4	—	—	—	—	21
20/2/20	5	—	—	—	—	—	1	—	1	2	1	2	1	1	—	—	9
13/2/20	6	—	—	—	—	3	3	7	8	7	10	12	2	—	—	—	52
20/2/20	6	—	—	—	1	3	5	8	16	12	27	12	7	3	—	—	94
13/2/20	7	—	—	1	2	—	3	9	6	7	7	1	2	—	—	—	38
20/2/20	7	—	—	1	1	1	2	4	7	13	8	2	2	—	—	—	41
13/2/20	8 and +	—	2	1	6	1	—	2	1	1	—	1	1	—	—	—	16
20/2/20	8 and +	1	—	—	1	—	—	—	1	3	—	2	—	—	—	—	8

TABLE III.—*Continued.*

NORTH SHIELDS SAMPLES (Drift Net).—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total
24/7/19	2	—	—	—	—	—	2	2	6	15	19	2	2	1	—	—	49
6/8/19	2	—	—	—	—	—	—	—	5	10	16	7	—	—	—	—	38
27/8/19	2	—	—	—	—	—	6	21	32	31	29	6	—	—	—	—	125...
24/7/19	3	—	—	5	13	35	43	34	26	12	4	1	—	—	—	—	173
6/8/19	3	—	—	3	9	23	32	29	27	13	4	1	—	—	—	—	141
27/8/19	3	—	4	9	18	29	16	14	7	5	—	—	—	—	—	—	102
24/7/19	4	—	1	—	2	3	4	2	5	1	2	—	1	—	—	—	21
6/8/19	4	—	—	—	5	9	4	7	8	7	1	1	—	—	—	—	42
27/8/19	4	1	1	1	—	5	1	1	1	1	1	1	—	—	—	—	14
24/7/19	5 and +	—	—	3	—	2	1	—	1	—	—	—	—	—	—	—	7
6/8/19	5 and +	1	1	4	2	7	7	3	2	3	—	—	—	—	—	—	29
27/8/19	5 and +	—	1	—	2	1	2	—	—	—	2	—	—	—	—	—	8

NORTH SHIELDS SAMPLES (Trawled)—SECOND YEAR GROWTH.

26/9/19	2	—	—	—	—	—	—	—	—	4	3	—	—	—	—	—	7
8/10/19	2	—	—	—	—	2	1	3	2	2	3	—	—	—	—	—	13
26/9/19	3	—	—	1	—	3	10	19	14	19	2	—	—	—	—	—	68
8/10/19	3	—	1	1	3	7	7	10	4	6	5	2	—	—	—	—	46
26/9/19	4	—	1	2	2	8	11	17	13	7	1	—	—	—	—	—	62
8/10/19	4	—	2	5	6	5	8	8	11	7	3	—	—	—	—	—	55
26/9/19	5	—	1	—	1	7	6	8	7	7	1	1	—	—	—	—	39
8/10/19	5	—	—	1	3	6	12	11	4	2	1	1	—	—	—	—	41
26/9/19	6	—	1	2	3	10	11	7	4	2	2	—	—	—	—	—	42
8/10/19	6	—	1	1	—	3	7	3	—	1	1	—	—	—	—	—	17
26/9/19	7	—	—	1	3	2	3	4	1	—	—	—	—	—	—	—	14
8/10/19	7	—	1	6	5	9	7	5	3	1	3	—	—	—	—	—	40
26/9/19	8 and +	1	1	2	1	1	—	1	1	—	—	—	—	—	—	—	8
8/10/19	8 and +	—	1	1	1	6	2	3	1	—	—	—	—	—	—	—	15

TABLE III.—*Continued.*

SCARBOROUGH SAMPLES.—SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total
12/8/19	2	—	—	—	—	—	2	4	14	24	19	7	2	—	—	—	72
11/9/19	2	—	—	1	1	2	4	8	22	33	11	1	—	—	—	—	83
25/9/19	2	—	—	—	—	—	—	2	5	4	7	1	—	—	—	—	19
12/8/19	3	—	—	12	20	20	20	13	8	5	3	1	—	—	—	—	102
11/9/19	3	—	2	10	18	35	22	15	10	2	1	—	—	—	—	—	115
25/9/19	3	—	—	—	1	5	7	6	10	5	6	2	—	—	—	—	42
12/8/19	4	—	2	1	4	4	—	3	2	—	3	—	—	—	—	—	19
11/9/19	4	—	1	1	1	1	5	8	1	5	1	1	—	—	—	—	25
25/9/19	4	—	1	4	4	7	9	5	20	7	2	1	—	—	—	—	60
12/8/19	5 and +	—	—	1	4	1	—	—	—	—	1	—	—	—	—	—	7
11/9/19	5 and +	—	—	3	3	1	6	4	3	2	1	1	—	—	—	—	24
25/9/19	5	—	4	2	1	7	16	11	4	4	6	1	—	—	—	—	56
25/9/19	6	—	1	3	2	5	3	1	1	2	1	—	—	—	—	—	19
25/9/19	7	1	—	2	7	7	5	4	2	2	2	—	—	—	—	—	32
25/9/19	8 and +	—	1	3	1	3	6	1	1	1	—	—	—	—	—	—	17

GREAT YARMOUTH SAMPLES.—SECOND YEAR GROWTH.

6/11/19	2	—	—	—	—	1	1	1	1	—	—	1	—	—	—	—	5
20/11/19	2	—	—	—	—	1	—	1	3	2	5	—	—	—	—	—	12
6/11/19	3	—	—	2	6	4	3	4	1	5	2	—	—	—	—	—	27
20/11/19	3	—	—	4	15	20	21	10	9	5	—	1	—	—	—	—	85
6/11/19	4	—	—	1	6	5	9	5	7	1	1	—	—	—	—	—	35
20/11/19	4	—	1	6	4	8	2	4	2	2	1	—	—	—	—	—	30
6/11/19	5	—	—	4	5	12	10	8	4	2	—	—	—	—	—	—	45
20/11/19	5	—	7	7	5	12	9	9	7	2	2	—	—	—	—	—	60
6/11/19	6	—	6	8	9	7	7	7	3	2	1	—	—	—	—	—	50
20/11/19	6	—	2	5	11	11	8	5	4	1	1	—	—	—	—	—	48
6/11/19	7	—	4	4	7	8	2	1	—	—	—	—	—	—	—	—	26
20/11/19	7	—	5	3	11	4	2	5	2	—	—	—	—	—	—	—	32
6/11/19	8 and +	1	2	6	3	7	1	1	1	—	1	—	—	—	—	—	23
20/11/19	8 and +	1	1	1	9	—	6	—	1	—	—	—	—	—	—	—	19

TABLE III —*Continued.*

FIRTH OF FORTH SAMPLES —SECOND YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	Total
22/1/20	2	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
17/2/20	2	—	—	—	—	—	—	1	1	—	2	—	—	—	—	—	4
10/3/20	2	—	—	—	—	—	—	—	—	—	—	5	4	—	—	—	9
22/1/20	3	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
17/2/20	3	—	—	—	—	1	1	9	9	20	18	6	2	—	—	—	66
10/3/30	3	—	—	—	—	3	1	8	10	20	11	10	2	5	—	—	70
22/1/20	4	—	—	—	—	1	3	6	1	6	—	—	—	—	—	—	17
17/2/20	4	—	1	1	1	2	4	5	8	14	10	4	3	1	—	—	54
10/3/20	4	—	—	1	3	5	7	8	21	19	14	4	2	1	—	—	85
22/1/20	5	—	—	—	1	1	2	2	8	3	1	3	—	—	—	—	21
17/2/20	5	—	1	2	2	2	3	3	8	7	6	1	—	—	—	—	35
10/3/20	5 and +	—	—	1	—	2	1	2	5	2	—	—	—	—	—	—	13
22/1/20	6	—	1	2	3	9	5	6	8	15	5	—	—	—	—	—	54
17/2/20	6	—	—	—	1	1	—	6	11	12	9	2	—	1	—	—	43
22/1/20	7	—	4	3	10	7	7	6	6	8	3	—	—	—	—	—	54
17/2/20	7	—	—	—	1	1	4	3	4	8	10	3	—	—	—	—	34
22/1/20	8*	2	3	3	5	7	4	3	7	7	2	1	—	—	—	—	45
17/2/20	8	—	—	—	1	2	—	3	8	3	2	—	—	—	—	—	19
22/1/20	9 and +	1	4	4	6	6	2	—	—	1	1	1	—	—	—	—	26
17/2/20	9 and +	1	1	1	—	—	—	1	1	6	—	—	—	—	—	—	11
10/3/20	2	—	—	1	4	8	16	17	9	9	6	2	1	—	—	—	73
Small	3	—	—	—	—	1	—	2	—	—	—	—	—	—	—	—	3

* 1 under 11 cm.

TABLE III.—*Continued.*

STORNOWAY SAMPLES.—THIRD YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
27/5/19	3	—	—	—	—	—	—	2	11	7	10	10	13	5	3	61
22/7/19	3	—	—	1	1	2	10	20	23	13	6	8	2	—	—	86
23/9/19	3	—	—	—	—	—	5	8	12	13	8	5	4	—	—	55
10/2/20	4	—	—	—	—	—	—	5	8	11	14	11	3	1	—	53
9/3/20	4	—	—	—	—	—	1	5	14	21	9	6	3	—	—	59
27/5/19	4	—	—	—	—	—	2	12	12	9	6	4	1	—	—	46
22/7/19	4	—	—	1	—	1	3	12	12	3	3	—	—	—	—	35
23/9/19	4	—	—	—	3	5	5	17	13	8	—	—	—	—	—	51
10/2/20	5	—	—	—	—	—	1	7	4	7	3	4	—	—	—	26
9/3/20	5	—	—	—	—	—	1	3	2	8	1	3	—	—	—	18
27/5/19	5	—	—	—	—	—	2	3	7	13	10	2	—	—	—	37
22/7/19	5	—	—	—	—	1	1	2	2	2	1	1	1	—	—	11
23/9/19	5	—	—	1	4	5	6	8	7	5	1	—	—	—	—	37
10/2/20	6	—	—	—	—	1	—	4	10	9	6	2	—	—	—	32
9/3/20	6	—	—	—	1	3	2	4	8	5	4	1	—	—	—	28
27/5/19	6	—	—	2	1	6	2	16	15	9	3	—	—	—	—	54
22/7/19	6	—	—	—	—	—	5	1	4	—	—	—	—	—	—	10
23/9/19	6	—	—	2	1	7	3	4	9	2	—	—	—	—	—	28
10/2/20	7	—	—	—	2	1	1	9	14	9	7	2	—	—	—	45
9/3/20	7	—	—	—	—	2	3	2	4	5	—	—	—	—	—	16
10/2/20	3	—	—	—	—	—	—	—	—	9	16	19	5	—	—	49
9/3/20	3	—	—	—	—	—	—	1	6	13	36	52	14	2	—	124

