1021 Plymouth Winter-Herring (Orton) minus 100 Channel Sea Herring, North Sea St. H. 8 (Redeke).

Difference Vert. S. = 0.21 Standard deviation of Difference 0.091.
— K_2 = 0.55 — — - — 0.069.

The mean temperature at the bottom of the sea in the western part of the Channel is in December about 10—12° C and in February about 8—10° C. The mean temperature on the spawning places in the spawning period is then probably between 8 and 12° C. The mean salinity on the sea bottom lies between 35.2 ‰ and 35.4 ‰.

XII. Are the Summer- and Autumn-Spawning Herrings of the North Sea of importance for the great Winter Fishing in the Eastern Skagerak?

A. The Herring Fishery in the Eastern Skagerak.

In the period from December to March a great herring fishery takes place in the eastern Skagerak. The principal fishery is carried out from Bohuslän in Sweden, and the purse seine is the most important fishing gear used.

The main fishing takes place off the coasts of Bohuslän between Vinga and Hållö and westwards to the waters north of Skagen and Hirshals. At the end of the season (in March), the fishing places are usually situated off the stretch Skagen—Hirshals or even more westerly, to the North West of Rubjerg. (Fig. 15). A considerable herring trawling takes place from Germany in this last named area during the winter months, while Danish fishermen only to a small extent take part in the winter fishing in the eastern Skagerak.

The extremely great fluctuations in the yield of the Bohuslän herring fishery during winter are known from old times and are described and explained in different ways by various naturalists.

According to Ljungman (1879 (b)) and Pettersson (1922) we can distinguish between the following periods with alternately rich and poor fishing in the coastal region of Bohuslän.

1307—1362	very rich fishing, at least during the first third part of the century.
1363—1418	no rich fishing.
1419—1474	good yield, at least in the middle of the century.
1475—1530	no rich fishing.
1531—1586	very rich fishing, at least between 1556 and 1587.
1587—1642	no rich fishing.
1643—1698	good yield, at least between 1660 and 1680.
1699—1747	no rich fishing.
1748—1808	very rich fishing which in the last quarter of the century grew up to enormous dimensions.
1809—1877	no rich fishing.
1878—1896	rich fishing, especially between 1887—1896.
1897 and onwards	a period with poor fishing has begun again.

Ljungman maintained that the secular periodicity in the yield corresponded with the periodicity of the solar spots, and he supposed that there was a connection between these phenomena.

The yield of the Bohuslän herring fishery in the period 1860—1923 is represented on Fig. 12 after Otto Pettersson. For the period prior to 1896 the yield was originally recorded by Dr. Malm, and for the period 1896—1921 the statistics are compiled by Dr. Hessle. For the years 1922 and 1923 the yield stated is only approximately. The yield for the period from $^1/_4$ 1922 to $^{31}/_3$ 1923 is put down under

1923 and a similar proceeding has been followed for the previous years. The statistics also include the yield of the herring fishery in Kattegat from Bohuslän.

The curve shows that the fluctuations are extremely great. Both the very small yield in the period prior to 1878 and the exceedingly large yield in the period 1887—1896 are very peculiar. In spite of the fact that a great development has taken place in the Swedish herring fishing since 1896, the very rich yield in the period 1887—1896 has never been approached since that time.

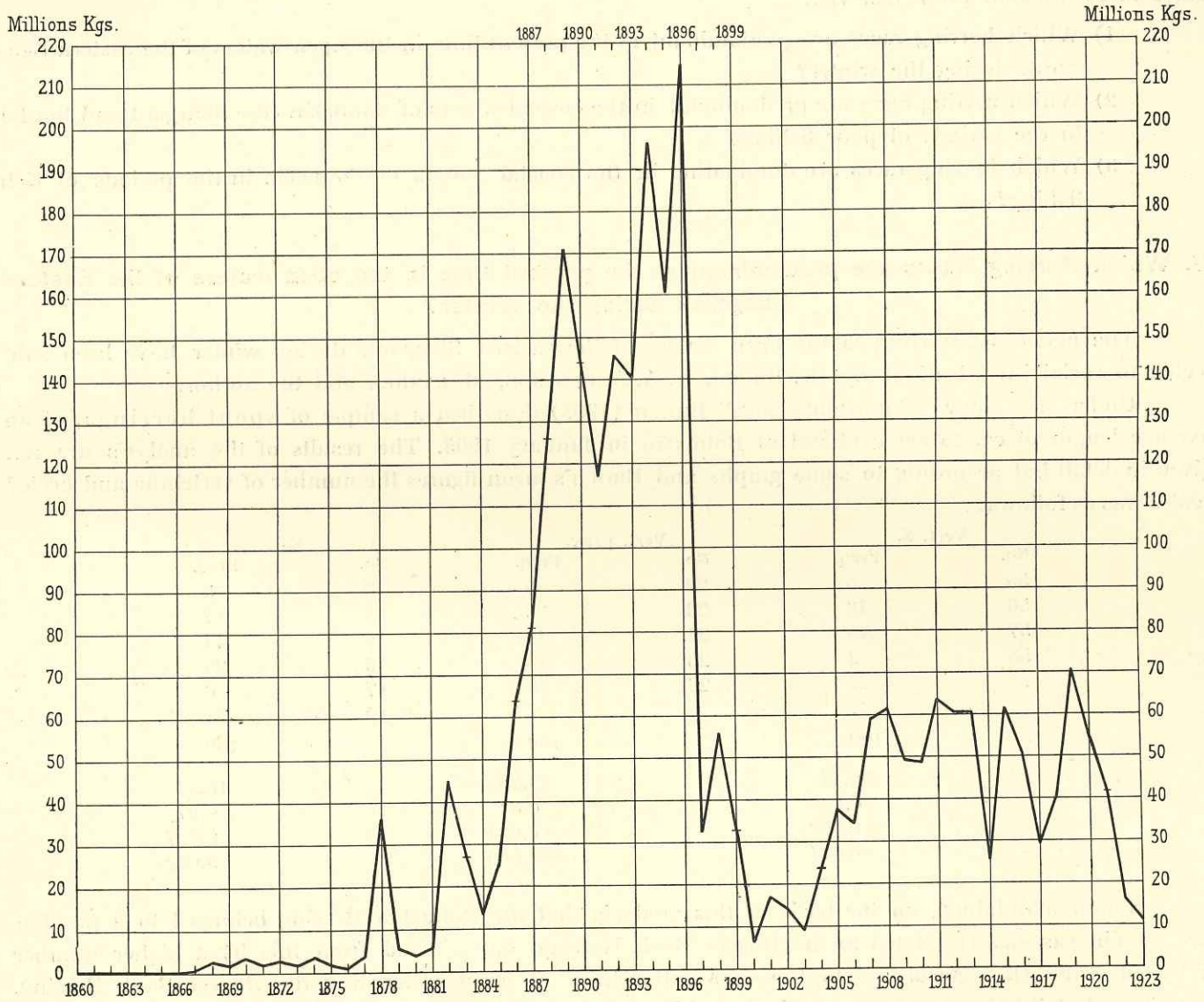

Fig. 12. The yield of the Herring Fishery from Bohuslän in the period from 1860—1923. After Otto Pettersson. In the period prior to 1897 the fishery was mainly a coast fishery. After 1904 it became mainly a fishery in the open Sea. The years 1897—1903 were a transition period.

The most important fishing apparatus in the Bohuslän Skärgård from old times were land-seines (Swedish: landvadar). Besides these drift nets and gill nets were used, e. g. during the great herring period 1887—96. According to N. Rosén (1920) the purse seine was introduced in Bohuslän in 1882, but in the beginning it played only a very subordinate rôle. At the end of the nineties of the past century, when the herring ceased to enter the Bohuslän Skärgård, the purse seine was also employed outside the Skärgård in the open sea, but it was not until motor power was introduced in the fishing vessels using the purse seine that this gear came to play a very important part. This happened in 1904, and from that

year we can date a new period in the history of the Bohuslän herring fishery. During the great herring-period from 1887—1896 the Bohuslän herring fishery was still a coast fishery. After 1904 it became mainly a fishery in the open sea. The purse seine soon became the main fishing gear, and also the herring trawl came in use.

Very different opinions have, in the course of time, been expressed as to the origin and habits of the Bohuslän Herrings. When, in the following, we shall try to elucidate this old question, we shall consider three different problems, viz.:

1) Which herring races are predominant at the present time in the open waters of the eastern Skagerak during the winter?
2) Which herring races are predominant in the coastal waters of Bohuslän (the Skärgård and fiords) in the periods of poor fishing?
3) Which herring races are dominating in the coastal waters of Bohuslän in the periods of rich fishing?

B. Which Herring Races are predominant at the present time in the open waters of the Eastern Skagerak during the Winter?

The herrings occurring in the open waters of the eastern Skagerak during winter have been subjected to racial investigations by Hj. Broch, K. A. Andersson, Molander and the author.

Under the name "Bohuslänheringe" Broch (1908) described a sample of spent herrings, of an average length of ca. 25 cm captured at Bohuslän in January 1905. The results of the analysis are not given in detail but according to some graphs and Broch's mean figures the number of vertebrae and keeled scales was as follows:

Vert. S.		Vert. præc.		K_2	
No.	Freq.	No.	Freq.	No.	Freq.
55	5	22	5	13	3
56	48	23	30	14	17
57	45	24	49	15	44
58	2	25	13	16	29
..	..	26	3	17	6
..	..	..	..	19	1
n	100		100		100
m	56.44		23.79		15.22
σ	0.62		0.84		0.97
σ_m	0.062		0.084		0.097
σ_σ	0.044		0.060		0.069

Broch maintained, on the basis of this analysis that the Bohuslän Herring belonged to a peculiar race which was closely related to the Dogger Bank Herring, but differed from this by a higher number of keeled scales (K_2). According to the information now at hand concerning the Dogger Bank Herring, (see Chap. IV) this herring has a particularly high number of keeled scales, and, in this respect, we find no difference between the Dogger Bank Herring and the sample in question. One of the samples from Dogger Bank investigated by Redeke, had even a higher average number of keeled scales (viz. 15.25) than that investigated by Broch.

K. A. Andersson (1916) and A. R. Molander (1918) are of opinion that the true "Bohuslän Winter Herring" is an autumn spawning herring, which is spawning so early in the year that the scales are formed in the very calendar year in which the hatching has taken place. They follow Heincke in the view that the "Bohuslän Winter Herring" is identical with the Jutland Bank Herring, but they are not aware that the young of the Jutland Bank Herring do not get scales in the same calendar year in which the spawning takes place (comp. Chap. IX).

Molander has tried by means of analyses of the scales to distinguish between various races of herrings caught at Skagen on March 8. 1915. He arrives at the result that there occurred two different races of autumn spawners, viz.: one with small central field in the scales, which he referred to the "Bohuslän Winter Herring", and another with large central field, which he referred to the "Kobbergrund (or Koppargrund) Herring". He found that the last harmonized with the "Kobbergrund Herrings" from the eastern Kattegat both as regard the large central field and the frequency distribution of the specimens according to the various year classes. As Dr. Molander has not investigated the number of vertebrae or fin rays etc., I consider it very doubtful whether he is right in his view. The Bank Herring of the North Sea, which according to my investigations plays a great rôle in the winter fishing of the eastern Skagerak, has also often a large central field in the scales.

When Dr. Molander includes specimens of maturity III and IV, taken on the 8. of March 1915, among the autumn spawning "Bohuslän Winter Herring" he is evidently not right. Such specimens are spring spawners.

We shall now regard the results of a series of analyses which I and my collaborators have carried out in the last decennium.

Herrings from the borders between the Kattegat and Skagerak.

In 1915 I received from Dr. K. A. Andersson a sample of fresh herrings captured by Swedish purse seine fishermen W. by S. of Vinga on February 10. 1915. Dr. Andersson stated in a letter to me (February 12. 1915) that the sample consisted of mixed herrings, and that during the Swedish fishery for the winter herring it was almost entirely such mixed herrings which had been captured, the large herrings having been extraordinarily few during the winter in question. The stage of maturity of the specimens in the sample was as follows:

ca. 1500 specimens	Maturity	I—II	(Young herrings)
- 66	—	—	III—IV	(Spring spawning herrings)
- 51	—	—	VIII	(Autumn spawning herrings).

Of the herrings of maturity I and II, 591 unsorted specimens were investigated, the lengths of which were as follows:

cm	11	12	13	14	15	16	17	18	19	20	21	22	23	24
number	2	1	5	14	10	37	88	155	103	86	54	24	10	2

The number of vertebrae was as follows:

Vert. S.		Vert. præc.		Vert. caud.	
No.	Freq.	No.	Freq.	No.	Freq.
54	3	22	5	30	4
55	15	23	148	31	40
56	181	24	270	32	180
57	263	25	128	33	244
58	119	26	36	34	110
59	10	27	3	35	13
..	..	28	1	..	..
n	591		591		591
m	56.86		24.09		32.77
σ	0.840		0.900		0.93
σ_m	0.0345		0.037		0.038
σ_σ	0.0244		0.026		0.027

This sample belongs to the Kattegat Winter Herring, which spawns in the Kattegat during winter (A. C. Johansen 1923). It differs, amongst other characters, from the North Sea Bank Herring by a higher number of vertebrae and a higher number of rays in the ventral fins.

The herrings of maturity III—IV captured south-west of Vinga on February 10. 1915 were of the following lengths:

Length cm	20	21	22	23	24	25	26	27	32	No. of spec.	Average length
♂	1	5	19	4	3	2	..	1	..	35	22.40 + 0.5
♀	..	9	7	9	3	..	2	..	1	31	22.65 + 0.5
♂ + ♀	1	14	26	13	6	2	2	1	1	66	22.52 + 0.5

The analyses showed, for the individually constant characters examined, the following distribution of the variants:

	Vert. S.		Vert. præc.		Vert. caud.		K_2	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	1	22	3	30	2	13	9
55	9	23	13	31	12	14	33
56	37	24	27	32	27	15	18
57	11	25	19	33	20	16	4
58	4	26	2	34	3	..	..
59	2	..	..	..	..	..	..
n	64		64		64		64
m	56.22		24.06		32.16		14.27
σ	0.93		0.91		0.76		0.78
σ_m	0.117		0.114		0.095		0.097
σ_σ	0.082		0.081		0.067		0.069

The number of vertebrae according to the length of the herring was distributed as follows:

Number of vertebrae	Length cm 20	21	22	23	24	25	26	27	32	Σ_I
54	..	..	1	..	..	..	..	..	..	1
55	..	..	6	2	1	..	..	..	..	9
56	1	10	12	9	3	..	1	1	..	37
57	..	1	7	1	1	1	..	..	..	11
58	..	1	..	1	..	..	1	..	1	4
59	..	..	..	..	1	1	..	..	..	2
Σ_{II}	1	12	26	13	6	2	2	1	1	64

If we calculate the correlation coefficient, we get: $r = 0.33 \pm 0.11$.