TABLE III.—*Continued.*

LERWICK SAMPLES.—THIRD YEAR GROWTH

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
28/5/19	3	—	—	—	—	—	—	1	7	13	8	4	—	—	—	33
5/7/19	3	—	—	—	—	—	—	3	9	11	7	3	—	—	—	33
16/8/19	3	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
21/2/20	4	—	—	—	—	—	—	2	4	4	7	4	1	—	—	22
13/3/20	4	—	—	—	—	—	—	1	6	11	11	5	3	1	—	38
28/5/19	4	—	—	—	—	2	7	3	9	8	—	—	—	—	—	29
5/7/19	4	—	—	—	—	1	9	8	8	6	1	—	—	—	—	33
16/8/19	4	—	—	—	1	—	1	2	2	3	—	—	—	—	—	9
21/2/20	5	—	—	—	—	—	1	—	5	1	1	1	2	1	—	12
13/3/20	5	—	—	—	—	—	2	—	1	4	4	1	—	1	—	13
28/5/19	5	—	—	1	1	4	4	5	8	2	1	—	—	—	—	26
5/7/19	5	—	—	1	1	3	9	7	7	—	1	—	—	—	—	29
16/8/19	5	—	—	—	3	3	7	1	3	2	—	—	—	—	—	19
21/2/20	6	—	—	—	1	—	5	12	17	15	5	10	2	—	—	67
13/3/30	6	—	—	—	—	1	3	7	20	24	15	3	1	—	—	74
28/5/19	6	—	1	1	4	4	10	4	1	2	—	—	—	—	—	27
5/7/19	6	—	—	4	3	8	8	3	3	1	—	—	—	—	—	30
16/8/19	6	—	1	2	4	7	2	6	7	5	2	—	—	—	—	36
21/2/20	7	—	—	—	—	2	4	7	9	7	7	1	1	—	—	38
13/3/20	7	—	—	—	—	4	4	8	12	7	4	1	2	—	—	42
28/5/19	7	—	—	3	2	5	8	—	1	1	—	—	—	—	—	20
5/7/19	7	1	—	2	5	11	7	9	6	1	—	—	—	—	—	42
16/8/19	7	—	—	5	3	8	12	10	2	2	2	—	—	—	—	44
21/2/20	8	—	—	—	1	—	2	3	1	1	—	—	—	—	—	8
13/3/20	8	—	—	—	—	1	2	2	—	—	—	—	—	—	—	5
16/8/19	8*	—	2	2	5	4	12	15	5	1	—	—	—	—	—	47
28/5/19	8 and +	1	1	6	5	8	10	5	2	—	—	—	—	—	—	38
5/7/19	8 and +	1	2	1	8	6	9	5	—	—	—	—	—	—	—	32
16/8/19	9 and +	—	2	3	4	12	12	6	3	—	—	—	—	—	—	42

* 1 under 16 cm

TABLE III.—*Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.—THIRD YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	28	30	Total.
13/2/20	4	—	—	—	—	—	—	2	1	10	10	17	7	—	—	47
20/2/20	4	—	—	—	—	—	—	—	—	7	12	4	3	—	—	26
13/2/20	5	—	—	—	—	1	2	2	3	3	6	2	2	—	—	21
20/2/20	5	—	—	—	—	—	—	—	—	2	4	1	2	—	—	9
13/2/20	6	—	—	—	—	—	2	9	10	12	13	5	1	—	—	52
20/2/20	6	—	—	—	—	1	3	10	18	28	16	13	5	—	—	94
13/2/20	7	—	—	—	1	—	3	7	13	9	4	1	—	—	—	38
20/2/20	7	—	—	—	—	2	4	5	9	15	4	2	—	—	—	41
13/2/20	8 and +	—	—	—	4	2	1	4	1	2	1	—	1	—	—	16
20/2/20	8 and +	—	1	—	—	—	—	2	1	2	1	1	—	—	—	8

PETERHEAD SAMPLES.—THIRD YEAR GROWTH.

19/6/19	3	—	—	—	1	18	33	25	10	1	1	—	—	—	—	89
29/7/19	3	—	—	—	2	9	28	42	22	17	9	2	—	—	—	131
20/8/19	3	—	—	—	3	21	26	43	18	8	2	1	—	—	—	122
9/9/19	3	—	—	1	—	—	2	5	7	8	8	—	1	—	—	32
19/6/19	4	—	—	—	3	15	16	3	2	1	—	—	—	—	—	40
29/7/19	4	—	1	—	2	9	5	21	10	7	4	1	—	—	—	60
20/8/19	4	—	2	1	6	14	14	8	6	6	1	—	—	—	—	58
9/9/19	4	—	—	—	—	3	3	4	9	11	7	1	—	—	—	38
19/6/19	5	—	—	3	1	4	6	3	1	—	—	—	—	—	—	18
29/7/19	5	—	—	1	2	3	—	6	3	3	—	—	—	—	—	18
20/8/19	5	—	1	4	6	6	2	4	6	2	—	—	—	—	—	31
9/9/19	5	—	—	—	—	4	1	5	3	1	2	1	—	—	—	17
19/6/19	6	—	1	—	3	6	4	4	—	—	—	—	—	—	—	18
29/7/19	6	—	—	—	1	1	4	1	1	—	—	1	—	—	—	9
20/8/19	6	—	—	1	1	6	—	3	—	—	—	—	—	—	—	11
9/9/19	6	—	—	—	—	3	4	8	7	3	1	1	—	—	—	27
19/6/19	7 and +	—	—	—	2	4	1	—	—	—	—	—	—	—	—	7
29/7/19	7 and +	—	—	—	—	2	1	1	4	—	—	1	—	—	—	9
20/8/19	7 and +	—	—	—	1	1	6	1	—	—	—	—	—	—	—	9
9/9/19	7 and +	—	—	4	1	4	8	11	8	4	1	—	—	—	—	41

TABLE III.—*Continued.*

WICK SAMPLES.—THIRD YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
8/7/19	3	—	—	—	2	24	55	40	14	5	3	—	—	—	—	143
14/8/19	3	—	—	2	8	19	18	29	15	3	1	—	—	—	—	86
8/7/19	4	—	2	1	5	13	24	16	4	2	—	—	—	—	—	67
14/8/19	4	—	1	2	3	6	4	5	2	2	1	—	—	—	—	26
8/7/19	5	—	—	—	3	12	7	—	—	—	—	—	—	—	—	22
14/8/19	5	—	1	2	2	5	3	—	2	—	—	—	—	—	—	15
8/7/19	6 and +	—	—	2	2	2	5	1	—	—	—	—	—	—	—	12
14/8/19	6 and +	2	1	—	3	6	3	3	1	1	—	—	—	—	—	20

NORTH SHIELDS SAMPLES (Drift Net).—THIRD YEAR GROWTH.

24/7/19	3	—	—	—	3	36	59	40	26	7	2	—	—	—	—	173
6/8/19	3	—	—	—	1	15	44	55	21	5	—	—	—	—	—	141
27/8/19	3	—	—	5	12	30	33	9	11	1	1	—	—	—	—	102
24/7/19	4	—	—	2	—	2	3	6	2	4	—	—	2	—	—	21
6/8/19	4	—	—	—	2	11	10	10	7	2	—	—	—	—	—	42
27/8/19	4	1	—	1	2	1	3	2	3	1	—	—	—	—	—	14
24/7/19	5 and +	—	1	1	1	2	2	—	—	—	—	—	—	—	—	7
6/8/19	5 and +	1	—	1	8	5	9	4	1	—	—	—	—	—	—	29
27/8/19	5 and +	—	1	—	—	4	1	—	1	1	—	—	—	—	—	8

NORTH SHIELDS SAMPLES (Trawled).—THIRD YEAR GROWTH.

26/9/19	3	—	—	—	1	3	16	27	17	3	1	—	—	—	—	68
8/10/19	3	—	—	2	1	8	9	14	9	1	1	1	—	—	—	46
26/9/19	4	—	—	1	5	9	15	25	3	4	—	—	—	—	—	62
8/10/19	4	—	—	—	12	7	13	15	7	1	—	—	—	—	—	55
26/9/19	5	1	—	—	1	7	9	18	3	—	—	—	—	—	—	39
8/10/19	5	—	—	—	4	8	19	7	3	—	—	—	—	—	—	41
26/9/19	6	—	1	3	6	11	14	4	2	1	—	—	—	—	—	42
8/10/19	6	—	1	2	1	7	4	—	2	—	—	—	—	—	—	17
26/9/19	7	—	—	1	5	1	3	3	1	—	—	—	—	—	—	14
8/10/19	7	—	2	3	8	10	10	4	3	—	—	—	—	—	—	40
26/9/19	8 and +	—	—	3	1	3	—	1	—	—	—	—	—	—	—	8
8/10/19	8 and +	—	1	—	4	2	4	4	—	—	—	—	—	—	—	15

TABLE III.—*Continued.*

SCARBOROUGH SAMPLES.—THIRD YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
12/8/19	3	—	—	1	7	25	33	19	12	5	—	—	—	—	—	102
11/9/19	3	—	—	5	15	46	28	14	4	3	—	—	—	—	—	115
25/9/19	3	—	—	—	—	—	8	14	13	6	1	—	—	—	—	42
12/8/19	4	—	1	1	2	4	3	5	1	2	—	—	—	—	—	19
11/9/19	4	—	—	—	1	3	7	5	8	—	1	—	—	—	—	25
25/9/19	4	—	—	—	3	5	14	23	9	5	1	—	—	—	—	60
12/8/19	5 and +	—	—	1	2	1	1	—	2	—	—	—	—	—	—	7
11/9/19	5 and +	—	1	1	2	3	7	6	2	2	—	—	—	—	—	24
25/9/19	5	1	—	—	2	10	19	20	2	2	—	—	—	—	—	56
25/9/19	6	—	—	1	6	3	5	1	2	1	—	—	—	—	—	19
25/9/19	7	—	—	3	4	9	11	2	3	—	—	—	—	—	—	32
25/9/19	8 and +	—	2	2	4	1	4	3	—	1	—	—	—	—	—	17

GREAT YARMOUTH SAMPLES.—THIRD YEAR GROWTH.

6/11/19	3	—	—	2	2	6	8	5	3	1	—	—	—	—	—	27
20/11/19	3	—	—	1	4	23	30	21	4	2	—	—	—	—	—	85
6/11/19	4	—	—	—	3	12	12	7	1	—	—	—	—	—	—	35
20/11/19	4	—	—	3	2	5	12	6	1	1	—	—	—	—	—	30
6/11/19	5	—	3	2	9	9	15	7	—	—	—	—	—	—	—	45
20/11/19	5	—	1	6	11	12	20	8	2	—	—	—	—	—	—	60
6/11/19	6	—	5	8	12	14	7	2	2	—	—	—	—	—	—	50
20/11/19	6	—	3	6	7	16	10	5	1	—	—	—	—	—	—	48
6/11/19	7	—	1	7	7	8	3	—	—	—	—	—	—	—	—	26
20/11/19	7	—	2	4	8	9	7	1	1	—	—	—	—	—	—	32
6/11/19 *	8 and +	—	1	5	7	6	—	2	—	—	—	—	—	—	—	23
20/11/19	8 and +	—	—	1	7	5	5	1	—	—	—	—	—	—	—	19

* 2 under 16 cm.

TABLE III.—*Continued.*

FIRTH OF FORTH SAMPLES.—THIRD YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	17	18	19	20	21	22	23	24	25	26	27	28	29	30	Total.
22/1/20	3	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2
17/2/20	3	—	—	—	1	2	4	12	25	15	4	2	1	—	—	66
10/3/20	3	—	—	—	—	2	6	13	22	11	10	4	1	1	—	70
22/1/20	4	—	—	—	—	2	5	5	3	2	—	—	—	—	—	17
17/2/20	4	—	—	—	1	3	4	5	8	15	9	8	—	1	—	54
10/3/20	4	—	—	—	2	5	4	7	18	24	18	6	—	1	—	85
22/1/20	5	—	—	—	1	1	1	6	5	4	2	1	—	—	—	21
17/2/20	5	—	—	1	2	3	2	8	10	6	3	—	—	—	—	35
10/3/20	5 and +	—	—	1	—	1	1	6	4	—	—	—	—	—	—	13
22/1/20	6	—	—	—	3	12	9	13	13	4	—	—	—	—	—	54
17/2/20	6	—	—	—	1	1	1	11	16	10	2	—	1	—	—	43
22/1/20	7	—	—	5	4	17	7	9	10	2	—	—	—	—	—	54
17/2/20	7	—	—	1	—	2	3	7	12	9	—	—	—	—	—	34
22/1/20	8	1	—	4	7	9	6	7	8	2	1	—	—	—	—	45
17/2/20	8	—	—	—	1	2	1	5	8	2	—	—	—	—	—	19
22/1/20	9 and +	—	1	1	6	12	3	—	1	1	1	—	—	—	—	26
17/2/20	9 and +	—	1	—	—	2	—	1	4	3	—	—	—	—	—	11
10/3/20 Small	3	—	—	—	—	1	1	1	—	—	—	—	—	—	—	3

TABLE III.—*Continued.*

STORNOWAY SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
27/5/19	4	—	—	—	—	—	1	2	16	13	7	6	1	—	46
22/7/19	4	—	—	—	1	1	1	8	10	13	1	—	—	—	35
23/9/19	4	—	—	—	—	3	4	12	21	10	1	—	—	—	51
10/2/20	5	—	—	—	—	—	—	1	6	8	3	5	3	—	26
9/3/20	5	—	—	—	—	—	1	1	2	8	3	1	2	—	18
27/5/19	5	—	—	—	—	—	1	3	10	5	14	3	1	—	37
22/7/19	5	—	—	—	—	—	2	1	3	1	1	3	—	—	11
23/9/19	5	—	—	—	—	1	10	8	13	4	1	—	—	—	37
10/2/20	6	—	—	—	—	—	—	—	3	13	10	6	—	—	32
9/3/20	6	—	—	—	—	—	2	5	6	6	5	4	—	—	28
27/5/19	6	—	—	2	—	3	4	11	19	10	4	1	—	—	54
22/7/19	6	—	—	—	—	—	1	4	4	1	—	—	—	—	10
23/9/19	6	—	—	—	2	4	5	6	9	2	—	—	—	—	28
10/2/20	7	—	—	—	—	—	2	2	15	12	10	4	—	—	45
9/3/20	7	—	—	—	—	—	2	1	4	6	3	—	—	—	16
10/2/20	4	—	—	—	—	—	—	—	5	19	15	10	2	2	53
9/3/20	4	—	—	—	—	—	—	4	12	16	19	3	5	—	59

TABLE III.—*Continued.*

LERWICK SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
28/5/19	4	—	—	—	—	—	4	6	9	9	1	—	—	—	29
5/7/19	4	—	—	—	—	—	4	8	10	10	—	1	—	—	33
16/8/19	4	—	—	—	—	1	1	3	2	2	—	—	—	—	9
21/2/20	5	—	—	—	—	—	—	—	1	1	4	1	4	1	12
13/3/20	5	—	—	—	—	—	—	1	1	—	5	4	2	—	13
28/5/19	5	—	—	—	—	1	9	6	9	—	—	1	—	—	26
5/7/19	5	—	—	—	1	2	8	6	11	—	1	—	—	—	29
16/8/19	5	—	—	—	2	2	7	1	7	—	—	—	—	—	19
21/2/20	6	—	—	—	—	—	—	2	6	23	12	18	6	—	67
13/3/20	6	—	—	—	—	—	—	3	7	24	23	15	1	1	74
28/5/19	6	—	—	—	2	5	6	9	3	—	2	—	—	—	27
5/7/19	6	—	—	1	2	6	12	6	1	2	—	—	—	—	30
16/8/19	6	—	—	1	—	4	9	8	5	7	2	—	—	—	36
21/2/20	7	—	—	—	—	—	—	2	7	14	11	3	1	—	38
13/3/20	7	—	—	—	—	—	1	5	5	18	10	3	—	—	42
28/5/19	7	—	—	—	3	1	9	6	—	—	1	—	—	—	20
5/7/19	7	—	—	1	2	16	11	4	7	1	—	—	—	—	42
16/8/19	7	—	—	—	4	7	9	12	9	1	2	—	—	—	44
21/2/20	8	—	—	—	—	—	—	2	2	2	2	—	—	—	8
13/3/20	8	—	—	—	—	—	—	3	2	—	—	—	—	—	5
16/8/19	8	—	1	—	2	6	10	16	10	2	—	—	—	—	47
28/5/19	8 and +	—	2	—	7	9	11	7	2	—	—	—	—	—	38
5/7/19	8 and +	—	1	2	2	12	10	4	1	—	—	—	—	—	32
16/8/19	9 and +	—	—	—	3	9	13	15	2	—	—	—	—	—	42
21/2/20	4	—	—	—	—	—	—	—	2	8	3	6	3	—	22
13/3/20	4	—	—	—	—	—	—	—	4	7	13	9	4	1	38

TABLE III.—*Continued.*

WICK SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total
8/7/19	4	—	1	—	3	13	26	15	7	1	1	—	—	—	67
14/8/19	4	—	—	—	2	8	7	2	5	2	—	—	—	—	26
8/7/19	5	—	—	—	3	11	7	1	—	—	—	—	—	—	22
14/8/19	5	—	—	1	3	4	3	3	1	—	—	—	—	—	15
8/7/19	6 and +	—	—	1	2	4	4	1	—	—	—	—	—	—	12
14/8/19	6 and +	—	1	2	1	4	5	4	3	—	—	—	—	—	20

PETERHEAD SAMPLES.—FOURTH YEAR GROWTH.

19/6/19	4	—	—	—	1	14	14	8	2	1	—	—	—	—	40
29/7/19	4	—	—	—	1	4	9	14	17	10	3	2	—	—	60
20/8/19	4	—	1	1	4	14	14	8	12	1	3	—	—	—	58
9/9/19	4	—	—	—	—	1	2	7	8	15	5	—	—	—	38
19/6/19	5	—	—	—	4	5	5	3	1	—	—	—	—	—	18
29/7/19	5	—	—	—	1	3	4	4	5	—	1	—	—	—	18
20/8/19	5	—	—	1	3	7	6	8	5	1	—	—	—	—	31
9/9/19	5	—	—	—	—	—	2	4	7	2	2	—	—	—	17
19/6/19	6	—	—	1	4	7	4	2	—	—	—	—	—	—	18
29/7/19	6	—	—	—	—	1	4	2	—	2	—	—	—	—	9
20/8/19	6	—	—	—	3	1	4	3	—	—	—	—	—	—	11
9/9/19	6	—	—	—	—	—	1	6	16	3	1	—	—	—	27
19/6/19	7 and +	—	—	—	1	5	—	1	—	—	—	—	—	—	7
29/7/19	7 and +	—	—	—	—	1	1	4	1	1	—	1	—	—	9
20/8/19	7 and +	—	—	—	1	1	4	3	—	—	—	—	—	—	9
9/9/19	7 and +	—	—	—	2	4	6	11	11	6	1	—	—	—	41

TABLE III.—*Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
13/2/20	4	—	—	—	—	—	—	—	1	5	10	22	8	1	47
20/2/20	4	—	—	—	—	—	—	—	—	3	8	10	5	—	26
13/2/20	5	—	—	—	—	—	—	—	1	3	6	8	3	—	21
20/2/20	5	—	—	—	—	—	—	—	—	—	2	4	2	1	9
13/2/20	6	—	—	—	—	—	—	1	5	12	23	8	3	—	52
20/2/20	6	—	—	—	—	—	—	—	5	25	41	16	7	—	94
13/2/20	7	—	—	—	—	—	—	1	14	14	7	2	—	—	38
20/2/20	7	—	—	—	—	—	—	5	2	17	14	2	1	—	41
13/2/20	8 and +	—	—	—	—	—	3	3	3	2	4	—	1	—	16
20/2/20	8 and +	—	—	1	—	—	—	—	2	3	1	1	—	—	8

NORTH SHIELDS SAMPLES (Drift Net).—FOURTH YEAR GROWTH.

24/7/19	4	—	—	—	—	—	1	5	7	5	1	—	2	—	21
6/8/19	4	—	—	—	—	—	2	4	14	11	9	1	1	—	42
27/8/19	4	—	—	—	—	—	2	3	—	3	5	1	—	—	14
24/7/19	5 and +	—	—	—	—	—	1	2	3	1	—	—	—	—	7
6/8/19	5 and +	—	—	—	—	2	3	10	9	4	1	—	—	—	29
27/8/19	5 and +	—	—	—	—	1	—	2	2	2	—	1	—	—	8

NORTH SHIELDS SAMPLES (Trawled).—FOURTH YEAR GROWTH.

26/9/19	4	—	—	—	—	—	4	6	15	28	5	3	1	—	62
8/10/19	4	—	—	—	—	—	2	9	15	20	8	1	—	—	55
26/9/19	5	—	—	—	—	1	1	4	13	15	5	—	—	—	39
8/10/19	5	—	—	—	—	—	1	9	14	14	3	—	—	—	41
26/9/19	6	—	—	—	1	—	7	8	18	4	3	1	—	—	42
8/10/19	6	—	—	—	—	—	3	5	6	2	1	—	—	—	17
26/9/19	7	—	—	—	—	1	—	5	3	4	1	—	—	—	14
8/10/19	7	—	—	—	—	3	5	7	16	5	4	—	—	—	40
26/9/19	8 and +	—	—	—	—	1	3	2	1	1	—	—	—	—	8
8/10/19	8 and +	—	—	—	—	—	1	5	3	6	—	—	—	—	15

TABLE III.—*Continued.*

SCARBOROUGH SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
12/8/19	4	—	—	—	1	6	2	7	2	1	—	—	—	—	19
11/9/19	4	—	—	—	1	—	4	10	7	3	—	—	—	—	25
25/9/19	4	—	—	—	—	2	11	22	19	4	2	—	—	—	60
12/8/19	5 and +	—	—	—	—	4	1	—	1	1	—	—	—	—	7
11/9/19	5 and +	—	—	1	1	3	8	8	2	1	—	—	—	—	24
25/9/19	5	—	—	1	—	3	17	28	7	—	—	—	—	—	56
25/9/19	6	—	—	—	1	6	5	5	1	—	1	—	—	—	19
25/9/19	7	—	—	—	3	10	10	6	3	—	—	—	—	—	32
25/9/19	8 and +	—	—	1	3	4	4	4	1	—	—	—	—	—	17

GREAT YARMOUTH SAMPLES.—FOURTH YEAR GROWTH.