The sample does not appear to be quite homogeneous, the larger specimens having on an average a higher number of vertebrae than the smaller ones. The majority of the specimens evidently belong to one of the local races of spring spawning herrings of the Kattegat or the southern Skagerak, but a few of the larger specimens probably belong to the Winter Herrings of the Kattegat, and a single one, much larger than the other specimens (32 cm length), is probably a Norwegian Spring Herring. It had 58 vertebrae and 14 keeled scales (K_2).

The specimens of maturity VIII, captured W. by S. of Vinga on February 10. 1915, were of the following lengths.

Length cm	17	20	21	22	23	24	25	26	27	28	29	No. of spec.	Average length
♂	1	1	3	1	2	3	3	2	5	1	..	22	24.18 + 0.5
♀	..	..	2	3	4	8	6	4	..	1	1	29	24.24 + 0.5
♂ + ♀	1	1	5	4	6	11	9	6	5	2	1	51	24.22 + 0.5

The analysis showed the following distribution of the variants for vertebrae etc.:

Vert. S.		Vert. præc.		Vert. caud.		K_2		Ventr. fin rays	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	1	22	2	30	2	14	14	16	3
55	2	23	11	31	4	15	22	17	12
56	25	24	27	32	16	16	13	18	34
57	16	25	6	33	20	..	..	..	..
58	4	26	3	34	7	..	..	..	..
59	1	..	..	..	..	..	..	..	..
n	49		49		49		49		49
m	56.47		23.94		32.53		14.98		17.63
σ	0.87		0.88		0.98		0.75		0.60
σ_m	0.124		0.126		0.140		0.107		0.086
σ_σ	0.088		0.089		0.098		0.075		0.061

A comparison with the samples of the Bank Herrings of the North Sea will show that the sample at hand is in entire agreement with these. (Comp. Chap. VII).

Herrings from North of Skagen.

In the spring of 1915 I investigated a sample of herrings captured with purse seine N. of Skagen on March 17. 1915. The sample consisted of 287 specimens of the following maturity:

83	specimens	of	maturity	I and II	(Young herrings)
14	—	-	—	III—IV	(Spring spawning herrings)
190	—	-	—	VIII	(Autumn spawning herrings)

The specimens of maturity I—II were of the following lengths:

	Group A						Group B				
cm	19	20	21	22	23	24	20	21	22	23	24
number	5	13	23	27	6	2	2	0	3	1	1

The analysis gave, for the individually constant characters examined, the following results:

Herrings of maturity I and II N. of Skagen. March 17. 1915.

Group A						Group B			
Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	1	23	23	30	1	14	3	18	7
56	25	24	36	31	2	15	4	..	..
57	36	25	13	32	19	..	..	..	..
58	14	26	4	33	42	..	..	..	..
..	..	..	..	34	9	..	..	..	..
..	..	..	..	35	3	..	..	..	..
n	76		76		76		7		7
m	56.83		23.97		32.86		14.6		18.0
σ	0.73		0.83		0.86		..		..
σ_m	0.084		0.095		0.099		..		..
σ_σ	0.060		0.067		0.070		..		..

This sample, which has the same race characters as the sample mentioned on p. 63, belongs to the Kattegat Winter Herring.

The 14 specimens of maturity III and IV were of the following lengths:

cm	20	21	22	23	24	No. of spec.	Average length
♂	..	1	..	3	3	7	$23.1 + 0.5$
♀	1	2	1	1	2	7	$22.1 + 0.5$
♂ + ♀	1	3	1	4	5	14	$22.6 + 0.5$

The analysis of vertebrae and keeled scales etc. gave the following result:

Vert. S.		Vert. præc.		K_2		Ventr. fin rays	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
53	1	21	1	13	2	17	3
54	..	22	2	14	7	18	10
55	5	23	4	15	4	..	..
56	6	24	4	..	..	..	..
59	1	25	1	..	..	..	..
..	..	26	1	..	..	..	..
n	13		13		13		13
m	55.62		23.38		14.15		17.70

The specimens undoubtedly belong to one of the local races of spring herrings of the Kattegat. A herring spawning in Aalbæk Bay is of a similar type.

The specimens of maturity VIII had the following lengths:

cm	21	22	23	24	25	26	27	28	29	30	No. of spec.	Average length
♂	2	5	5	20	28	17	10	2	1	1	91	24.99 + 0.5
♀	..	8	8	17	25	23	15	2	..	1	99	25.07 + 0.5
♂ + ♀	2	13	13	37	53	40	25	4	1	1	190	25.03 + 0.5

The distribution of the variants in the individually constant characters examined was as follows:

Herrings of maturity VIII N. of Skagen. March 17. 1915.

Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	9	22	2	31	22	13	2	16	1
56	76	23	46	32	62	14	21	17	2
57	86	24	87	33	77	15	43	18	11
58	10	25	41	34	19	16	20	..	..
..	..	26	5	35	1	17	1	..	..
n	181		181		181		87		14
m	56.54		24.01		32.53		14.97		17.71
σ	0.68		0.80		0.86		0.78		0.6
σ_m	0.051		0.059		0.064		0.084		0.16
σ_σ	0.036		0.042		0.045		0.059		0.11

If we compare this sample with the sample of Bank Herrings from Balta Sound (Shetland Isles) investigated by me (Sept. 1921) we obtain the following result:

363 Bank Herrings, Balta Sound, minus 181 Autumn Herrings from Skagen:

Diff. Vert. S.	— 0.04	Standard	Dev.	of	Diff. 0.063
— Vert. præc.	— 0.17	—	—	—	0.075
— Vert. caud.	+ 0.14	—	—	—	0.081
— K_2	— 0.12	—	—	—	0.096

If we compare the sample from Skagen with the Bank Herrings from the Dogger Bank area investigated by Redeke (Aug., Sept., Oct. 1906), we obtain the following result:

65 Dogger Bank Herrings (Redeke) minus 181 Herrings from Skagen (Johansen):

Diff. Vert. S.	— 0.06	Standard	Dev.	of	Diff. 0.09
— Vert. præc.	+ 0.17	—	—	—	0.16
— Vert. caud.	— 0.24	—	—	—	0.17
— K_2	+ 0.06	—	—	—	0.13

It will be seen that we have not found any essential difference between the sample from Skagen and the samples of the North Sea Bank Herring mentioned. On the other hand the sample from Skagen differs perceptibly from the Autumn Herrings of the North Eastern Kattegat by a higher number of caudal vertebrae as well as in other ways (Chap. XI). The same holds good for the sample from Vinga.

Herrings from North of Skagen. January 5. 1924.

Of a sample of herrings caught in purse seine 3 miles N. of Skagen on January 5. 1924, 514 specimens were investigated with regard to maturity. The distribution of the different stages was as follows:

360	specimens	of	maturity	I—II	Young herrings
39	—	-	—	III and IV	Spring spawners
38	—	-	—	IV—VI	Spring spawners and winter spawners
107	—	-	—	VII—VIII	Autumn spawners.

The lengths of 95 specimens of maturity I—II were as follows:

Length cm	18	19	20	21	22	23	24	25	26	27	28	No. of spec.	Average length cm
♂	..	3	6	7	16	7	9	3	..	..	..	51	22.12 + 0.5
♀	1	4	4	9	7	3	6	4	3	1	2	44	22.52 + 0.5
♂ + ♀	1	7	10	16	23	10	15	7	3	1	2	95	22.31 + 0.5

The analysis gave the following result for the characters constant for the individual:

Vert. S. No.	Vert. S. Freq.	Vert. præc. No.	Vert. præc. Freq.	Vert. caud. No.	Vert. caud. Freq.	Keeled scales (K_9) No.	Keeled scales (K_9) Freq.	Rays in ventr. fins No.	Rays in ventr. fins Freq.
55	3	22	3	29	1	12	1	16	9
56	41	23	34	30	1	13	5	17	10
57	47	24	40	31	6	14	37	18	75
58	3	25	13	32	27	15	39	..	..
..	..	26	2	33	40	16	12	..	..
..	..	27	2	34	19	17	1	..	..
n	94		94		94		95		94
m	56.53		23.82		32.71		14.62		17.70
σ	0.64		0.94		0.97		0.85		0.64
σ_m	0.066		0.097		0.100		0.087		0.066
σ_σ	0.047		0.068		0.071		0.062		0.046

Total No.	Total Freq.	Rays in anal fins branched No.	Rays in anal fins branched Freq.	unbranched No.	unbranched Freq.	Rays in dorsal fin branched No.	Rays in dorsal fin branched Freq.
15	4	12	3	2	2	14	11
16	18	13	19	3	84	15	46
17	29	14	33	4	9	16	36
18	33	15	33	..	..	17	2
19	11	16	7	..	..	..	..
n	95		95		95		95
m	17.31		14.23		3.07		15.31
σ	1.04		0.96		0.33		0.70
σ_m	0.107		0.099		0.034		0.072
σ_σ	0.076		0.070		0.024		0.051

This sample harmonizes with the Bank Herring of the North Sea (Comp. Chap. VII) although the number of keeled scales is rather low. If we compare the figures found with those observed in the Bank Herring

from Balta Sound, Sept. 1. 1921 (p. 8), we notice a difference of 0.23 with a standard deviation of the difference of 0.10.

The lengths of 39 specimens of maturity III—IV were as follows:

Length cm	19	20	21	22	23	24	25	26	No. of spec.	Average length cm
♂	..	2	..	1	2	1	1	..	7	22.78 + 0.5
♀	1	..	9	6	7	2	2	5	32	22.43 + 0.5
♂ + ♀	1	2	9	7	9	3	3	5	39	22.72 + 0.5

The distribution of the variants for vertebrae, and keeled scales etc. was as follows:

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	3	21	1	29	1	13	3	18	38
55	11	22	8	31	4	14	24	19	1
56	12	23	12	32	16	15	11	..	..
57	12	24	12	33	10	16	1	..	..
58	1	25	5	34	6	..	..	..	..
..	..	26	1	35	2	..	..	..	..
n	39		39		39		39		39
m	55.92		23.38		32.54		14.26		18.03
σ	1.01		1.115		1.19		0.64		0.16
σ_m	0.16		0.18		0.19		0.10		0.03
σ_σ	0.11		0.13		0.135		0.07		0.02

Total		Rays in anal fin branched		unbranched		Rays in dorsal fin branched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
14	1	11	1	3	32	13	1
15	3	12	3	4	5	14	7
16	6	13	6	..	..	15	25
17	10	14	11	..	..	16	6
18	13	15	16	..	..	..	..
19	4	..	..	..	..	..	..
n	37		37		37		39
m	17.16		14.03		3.14		14.92
σ	1.24		1.11		0.35		0.66
σ_m	0.20		0.18		0.06		0.11
σ_σ	0.14		0.13		0.04		0.075

The sample belongs to one of the local races of spring spawners of the Kattegat and the southern Skagerak.

The lengths of 38 specimens of maturity IV—VI were as follows:

Length cm	20	21	22	23	24	25	26	27	No. of spec.	Average length cm
♂	1	5	9	11	4	3	2	1	36	22.9 + 0.5
♀	..	..	..	..	..	..	2	..	2	26.0 + 0.5
♂ + ♀	1	5	9	11	4	3	4	1	38	23.1 + 0.5

It will be noticed that almost all the specimens were males. If we regard the length of the specimens in proportion to the total number of vertebrae and the total number of anal fin rays, it will be seen that the larger specimens have a higher number of vertebrae and of anal fin rays than the smaller ones:

Correlation between length and total number of vertebrae in specimens of maturity IV—VI.

Length cm / Vert. S.	20	21	22	23	24	25	26	27	Σ_I
53	..	2	..	..	..	..	..	..	2
54	..	..	1	1	1	..	..	..	3
55	1	3	4	1	1	..	..	..	10
56	..	..	3	8	..	1	..	..	12
57	..	..	1	1	1	2	3	..	8
58	..	..	..	..	1	..	1	1	3
Σ_{II}	1	5	9	11	4	3	4	1	38

$r = 0.66 \pm 0.09$.

Correlation between length and total number of anal fin rays in specimens of maturity IV—VI.

Length cm / Anal rays	20	21	22	23	24	25	26	27	Σ_I
15	1	1	1	1	..	..	..	..	4
16	..	3	3	3	1	..	..	..	10
17	..	..	1	1	2	1	1	..	6
18	..	1	4	4	..	1	1	1	12
19	..	..	..	2	1	1	1	..	5
20	..	..	..	..	..	..	1	..	1
Σ_{II}	1	5	9	11	4	3	4	1	38

$r = 0.44 \pm 0.13$

If we divide the sample into two groups according to length, it appears that the specimens of 20—24 cm length harmonize with the spring spawners of maturity III—IV mentioned above, while the specimens of 25—27 cm length in all probability belong to the Winter Herrings of the Kattegat (comp. A. C. Johansen, 1923).

Length cm	No. of spec.	Vert. S.	Vert. præc.	Vert. caud.	Keeled scales K_2	Rays in ventral fins	Rays in anal fin total	Branched rays in dorsal fin
20—24	30	55.43	23.33	32.10	14.13	17.90	16.90	14.87
25—27	8	57.13	24.13	33.00	14.38	18.00	18.25	15.13

The lengths of 107 specimens of maturity VII—VIII were as follows:

Length cm	20	21	22	23	24	25	26	27	28	29	No. of spec.	Average length cm
♂	2	1	2	6	8	7	8	12	7	1	54	$25.31 + 0.5$
♀	..	1	4	11	5	10	7	9	2	4	53	$25.08 + 0.5$
♂ + ♀	2	2	6	17	13	17	15	21	9	5	107	$25.20 + 0.5$

The distribution of the variants for the individually constant characters examined is given below:

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventral fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	9	22	1	30	8	12	2	14	1
56	42	23	30	31	9	13	5	15	1
57	50	24	49	32	33	14	23	16	18
58	5	25	19	33	40	15	49	17	11
59	1	26	8	34	15	16	25	18	75
..	..	..	..	35	2	17	3	20	1
n	107		107		107		107		107
m	56.50		24.03		32.48		14.93		17.50
σ	0.76		0.90		1.11		0.96		1.00
σ_m	0.073		0.087		0.107		0.093		0.097
σ_σ	0.052		0.061		0.076		0.066		0.068

Total		Rays in anal fin branched		unbranched		Rays in dorsal fin branched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
15	3	12	3	2	6	14	9
16	19	13	18	3	90	15	57
17	31	14	34	4	9	16	37
18	36	15	37	..	..	17	2
19	15	16	11	..	..	..	..
20	1	17	2	..	..	..	..
n	105		105		105		105
m	17.42		14.39		3.03		15.30
σ	1.06		1.05		0.38		0.66
σ_m	0.104		0.103		0.037		0.064
σ_σ	0.073		0.073		0.026		0.046

It will be seen that this sample harmonizes with the Bank Herring of the North Sea (comp. Chap. VII). The number of rays in the ventral fins is unusually low, but it should be noted that the mean error of the mean value is as high as 0.10. In the Bank Herring the average number of rays in the ventral fins lies usually between 17.65 and 17.85.

Herrings from N.W. of Skagen. January 26. 1924.

A sample of Herrings of 410 specimens caught in purse seine North West of Skagen on January 26. 1924, contained:

102	herrings	of	maturity	I and II	Young herrings
42	—	-	—	III and IV	Spring spawners
16	—	-	—	IV—VI	Spring spawners and winter spawners
150	—	-	—	VII—VIII	Autumn spawners
100	—	-	—	VIII	Autumn spawners

The specimens of maturity I—V were not investigated for any other character but maturity.[1] The autumn spawners were divided in two groups according to the state of maturity and the fat contents. The group consisting of 150 specimens of maturity VII—VIII had evidently spawned later in the season than the other group of maturity VIII. The first named group consisted of meagre specimens with no fat observable in the ventral cavity, while the second group of maturity VIII had some fat on the intestines (fat contents + or 1 according to Hjort's scale). The lengths of the specimens of maturity VII—VIII were as follows:

Length cm	21	22	23	24	25	26	27	28	29	30	32	34	No. of spec.	Average length cm
Number ♂+♀	8	6	13	18	31	22	30	17	2	1	1	1	150	25.45 + 0.5

The distribution of the variants for the individually constant characters examined was as follows:

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	10	22	8	30	2	13	5	15	1
56	72	23	46	31	8	14	32	16	20
57	52	24	63	32	44	15	78	17	19
58	3	25	17	33	68	16	35	18	106
..	..	26	3	34	14	..	..	19	1
..	..	..	..	35	1	..	..	..	..
n	137		137		137		150		147
m	56.35		23.72		32.63		14.95		17.58
σ	0.648		0.840		0.830		0.763		0.757
σ_m	0.055		0.072		0.071		0.062		0.062
σ_σ	0.039		0.051		0.050		0.044		0.044

[1] The sample taken North of Skagen on January 5. 1924 contained also specimens of maturity I—VI. These specimens were subjected to a closer examination (comp. p. 67).

The sample was evidently not quite homogeneous. If we calculate the correlation between length and Vert. S. and length and K_2, we obtain the following result:

Length cm	21	22	23	24	25	26	27	28	29	30	32	34	Σ_I
Vert. S.													
55	2	2	2	..	1	2	..	1	..	..	..	..	10
56	3	2	5	10	16	10	13	9	1	1	1	1	72
57	..	1	2	5	11	9	16	7	1	..	..	..	52
58	..	..	..	..	1	1	1	..	..	..	..	..	3
Σ_{II}	5	5	9	15	29	22	30	17	2	1	1	1	137

$r = 0.27 \pm 0.08$

Length cm	21	22	23	24	25	26	27	28	29	30	32	34	Σ_I
K_2													
13	..	..	..	..	2	1	1	1	..	..	..	..	5
14	4	1	2	2	7	6	5	4	1	..	..	..	32
15	3	3	5	15	16	8	17	9	1	..	1	..	78
16	1	2	6	1	6	7	7	3	..	1	..	1	35
Σ_{II}	8	6	13	18	31	22	30	17	2	1	1	1	150

$r = 0.02 \pm 0.06$

It will be seen that the small specimens have a lower number of vertebrae than the larger ones, but about the same number of keeled scales. Most of the larger specimens evidently belonged to the Bank Herring of the North Sea. It is not clear whether the smaller ones belong to one of the local races of autumn spawners from the marginal areas of the North Sea or to the small autumn herring spawning in shallow water of the Northern Kattegat (see p. 49 footnote). From the survey below it will be seen that the specimens of 25 cm and above agree very closely with the Bank Herring of the North Sea.

Herrings of Maturity VII—VIII caught N.W. of Skagen on January 26. 1924. — Only specimens of 25—34 cm.

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventral fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	4	22	4	30	1	13	5	15	1
56	52	23	36	31	5	14	23	16	11
57	44	24	48	32	32	15	52	17	16
58	3	25	12	33	52	16	25	18	76
..	..	26	3	34	12	..	..	..	..
..	..	..	..	35	1	..	..	..	..
n	103		103		103		105		104
m	56.45		23.75		32.70		14.92		17.61
σ	0.62		0.83		0.54		0.81		0.72
σ_m	0.061		0.081		0.053		0.079		0.070
σ_σ	0.043		0.057		0.037		0.056		0.050

The lengths of the specimens of maturity VIII were as follows:

Length cm	22	23	24	25	26	27	28	29	No. of spec.	Average length cm
♂ + ♀	1	6	26	29	12	19	2	5	100	$25.35 + 0.5$

The distribution of the variants for the individually constant characters examined was as follows:

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventral fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	5	22	7	30	3	13	10	15	1
56	53	23	37	31	7	14	31	16	13
57	39	24	40	32	24	15	42	17	10
58	2	25	13	33	46	16	16	18	74
..	..	26	2	34	18	17	1	..	..
..	..	..	..	35	1	..	..	..	..
n	99		99		99		100		98

m	56.38	23.66	32.73	14.67	17.60
σ	0.618	0.871	0.978	0.900	0.753
σ_m	0.062	0.088	0.098	0.090	0.076
σ_o	0.044	0.062	0.069	0.064	0.054

Total		Rays in anal fin branched		unbranched		Rays in dorsal fin branched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
14	1	11	1	3	78	13	1
15	1	12	2	4	13	14	9
16	13	13	16	..	..	15	50
17	34	14	36	..	..	16	39
18	37	15	33	..	..	..	..
19	5	16	3	..	..	..	..
n	91		91		91		99
m	17.32		14.18		3.14		15.28
σ	0.906		0.914		0.352		0.671
σ_m	0.095		0.096		0.037		0.067
σ_o	0.067		0.068		0.026		0.048

There seems no reason to believe that the sample should not be homogeneous. If we calculate the correlation between length and number of vertebrae (Vert. S.), we obtain the correlation coefficient $r = -0.06 \pm 0.10$.

The sample belongs evidently to the Bank Herring of the North Sea, but it is noteworthy that it has a lower number of keeled scales than the other autumn spawners taken in the same catch. In all probability the Bank Herrings of maturity VII—VIII originate from the Dogger Bank area, while the specimens of maturity VIII come from a more northern part of the North Sea, where the spawning takes place at an earlier date than in the Dogger Bank area.

Also if we regard the distribution of the various year classes, there appears to be a difference between the two groups. From the survey below it will be seen that the sample of maturity VII—VIII contains proportionately many more specimens with 7 winter rings than the specimens of maturity VIII. The specimens with 3 winter rings in the sample of maturity VII—VIII probably do not belong to the Bank Herring of the North Sea.

Age and Length of herrings of maturity VII—VIII caught in purse seine N.W. of Skagen on January 26. 1924.

Length cm / No. of winter rings	21	22	23	24	25	26	27	28	29	30	32	34	Total No. of spec.	Average length cm	+ 0.5
3	4	3	2	..	..	..	..	..	..	..	..	..	9	21.78	22.28
4	4	1	7	4	1	2	1	..	..	..	..	..	20	23.35	23.85
5	..	2	4	10	15	6	3	..	..	..	..	..	40	24.70	25.20
6	..	..	..	3	9	6	8	2	..	..	..	..	28	25.89	26.39
7	..	..	..	1	3	3	12	3	1	..	1	..	24	26.92	27.42
8	..	..	..	..	..	4	3	8	..	..	..	..	15	27.27	27.77
9	..	..	..	..	..	..	2	1	..	1	..	..	4	28.00	28.50
10	..	..	..	..	..	..	..	..	1	..	..	..	1	29.00	29.50
11	..	..	..	..	..	..	..	1	..	..	..	..	1	28.00	28.50
4—5	..	..	..	..	1	..	..	..	..	..	..	..	1	..	..
?	..	..	..	..	2	1	1	2	..	..	..	1	7	..	..
Total	8	6	13	18	31	22	30	17	2	1	1	1	150	..	..

Age and length of specimens of maturity VIII caught in purse seine N.W. of Skagen on January 26. 1924.

Length cm / No. of winter rings	22	23	24	25	26	27	28	29	No. of spec.	Average length cm	+0.5
4	..	1	8	6	1	..	..	..	16	24.44	24.94
5	1	2	13	11	4	3	..	..	34	24.71	25.21
6	..	3	5	11	7	10	2	1	39	25.67	26.17
7	..	..	..	..	..	5	..	1	6	27.33	27.83
8	..	..	..	..	..	..	..	3	3	29.00	29.50
9	..	..	..	..	..	1	..	..	1	27.00	27.50
5—6	..	..	..	1	..	..	..	..	1	..	..
Total	1	6	26	29	12	19	2	5	100	..	..

It will be noted that for both samples the average length at a certain age agrees with that observed in the Bank Herring of the North Sea taken off the East Coast of England between North Shields and North Haisborough Float (comp. Table 3 p. 24).

Herrings caught N. W. of Hirshals.

A sample of herrings caught in purse seine N. W. of Hirshals at 40 fms. depth (ca. 57° 45′ N. 9° 15′ E.) on the 6. of March 1923, consisted of 561 specimens the maturity of which was as follows:

120 specimens of Maturity I	}	Young herrings
256 — - — II	}	
34 — - — III	}	Spring spawning herrings
19 — - — IV	}	
12 — - — V	}	
120 — - — VII-VIII		Autumn spawning herrings.

The sample was caught during a period when the yield of the herring fishing in that part of the Skagerak was small.

The lengths of the 120 specimens of Maturity I were as follows:

cm	16	17	18	19	20	21	22	23	Average length
No. of specimens	2	3	16	19	22	29	24	5	20.2 + 0.5

The lengths of 146 specimens of Maturity II were as follows:

cm	17	18	19	20	21	22	23	24	No. of spec.	Average length
♂	..	..	2	9	13	28	15	2	69	21.74 + 0.5
♀	1	4	8	5	18	27	10	4	77	21.29 + 0.5
♂ + ♀	1	4	10	14	31	55	25	6	146	21.50 + 0.5

The analysis showed that the herrings of Maturity I and II had the same racial characteristics. The distribution of the variants of 266 specimens of Maturity I and II was as follows:

Herrings from N. W. of Hirshals. March 6. 1923. Maturity I—II.

Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	4	22	6	29	2	12	1	14	2
56	107	23	86	30	3	13	26	15	..
57	136	24	123	31	17	14	107	16	31
58	18	25	41	32	67	15	95	17	25
59	1	26	7	33	123	16	32	18	202
..	..	27	2	34	52	17	4	19	3
..	..	28	1	35	2	..	..	..	..
n	266		266		266		265		263

m	56.64	23.88	32.77	14.54	17.65
σ	0.65	0.89	0.95	0.90	0.76
σ_m	0.040	0.054	0.058	0.055	0.047
σ_σ	0.028	0.038	0.041	0.039	0.033

Rays in dorsal fin branched		Total		Rays in anal fin branched		unbranched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
13	1	16	34	13	40	2	1
14	18	17	95	14	98	3	229
15	148	18	90	15	89	4	24
16	86	19	33	16	25	..	..
17	3	20	2	17	2	..	..
n	256		254		254		254
m	15.28		17.50		14.41		3.09
σ	0.63		0.91		0.90		0.30
σ_m	0.039		0.057		0.056		0.019
σ_σ	0.028		0.040		0.040		0.013

The analysis suggests that the sample consists mainly of the North Sea Deep Water Herring, and to a smaller extent of the Bank Herring of the North Sea. We get some evidence in favour of the view that we have such a mixture before us by a calculation of the correlation between the length and

1) the total number of vertebrae
2) the number of keeled scales (K_2).

It appears from the figures below that there is probably a positive correlation between length and Vert. S., but a negative correlation between length and keeled scales. The small herrings which are mixed with the larger Deep Water Herrings have therefore a lower number of Vert. S. but a higher number of keeled scales than these. This agrees with the characters of the Bank Herring.

Correlation between length and number of Vertebrae (Vert. S.).
Herrings N.W. of Hirshals March 6. 1923.

cm / Vert. S.	16	17	18	19	20	21	22	23	24	Σ_I
55	..	..	1	2	1	..	..	..	..	4
56	..	1	12	11	18	23	29	12	1	107
57	2	3	6	15	14	36	42	14	4	136
58	..	..	1	1	3	1	7	4	1	18
59	..	..	..	..	..	..	1	..	..	1
Σ_{II}	2	4	20	29	36	60	79	30	6	266

$r = 0.157 \pm 0.060$

Correlation between Length and number of Keeled Scales (K_2).
Herrings N.W. of Hirshals, March 6. 1923.

cm / K_2	16	17	18	19	20	21	22	23	24	Σ_I
12	..	..	..	..	1	..	..	..	..	1
13	..	..	2	1	1	7	10	4	1	26
14	..	3	5	10	11	24	32	18	4	107
15	1	1	11	14	16	20	27	4	1	95
16	1	..	2	3	7	9	6	4	..	32
17	..	..	..	1	..	..	3	..	..	4
Σ_{II}	2	4	20	29	36	60	78	30	6	265

$r = -0.162 \pm 0.060$

The lengths of the specimens of Maturity III—V were as follows:

Length cm	19	20	21	22	23	24	No. of spec.	Average length
♂	1	4	10	10	9	4	38	21.89 + 0.5
♀	..	..	6	8	10	3	27	22.37 + 0.5
♂ + ♀	1	4	16	18	19	7	65	22.09 + 0.5

The specimens of maturity III, IV and V had a uniform racial stamp. The distribution of the variants was as follows:

Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventral fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	4	22	4	30	2	13	17	15	1
55	11	23	23	31	7	14	29	16	1
56	24	24	22	32	25	15	18	17	2
57	18	25	14	33	24	16	1	18	60
58	8	26	2	34	6	..	..	..	..
..	..	..	..	35	1	..	..	..	..
n	65		65		65		65		64
m	56.23		23.80		32.43		14.05		17.89
σ	1.07		0.96		0.97		0.78		0.48
σ_m	0.13		0.12		0.12		0.10		0.06
σ_σ	0.09		0.08		0.08		0.07		0.04

Rays in dorsal fin branched		Total		Rays in anal fin branched		unbranched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
14	7	15	2	12	2	2	1
15	12	16	9	13	13	3	49
16	43	17	26	14	29	4	14
..	..	18	22	15	17	..	..
..	..	19	5	16	3	..	..
n	62		64		64		64
m	15.58		17.30		14.09		3.20
a	0.69		0.92		0.89		0.44
σ_m	0.09		0.12		0.11		0.06
σ_σ	0.06		0.08		0.08		0.04

The results of the analyses show that we are here concerned with one of the local races of small spring herrings spawning in the Kattegat or the southern Skagerak (comp. A. C. Johansen 1919 and 1923.)