6/11/19	4	—	—	—	1	9	16	8	1	—	—	—	—	—	35
20/11/19	4	—	—	1	—	5	14	7	2	—	1	—	—	—	30
6/11/19	5	—	—	4	1	15	15	10	—		—	—		—	45
20/11/19	5	—	—	1	5	17	20	14	3	—	—	—	—	—	60
6/11/19	6	—	—	5	12	18	11	3	1	—	—	—	—	—	50
20/11/19	6	—	—	1	6	16	18	6	1	—	—	—	—	—	48
6/11/19	7	—	—	1	12	8	5	—	—	—	—	—	—	—	26
20/11/19	7	—	—	2	5	11	11	3	—	—	—	—	—	—	32
6/11/19	8 and +	2	—	2	9	8	1	1	—	—	—	—	—	—	23
20/11/19	8 and +	—	—	—	3	9	5	2	—	—	—	—	—	—	19

TABLE III.—*Continued.*

FIRTH OF FORTH SAMPLES.—FOURTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	Total.
22/1/20	4	—	—	—	—	2	2	4	7	2	—	—	—	—	17
17/2/20	4	—	—	—	—	3	2	7	8	7	15	10	1	1	54
10/3/20	4	—	—	—	—	3	5	5	8	24	24	13	2	1	85
22/1/20	5	—	—	—	—	1	2	5	5	5	2	—	1	—	21
17/2/20	5	—	—	—	2	1	2	4	11	13	1	1	—	—	35
10/3/20	5 and +	—	—	—	—	1	2	5	4	1	—	—	—	—	13
22/1/20	6	—	—	—	1	2	11	19	19	1	—	1	—	—	54
17/2/20	6	—	—	—	—	—	4	8	21	7	1	1	1	—	43
22/1/20	7	—	—	—	3	4	16	18	12	1	—	—	—	—	54
17/2/20	7	—	—	—	1	1	5	8	13	6	—	—	—	—	34
22/1/20	8	—	—	—	3	8	12	8	10	4	—	—	—	—	45
17/2/20	8	—	—	—	—	2	—	7	9	1	—	—	—	—	19
22/1/20	9 and +	—	—	—	1	6	9	7	1	2	—	—	—	—	26
17/2/20	9 and +	—	—	1	—	—	1	3	4	2	—	—	—	—	11

TABLE III.—*Continued.*

STORNOWAY SAMPLES.—FIFTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	23	24	25	26	27	28	29	30	31	32	33	34	35	Total.
27/5/19	5	—	—	1	2	7	7	12	7	1	—	—	—	—	37
22/7/19	5	—	—	1	—	5	—	3	2	—	—	—	—	—	11
23/9/19	5	—	—	2	9	12	10	4	—	—	—	—	—	—	37
10/2/20	6	—	—	—	—	—	4	15	11	2	—	—	—	—	32
9/3/20	6	—	—	1	3	4	7	6	7	—	—	—	—	—	28
27/5/19	6	2	1	5	6	14	18	6	—	2	—	—	—	—	54
22/7/19	6	—	—	—	2	6	2	—	—	—	—	—	—	—	10
23/9/19	6	—	1	6	9	7	5	—	—	—	—	—	—	—	28
10/2/20	7	—	—	—	—	6	17	11	9	2	—	—	—	—	45
9/3/20	7	—	—	—	2	—	5	7	2	—	—	—	—	—	16
10/2/20	5	—	—	—	—	4	6	4	6	6	—	—	—	—	26
9/3/20	5	—	—	—	1	2	8	3	2	1	1	—	—	—	18

LERWICK SAMPLES.—FIFTH YEAR GROWTH.

28/5/19	5	—	—	4	9	10	2	—	—	1	—	—	—	—	26
5/7/19	5	—	1	8	7	5	7	1	—	—	—	—	—	—	29
16/8/19	5	1	1	6	4	5	2	—	—	—	—	—	—	—	19
21/2/20	6	—	—	—	—	—	3	22	21	17	4	—	—	—	67
13/3/20	6	—	—	—	—	4	7	27	24	11	1	—	—	—	74
28/5/19	6	—	2	7	11	4	1	2	—	—	—	—	—	—	27
5/7/19	6	1	1	13	5	9	1	—	—	—	—	—	—	—	30
16/8/19	6†	—	2	7	6	9	8	3	—	—	—	—	—	—	36
21/2/20	7	—	—	—	1	—	6	16	12	3	—	—	—	—	38
13/3/20	7	—	—	—	1	5	7	16	13	—	—	—	—	—	42
28/5/19	7	1	2	4	9	3	—	—	1	—	—	—	—	—	20
5/7/19	7	3	8	15	8	6	2	—	—	—	—	—	—	—	42
16/8/19	7	1	8	7	9	14	2	3	—	—	—	—	—	—	44
21/2/20	8	—	—	—	—	1	2	3	1	1	—	—	—	—	8
13/3/20	8	—	—	—	—	4	1	—	—	—	—	—	—	—	5
16/8/19	8	2	3	8	13	17	4	—	—	—	—	—	—	—	47
28/5/19 *	8 and +	4	7	15	8	3	—	—	—	—	—	—	—	—	38
5/7/19 †	8 and +	3	9	10	8	1	—	—	—	—	—	—	—	—	32
16/8/19	9 and +	1	3	10	15	12	1	—	—	—	—	—	—	—	42
21/2/20	5	—	—	—	—	—	1	1	2	2	5	1	—	—	12
13/3/20	5	—	—	—	—	—	2	1	4	4	2	—	—	—	13

* 1 under 21 cm. † 1 under 22 cm.

TABLE III.—*Continued.*

WICK SAMPLES.—FIFTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	23	24	25	26	27	28	29	30	31	32	33	34	35	Total.
8/7/19	5	2	6	10	4	—	—	—	—	—	—	—	—	—	22
14/8/19	5	2	1	5	5	2	—	—	—	—	—	—	—	—	15
8/7/19	6 and +	2	4	3	3	—	—	—	—	—	—	—	—	—	12
14/8/19	6 and +	*1	3	5	5	3	1	—	—	—	—	—	—	—	20

* 2 under 22 cm.

PETERHEAD SAMPLES.—FIFTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	20	21	22	23	24	25	26	27	28	29	30	31	32	Total.
19/6/19	5	—	—	—	—	8	5	5	—	—	—	—	—	—	18
29/7/19	5	—	—	—	—	4	2	7	3	1	—	1	—	—	18
20/8/19	5	—	—	—	1	7	8	8	4	3	—	—	—	—	31
9/9/19	5	—	—	—	—	—	1	1	5	8	2	—	—	—	17
19/6/19	6	—	—	3	7	6	2	—	—	—	—	—	—	—	18
29/7/19	6	—	—	—	—	—	3	2	2	2	—	—	—	—	9
20/8/19	6	—	—	—	2	1	4	1	2	1	—	—	—	—	11
9/9/19	6	—	—	—	—	—	—	1	20	4	2	—	—	—	27
19/6/19	7 and +	—	—	—	2	3	1	1	—	—	—	—	—	—	7
29/7/19	7 and +	—	—	—	—	1	—	4	2	1	—	—	—	1	9
20/8/19	7 and +	—	—	—	—	1	6	—	2	—	—	—	—	—	9
9/9/19	7 and +	—	—	—	—	2	5	14	11	7	2	—	—	—	41

TABLE III.—*Continued.*

NORTH COAST OF SUTHERLAND SAMPLES.—FIFTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	23	24	25	26	27	28	29	30	31	32	33	33	34	Total.
13/2/20	5	—	—	—	—	—	1	2	10	5	3	—	—	—	21
20/2/20	5	—	—	—	—	—	—	—	2	5	2	—	—	—	9
13/2/20	6	—	—	—	—	1	5	19	19	8	—	—	—	—	52
20/2/20	6	—	—	—	—	—	6	29	44	15	—	—	—	—	94
13/2/20	7	—	—	—	—	1	14	20	3	—	—	—	—	—	38
20/2/20	7	—	—	4	2	7	3	11	13	1	—	—	—	—	41
13/2/20	8 and +	—	—	—	1	4	5	5	—	1	—	—	—	—	16
20/2/20	8 and +	—	—	1	—	—	2	2	3	—	—	—	—	—	8

NORTH SHIELDS SAMPLES. (Drift Net)—FIFTH YEAR GROWTH.

21/7/19	5 and +	—	2	3	2	—	—	—	—	—	—	—	—	—	7
6/8/19	5 and +	3	5	16	4	—	1	—	—	—	—	—	—	—	29
27/8/19	5 and +	1	1	2	1	2	1	—	—	—	—	—	—	—	8

NORTH SHIELDS SAMPLES (Trawled).—FIFTH YEAR GROWTH.

26/9/19	5	2	2	10	15	7	3	—	—	—	—	—	—	—	39
8/10/19	5	1	3	16	16	5	—	—	—	—	—	—	—	—	41
26/9/19	6*	—	9	21	6	4	1	—	—	—	—	—	—	—	42
8/10/19	6	1	5	7	2	2	—	—	—	—	—	—	—	—	17
26/9/19	7*	—	1	4	6	2	—	—	—	—	—	—	—	—	14
8/10/19	7	4	8	11	12	5	—	—	—	—	—	—	—	—	40
26/9/19	8 and +	3	2	2	—	1	—	—	—	—	—	—	—	—	8
8/10/19	8 and +	—	3	5	6	1	—	—	—	—	—	—	—	—	15

* 1 under 22 cm.

TABLE III.—*Continued.*

SCARBOROUGH SAMPLES.—FIFTH YEAR GROWTH.

CENTIMETRES.

Date.	Winter Rings.	23	24	25	26	27	28	29	30	31	32	33	34	35	Total
12/8/19	5 and +	—	1	2	2	1	1	—	—	—	—	—	—	—	7
11/9/19	5 and +	1	2	6	9	4	2	—	—	—	—	—	—	—	24
25/9/19	5	1	1	7	32	12	3	—	—	—	—	—	—	—	56
25/9/19	6	—	1	8	5	4	—	1	—	—	—	—	—	—	19
25/9/19	7	—	6	11	12	3	—	—	—	—	—	—	—	—	32
25/9/19	8 and +	2	3	5	6	—	1	—	—	—	—	—	—	—	17

GREAT YARMOUTH SAMPLES.—FIFTH YEAR GROWTH.

6/11/19	5*	3	4	19	15	3	—	—	—	—	—	—	—	—	45
20/11/19	5	1	7	26	19	7	—	—	—	—	—	—	—	—	60
6/11/19	6*	5	20	18	5	1	—	—	—	—	—	—	—	—	50
20/11/19	6	2	9	23	10	3	1	—	—	—	—	—	—	—	48
6/11/19	7	6	12	7	1	—	—	—	—	—	—	—	—	—	26
20/11/19	7	2	8	14	8	—	—	—	—	—	—	—	—	—	32
6/11/19	8 and +	† 4	12	1	2	—	—	—	—	—	—	—	—	—	23
20/11/19	8 and +	2	2	9	5	1	—	—	—	—	—	—	—	—	19

* 1 under 22 cm. † 4 under 22 cm.

FIRTH OF FORTH SAMPLES.—FIFTH YEAR GROWTH.

22/1/20	5	—	1	1	6	3	9	—	—	1	—	—	—	—	21
17/2/20	5	2	—	2	4	10	12	4	—	1	—	—	—	—	35
10/3/20	5 and +	—	—	2	4	4	2	1	—	—	—	—	—	—	13
22/1/20	6	1	—	3	19	21	9	—	1	—	—	—	—	—	54
17/2/20	6	—	—	—	11	16	13	1	—	1	1	—	—	—	43
22/1/20	7	—	1	8	26	17	2	—	—	—	—	—	—	—	54
17/2/20	7	—	2	3	10	10	8	—	1	—	—	—	—	—	34
22/1/20	8	1	4	12	14	10	4	—	—	—	—	—	—	—	45
17/2/20	8	—	1	1	6	11	—	—	—	—	—	—	—	—	19
22/1/20	9 and +	—	2	9	11	2	2	—	—	—	—	—	—	—	26
17/2/20	9 and +	—	1	1	3	5	1	—	—	—	—	—	—	—	11

II.—SIZE.

BY DOROTHY COWAN.

In previous reports an analysis of the size of the herrings examined, together with the size for age, has been given. The data for the year 1919 to June, 1920, will be found in Tables I. and II. The size is expressed to the nearest centimetre, 20·6 to 21·5 being taken as 21 cm.

The samples are indicated by letters for the various ports, and are in the same order as on page 10.

Table I. shows that the northern samples consisted of much larger herrings than those from the more southerly fishing grounds. This difference remains when herrings of the same age are compared, and points to the oceanic herrings from the northern fishing grounds having a much more rapid growth than those caught in the North Sea. The following table of herrings with three winter rings illustrates the difference in size for the herrings from summer feeding shoals :—

CENTIMETRES.

Port.	Date.	22	23	24	25	26	27	28	29	Total.
Lerwick ...	... 5th July ...	—	—	—	2	13	13	2	3	33
Stornoway ...	... 22nd July ...	—	5	9	27	22	6	11	5	86
Wick ...	... 8th July ...	3	26	66	33	10	5	—	—	143
Peterhead ...	... 29th July ...	1	10	34	44	25	10	7	—	131
North Shields	... 14th July ...	3	37	57	45	23	7	1	—	173
Scarborough	... 12th August ...	1	15	49	23	11	3	—	—	102

Between summer feeding shoals and autumn spawning shoals there is a considerable difference, the latter having a much larger size for age. Below is given the size for herrings with three winter rings from the summer feeding shoals (F) and autumn spawning shoals (S) of the same port :—

CENTIMETRES.

Port.	Date.	21	22	23	24	25	26	27	28	29	30	31	32	Total.
Stornoway ...	22nd July, F.	—	1	5	9	27	22	6	11	5	—	—	—	86
	23rd Sept., S.	—	—	—	1	8	16	15	6	7	2	—	—	55
Peterhead ...	20th Aug., F.	—	—	1	11	34	49	15	7	4	—	1	—	122
	23rd Sept., S.	—	—	1	—	—	2	2	10	11	5	—	1	32
Scarborough	11th Sept., F.	1	13	36	38	22	3	2	—	—	—	—	—	115
	25th Sept., S.	—	—	—	4	17	16	4	1	—	—	—	—	42

The second and third samples from the Firth of Forth, taken February and March, 1920, do not vary as to size for age to any extent. In sample 1, caught 23rd January, the herrings with four, five and six winter rings are smaller than those of the same age in the following samples. That the analysis of total length for the three samples varies will be seen from Table I. Sample 1 has a majority about 28 cm. ; sample II., while still keeping a large number about 28 cm., has a larger number of fish under 24 to 27 cm. ; sample III. also has a number of smaller fish principally about 24 cm., though large numbers are still under 27 and 28 cm. This increase in the number of small fish is due to a change in the age composition of the samples (Table II.), fish with three and four winter rings being more numerous in the later samples than in sample I.

It has been shown that the summer herrings decrease in size for age as the fishing grounds come more to the south. This fact is also true for the winter herrings as the following table will show. Herrings with six winter rings have been taken, as they were the fish most evenly represented in the samples.

CENTIMETRES.

Port.	Date.	26	27	28	29	30	31	32	33	Total.
Lerwick ...	... 21st February ...	—	—	—	1	11	25	20	10	67
North Coast of Sutherland	... 13th February	—	—	1	1	19	20	11	—	52
Stornoway ...	... 10th February	—	—	1	2	16	12	1	—	32
Firth of Forth	... 17th February	4	10	12	14	1	1	—	—	43

Two samples worth noting are the first sample from Stornoway and the first one from Lerwick. They were taken May 27th and 28th respectively. They had much the same age composition, the Lerwick sample having more fish with over six winter rings. In spite of this, the Lerwick fish are smaller than those from Stornoway. Below is given an analysis of the two samples age for age :—

CENTIMETRES.

Port.	Rings. Winter	24	25	26	27	28	29	30	31	32	Total.
Stornoway	3	3	12	9	10	9	12	5	1	—	61
Lerwick...	3	1	5	19	6	2	—	—	—	—	33
Stornoway	4	—	3	8	19	7	5	4	—	—	46
Lerwick...	4	1	3	9	9	7	—	—	—	—	29
Stornoway	5	—	1	2	5	6	12	10	1	—	37
Lerwick...	5	—	3	7	8	7	—	—	1	—	26
Stornoway	6	—	2	4	5	12	17	10	3	1	54
Lerwick...	6	—	1	5	10	8	—	2	1	—	27
Stornoway	7	—	—	—	—	—	4	4	6	1	15
Lerwick...	7	—	1	—	5	11	2	—	—	1	20

The smallest sample examined was from the Firth of Forth, 16th March. It was composed of herrings with one and two winter rings. The size will be seen in Table I.

The opportunity is taken to correct here an error that occurred in the printing of last year's report (Herring Investigations, 1918, Table IV., page 15, sample 8). The range of size is given under 20 to 28 cm. This is 1 cm. too small, and should be from 21 to 29 cm.

TABLE I.—SIZE.

CENTIMETRES.

Samples.		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
SY.—1 ...	Nos. ...	—	—	—	—	—	4	21	23	41	39	53	37	7	1	—	—	—
	% ...	—	—	—	—	—	1·8	9·3	10·2	18·1	17·2	23·4	16·3	3·1	0·4	—	—	—
SY.—2 ...	Nos. ...	—	1	1	7	18	29	60	47	22	30	12	9	3	—	—	—	—
	% ...	—	0·4	0·4	3·0	8·0	12·0	15·0	20·0	9·0	13·0	5·0	4·0	1·0	—	—	—	—
SY.—3 ...	Nos. ...	—	—	—	—	—	2	16	41	57	38	36	11	—	—	—	—	—
	% ...	—	—	—	—	—	1·0	8·0	20·2	28·4	18·9	17·9	5·5	—	—	—	—	—
SY.—4 ...	Nos. ...	—	—	—	—	—	—	9	21	42	29	21	42	38	8	2	—	—
	% ...	—	—	—	—	—	—	4·3	9·1	19·8	13·9	9·9	19·8	17·9	3·8	0 9	—	—
SY.—5 ...	Nos. ...	—	—	2	3	3	10	17	50	71	48	16	26	12	4	—	—	—
	% ...	—	—	0·8	1·0	1·0	3·8	6·5	19·1	27·0	18·3	6·1	9·9	4·6	1·5	—	—	—
LK.—1 ...	Nos. ...	—	—	—	—	—	2	14	41	42	49	20	3	2	1	—	—	—
	% ...	—	—	—	—	—	1·1	8·0	23·6	24·1	28·2	11·5	1·7	1·1	0·6	—	—	—
LK —2 ...	Nos. ...	—	—	—	—	—	—	9	40	75	40	25	11	—	—	—	—	—
	% ...	—	—	—	—	—	—	4·5	20·0	37·5	20·0	12·5	5·5	—	—	—	—	—
LK.—3 ...	Nos. ...	—	—	—	—	—	1	7	21	17	46	45	45	17	—	—	—	—
	% ...	—	—	—	—	—	0·5	3·5	10·5	8·5	23·0	22·5	22·5	8·5	—	—	—	—
LK.—4 ...	Nos. ...	—	—	—	—	—	—	1	2	9	4	8	17	40	50	18	1	1
	% ...	—	—	—	—	—	—	0·7	1·3	6·0	2·6	5·3	11·3	25·5	33·1	11·9	0·7	0·7
LK.—5 ...	Nos. ...	—	—	—	—	—	—	—	6	7	18	17	38	54	28	8	—	—
	% ...	—	—	—	—	—	—	—	3·4	4·0	10·2	9·7	21·6	30·6	15·9	4·6	—	—
WK.—1 ...	Nos. ...	—	—	—	4	29	86	73	33	19	5	1	—	—	—	—	—	—
	% ...	—	—	—	0·6	11·6	34·4	29·2	13·4	7·6	2·0	0·4	—	—	—	—	—	—
WK.—2 ...	Nos. ...	—	—	2	7	24	33	44	24	18	11	3	2	—	—	—	—	—
	% ...	—	—	1·2	4·2	14·3	19·6	26·2	14·3	10·7	6·5	1·8	1·2	—	—	—	—	—
PD.—1 ...	Nos. ...	—	—	—	8	39	52	46	26	5	3	1	—	—	—	—	—	—
	% ...	—	—	—	4·4	21·6	28·8	25·6	14·4	2·8	1·7	0·6	—	—	—	—	—	—
PD.—2 ...	Nos. ...	—	—	—	2	13	46	62	49	40	21	8	8	—	—	—	—	—
	% ...	—	—	—	0·8	5·2	18·4	24·8	19·6	16·0	8·4	3·2	3·2	—	—	—	—	—
PD.—3 ...	Nos. ...	—	—	2	2	21	52	75	38	24	24	7	5	—	—	—	—	—
	% ...	—	—	0·8	0·8	8·4	20·9	30·1	15·3	9·6	9·6	2·8	2·0	—	—	—	—	—
PD — 4 ...	Nos. ...	—	2	7	10	1	4	4	17	22	32	46	22	10	—	—	—	—
	% ...	—	1·1	3·9	5·6	0·6	2·3	2·3	9·6	12·4	18·1	26·0	12·4	5·6	—	—	—	—
PD.—5 ...	Nos. ...	—	—	—	—	—	—	1	1	6	12	25	49	48	31	3	—	—
	% ...	—	—	—	—	—	—	0·6	0·6	3·4	6·8	14·2	27·8	27·2	17·6	1·7	—	—
PD.—6 ...	Nos. ...	—	—	—	—	—	—	—	—	5	10	19	38	76	31	3	1	—
	% ...	—	—	—	—	—	—	—	—	2·7	5·6	10·1	20·8	41·5	16·9	1·6	0·5	—

TABLE I.—*Continued.*

CENTIMETRES.