The lengths of 120 specimens of Maturity VIII were as follows:

cm	♂	♀	♂ + ♀
20	1	1	2
21	6	3	9
22	11	9	20
23	13	9	22
24	10	9	19
25	8	7	15
26	12	6	18
27	2	8	10
28	1	2	3
29	1	1	2
n	65	55	120
m^1	24.35	24.79	24.55

[1] Corrected by adding 0.5.

We notice here that the average length of the specimens is a little smaller than is usually the case in the mature Dogger Bank Herring.

The distribution of the variants for the individually constant characters was as follows:

Vert. S.		Vert. præc.		Vert. caud.		K_2	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	1	22	8	29	1	13	3
55	8	23	43	30	1	14	30
56	64	24	55	31	6	15	61
57	44	25	11	32	39	16	20
58	3	26	2	33	56	17	5
..	..	..	..	34	16	..	..
..	..	28	1	35	1	..	..
n	120		120		120		119
m	56.33		23.66		32.67		14.95
σ	0.68		0.90		0.89		0.83
σ_m	0.062		0.083		0.081		0.076
σ_σ	0.044		0.058		0.058		0.054

Rays in ventral fins		Rays in dorsal fin branched		Total		Rays in anal fin branched		unbranched	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
14	1	13	1	15	3	12	5	2	3
15	1	14	13	16	30	13	28	3	103
16	15	15	60	17	46	14	50	4	9
17	9	16	39	18	29	15	25	..	..
18	91	17	3	19	5	16	5	..	..
19	3	..	..	20	2	17	2	..	..
n	120		116		115		115		115
m	17.64		15.26		17.08		14.03		3.05
σ	0.83		0.72		0.97		0.99		0.32
σ_m	0.076		0.067		0.091		0.092		0.030
σ_σ	0.053		0.048		0.064		0.065		0.021

If we calculate the correlation between length and number of vertebrae, and length and number of keeled scales, we obtain the following results:

Length cm / Vert. S.	20	21	22	23	24	25	26	27	28	29	Σ_I
54	..	..	..	..	1	..	..	..	..	..	1
55	..	2	3	1	..	1	1	..	..	..	8
56	1	3	10	12	12	8	10	5	2	1	64
57	1	4	7	7	6	6	6	5	1	1	44
58	..	..	..	2	..	..	1	..	..	..	3
Σ_{II}	2	9	20	22	19	15	18	10	3	2	120

$r = 0.08 \pm 0.09$

Length cm / K_2	20	21	22	23	24	25	26	27	28	29	Σ_I
13	..	..	..	1	1	..	1	..	..	..	3
14	1	1	7	3	5	5	3	2	1	2	30
15	1	5	7	11	12	9	10	4	2	..	61
16	..	3	3	6	1	1	3	3	..	..	20
17	..	..	2	1	..	..	1	1	..	..	5
Σ_{II}	2	9	19	22	19	15	18	10	3	2	119

$r = -0.07 \pm 0.09$

It will be seen that the small specimens have practically the same number of vertebrae and of keeled scales as the larger ones.

The sample of autumn spawners of maturity VIII from Hirshals has not a higher number of vertebrae (Vert. S.) than two of the samples of "Kobbergrund Herrings" mentioned in Chap. XI, but if we compare the two groups of samples, we find that the sample from Hirshals has a higher number of caudal vertebrae and of keeled scales than the "Kobbergrund Herrings":

120 Autumn Herrings from N.W. of Hirshals (March 6. 1923) minus 178 Kobbergrund Herrings (October 23. 1915).

Diff.	Vert. S.	— 0.02	Standard	Dev.	of Diff.	0.08
—	Vert. præc.	— 0.91	—	—	—	0.12
—	Vert. caud.	0.89	—	—	—	0.12
—	K_2	0.33	—	—	—	0.10
—	Rays in ventr. fins	0.26	—	—	—	0.10

If we compare the sample of autumn herrings of maturity VIII from Hirshals with the sample of Bank Herrings from Balta Sound, Sept. 1. 1921, we get the following result:

363 Bank Herrings, Balta Sound, minus 120 Autumn Herrings, Hirshals.

Diff.	Vert. S.	0.17	Standard	Dev.	of Diff.	0.073
—	Vert. præc.	0.18	—	—	—	0.095
—	Vert. caud.	0.00	—	—	—	0.095
—	K_2	— 0.10	—	—	—	0.089
—	branch. dorsal fin rays	— 0.16	—	—	—	0.076
—	total anal fin rays	0.03	—	—	—	0.104
—	branched anal fin rays	0.02	—	—	—	0.104
—	unbranched anal fin rays	0.01	—	—	—	0.038
—	ventral fin rays	0.09	—	—	—	0.084

It will be seen that the difference is greatest for the total number of vertebrae, where it is more than twice the standard deviation of the difference.

Comparing the sample of herrings of maturity VIII from Hirshals with a sample of small ripe autumn spawners of 20—26 cm length caught in the Lim Fiord off Lemvig on October 16. 1915, we obtain the following result:

171 Autumn Herrings, Lim Fiord, minus 120 Autumn Herrings, Hirshals.

Diff.	Vert. S.	0.04	Standard	Dev.	of Diff.	0.08
—	Vert. præc.	0.27	—	—	—	0.11
—	Vert. caud.	— 0.23	—	—	—	0.11
—	K_2	— 0.11	—	—	—	0.10
—	ventral fin rays	— 0.08	—	—	—	0.10

We notice here in the case of vert. præc. and vert. caud. a difference of more than twice the standard deviation of the difference.

There can be no doubt that the sample belongs either to the Bank Herring of the North Sea or to one of the local races of small autumn spawners from the marginal areas of the North Sea (the German Bight, the Lim Fiord etc.).

As the sample from Hirshals has a relatively high number of caudal vertebrae, the first possibility seems the more probable.[1]

If we regard the evidence set forth on the preceding pages it appears that the Bank Herring of the North Sea is the most important of the races upon which the great Bohuslän winter fishing is based in the open waters of the eastern and southern Skagerak at the present time. Also other races play a certain rôle for the fishery, such as the local spring spawners of the Kattegat and southern Skagerak, and the Winter Herrings of the Kattegat.

C. Which Herring Races are predominant in the Skärgård and Fiords of Bohuslän during the periods of poor fishing?

Axel Boeck (1870) who investigated the Bohuslän herrings in the period about 1870, says that the main part of the herrings were spring spawners, and v. Yhlen confirmed that the same had been the case for a series of years prior to 1870.

Ljungman (1879) maintained in his paper "Om sillens och skarpsillens fortplantning och tiltväxt" that the herrings spawning in the Bohuslän Skärgård were spring spawners, and that the importance of these had been underestimated formerly. He was of opinion that also the large winter or spring spawners which mainly occurred in the northern skärgård, belonged to the same race as the smaller ones, although — as he states — the spawning occurred earlier for the large ones than for the smaller ones.[2] He writes as follows about the autumn spawners (p. 197): "Besides the herring which usually are spawning in the skärgård or near to the coast, there seems in several places to occur another herring which spawns as a rule in the open sea on suitable banks, which are situated at such depths that they are protected against devastation from the strong waves, and it is an old supposition that the herring which, during rather long periods for the sake of spawning visits certain parts of the west coast of Scandinavia, during the intervening periods are spawning on such banks in the North Sea".

There is no reason to doubt that Boeck, v. Yhlen and Ljungman were right in their view that the main part of the herrings occurring in the coastal region of Bohuslän in poor herring periods are winter and spring spawners. In this connection it should be remembered that I have found a sample taken W. by S. of Vinga in a poor herring period in February of 1915 containing 93 % of winter spawners, 4 % of spring spawners and only 3 % of autumn spawners. The winter spawners belonged to the Winter Herrings of the Kattegat, and the spring spawners to one of the local races spawning in the Kattegat or the southern Skagerak.

[1] Knut Dahl (1909) investigated a sample of 110 spent herrings caught in drift nets in the Skagerak near the coasts of Norway on the 4th of March 1907 together with Norwegian Spring Herrings. The mean figures obtained for Vert. S. and Vert. præc. were 56.55 and 23.89, respectively. These figures are quite in agreement with those of the Bank Herring of the North Sea.

A sample of young herrings of 8—11 cm length captured at the beach E. of Hanstholm at Lild Strand (57° 09′ N. 8° 57′ E.) on August 23. 1921, also belonged probably to the Bank Herring of the North Sea.

The distribution of the variants for the individually constant characters examined was as follows:

Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
55	1	22	3	32	7	13	1	15	1
56	9	23	4	33	5	14	6	16	1
57	6	24	8	34	3	15	6	17	1
..	..	25	1	35	1	16	2	18	13
n	16		16		16		15		16
m	56.31		23.44		32.88		14.60		17.62

[2] There can hardly be any doubt that the large winter- or spring spawners mentioned by Ljungman belonged to the Norwegian Spring Herring.

Trybom (1882) has described samples of spring spawners from the fiords of Bohuslän, and it is clear from his description that some of them belonged to the Norwegian Spring Herring (see Section D), while the main part were smaller forms and had a somewhat later spawning season. These smaller spring herrings are partly spawning in the fiords of Bohuslän.

Heincke (1898) describes 25 specimens of such local spring spawners from Bohuslän taken on April 15. 1878. The specimens were of maturity IV—VI and their lengths were as follows:

Length cm.....	18	19	20	22	24	25	26	27	28	No. of spec.	Average length
No. of spec.....	1	3	2	3	8	4	2	1	1	25	23.80 + 0.5

The distribution of the variants for the individually constant characters examined was as follows:

Vert. S.		Vert. præc.		Vert. caud.		Keeled scales K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
56	12	23	3	30	1	12	2	17	2
57	12	24	11	31	7	13	5	18	23
58	1	25	6	32	8	14	14	..	..
..	..	26	4	33	9	15	4	..	..
..	..	27	1	..	..	..	..	..	..
n	25		25		25		25		25
m	56.56		24.56		32.00		13.80		17.92
σ	0.58		1.04		0.91		0.82		0.28
σ_m	0.12		0.21		0.18		0.16		0.06
σ_σ	0.08		0.15		0.13		0.12		0.04

Rays in dorsal fin total		Rays in anal fin total	
No.	Freq.	No.	Freq.
17	3	14	1
18	20	..	..
19	2	16	4
..	..	17	13
..	..	18	6
..	..	19	1
n	25		25
m	17.96		17.04
σ	0.45		0.98
σ_m	0.09		0.20
σ_σ	0.06		0.14

It will be seen that this herring has a distinctly lower number of vertebrae than the Norwegian Spring Herring.

D. Which Herring Races are predominant in the Skärgård and Fiords of Bohuslän during the periods of rich fishing.

Axel Boeck (1870) maintains that there is a series of statements and sayings to show that the main part of the herrings caught in the great herring period from 1748 to 1808 were autumn spawners, and A. W. Ljungman (1879(b)) agrees with him in this view.

Trybom (1882) has, in his paper on the herring-fishing in Bohuslän during the winters 1880—81 and 1881—82, described about twenty small samples of herrings taken in the coastal area of Bohuslän in

the months December and January of the period named above. By investigations of the sexual organs he found the following relative frequency of spring spawners and autumn spawners:

	Autumn spawners %	Spring spawners %
Herrings caught in drift nets	57	43
— — land seines	88	12

Trybom does not attempt to show to which races the spring spawners belong, but his examinations were so careful that it is possible to say with great certainty that the main part of them belonged to the local coast herrings of the southern Skagerak and a not inconsiderable part of them to the Norwegian Spring Herring. The last was for example the case with a selected sample taken in mackerel-nets in Dynnekilen on January 14. 1880. The lengths of 10 specimens were as follows:

Length cm	32	33	34	35	36
No. of spec.	3	2	1	3	1

These specimens were of maturity V. The eggs had a diameter of 1.1—1.35 mm, and the testes were white and had a breadth of 25—37 mm. The spring spawning herrings in the fiords of Bohuslän have a smaller size and less developed sexual organs at that time of the year.

HEINCKE has in "Naturgeschichte des Herings" (1898) described a small sample of the Bohuslän hafssill which was captured in January 1878, and originated "from the first great shoal, which has visited the Bohuslän coasts since the year 1808". Only about 20 specimens of lengths from 22.3 to 27.8 mm were investigated.

Most of the specimens were probably recovering spents of an autumn spawning herring, but it cannot be determined whether the question concerns the autumn herrings of the North Eastern Kattegat or the autumn herrings of the North Sea. The average number of vertebrae and of keeled scales etc. found in specimens of maturity II and VII—VIII was as follows:

Vert. S.	= 56.50 (12 spec.)
K_2	= 14.35 (17 spec.)
Rays in ventr. fins	= 17.89 (9 spec.)

The sample also included a few spring spawners belonging to a smaller form than the Norwegian Spring Herring (probably one of the local races of the southern Skagerak).

An other sample investigated by HEINCKE originated from Marstrand, January 1891. It is mentioned by HEINCKE as Hafssill (Swedish) or Seeheringe (German). The sample consisted of 50 specimens of the following maturity and lengths.

Maturity	I	2 specimens	219, 273 mm
—	II	15 —	227—284 -
—	II a (VIII)	31 —	244—300 -
—	?	2 —	256, 258 -

The analysis of the specimens of maturity II showed the following distribution of the variants for vertebrae etc.:

Vert. S.		K_2		Ventral fin rays	
No.	Freq.	No.	Freq.	No.	Freq.
56	4	14	5	16	1
57	10	15	7	17	2
58	1	16	3	18	12
n	15		15		15
m	56.80		14.87		17.73

The analysis of the specimens of maturity II_a (my stage VIII) gave the following result:

Vert. S.		K_2		Ventral fin rays	
No.	Freq.	No.	Freq.	No.	Freq.
56	15	13	2	17	4
57	15	14	12	18	26
58	1	15	11	19	1
..	..	16	5	..	..
..	..	17	1	..	..
n	31		31		31
m	56.55		14.71		17.90
σ	0.57		0.94		0.40
σ_m	0.10		0.17		0.07
σ_σ	0.07		0.12		0.05

Without doubt the latter group is composed of autumn spawning herrings, which agree entirely with the Bank Herring of the North Sea. The racial characteristics of the few specimens of maturity II cannot be determined with certainty; the probability is however, that the main part ot these also belong to the Bank Herring. If we combine both groups, including two specimens of doubtful maturity, we obtain the following survey:

48 "Hafssill" from Marstrand. Jan. 1891, (HEINCKE):

Vert. S.		K_2		Rays in ventral fins	
No.	Freq.	No.	Freq.	No.	Freq.
56	21	13	3	16	1
57	25	14	17	17	6
58	2	15	19	18	40
..	..	16	8	19	1
..	..	17	1	..	..
n	48		48		48
m	56.60		14.73		17.85
σ	0.57		0.89		0.46
σ_m	0.08		0.129		0.066
σ_σ	0.06		0.091		0.047

It must be regarded as very fortunate that HEINCKE and TRYBOM have investigated samples of the Bohuslän herrings during the last great herring period. From the results of their researches combined with the results of my investigations of Bohuslän herrings taken in the open waters of the eastern Skagerak during the last decennium, it seems fairly clear that it is the Bank Herring of the North Sea which has been the dominating race in the inshore waters of Bohuslän during the last great herring period from 1878 to 1896. As both AXEL BOECK and A. W. LJUNGMAN on the basis of a series of old statements substantiate that the herrings caught in the penultimate herring period from 1748—1808 were autumn spawners, the probability is that the Bank Herring of the North Sea has also in times past been responsible for "the great herring periods" off the coasts of Bohuslän.

E. General Survey of the "foreign" Herring Races occurring in the Eastern and Southern Skagerak during the Winter.

In the sections B., C. and D of this Chapter we have seen that in the eastern and southern Skagerak several race groups of herrings occur which are not indigenous to this area, viz.:

1) The Bank Herring of the North Sea.
2) The North Sea Deep Water Herring.
3) The Norwegian Spring Herring.
4) The Winter Spawning Herrings of the Kattegat.

5) Spring spawners of the Kattegat.

6) Autumn spawners of the Kattegat.

According to the evidence to hand it appears that the Bank Herring of the North Sea is the most important of these races for the great winter fishing in the named area, indeed more important than all the other races together, including also the spring spawners which are in-

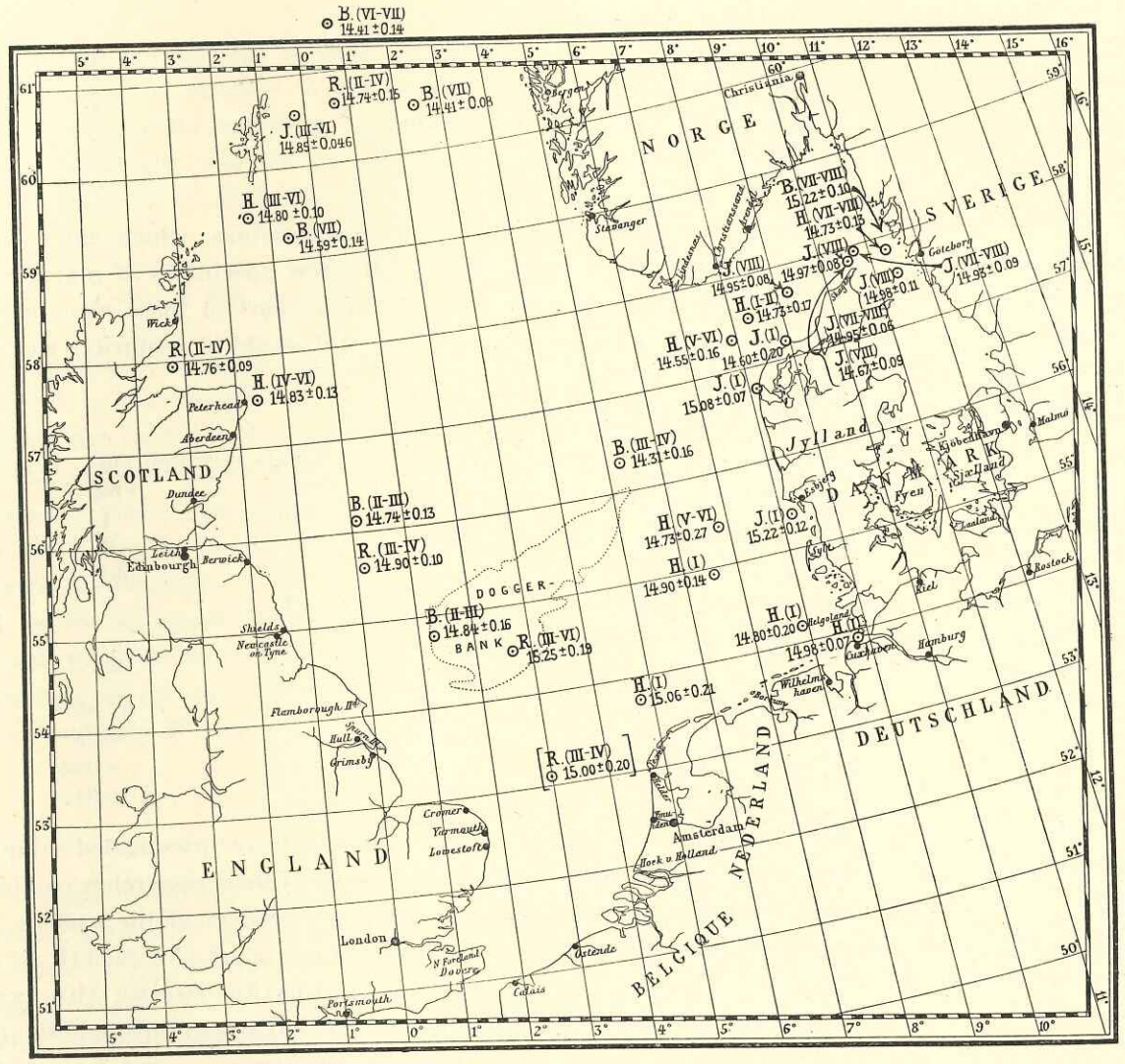

Fig. 13. Average No. of Keeled Scales (K_2) observed in Summer- and Autumn-Spawning Herrings of the North Sea (with mean error). B., H., J., R. indicate Name of the Investigators (Broch, Heincke, Johansen, Redeke). The Roman numerals represent the stage of Maturity.

digenous to the southern and eastern Skagerak. The question now arises: Which group of the Bank Herrings of the North Sea yields the greatest contribution to the great invasion or inflow into the Skagerak?

Of the various groups of Bank Herrings of the North Sea, the Jutland Bank Herring has its spawning places nearest to the area where the Bohuslän Herrings are caught, and it would therefore *a priori* seems probable that this group was responsible for the greatest part of the invasion. There is, however, no evidence in favour of the view that the Jutland Bank Herring should consist of such enormous shoals of herrings as those upon which the Bohuslän fishermen base their winter fishing. Moreover, it should be noted that most of the analysed samples of Bank Herrings from the eastern Skagerak have had a higher number of keeled scales (K_2) than is known

in any of the samples of Jutland Bank Herrings and Scotch Summer Herrings hitherto investigated (see Table 9). In this respect they agree entirely with the Dogger Bank Herring. It should also be observed that a very great part of the spent Bohuslän Herrings are very meagre. They have evidently not had much time for feeding after spawning.[1] This feature would also agree better with the Dogger Bank Herring than with Northern Bank Herrings spawning on Jutland Bank, off Scotland and the Shetland Isles.

It should be added that the analyses of scales have shown that the autumn spawning Bohuslän Herrings have the same size at the same age as the Dogger Bank Herrings and the herrings spawning off the coast of Northumberland, while the Bank Herrings spawning off the northern coast of Scotland and off the Shetland Isles are larger (comp. Chap. VIII).

On Fig. 13 the number of keeled scales observed in Bank Herrings taken in the Skagerak is represented, and for comparison the corresponding figures for summer and autumn spawning herrings taken in various parts of the North Sea are put down.

There is some evidence to hand that the Scotch Summer Herring may also occur in the Skagerak. An observation of K. A. Andersson (1916) and Molander (1918) speaks in favour of the view that some of the "Bohuslän Winter Herrings" are spawning in summer and not in autumn. These authors have found in samples of "Bohuslän Winter Herrings" that the central field of the scales was extremely small. When this is the case, there is evidently no question about Jutland Bank Herrings or Dogger Bank Herrings, but probably about the Scotch Summer Herring. In this connection it should be remembered that samples belonging to the North Sea Deep Water Herring have been observed in the Skagerak, so that it is not improbable that the Scotch Summer Herring may also occur in the Skagerak.

While in this paper it has been clearly demonstrated that the Bank Herring of the North Sea is the most important of the herring races occurring in the eastern Skagerak during the winter, there is still some doubt as to the question whether the Northern Bank Herrings or the Dogger Bank Herrings are of greatest importance for the fisheries.

In one respect most of the samples of autumn spawners from the Skagerak might seem to differ a little from the Dogger Bank Herrings, viz. by a lower number of rays in the ventral fins. I suppose, however, that future investigations will show that the majority of the Dogger Bank Herrings have a lower number of rays in the ventral fins than that found in the small samples investigated by Redeke. The racial characteristics of the Jutland Bank Herring are not yet sufficiently known, so that the possibility is not excluded that the majority of these may have the same high number of keeled scales as the Dogger Bank Herrings. The evidence to hand at present is, however, in favour of the view that the Dogger Bank Herring constitutes a very great part of the huge shoals of herrings which in the beginning of winter enter the Skagerak from the North Sea.

If the view set forth here is right, great shoals of herrings are moving in an easterly direction past Hanstholm late in autumn or in the beginning of winter. These shoals have hitherto not been subjected to any fishery in the boundary area between the North Sea and the Skagerak.

The North Sea Deep Water Herring seems not to be of great importance for the fisheries in the Skagerak. It has dominated in only one of the samples investigated, viz. in that caught N.W. of Hirshals on the 6. of March 1923. The specimens of maturity I and II, which had a length of 16—24 cm, consisted mainly of that race (see the survey below). It may have been present also in some other samples (e. g. in the sample from Marstrand, January 1891 investigated by Heincke), but it has not been sufficiently numerous to be identified.

The Norwegian Winter or Spring Herring has its main spawning places off the West Coast of Norway between Flekkefjord and Aalesund, but some spawning also takes place in the northern part of the Skagerak between Cape Lindesnæs and Christiania Fiord. It is frequently taken off the

[1] As shown by Ehrenbaum (1911) the herring takes almost no planktonic food during the winter, and it is a fact that proportionately few of the Bohuslän Herrings are taken with food in their stomach.

northern coasts of Bohuslän, but farther south it becomes gradually rarer, and it plays no great rôle in the herring fishing of the southern and eastern Skagerak as a whole. In the northern Kattegat the Norwegian Spring Herring is a rare occurrence.

The Winter Spawning Herrings of the Kattegat may be present in great quantities in the south eastern Skagerak during the winter, and in poor herring periods they may be dominating in the

Table. 9 Summer and Autumn spawning Herrings from the North Sea compared with samples caught in the eastern and southern Skagerak.

Locality	Investigator	Date	Number of specimens investigated	Average length of mat. spec. cm	Maturity	Vertebrae			Keeled scales K_2	Rays in ventral fins	Rays in dorsal fin, branched	Rays in anal fin		
						Total	præc.	caud.				Total	branched	unbranched
A. Deep Water Herrings.														
Tampen ca. 61°51′ N., 0°45′ E.[1]).	Broch	13-IX-04	32	30.7	VI-VII	56.94	23.59	33.35	14.41	..	..	..	..	..
Viking Bank	—	14-X-04	60	30.65	VII	56.62	23.73	32.89	14.39	..	..	..	..	..
— —	—	27-X-04	16	30.2	VII	56.63	23.31	33.32	14.25	17.62	..	..	..	..
— —	—	1-XI-04	20	29.4	VII	56.65	23.60	33.05	14.60	17.95	..	..	..	..
40 m SE. of Fair Isle 59°14′ N., 0°38′ W.[2])	—	10-IX-04	29	28.8	VII	56.52	23.83	32.69	14.59	17.76	..	..	..	..
NW. of Hirshals (the Skagerak)[3]).	Johansen	6-III-23	264	..	I-II	56.64	23.88	32.77	14.54	17.65	15.28	17.50	14.41	3.09
B. Bank Herrings.														
SE. of Balta Sound	Johansen	1-IX-21	363	28.6	III-VII	56.50	23.84	32.67	14.85	17.73	15.10	17.10	14.05	3.06
Fair Isle	Heincke	27-VI-87	75(30)	26.4	III-VII	56.45	23.63	32.63	14.80	17.91	..	..	..	..
Moray Firth	Redeke	18-VII-06	50	24.7	II-IV	56.56	23.89	32.64	14.74	17.84	..	..	..	..
Off Peterhead	Heincke	Aug. 71	24	..	IV-VI	..	..	..	14.83	17.83	..	..	..	..
Off Firth of Forth	Broch	8-IX-04	31	25.4	II-III	56.45	23.81	32.64	14.74	17.61	..	..	..	..
Jutland Bank	Heincke	12-IX-89	29	28.6	V-VII	56.55	..	..	14.54	17.72	..	..	..	..
— —	—	12-VIII-89	26	..	I-II	56.31	23.81	32.50	14.73	17.81	..	..	..	..
Dogger Bank	Broch	6-IX-04	31	25.6	II-IV	56.58	23.74	32.88	14.84	..	..	..	..	..
NW. of Dogger Bank	Redeke	3-IX-06	40	25.2	III-IV	56.50	24.28	32.23	14.90	17.83	..	..	..	..
Dogger Bank	—	11-X-06	25	26.4	III-VI	56.44	24.04	32.40	15.25	17.88	..	..	..	..
Off Marstrand (The Skagerak)	Heincke	Jan. 91	48	..	VII-VIII	56.60	..	..	14.73	17.85	..	..	..	..
Off Bohuslän —	Broch	Jan. 05	100	ca. 25	VII-VIII	56.44	23.79	32.65	15.22	..	..	..	..	..
W. by S. of Vinga —	Johansen	10-II-15	49	24.72	VIII	56.47	23.94	32.53	14.98	17.63	..	..	..	..
N. of Skagen —	—	17-III-15	181	25.5	VIII	56.54	24.01	32.53	14.97	17.71	..	..	..	..
— —	—	5-I-24	95	..	I-II	56.53	23.82	32.71	14.62	17.70	15.31	17.31	14.23	3.07
— —	—	5-I-24	107	25.7	VII-VIII	56.50	24.03	32.47	14.93	17.50	15.30	17.42	14.39	3.03
NW. of Skagen —[4])	—	26-I-24	105	ca. 26	VII-VIII	56.45	23.75	32.70	..	..	..	..	..	..
— —	—	26-I-24	100	25.85	VIII	56.38	23.66	32.73	14.67	17.60	15.28	17.32	14.18	3.14
NW. of Hirshals —	—	6-III-23	120	..	VIII	56.33	23.66	32.67	14.95	17.64	15.26	17.08	14.03	3.05

[1] Contains a few spring spawners of maturity II—III.
[2] It is doubtful whether this sample belongs to the Deep Water Herring or to the Scotch Summer Herring.
[3] Contains some Bank Herrings of the North Sea.
[4] Contains small autumn spawners, possibly from the Kattegat.

catches in the boundary area between the Kattegat and the Skagerak (A. C. Johansen 1923). The specimens caught here are mostly young herrings, but some mature specimens may also be taken in this area. The spawning takes place mainly in the eastern Kattegat.