Sample.		19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
S.N.—1 ...	Nos. ...	—	—	2	11	57	76	56	33	12	2	1	—	—	—	—	—	—
Drift	% ...	—	—	0·8	4·4	22·8	30·4	22·4	13·2	4·8	0·8	0·4	—	—	—	—	—	—
S.N.—2 ...	Nos.	—	—	1	1	22	75	83	44	16	7	1	—	—	—	—	—	—
Drift	% ...	—	—	0·4	0·4	8·8	30·0	33·2	17·6	6·4	2·8	0·4	—	—	—	—	—	—
S.N.—3 ...	Nos. ...	—	—	11	36	77	63	33	15	8	4	3	—	—	—	—	—	—
Drift	% ...	—	—	4·4	14·8	30·8	25·2	13·2	6·0	3·2	1·6	1·2	—	—	—	—	—	—
S.N.—4 ...	Nos. ...	—	1	1	1	11	26	53	67	48	20	14	—	—	—	—	—	—
Trawled	% ...	—	0·4	0·4	0·4	4·5	10·7	21·9	27·7	19·8	8·3	5·8	—	—	—	—	—	—
S.N.—5 ...	Nos. ...	2	2	3	7	8	20	41	58	50	23	13	2	—	—	—	—	—
Trawled	% ...	0·9	0·9	1·3	3·1	3·5	8·7	17·9	25·3	21·8	10·0	5·7	0·9	—	—	—	—	—
SH —1 ...	Nos. ...	—	—	4	9	42	79	36	21	5	1	2	1	—	—	—	—	—
	% ...	—	—	2·0	4·5	21·0	39·5	18·0	10·5	2·5	0·5	1·0	0·5	—	—	—	—	—
SH.—2 ...	Nos. ...	3	2	7	32	75	55	27	16	18	10	4	1	—	—	—	—	—
	% ...	1·2	0·8	2·8	12·8	30·0	22·0	10·8	6·4	7·2	4·0	1·6	0·4	—	—	—	—	—
SH.—3 ...	Nos. ...	—	—	—	4	6	14	31	48	69	45	23	5	—	—	—	—	—
	% ...	—	—	—	1·6	2·5	5·7	12·7	19·6	28·1	18·4	9·4	2·0	—	—	—	—	—
YH.—1 ...	Nos. ...	—	—	1	5	9	19	49	51	60	15	1	1	—	—	—	—	—
	% ...	—	—	0·5	2·4	4·3	9·0	23·2	24·2	28·4	7·1	0·5	0·5	—	—	—	—	—
YH.—2 ...	Nos. ...	—	—	—	6	20	37	50	62	59	37	10	5	—	—	—	—	—
	% ...	—	—	—	2·1	7·0	12·8	17·5	21·7	20·6	12·8	3·5	1·7	—	—	—	—	—
F.F.—1 ...	Nos. ...	—	—	2	—	3	4	5	16	37	89	46	15	3	—	—	—	—
	% ...	—	—	0·9	—	1·4	1·8	2·3	7·3	16·8	40·5	20·9	6·8	1·4	—	—	—	—
F.F.—2 ...	Nos. ...	*1	1	4	4	17	27	24	26	31	63	56	5	5	—	—	1	—
	% ...	0·4	0·4	1·5	1·5	6·4	10·1	9·0	9·9	11·6	23·5	20·9	1·9	1·9	—	—	0·4	—
F.F.—3 ...	Nos. ...	—	—	2	11	20	27	17	20	32	30	15	2	1	—	—	—	—
	% ...	—	—	1·1	6·2	11·3	15·3	9·6	11·3	18·0	17·0	8·5	1·1	0·6	—	—	—	—

CENTIMETRES.

Sample.		10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
F.F.—4 ...	Nos. ..	3	5	9	5	2	4	8	16	17	9	9	7	3	2	—	—	—

* 1 under 18 cm.

TABLE II.—SIZE AND AGE.

CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
SY.—1 ...	2	—	—	—	—	—	1	3	—	2	—	—	—	—	—	—	—	6
	3	—	—	—	—	—	3	12	9	10	9	12	5	1	—	—	—	61
	4	—	—	—	—	—	—	3	8	19	7	5	4	—	—	—	—	46
	5	—	—	—	—	—	—	1	2	5	6	12	10	1	—	—	—	37
	6	—	—	—	—	—	—	2	4	5	12	17	10	3	1	—	—	54
	7	—	—	—	—	—	—	—	—	—	4	4	6	1	—	—	—	15
	8	—	—	—	—	—	—	—	—	—	1	3	1	—	—	—	—	5
	10	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	2
		—	—	—	—	—	4	21	23	41	39	53	37	7	1	—	—	226
SY.—2 ...	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	2	—	—	1	6	12	19	31	16	3	1	—	—	—	—	—	—	89
	3	—	—	—	1	5	9	27	22	6	11	5	—	—	—	—	—	86
	4	—	—	—	—	1	1	2	8	12	7	4	—	—	—	—	—	35
	5	—	—	—	—	—	—	—	1	—	5	—	4	1	—	—	—	11
	6	—	—	—	—	—	—	—	—	1	5	1	3	—	—	—	—	10
	7	—	—	—	—	—	—	—	—	—	1	2	2	1	—	—	—	6
	8	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
		—	1	1	7	18	29	60	47	22	30	12	9	3	—	—	—	239
SY.—3 ...	2	—	—	—	—	—	—	4	7	3	1	—	—	—	—	—	—	15
	3	—	—	—	—	—	1	8	16	15	6	7	2	—	—	—	—	55
	4	—	—	—	—	—	1	4	15	19	9	3	—	—	—	—	—	51
	5	—	—	—	—	—	—	—	2	11	14	6	4	—	—	—	—	37
	6	—	—	—	—	—	—	—	1	9	6	10	2	—	—	—	—	28
	7	—	—	—	—	—	—	—	—	—	2	6	2	—	—	—	—	10
	8	—	—	—	—	—	—	—	—	—	—	4	1	—	—	—	—	5
		—	—	—	—	—	2	16	41	57	38	36	11	—	—	—	—	201
SY.—4 ...	3	—	—	—	—	—	—	9	16	19	5	—	—	—	—	—	—	49
	4	—	—	—	—	—	—	—	5	19	15	10	2	2	—	—	—	53
	5	—	—	—	—	—	—	—	—	4	6	4	6	6	—	—	—	26
	6	—	—	—	—	—	—	—	—	—	1	2	16	12	1	—	—	32
	7	—	—	—	—	—	—	—	—	—	1	4	17	16	6	1	—	45
	8	—	—	—	—	—	—	—	—	—	—	1	1	1	1	—	—	4
	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
	10	—	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	2
		—	—	—	—	—	—	9	21	42	29	21	42	38	8	2	—	212
SY.—5 ..	2	—	—	2	3	2	4	—	—	—	—	—	—	—	—	—	—	11
	3	—	—	—	—	1	6	13	36	52	14	2	—	—	—	—	—	124
	4	—	—	—	—	—	—	4	12	16	19	3	5	—	—	—	—	59
	5	—	—	—	—	—	—	—	1	2	8	3	2	1	1	—	—	18
	6	—	—	—	—	—	—	—	1	1	6	5	8	7	—	—	—	28
	7	—	—	—	—	—	—	—	—	—	1	2	9	2	2	—	—	16
	8	—	—	—	—	—	—	—	—	—	—	1	2	2	—	—	—	5
	9	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
		—	—	2	3	3	10	17	50	71	48	16	26	12	4	—	—	262

TABLE II.—*Continued.*

CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
LK.—1 ...	2	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
	3	—	—	—	—	—	1	5	19	6	2	—	—	—	—	—	—	33
	4	—	—	—	—	—	1	3	9	9	7	—	—	—	—	—	—	29
	5	—	—	—	—	—	—	3	7	8	7	—	—	1	—	—	—	26
	6	—	—	—	—	—	—	1	5	10	8	—	2	1	—	—	—	27
	7	—	—	—	—	—	—	1	—	5	11	2	—	—	1	—	—	20
	8	—	—	—	—	—	—	—	1	1	8	5	—	—	—	—	—	15
	9	—	—	—	—	—	—	—	—	1	1	4	—	—	—	—	—	6
	10	—	—	—	—	—	—	—	—	2	2	6	1	—	—	—	—	11
	11	—	—	—	—	—	—	—	—	—	3	3	—	—	—	—	—	6
		—	—	—	—	—	2	14	41	42	49	20	3	2	1	—	—	174
LK.—2 ...	2	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
	3	—	—	—	—	—	—	2	13	13	2	3	—	—	—	—	—	33
	4	—	—	—	—	—	—	3	7	13	7	2	1	—	—	—	—	33
	5	—	—	—	—	—	—	3	6	10	6	3	1	—	—	—	—	29
	6	—	—	—	—	—	—	1	6	11	5	7	—	—	—	—	—	30
	7	—	—	—	—	—	—	—	7	15	10	5	5	—	—	—	—	42
	8	—	—	—	—	—	—	—	1	6	6	4	2	—	—	—	—	19
	9	—	—	—	—	—	—	—	—	3	3	—	1	—	—	—	—	7
	10	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
	11	—	—	—	—	—	—	—	—	1	1	1	—	—	—	—	—	3
	12	—	—	—	—	—	—	—	—	1	—	—	1	—	—	—	—	2
		—	—	—	—	—	—	9	40	75	40	25	11	—	—	—	—	200
LK.—3 ...	3	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	—	2
	4	—	—	—	—	—	—	1	3	2	3	—	—	—	—	—	—	9
	5	—	—	—	—	—	1	1	5	6	5	—	1	—	—	—	—	19
	6	—	—	—	—	—	—	2	3	3	11	10	6	1	—	—	—	36
	7	—	—	—	—	—	—	1	8	4	13	7	8	3	—	—	—	44
	8	—	—	—	—	—	—	—	2	2	8	16	13	6	—	—	—	47
	9	—	—	—	—	—	—	—	—	—	3	9	10	4	—	—	—	26
	10	—	—	—	—	—	—	—	—	—	2	1	6	2	—	—	—	11
	11	—	—	—	—	—	—	—	—	—	1	—	1	1	—	—	—	3
	12	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	2
		—	—	—	—	—	1	7	21	17	46	45	45	17	—	—	—	199
LK.—4 ...	3	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	—	1
	4	—	—	—	—	—	—	—	2	8	3	6	3	—	—	—	—	22
	5	—	—	—	—	—	—	—	—	—	1	1	2	2	5	1	—	12
	6	—	—	—	—	—	—	—	—	—	—	1	11	25	20	10	—	67
	7	—	—	—	—	—	—	—	—	1	—	—	1	11	20	5	—	38
	8	—	—	—	—	—	—	—	—	—	—	—	—	2	5	—	1	8
	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	*2
	13	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
		—	—	—	—	—	—	1	2	9	4	8	17	40	50	18	1	151

* 1 at 35 cm.