The small spring Spawners of the Kattegat are usually present in minor quantities in the herring catches during the winter in the eastern Skagerak. There is here a question about different races, and those with the highest number of vertebrae can hardly be distinguished at present from the local spring spawners of the fiords of Bohuslän.

The Autumn Herrings which are spawning in the northern Kattegat may probably also be found in the Skagerak. When the herring fishery begins in August or September in the eastern Kattegat, the main shoals are evidently coming from the North. MOLANDER (1918) is of opinion that a sample of Herrings taken at Skagen on March 8. 1915 consisted partly of "Kobbergrund Herrings", but the evidence he gives, is rather weak.

A sample of North Sea Bank Herrings of maturity VII—VIII caught N.W. of Skagen on January 26. 1924 was mixed with some small autumn spawners, which possibly belonged to the herring spawning late in autumn in shallow water of the Northern Kattegat (comp. p. 49). These were, however, not so numerous that an identification could be made with certainty.

HEINCKE investigated a sample of herrings caught 28 miles N. by W. of Hanstholm on August 12. 1889 (see p. 18). In the sample a few specimens of maturity III—V and of the lengths stated below occurred:

Length in cm	19	20	21	22	23
No. of specimens	2	1	2	1	1

The distribution of the variants for vertebrae etc. was as follows:

Vert. S.		Vert. præc.		Vert. caud.		K_2		Rays in ventr. fins	
No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.	No.	Freq.
54	1	23	2	28	1	12	1	16	1
55	1	24	3	..	..	13	3	17	1
56	4	25	1	31	3	14	0	18	5
57	1	..	..	32	1	15	1	..	..
..	..	28	1	33	2	16	2	..	..
n	7		7		7		7		7
m	55.71		24.42		31.29		14.00		17.57

It appears that this small sample has a very low number of Vert. S. and of K_2 but a high number of Vert. præc. in comparison with the other autumn spawners observed in the Skagerak. It seems probable that the few small mature specimens belong to one of the local races of small autumn spawners of the Kattegat (comp. A. C. JOHANSEN 1923).

The herring fishery in the eastern Skagerak has a pronounced periodic character, and there is reason to believe that at least the most important of the foreign herring races: the Bank Herring of the North Sea leaves in the main the Skagerak during the spring months and moves towards the West across the North Sea (comp. Fig. 15 p. 96).

F. Otto Pettersson's explanation of the Annual and the Secular Periodicity in the Bohuslän Herring Fishery.

Professor OTTO PETTERSSON has for many years studied the current-system of the North Atlantic and the minor waters of the northern Europe in connection with the periodicity of the herring fisheries. On the basis of such studies he has put forth a series of facts, hypotheses, and suggestions which have been most valuable to biologists.

We shall here quote the views which Prof. Pettersson sets forth concerning the periodicity in the Bohuslän herring fishing in his paper: "Kosmiska orsaker till rörelserna uti hafvets och atmosfärens mellanskikt" (1922). Professor Pettersson writes as follows (p. 22):

"The annual period of inflow of Gulfstream-water from spring to autumn compels the North Sea water to flow southwards along the English coast, and eastwards towards the entrance of the Skagerak as proved by the wellknown experiments with drifting-bottles[1] by Dr. WEMYSS FULTON. The herringshoals

[1] Fishery Investigations of the Ministry of Agriculture and Fisheries. Ser. I. Vol. IV, No. 4 p. 7.

of the North Sea follow the movement of the surrounding water. The English season for herring drifting begins in April and lasts till September, the Swedish season for herring drifting in the Kattegat begins later in August and lasts till October under normal conditions, The spawning season of the North Sea herring falls in the beginning of September in the western part of the North Sea (Fladen-ground) and south and east of the Fladen-ground, in the vicinity of the Doggerbank, in October.[1]

The spawning takes place late in summer when the stagnant bottom water on the N. Sea plateau with its highly reduced percentage of Oxygen (up to 60 %) has been renewed by a fresh inflow.[2] During the spawning season of the North Sea herring the inflow of northern waters through the Norwegian Channel is arrested by the flow of the Gulfstream which, as may be seen from the foregoing sections, fills the channel almost entirely with Atlantic water.

Such is the usual hydrographic regimen of the North Sea in normal years, the Atlantic water dominating in autumn and the waters of northern origin in the winter months. There exists also a secular periodicity, known since a thousand years by the fishermen of the Scandinavian countries, which consists in an increment of the inflow of the northern waters into Skagerak in autumn and winter, whereby the spawning of the Norwegian spring-herring on its usual breeding-grounds is disturbed.

This secular periodicity is caused by an alteration in the circulation of the Northern Atlantic Ocean, the inflow of water of southerly origin (Gulfstream-water) from Shetland into the Norwegian Channel and Skagerak being partly arrested during some months of the year and supplanted by an inflow of waters from the Norwegian Sea and bankwater from the coastal banks of Norway. Thereby the spawningtime and spawningplaces of the Norwegian spring-herring are removed from the west coast of Norway to the other side of the Norwegian Channel which is the habitat of the other great race of herrings of the North Atlantic".

When Professor Pettersson here says that the herring shoals of the North Sea follow the movement of the surrounding water, this is probably right for certain stages of the herring, but it is not a general feature that the herring in all stages of its life follows the current. In Chap. IX of this paper I have put forth some evidence to show that we must reckon with active migrations of the herring even from the larval stages. After the transformation the herrings very often move against the current, and it is a well known fact that the full herrings often do so.

A few examples may be mentioned here. The full Autumn Herrings of the Sound, are almost always taken when wandering towards the South, although the surface current here usually has a direction towards the North. But also in cases when the current is going south, the full herrings move in a southern direction. They strive evidently to reach the suitable spawning grounds (between Saltholm and Falsterbo etc.) and they do not seem to care about the direction of the currents. (The direction of the movements of the herring can easily be seen from the way in which the fish are sitting in the drift nets. In the Sound the nets are almost always shot in the direction West-East across the current).

In the Great Belt we notice in autumn a similar movement of the full herrings towards the South and against the prevalent currents. In the case of the Norwegian Spring Herring we see that the maturing herrings (Storsild) are caught in great quantities in the period November—February off the stretch Aalesund—Throndhjem Fiord and further north, but in the spawning season: February, March and April, the ripe herrings are caught mainly on the stretch Stavanger—Aalesund. It seems then that there must have been a great movement of the maturing herrings towards the south and against the prevalent current between the two periods.

The movements of the herrings of the North Sea can not be explained solely by means of the currents, but there are two stages in the life of the herrings in which the current undoubtedly plays a great rôle for the transport, viz. the young larval stage[3], and the stage just after spawning

[1] Über den Trawlherring by Ehrenbaum and Peters. Der Fischerbote 1922 No. 11.
[2] Über die Sauerstoff-Verhältnisse der Nordsee by Dr. Gehrke; Ann. d. Hydr. 1916 p. 190.
[3] Comp. Johs. Schmidt (1904), Bjarni Sæmundsson (1908), Redeke und van Breemen (1908), and Jespersen (1920).

(maturity VII). When the spawning is over, the herrings are very meagre and not very strong. There is a series of facts to hand to show that in that stage they are moving in the same directions as the current. The spent Autumn Herrings of the Sound are almost always caught when going north like the current. The Spring Herring of Iceland is spawning off the south coast, but after spawning it follows the Irminger Stream to the West and North of Iceland[1]. It agrees quite well with these facts that the Dogger Bank Herring and other Bank Herrings of the North Sea are caught in the Skagerak not very long after spawning. But even in the spent stage the herrings do not everywhere go with the current, as may be noticed e. g. in the Kattegat. A branch of the Jutland current bends southwards into the Kattegat (Fig. 14) and forms now the under-current in the eastern Kattegat and further south in the Belt-Sea. But the spent herrings from the North Sea do not seem to follow this current further south than to the area east of Læsö. The "Kobbergrund Herrings" and the other autumn spawners caught further south in the Kattegat and Belt Sea belong to other races than the North Sea Herrings (comp. Chap. XI). The south going salt water current becomes gradually mixed with the less saline Baltic surface current, and the North Sea herrings seem to avoid such brackish water.

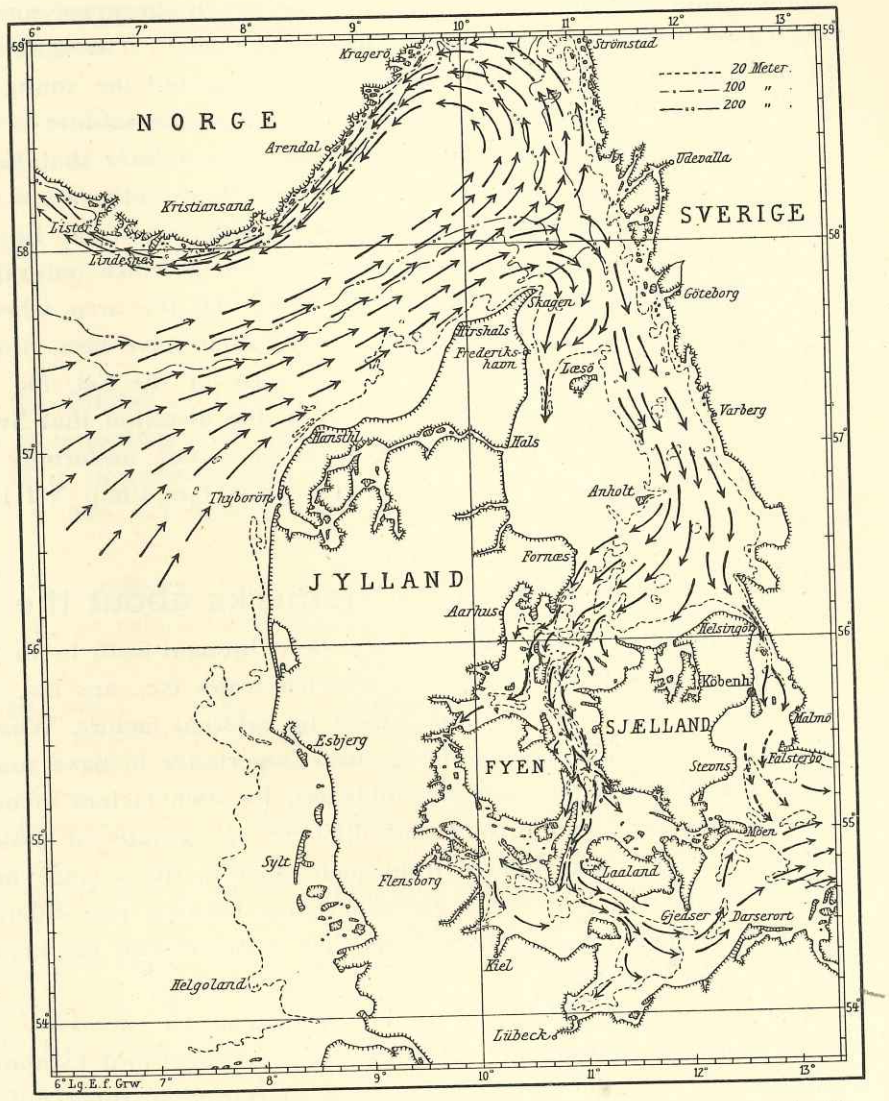

Fig. 14. The main direction of the Currents in the intermediate layers (c. 30—100 m) of the Skagerak and the lower layers of the Kattegat and Belt Sea. Drawn up by Aage J. C. Jensen on the basis of observations of O. Pettersson, G. Ekman, Martin Knudsen, J. P. Jacobsen, Ruppin etc.

The way in which Professor Pettersson explains the secular periodicity in the herring fishery of the eastern Skagerak, is very interesting, but there does not seem sufficient reason for combining this explanation with the hypothesis that the spawning grounds of the Norwegian Spring Herring should be disturbed by an increase of the inflow of northern waters in the Skagerak in autumn and the beginning of winter.

Gustav Ekman and Otto Pettersson give prominence to the view that the various races of herrings are bound to a certain kind of water, characterized by its temperature, salinity, plankton etc.[2] This view is undoubtedly largely correct, but it should be remembered that it is especially during — and shortly before — the spawning period that the herrings are sensitive to the tempera-

[1] Ove Paulsen (1906) is of opinion that the main food for the herring in the Icelandic Waters, viz.: *Calanus finmarchicus*, is carried to the West and North of Iceland from the South Coast by the Irminger Current. It might be suggested that the reason why the herrings move here in the same direction as the current is the fact that they are pursuing the *Calanus*. It is not probable, however, that the Spring Herring of Iceland normally begins to feed immediately after spawning.

[2] See Pettersson och Ekman (1891); Ekman, Pettersson och Trybom (1907).

ture and salinity. Outside the spawning period they may occur in great shoals in places where the temperature and salinity differ a good deal from the conditions prevailing on the spawning grounds. The Bank Herring of the North Sea spawns for example in water with a temperature of about 9—13° C, but in February and March it occurs in great numbers in the upper and intermediate layers of the eastern Skagerak, where the temperature of the water is ca. 3—5° C. The salinity of the water on the spawning places for the Bank Herring of the North Sea is 34—35.2 $^0/_{00}$, but the young year classes of this herring occur in numbers in the western part of the Lim Fiord where the salinity is only about 30 $^0/_{00}$.

Ekman, Pettersson and Trybom maintain (1907) that the herrings have no homestead, but are, so to speak, always in the act of wandering. These authors are of the opinion, that herrings of the same origin may spawn in very different areas in different years. In opposition to this standpoint it will be worth while to recall the views of the renowned Swedish naturalist, the late Sven Nilsson. He writes in "Skandinavisk Fauna" (IV Bd. 1855 p. 506): "To the area where the fishes are born, thither do they go to spawn when they are mature". Many facts have been brought forth in favour of this view since Sven Nilsson wrote these words, e. g. in case of the Eel, the Plaice and the Flounder, and I am of opinion that the evidence to hand points in the direction that Sven Nilsson on the whole is right also in the case of the herring. There seems to be a fair uniformity among herrings spawning at the same season and on the same place in different years (see Chap. XIII).

XIII. General Remarks about the Herring Races.

In later years some evidence has been brought forth to show that even such characters as number of vertebrae, number of fin rays, and keeled scales etc., are not absolutely constant in a certain race of fishes, but are influenced to some extent by external factors. When we are trying to distinguish between different races of fish, it is of the greatest importance to have some idea to what extent the mean values for the named characters may be influenced by such factors in nature.

Some years ago I proved that different age groups of plaice caught on the same locality in the northern Kattegat often differed from each other in the average number of anal fin rays (A. C. Johansen 1910). This area is, however, a boundary area between two different races of plaice, and I explained the named phenomenon by the hypothesis that the race with the highest number of anal fin rays was more predominating in certain year classes than in others.

Johs. Schmidt (1917 (b), 1921) investigated 10 successive year classes of the same population of *Zoarces viviparus* L. from the inner part of Roskilde Fiord (Sealand). He was able to demonstrate a not inconsiderable variation from year to year in respect to three different Characters, viz. total number of vertebrae, rays in right pectoral fin, and hard rays in dorsal fin. The greatest variation observed was as follows:[1]

	Lowest value	Highest value
Vert. S.	107.667 $\pm$ 0.055	108.312 $\pm$ 0.073
Rays in right pectoral	18.960 $\pm$ 0.017	19.598 $\pm$ 0.025
Hard rays in dorsal fin	5.012 $\pm$ 0.067	6.739 $\pm$ 0.025

As a mixture of the various year classes gave, year after year, on repeated analysis, about the same average values, Dr. Schmidt substantiated that the population was highly stationary, so that the differences observed could not be ascribed to migrations.

Lea (1918) found in the autumn of 1915 that two different year classes of young herrings from the North of Norway seemed to differ as regards the total number of vertebrae. He observed that the fish of about $1^2/_3$ years old averaged 57.37 vertebrae (49 specimens), while those of $2^2/_3$ years showed an average of 57.72 (241 specimens). The difference between the two age groups in this respect was 0.35 $\pm$ 0.11,

[1] The probable error of the average (not the mean error) is stated here.

but it must be remembered that the mean error of σ in the group of 49 specimens must have been considerable (I suppose about 0.07). The very high number of Vert. S. in the 241 specimens aged $2^2/_3$ years is, however, peculiar. The mean error of the mean value is here probably not more than 0.05, and the average number of vertebrae in the Norwegian spring herring is only 57.50. Here seems to be a real proof that a certain year class may differ a little in respect to number of vertebrae from the typical racial mean value.

In the spring spawning herring of the western part of the Lim Fiord I found in the years 1915, 1916 and 1918 the following average number of vertebrae and keeled scales in mature specimens of various year classes (A. C. Johansen 1919).

Date	Locality	No. of specimens	Vert. S.	K_2
27-5-1915	Off Lemvig	270	55.73 ± 0.041	14.17 ± 0.043
8-5-1916	Off Nykøbing	143	55.73 ± 0.054	14.09 ± 0.052
31-1-1918	Thisted Bredning	135	55.85 ± 0.056	14.44 ± 0.061

There is here a real difference in the number of keeled scales between the specimens taken in 1918 and those taken in 1915 and 1916, but it is perhaps not out of the question that more than one race of spring spawners may have a homestead in the western part of the Lim Fiord. There is also a possibility that the sample from January 1918 does not belong to the herrings which are spawning in the Lim Fiord.

In comparing mature specimens of four different year classes caught off the south west coast of Iceland in 1919, I observed the following mean values (A. C. Johansen 1921 a):

Year class	No. of spec.	Vert. S.	Vert. caud.	K_2	Rays in dorsal fin	Rays in anal fin	Rays in ventr. fins
1915	60	57.07 ± 0.07	32.40 ± 0.13	13.83 ± 0.10	19.30 ± 0.07	18.23 ± 0.09	17.98 ± 0.07
1914	52	57.00 ± 0.095	32.54 ± 0.10	13.67 ± 0.09	19.21 ± 0.08	18.21 ± 0.11	18.00 ± 0.10
1912	105	56.97 ± 0.067	32.29 ± 0.11	13.40 ± 0.07	19.41 ± 0.06	18.15 ± 0.09	17.73 ± 0.07
1911	126	57.04 ± 0.062	32.25 ± 0.10	13.50 ± 0.075	19.30 ± 0.05	18.21 ± 0.07	18.01 ± 0.05

We gain the impression here that the year class of 1912 differs in several respects from the other year classes.

It will be seen that the observed differences in the average values for Vertebrae etc. for various year classes of the herring on the whole are much smaller than those found between the different races of herrings mentioned in this paper.

We shall now consider the results of some experiments which Dr. Johs. Schmidt has carried out in order to demonstrate the influence of external factors on the mean values for some characters, constant to the individual, in certain species of fish. The experiments have comprised three different species: *Zoarces viviparus* L., *Lebistes reticulatus*, Regan, and *Salmo trutta* L.

A great number of *Zoarces* were in early summer, and therefore when the sexual organs were still unripe, transplanted in large wooden boxes from one locality, where the mean salinity was about 21 $^0/_{00}$, to another, where the salinity was about 12 $^0/_{00}$ (Johs. Schmidt 1920). The temperature was somewhat higher in the last named locality, but the difference is not known. The young of the transplanted specimens had 114,8 vertebrae in mean value, whilst the mother population had only about 113 in mean value. It was not possible to decide for certain to which factor or factors the difference was due.[1]

[1] Dr. Schmidt is of opinion that the influence of salinity has been greatly overestimated. He found as a general rule that the Zoarces populations had a lower number of vertebrae in the inner parts of the fiords than in the outer parts. The salinity shows usually a gradation which corresponds strikingly to the gradation in the average number of vertebrae. But in Schmidt's opinion the gradation of the average number of vertebrae has to be interpreted not as a direct effect of the salinity or of a factor acting parallel to it, but as a result of a selection.

Lebistes reticulatus is viviparous, and the female bring forth a considerable number of young at a time. The principle on which the experiments were made, was to vary the external conditions for the same pair of parents from one period of gravidity to the other and then determine the number of dorsal fin rays in the various broods of offspring (Johs. Schmidt 1917 (b), 1919). It was found that the average number of rays was larger in offspring which had developed at high temperature than in offspring the development of which had taken place at low temperature. The brood developed at 25° C. had an average of 6.91 rays, and the brood developed at 18° C. an average of 6.25 rays. Therefore a difference in the number of dorsal fin rays of about 0.1 corresponds to a difference of 1° C.

The influence of temperature on the number of vertebrae in *Salmo trutta* was tested by letting a quantity of eggs from a single female, fertilised with the sperma from one single male, develop at three different temperatures (Johs. Schmidt 1921). The result was that the lowest number of vertebrae was produced at intermediate temperatures, the values rising both with higher and with lower temperatures.

The experiment falls into three series. In the two first the development of the ova and young took place in running water, whereas in the third case the water was still, but aerated by a constant current of atmospheric air.

The results obtained were as follows:

First Series	Temp.:	1.9° C.	mean	value of vert.	58.48
—	—	6.5° -	—	—	57.70
—	—	10.4° -	—	—	57.98
Second Series	—	2.3° -	—	—	58.26
—	—	6.7° -	—	—	57.93
—	—	10.2° -	—	—	58.17
Third Series	—	1.9° -	—	—	58.52
—	—	4.0° -	—	—	58.17
—	—	7.0° -	—	—	58.38

It will be seen from these experiments that the difference in the number of vertebrae produced by a difference of 1° C. is about 0.05 to 0.15 or 0.1 in mean value.

Zoarces viviparus is surely a much more "plastic" species than the herring. The differences in number of vertebrae etc. between the different races in a certain region is much greater in Zoarces than in the herring, both in numerical value and taken in proportion to the total number of vertebrae. It seems probable also that Salmo trutta is a more plastic species than the herring. When we now remember that the temperature in the spawning places for a certain herring race hardly varies more than 2 to 4° C. from place to place or from one year to another, and when we observe that the numerical differences in the number of vertebrae, keeled scales and fin rays between different herring "races" frequently reaches a numerical value of 0.5 to 2.0 or even more, it seems probable, that we are dealing here with true races, the characteristics of which are due to heredity. It is very possible that the small differences pointed out between the Scotch Summer Herring and the Dogger Bank Herring, and between the Scotch Spring Herring and the Icelandic Summer Herring etc., are not of a hereditary nature.

B. Storrow (1920) has expressed the view that spring spawners may come from young fish born either in spring or in autumn, and autumn spawners may originate in the same way. The evidence he sets forth in favour of this view is based on a consideration of the growth made up to the formation of the first winter ring, but this is surely a very fragile basis for such a far reaching conclusion. If we in an autumn spawning herring find that the central field in the scale is relatively small, we can explain this in two different ways: Firstly, there is a possibility that the herring is hatched early in the season

e. g. in July or August, and that the scales are formed in the very calender year in which the hatching took place. Secondly, there is a possibility that the herring is hatched late in the season, (November—December) and that it had a proportionately slow growth during the whole of the first year of its life.

When we observe often in spring spawning herrings that the central field in the scales is relatively large, we have a natural explanation in the fact that many specimens reach a considerable size during the first summer of their life. If the hatching has taken place in March or April, the young herrings may have scales already in June—July. The quickest growing specimens of such spring spawners are probably much larger when the first winter ring is formed, than the slowest growing autumn spawners, which are about half a year older.

Besides the views set forth here, it should be remembered that we have no certain proof that a distinct winter ring is always formed during the first winter in which the herring is provided with scales.

A certain herring race may spawn at a different time of the year in different areas, but if we examine the herrings spawning on the same locality in spring and in autumn, we shall always observe that there are marked morphological differences between them.

It is a very noticeable fact that the average number of vertebrae in the dominating herring races of the Norwegian Sea, the North East Atlantic, the North Sea and the Baltic approximates to a whole number or a half (n or $n+0.5$).

In the Atlanto-Scandian Herring the average number is about 57.50. In my paper "On the large spring spawning Sea Herring in the North West European waters" (1919) I collected the whole material of Norwegian Spring Herrings then available, and I found that 665 specimens examined had an average number of vertebrae of 57.50 ± 0.028. In the spring spawning herrings of Iceland and the Faroes the following average numbers have been observed:

Date	Locality	No. of specimens	Average number of Vert. S.	Investigator
Sept. 1915	Off Eyjafiord	196	57.36 ± 0.051	Johansen
July 28 1900	Hornafiord	16	57.56 ± 0.20	—
Dec. 1878	Off Reykjavik	10	57.50 ± 0.17	Heincke
Sept. 10 1915	Kongshavn, the Faroes	207	57.47 ± 0.049	Johansen
April 1920	— —	160	57.33 ± 0.051	—

In the sample from Eyjafiord, Sept. 1915, the average number of vertebrae was somewhat below 57.50, but the sample probably contained some specimens of the Summer Spawning Herring of Iceland which has only 57.00 vertebrae in mean value.

In the sample from Kongshavn, April 1920, the average number of vertebrae is also somewhat below 57.50, but in this case there is a positive correlation between length and number of vertebrae (A. C. Johansen 1921 b. p. 6). It is not improbable that the sample contained specimens of the North East Atlantic Herring.

In the North East Atlantic Herring (the Scotch Spring Herring, the Icelandic Summer Herring etc.) we find that the average number of vertebrae is very nearly 57.00,[1] as will appear from the survey below:

[1] While this paper was in the press, I received a treatise of Ed. Le Danois et Henri Heldt on: "Les Harengs des Smalls et les Conditions hydrologiques de leurs migrations" (Janvier 1924). The authors show that the Herring of the Smalls differ markedly from the Channel Sea Herring, and Dr. Heldt is of opinion that when the Herrings leave the Smalls in the beginning of the winter, they migrate northwards to the East Coast and S.E. Coasts of Scotland. Dr. Heldt states that the average number of vertebrae in the Herring of the Smalls is 57.49, but it does not appear from his description how many specimens he examined in respect to number of vertebrae, or how large the mean error of the mean value is. If the mean value given by Dr. Heldt is based upon countings of a considerable number of specimens, the Herring of the Smalls has a higher number of vertebrae than both the Scotch Spring Herring and the Scotch Summer Herring.

Date	Locality	No. of specimens	Average number of Vert. S.	Investigator
May 1919	Eldey Bank, S.W. Iceland	297	57.071 ± 0.038	Johansen
Aug. 14 1919	Drangar —	180	57.011 ± 0.048	—
Febr. 1892	Ballantrae S. W. Scotland	30	56.80 ± 0.14	Heincke
July 7 1891	Barra, Hebrides	30	56.97 ± 0.12	—
Jan. 1892	Firth of Forth	30	56.83 ± 0.10	—
March 5 1923	Off Cape Wrath	270	57.13 ± 0.038	Johansen
— 21 —	N. of Flugga, Shetland Is.	300	57.07 ± 0.036	—

Table 10. Average Number of Vertebrae observed in Herring Races of Minor Importance from the North Sea and adjacent waters.

Name of Race	Locality of Capture	Time of Capture	No. of specimens examined	Maturity	Aver. number of vertebrae with mean error	Investigator
Winter Herring of western part of Channel	Off Plymouth	Dec.-Jan. 1914-15	1021	III-VI	56.77 ± 0.019	Orton
North Sea Deep Water Herring	Viking Bank, Tampen	Sept.-Nov. 1904	130	VII	56.73 ± 0.07	Broch
Spring Herring of Zuiderzee	Zuiderzee	April 1888	127	IV-VII	55.35 ± 0.068	Heincke
— — —	Marsdiep near Helder	May 1912	50	VII	54.78 ± 0.13	Delsman
— — —	Near the Island of Urk	Dec. 1912	40	III-V	55.125 ± 0.12	—
Spring Herring, Mouth of Ems	Ditzum, Dollart	May 1888	79	VI-VII	55.18 ± 0.09	Heincke
Spring Herring of Ringkøbing Fiord	Ringkøbing Fiord	April 1889	32	V-VI	55.50 ± 0.13	—
— — — —	— —	— 1915	165	V-VI	55.56 ± 0.054	Johansen
Autumn Herring of Lim Fiord[1]	Nissum Bredning off Lemvig	Oct. 1915	171	V-VI	56.37 ± 0.056	—
— — - — —	— — - Gjeller Hage	Nov. 1923	37	V-VII	56.38 ± 0.11	—
— — - — —	— — - Rimmer Str.	— —	44	V-VII	56.23 ± 0.10	—
Spring Herring of Lim Fiord	Lim Fiord off Struer	April 1887	50	V-VII	55.90 ± 0.087	Heincke
— — - — —	— — - Lemvig	May 1915	270	V-VI	55.73 ± 0.041	Johansen
— — - — —	— — - Nykøbing	— 1916	143	V-VII	55.73 ± 0.054	—
— — - — —	— — - Hals	— 1916	210	IV-V	55.77 ± 0.042	—
— — - — —	— — - Hals	Jan. 1918	135	IV-V	55.85 ± 0.056	—
Spring Herring of Bohuslän Fiords	Coastal waters off Bohuslän	April 1878	25	IV-VI	55.56 ± 0.12	Heincke
Winter Herrings of the Kattegat	N. of Skagen	March 1915	76	I-II	56.83 ± 0.084	Johansen
— — - - —	S. W. of Vinga	Febr. 1915	591	I-II	56.86 ± 0.0345	—
— — - - —	Near Kobbergrund, Kattegat	Oct. 1915	40	V	56.78 ± 0.14	—
— — - - —	E. of Læsø, —	— 1922	71	IV	56.75 ± 0.100	—
— — - - —	Groves Flak, —	— 1922	25	III-IV	56.84 ± 0.14	—
Spring Herring of N. E. Kattegat	S. V. of Vinga, —	Febr. 1915	64	III-V	56.22 ± 0.12	—
— — - —	N. V. of Hirshals, Skagerak	March 1923	65	III-V	56.23 ± 0.13	—
Autumn Herring of N. E. Kattegat	Off Varberg, Kattegat	Oct. 1887	67	IV-VII	56.37 ± 0.085	Heincke
— — - —	Near Kobbergrund, Læsø	Oct. 1915	178	VII	56.35 ± 0.052	Johansen
— — - —	Groves Flak, Kattegat	— 1922	400	VI	56.11 ± 0.034	—
— — - —	E. of Læsø —	— 1922	120	VII	56.12 ± 0.068	—

[1] This herring race originates undoubtedly from the North Sea and has entered the Lim Fiord in the period after 1825.