TABLE II.—*Continued.*

CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
LK.—5 ...	3	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
	4	—	—	—	—	—	—	—	4	7	13	9	4	1	—	—	—	38
	5	—	—	—	—	—	—	—	—	—	2	1	4	4	2	—	—	13
	6	—	—	—	—	—	—	—	—	—	3	3	21	31	13	3	—	74
	7	—	—	—	—	—	—	—	—	—	—	4	7	15	12	4	—	42
	8	—	—	—	—	—	—	—	—	—	—	—	1	3	1	—	—	5
	9	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
	11	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	1
		—	—	—	—	—	—	—	6	7	18	17	38	54	28	8	—	176
WK.—1 ...	2	—	—	—	—	1	3	2	—	—	—	—	—	—	—	—	—	6
	3	—	—	—	3	26	66	33	10	5	—	—	—	—	—	—	—	143
	4	—	—	—	1	2	14	27	12	9	1	1	—	—	—	—	—	67
	5	—	—	—	—	—	3	9	8	2	—	—	—	—	—	—	—	22
	6	—	—	—	—	—	—	2	2	—	3	—	—	—	—	—	—	7
	7	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	—	4
	8	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
		—	—	—	4	29	86	73	33	19	5	1	—	—	—	—	—	250
WK.—2 ..	2	—	—	1	3	9	7	1	—	—	—	—	—	—	—	—	—	21
	3	—	—	1	4	15	19	26	15	5	1	—	—	—	—	—	—	86
	4	—	—	—	—	—	6	10	4	4	2	—	—	—	—	—	—	26
	5	—	—	—	—	—	1	3	4	4	2	1	—	—	—	—	—	15
	6	—	—	—	—	—	—	2	—	2	4	1	2	—	—	—	—	11
	7	—	—	—	—	—	—	2	1	3	1	—	—	—	—	—	—	7
	8	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
	10	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
		—	—	2	7	24	33	44	24	18	11	3	2	—	—	—	—	168
PD.—1 ...	2	—	—	—	2	3	2	1	—	—	—	—	—	—	—	—	—	8
	3	—	—	—	6	35	31	12	5	—	—	—	—	—	—	—	—	89
	4	—	—	—	—	1	16	15	7	—	1	—	—	—	—	—	—	40
	5	—	—	—	—	—	2	11	4	1	—	—	—	—	—	—	—	18
	6	—	—	—	—	—	1	6	7	2	2	—	—	—	—	—	—	18
	7	—	—	—	—	—	—	1	2	1	—	—	—	—	—	—	—	4
	8	—	—	—	—	—	—	—	1	1	—	1	—	—	—	—	—	3
		—	—	—	8	39	52	46	26	5	3	1	—	—	—	—	—	180
PD —2 ...	2	—	—	—	1	2	9	6	4	1	—	—	—	—	—	—	—	23
	3	—	—	—	1	10	34	44	25	10	7	—	—	—	—	—	—	131
	4	—	—	—	—	1	3	8	14	21	8	3	2	—	—	—	—	60
	5	—	—	—	—	—	—	4	4	6	2	1	1	—	—	—	—	18
	6	—	—	—	—	—	—	—	2	2	2	1	2	—	—	—	—	9
	7	—	—	—	—	—	—	—	—	—	—	3	1	—	—	—	1	5
	8	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	2
	9	—	—	—	—	—	—	—	—	—	1	—	1	—	—	—	—	2
		—	—	—	2	13	46	62	49	40	21	8	8	—	—	—	1	250

TABLE II.—*Continued.*

CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
PD.—3 ..	2	—	—	1	1	7	4	3	2	—	—	—	—	—	—	—	—	18
	3	—	—	—	1	11	34	49	15	7	4	—	1	—	—	—	—	122
	4	—	—	1	—	3	12	16	9	6	9	2	—	—	—	—	—	58
	5	—	—	—	—	—	1	6	10	8	4	2	—	—	—	—	—	31
	6	—	—	—	—	—	1	1	2	3	1	1	2	—	—	—	—	11
	7	—	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	4
	8	—	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	4
	9	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	1
		—	—	2	2	21	52	75	38	24	24	7	5	—	—	—	—	249
PD.—4 ...	1	—	2	2	4	1	—	—	—	—	—	—	—	—	—	—	—	9
	2	—	—	4	6	—	1	1	1	—	—	—	—	—	—	—	—	13
	3	—	—	1	—	—	2	2	10	11	5	—	1	—	—	—	—	32
	4	—	—	—	—	—	1	1	5	10	14	7	—	—	—	—	—	38
	5	—	—	—	—	—	—	—	1	—	8	7	1	—	—	—	—	17
	6	—	—	—	—	—	—	—	—	—	3	18	4	2	—	—	—	27
	7	—	—	—	—	—	—	—	—	1	—	7	3	1	—	—	—	12
	8	—	—	—	—	—	—	—	—	—	1	6	9	2	—	—	—	18
	9	—	—	—	—	—	—	—	—	—	1	1	1	2	—	—	—	5
	10	—	—	—	—	—	—	—	—	—	—	—	2	1	—	—	—	3
	11	—	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	2
	12	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
		—	2	7	10	1	4	4	17	22	32	46	22	10	—	—	—	177
PD.—5 ..	3	—	—	—	—	—	—	1	—	1	—	—	—	—	—	—	—	2
	4	—	—	—	—	—	—	—	1	5	10	22	8	1	—	—	—	47
	5	—	—	—	—	—	—	—	—	—	1	2	10	5	3	—	—	21
	6	—	—	—	—	—	—	—	—	—	1	1	19	20	11	—	—	52
	7	—	—	—	—	—	—	—	—	—	—	—	11	16	11	—	—	38
	8	—	—	—	—	—	—	—	—	—	—	—	1	6	5	3	—	15
	11	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
		—	—	—	—	—	—	1	1	6	12	25	49	48	31	3	—	176
PD.—6 ...	3	—	—	—	—	—	—	—	—	2	2	1	—	—	—	—	—	5
	4	—	—	—	—	—	—	—	—	3	8	10	5	—	—	—	—	26
	5	—	—	—	—	—	—	—	—	—	—	—	2	5	2	—	—	9
	6	—	—	—	—	—	—	—	—	—	—	7	22	51	12	1	—	94
	7	—	—	—	—	—	—	—	—	—	—	1	8	17	15	—	—	41
	8	—	—	—	—	—	—	—	—	—	—	—	1	2	—	2	—	5
	9	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	1
	10	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	—	1
	11	—	—	—	—	—	—	—	—	—	—	—	—	—	1	—	—	1
		—	—	—	—	—	—	—	—	5	10	19	38	76	31	3	1	183
S N—1 .. Drift	2	—	—	2	8	19	15	3	1	1	—	—	—	—	—	—	—	49
	3	—	—	—	3	37	57	45	23	7	1	—	—	—	—	—	—	173
	4	—	—	—	—	1	4	8	5	1	1	1	—	—	—	—	—	21
	5	—	—	—	—	—	—	—	2	3	—	—	—	—	—	—	—	5
	6	—	—	—	—	—	—	—	2	—	—	—	—	—	—	—	—	2
		—	—	2	11	57	76	56	33	12	2	1	—	—	—	—	—	250

TABLE II.—*Continued.*

CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
S.N.—2 ...	2	—	—	1	1	10	14	12	—	—	—	—	—	—	—	—	—	38
Drift	3	—	—	—	—	10	54	55	17	5	—	—	—	—	—	—	—	141
	4	—	—	—	—	2	5	12	14	5	3	1	—	—	—	—	—	42
	5	—	—	—	—	—	2	3	10	2	1	—	—	—	—	—	—	18
	6	—	—	—	—	—	—	1	2	2	2	—	—	—	—	—	—	7
	7	—	—	—	—	—	—	—	1	2	1	—	—	—	—	—	—	4
		—	—	1	1	22	75	83	44	16	7	1	—	—	—	—	—	250
S.N.—3 ...	1	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
Drift	2	—	—	10	31	47	29	8	—	—	—	—	—	—	—	—	—	125
	3	—	—	—	5	29	31	22	11	3	1	—	—	—	—	—	—	102
	4	—	—	—	—	1	3	2	2	5	1	—	—	—	—	—	—	14
	5	—	—	—	—	—	—	1	1	—	2	1	—	—	—	—	—	5
	7	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
	8	—	—	—	—	—	—	—	—	—	—	2	—	—	—	—	—	2
		—	—	11	36	77	63	33	15	8	4	3	—	—	—	—	—	250
S.N.—4 ...	1	—	1	1	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Trawled	2	—	—	—	—	4	2	1	—	—	—	—	—	—	—	—	—	7
	3	—	—	—	1	6	15	30	11	5	—	—	—	—	—	—	—	68
	4	—	—	—	—	1	6	18	26	8	2	1	—	—	—	—	—	62
	5	—	—	—	—	—	2	2	16	11	6	2	—	—	—	—	—	39
	6	—	—	—	—	—	1	1	13	17	4	6	—	—	—	—	—	42
	7	—	—	—	—	—	—	1	—	3	6	4	—	—	—	—	—	14
	8	—	—	—	—	—	—	—	1	3	1	1	—	—	—	—	—	6
	10	—	—	—	—	—	—	—	—	1	1	—	—	—	—	—	—	2
		—	1	1	1	11	26	53	67	48	20	14	—	—	—	—	—	242
S.N.—5	1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	—	2
Trawled	2	2	—	1	5	3	2	—	—	—	—	—	—	—	—	—	—	13
	3	—	—	2	2	5	12	12	10	2	1	—	—	—	—	—	—	46
	4	—	—	—	—	—	5	20	20	10	—	—	—	—	—	—	—	55
	5	—	—	—	—	—	1	6	16	14	4	—	—	—	—	—	—	41
	6	—	—	—	—	—	—	1	6	8	2	—	—	—	—	—	—	17
	7	—	—	—	—	—	—	2	6	13	11	6	2	—	—	—	—	40
	8	—	—	—	—	—	—	—	—	3	4	4	—	—	—	—	—	11
	9	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	3
	11	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
		2	2	3	7	8	20	41	58	50	23	13	2	—	—	—	—	229
SH.—1 ...	2	—	—	4	8	26	26	8	—	—	—	—	—	—	—	—	—	72
	3	—	—	—	1	15	49	23	11	3	—	—	—	—	—	—	—	102
	4	—	—	—	—	1	4	5	7	1	1	—	—	—	—	—	—	19
	5	—	—	—	—	—	—	—	2	1	—	—	—	—	—	—	—	3
	6	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	—	1
	7	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
	8	—	—	—	—	—	—	—	—	—	—	1	1	—	—	—	—	2
		—	—	4	9	42	79	36	21	5	1	2	1	—	—	—	—	200

TABLE II.—*Continued.*

CENTIMETRES.

Sample	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
H.—2 ...	1	3	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3
	2	—	2	6	19	38	16	2	—	—	—	—	—	—	—	—	—	83
	3	—	—	1	13	36	38	22	3	2	—	—	—	—	—	—	—	115
	4	—	—	—	—	1	1	2	9	9	2	—	1	—	—	—	—	25
	5	—	—	—	—	—	—	1	2	4	1	2	—	—	—	—	—	10
	6	—	—	—	—	—	—	—	1	—	2	1	—	—	—	—	—	4
	7	—	—	—	—	—	—	—	1	2	3	1	—	—	—	—	—	7
	8	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	—	3
		3	2	7	32	75	55	27	16	18	10	4	1	—	—	—	—	250
H.—3 ..	2	—	—	—	4	6	8	1	—	—	—	—	—	—	—	—	—	19
	3	—	—	—	—	—	4	17	16	4	1	—	—	—	—	—	—	42
	4	—	—	—	—	—	1	12	18	19	6	4	—	—	—	—	—	60
	5	—	—	—	—	—	1	1	12	26	16	—	—	—	—	—	—	56
	6	—	—	—	—	—	—	—	1	8	6	3	1	—	—	—	—	19
	7	—	—	—	—	—	—	—	1	9	11	8	3	—	—	—	—	32
	8	—	—	—	—	—	—	—	—	1	5	5	1	—	—	—	—	12
	9	—	—	—	—	—	—	—	—	1	—	3	—	—	—	—	—	4
	11	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—	1
		—	—	—	4	6	14	31	48	69	45	23	5	—	—	—	—	245
YH.—1 ...	2	—	—	1	2	1	—	1	—	—	—	—	—	—	—	—	—	5
	3	—	—	—	3	6	8	7	2	1	—	—	—	—	—	—	—	27
	4	—	—	—	—	1	7	18	8	1	—	—	—	—	—	—	—	35
	5	—	—	—	—	1	2	9	15	14	4	—	—	—	—	—	—	45
	6	—	—	—	—	—	2	9	14	22	2	—	1	—	—	—	—	50
	7	—	—	—	—	—	—	3	9	11	3	—	—	—	—	—	—	26
	8	—	—	—	—	—	—	2	1	7	1	—	—	—	—	—	—	11
	9	—	—	—	—	—	—	—	1	4	3	1	—	—	—	—	—	9
	10	—	—	—	—	—	—	—	1	—	2	—	—	—	—	—	—	3
		—	—	1	5	9	19	49	51	60	15	1	1	—	—	—	—	211
YH —2 ...	2	—	—	—	4	2	3	3	—	—	—	—	—	—	—	—	—	12
	3	—	—	—	1	18	32	22	10	2	—	—	—	—	—	—	—	85
	4	—	—	—	1	—	1	14	10	3	—	—	1	—	—	—	—	30
	5	—	—	—	—	—	1	8	25	20	6	—	—	—	—	—	—	60
	6	—	—	—	—	—	—	2	12	17	15	1	1	—	—	—	—	48
	7	—	—	—	—	—	—	1	5	12	10	4	—	—	—	—	—	32
	8	—	—	—	—	—	—	—	—	4	3	2	1	—	—	—	—	10
	9	—	—	—	—	—	—	—	—	1	2	1	2	—	—	—	—	6
	10	—	—	—	—	—	—	—	—	—	1	2	—	—	—	—	—	3
		—	—	—	6	20	37	50	62	59	37	10	5	—	—	—	—	286

TABLE II.—*Continued.*

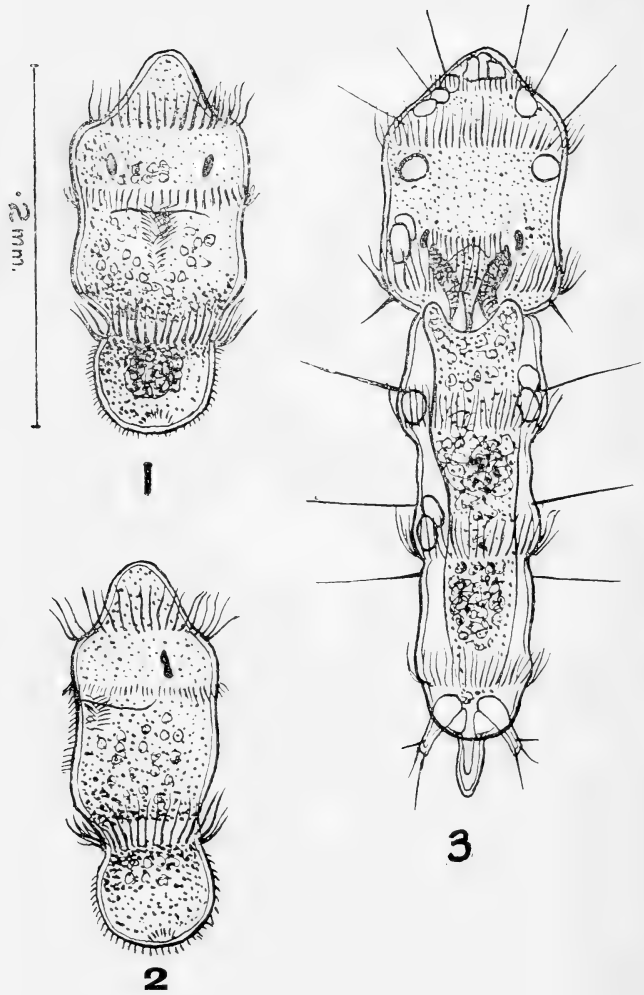
CENTIMETRES.

Sample.	Winter Rings.	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	Total.
F.F.—1 ...	2	—	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	1
	3	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	2
	4	—	—	—	—	2	2	4	7	2	—	—	—	—	—	—	—	17
	5	—	—	—	—	—	1	1	6	3	9	—	—	1	—	—	—	21
	6	—	—	—	—	—	1	—	2	18	23	9	—	1	—	—	—	54
	7	—	—	—	—	—	—	—	—	8	31	12	3	—	—	—	—	54
	8	—	—	—	—	—	—	—	1	6	19	11	8	—	—	—	—	45
	9	—	—	—	—	—	—	—	—	—	4	8	3	1	—	—	—	16
	10	—	—	—	—	—	—	—	—	—	3	5	1	—	—	—	—	9
	11	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
		—	—	2	—	3	4	5	16	37	89	46	15	3	—	—	—	220
F.F—2 ..	2	*1	—	2	—	—	—	—	—	—	—	—	—	—	—	—	—	4
	3	—	1	2	4	12	25	15	4	2	1	—	—	—	—	—	—	66
	4	—	—	—	—	3	2	7	8	7	15	10	1	1	—	—	—	54
	5	—	—	—	—	2	—	2	4	10	12	4	—	1	—	—	—	35
	6	—	—	—	—	—	—	—	4	10	12	14	1	1	—	—	1	43
	7	—	—	—	—	—	—	—	5	1	17	10	1	—	—	—	—	34
	8	—	—	—	—	—	—	—	1	1	5	11	1	—	—	—	—	19
	9	—	—	—	—	—	—	—	—	—	1	6	1	—	—	—	—	8
	10	—	—	—	—	—	—	—	—	—	—	—	—	2	—	—	—	2
	11	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	1
		1	1	4	4	17	27	24	26	31	63	56	5	5	—	—	1	266
F.F.—3 ...	2	—	—	—	5	4	—	—	—	—	—	—	—	—	—	—	—	9
	3	—	—	2	6	13	22	11	10	4	1	1	—	—	—	—	—	70
	4	—	—	—	—	3	5	5	8	24	24	13	2	1	—	—	—	85
	5	—	—	—	—	—	—	1	2	2	2	1	—	—	—	—	—	8
	6	—	—	—	—	—	—	—	—	3	1	—	—	—	—	—	—	4
	7	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	1
		—	—	2	11	20	27	17	20	32	30	15	2	1	—	—	—	177

* 1 under 18 cm.

CENTIMETRES.

Sample.	Winter Rings.	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	Total.
F.F.—4 ...	1	3	5	9	5	1	—	—	—	—	—	—	—	—	—	—	—	23
	2	—	—	—	—	1	4	8	16	17	9	9	6	2	1	—	—	73
	3	—	—	—	—	—	—	—	—	—	—	—	1	1	1	—	—	3
		3	5	9	5	2	4	8	16	17	9	9	7	3	2	—	—	99



LARVÆ OF *OPHRYOTROCHA PUERILIS.*

FIG. 1.—Ventral aspect of larva with one segment posterior to that of head.

FIG. 2.—Left aspect of same.

FIG. 3.—Ventral aspect of larva with three segments posterior to that of head.

NOTE ON LARVAE OF *OPHRYOTROCHA PUERILIS*.

BY A. D. PEACOCK, M.Sc.

On March 5th, 1920, Mr. Storrow drew my attention to the large numbers of *Ophryotrocha puerilis* in one of the tanks. On examination many of these were found to be egg-bearing, and at various times during the next fortnight batches of eggs were obtained from them. The eggs, however, never developed beyond a condition in which sixteen cells could be counted. During the next month microscopic examinations of watch glass skimmings of the surface of the tank and also of one connected with it revealed swarms of larvae with only one segment posterior to that of the head. Larvae with four to six hinder segments were also found, but only in very small numbers. Figures of larvae are given, drawn from the living specimens, since those of Braem* and Korschelt†, whilst drawn from material about the same age as mine, do not indicate certain features. For instance, Braem's figure of the larva with one posterior segment is not at all a characteristic likeness.

The larva moves forward and rotates on its long axis. The eyes, by reflected sunlight, are red. The cilia of the anterior and posterior bands are strong, coarse and long, but those of the middle band and those in the regions of the mouth, anus and posterior segment are much finer. Opportunity has not permitted me to distinguish the precise disposition of the cilia in the mouth region, but the drawings illustrate what I have observed. In the stomodaeal region an undulatory movement is visible, and has been indicated by a line in the drawing. A clear zone is very apparent between the head and posterior segments. A pair of little knobs, placed close together like terminal cirri, have been observed on the posterior segment of two specimens.

Figure 3 of a larva with three posterior segments is very similar to one of Korschelt's, except that his does not indicate

* 1893. Braem, F. Zur Ent. von *Ophryotrocha puerilis*. Zeitschr. w. Zool., lvii., pl XI.
† 1893. Korschelt, E. *Ibid.*, Pl. XIII.

clear vesicles, which in my specimen were present in an extreme anterior position, and also laterally in the head and the two succeeding segments.

Two very young worms bearing parapodia have been taken. One specimen showed five segments behind that of the head, the first (as in the adult) being without parapodia, as likewise was the fifth, while segments, two to four, were provided with them. A pair of lateral cirri and a single median one were present on the fifth. In the second specimen, which had six segments behind the head, segments two to four only had parapodia, while the sixth was provided with a pair of lateral cirri. Other young specimens with six and more pairs of parapodia were not infrequent.

Among the larvae it was interesting to find that females of *Dinophilus gyrociliatus* were also swarming.

FAUNISTIC NOTES.

Marine ciliata.—Below is given a list of marine ciliata found in two jars of stones and old shells sent from Cullercoats, 9th and 26th February, 1920, and examined by J. A. Craigie, University College, Dundee. The material was from between tide marks at the north side of the bay, and the jars filled with water from the Aquarium taps. The nomenclature is that of Nordisches Plankton, XIII., 1911.

HOLOTRICHA—

Chaenea elongata, Cl. u. Lachm.
Lionotus fasciola, O.F.M.
Aegyria oliva, Cl. u. Lachm.
Dysteria monostyla, Ehrbg.
Uronema marina, Duj.
Uronema elegans, Maup.
Uronema digitiformis, Fabre.
Placus striatus, Cohn.

OLIGOTRICHA—

Strombidium grande, Lev.

HYPOTRICHA—

**Stichotricha secunda*, Perty.
Amphisia diadenata, Rees.
Actinotricha saltans, Cohn.
Euplotes charon, O.F.M.
**Euplotes harpa*, Stein.
Certesia quadrinucleata, Fabre.
Diophrys appendiculatus, Ehrbg.
Uronychia transfuga, O.F.M.
Aspidisca costata, Duj.
Onychaspis leptaspis, Fresenius.

PERITRICHA—

Cothurnia innata, O.F.M.

Dinophilus gyrociliatus.—Females of all sizes were found swarming in two tanks from the 5th and during the whole of March, 1920. A. D. P.

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* Found with other species not in above list in aquarium tanks by T Bentham.