In the Bank Herring of the North Sea the average number of vertebrae is very nearly 56.50, as will be seen from Chap. VII of this paper. In 803 mature Bank Herrings from various parts of the North Sea we have found an average number of 56.496 ± 0.024.

The Channel Sea Herring has also nearly 56.50 vertebrae in mean value. The figures found by the various investigators were as follows:

Date	Locality	No. of specimens	Average number of Vert. S.	Investigator
Winter 1901-02	Off Cap d'Antifer	125	56.57 ± 0.063	Cligny
Oct. 24 1910	Off Gr. Yarmouth	50	56.50 ± 0.081	Delsman
Nov. 1905	H 8 (52°35′ N. 2°30′ E.)	100	56.56 ± 0.089	Redeke
— —	52°43.5′ N. 2°50′ E.	100	56.63 ± 0.073	—

The four important Herring races mentioned here, viz. the Atlanto-Scandian Herring, the North East Atlantic Herring, the Bank Herring of the North Sea and the Channel Sea Herring are responsible for about $^4/_5$ of the total yield of the European herring fisheries (which is about 1100—1200 million Kgs. pro year). All other herring races together are responsible only for about $^1/_5$ of the yield. We shall here shortly consider the average number of vertebrae in a group of these races of minor economical importance from the North Sea and the adjacent waters (Table 10).

From the figures in Table 10 we see that the average numbers of vertebrae in the races of minor importance do not usually group themselves about the whole or half numbers.

In the Baltic waters we notice a similar phenomenon. The most important race, viz. the South Baltic Autumn Herring, has nearly 55.50 vertebrae in mean value, as will be seen from the survey below.

Average number of vertebrae observed in the South Baltic Autumn Herring.

Locality of Capture	Date of capture	No. of spec. examined	Maturity	Average number of Vert. S. with mean error	Investigator
The Gotland Bank	18. Sept. 1887	35	IV-VII	55.51 ± 0.13	Heincke
N. W. of Nordpeerd, Rügen[1]	3. Oct. 1891	30	IV-VI	55.53 ± 0.10	—
Off Rönne, Bornholm	7. Oct. 1914	99	IV-VI	55.55 ± 0.065	Johansen
East of Bornholm	30. Sept. 1915	227	V-VII	55.45 ± 0.042	—
Off Rødby (S. of Laaland)	20. Oct. 1915	185	VII	55.48 ± 0.049	—
Masnedsund (S. of Sealand)[1]	5. Oct. 1915	215	V-VII	55.54 ± 0.040	—

The various races of the "Strömming" in the eastern and northern part of the Baltic have more than 55.00 but less than 55.50 vertebrae in mean value.

In the middle Kattegat autumn spawning herrings occur which have about 56.00 vertebrae in mean value. They are of considerable importance but they do not seem to have a quite uniform racial stamp. The hydrographical factors, such as temperature and salinity etc. do not appear to be sufficiently constant and uniform for the development of one single race which predominates markedly over all the others.

A spring spawning herring occurring in the western part of the Baltic has very nearly 56.00 vertebrae in mean value, as appears from the survey below:

Locality of Capture	Date of capture	No. of spec. examined	Maturity	Average number of vert.	Investigator
Prohner Wieck	11. May 1888	33	VI-VII	56.00 ± 0.12	Heincke
— —	28. May 1888	46	IV-VII	56.04 ± 0.12	—
— —	March 1891	24	IV-V	56.00 ± 0.12	—
— —	April 1891	30	IV-VII	56.17 ± 0.10	—
Guldborg Sund	3.-4. May 1916	211	V-VII	55.94 ± 0.043	Johansen

This herring does not play any great rôle at present, but it was possibly of great importance formerly when the waters in the Baltic were more saline.

There is naturally a characteristic difference in the distribution of the variants between races in which the average number of vertebrae approximates to whole numbers and races where it approximates to half numbers. In the first case it recalls the coefficients of $(a+b)^n$ where n is an even number, and in the second case the same where n is an odd number. A few examples will illustrate this:

[1] The samples from Nordpeerd and Masnedsund had a little higher number of keeled scales (K_2) than the other samples and belonged possibly to the West Baltic Herrings.

A. Herring Races whose average number of vertebrae approximates to whole numbers.

	North East Atlantic Herring		**South West Baltic Spring Herring**
	Drangar S.W. Iceland. Aug. 1919	All material available (see p. 51—55)	(see p. 93)
No.	Freq.	Freq.	Freq.
54	1	2	5
55	0	8	55
56	28	156	225
57	129	738	58
58	29	221	1
59	2	11	..
60	..	1	..
n	180	1137	344
m	57.011	57.060	55.985
σ	0.64	0.647	0.632
σ_m	0.048	0.019	0.034
σ_σ	0.034	0.014	0.024

B. Herring Races whose average number of vertebrae approximates to half numbers.

	Atlanto Scandian Spring Herring	**Bank Herring of the North Sea**	**South Baltic Autumn Herring**
	Norwegian samples (see p. 91)	All material available (see p. 5—22)	All material available (see p. 93)
No.	Freq.	Freq.	Freq.
51	..	1	..
52	..	..	..
53	..	..	..
54	..	1	26
55	..	27	376
56	41	377	355
57	291	363	34
58	291	33	..
59	40	1	..
60	2	..	..
n	665	803	791
m	57.505	56.496	55.502
σ	0.72	0.673	0.634
σ_m	0.028	0.024	0.023
σ_σ	0.019	0.017	0.016

We have seen that in a group of races the average number of vertebrae approximates to whole and half numbers,[1] whilst this does not seem to be the case in another group of races. In all probability there is a connection between this phenomenon and the different habitat of the two groups. The herring races whose average number of vertebrae approximates to whole or half numbers, are mostly found in the large open waters where such factors as the temperature and the salinity have a proportionately uniform and constant character. The herring races of minor importance, whose average number of vertebrae does not seem to approximate to whole or half numbers, are mostly found in fiords and other inshore waters where such factors as the temperature and salinity are varying much from place to place, and also are very changeable on the same locality. Moreover, the named factors, especially the salinity, are often subjected to great changes in the course of a proportionately short time from a geological point of view. Such races

[1] Also in races of other fishes we notice a similar approximation to whole or half numbers in the average no. of vertebrae. The plaice of the North Sea e. g. has very nearly 43.00 vertebrae in mean value (13.00 prec. + 30.00 caud. vert.) Cf. H. M. Kyle 1900, L. Keilhack 1913, G. Duncker 1913.

are probably not so constant and stable as the other races. It is possible, however, that several of the "races" of the last named group from the minor waters consist of mixtures of races of the first group. There is some evidence to hand that the herrings spawning in the inner and less saline parts of the fiords and bays have usually a smaller number of vertebrae than those spawning in the outer parts. In such small waters it is a difficult matter to demonstrate the racial characteristics of the herring races.

In the case of the more variable characters, such as number of keeled scales and number of fin rays, it is more difficult to see whether there is an approximation to a whole number or a half in the means. The environments induce here greater fluctuations from the typical racial mean values than in the case of the vertebrae. In certain cases, however, such an approximation seems to be evident. Thus in the North East Atlantic Herring the average number of rays in the ventral fins approximates to 18.00 $(9.00 + 9.00)$[1], and in the Atlanto-Scandian Herring the average number of keeled scales approximates in all probability to 14.00

I am much obliged to Dr. K. A. Andersson and Mr. David T. Jones for their help in procuring material for my investigations, and I beg my collaborators to accept my best thanks for their valuable assistance in the herring work.

Preparation-work has been carried out by Frøken B. Lockwood Larsen and Hr. cand. S. Weis Fogh.

Countings of vertebrae: Hr. cand. S. Weis Fogh.

Scale readings, countings of rays and keeled scales: Hr. mag. scient. Erik M. Poulsen, Hr. stud. mag. Anton Bruun, Hr. mag. scient. P. Kramp.

Statistical work: Dr. Kirstine Smith, Fru Konsulinde E. Neergaard-Möller, Hr. cand. mag. Aage J. C. Jensen.

The Charts were drawn by Hr. Tegner H. P. Simonsen.

Miss A. G. Davin has been good enough to correct the English translation.

The Tables of the Analyses have been printed at the cost of the Rask-Ørsted Fund.

[1] Comp. p. 51—55.

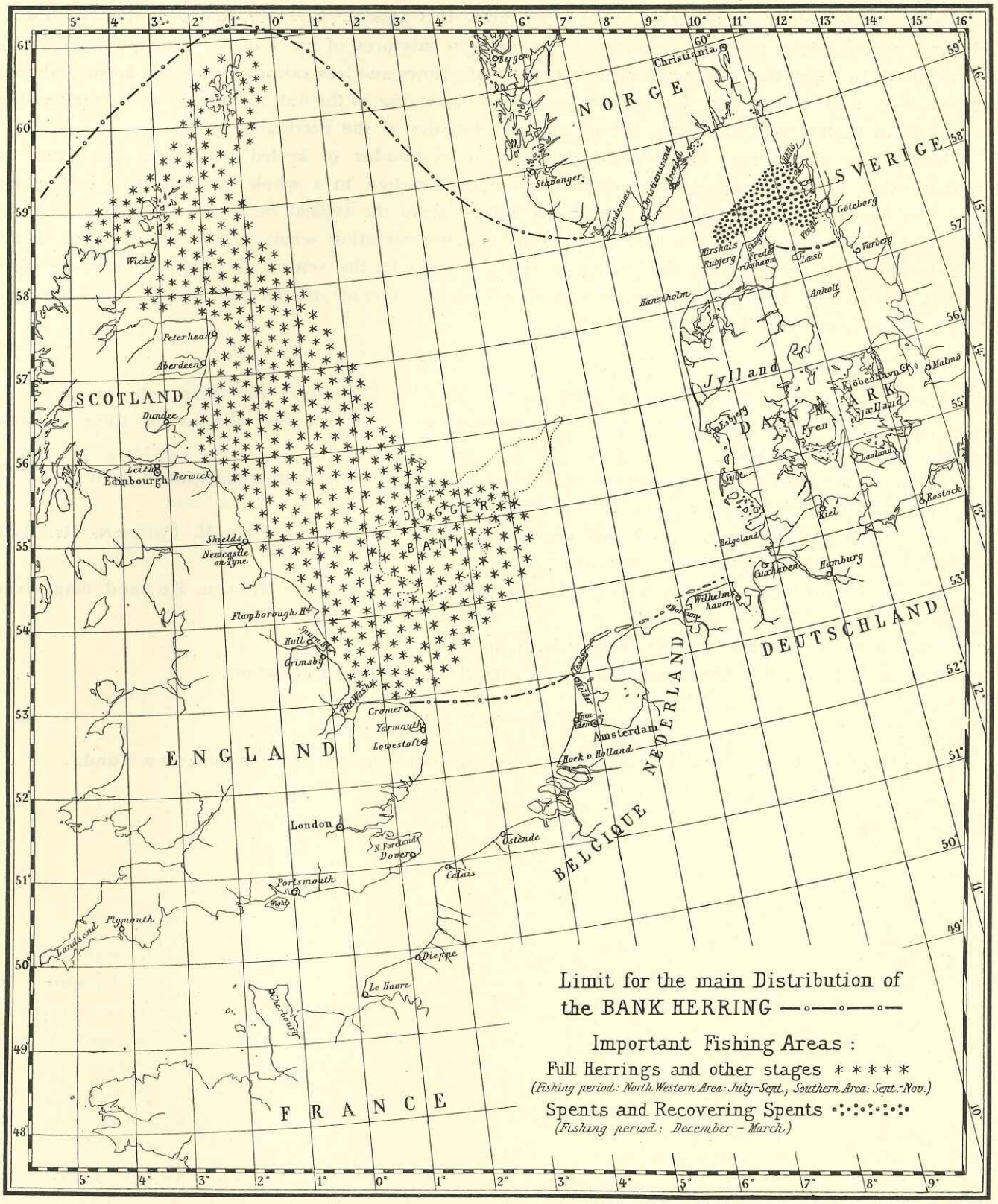

Fig. 15. The main distribution of the Bank Herring of the North Sea, and the situation of important fishing places where this Herring is predominant. (The yearly average catch of the Bank Herring in the North Sea may be estimated at about 350 million kgs. for the period 1904—1913. The yield in the Eastern Skagerak was in the period 1904—23 ca. 40 million kgs., and in the Herring Period from 1887—1896 ca. 150 million kgs pro year).

Tables of the Analyses of Herrings caught in the North Sea and the Skagerak.

(The letter r after the figure denoting number of winter-rings indicates that the last winter-ring is situated quite at the margin, not inside the margin).

A. Herrings from the Shetland Isles.

20 miles S.E. of Balta Sound, Sept. 1. 1921. Maturity III—VII. Caught in Drift Nets.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched Rays in Dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	30.5	♂	IV-VI	24	33	57	16	15	3 + 13[1]	9	9	4
2	29.0	♂	IV-VI	26	30	56	13	17	3 + 15	9	8	c. 8
3	28.5	♂	IV	23	34	57	15	16	3 + 13	9	8	c. 9
4	26.0	♂♀	IV-VI	23	34	57	17	14	3 + 14	9	9	7
5	28.1	♂♀	III	24	32	56	13	15	3 + 12	9	9	5
6	28.3	♂♀	IV-VI	24	33	57	15	15	3 + 14	9	9	4
7	30.0	♂♀	IV	23	33	56	16	15	3 + 14	9	9	4
8	28.8	♂♀	IV-VI	24	32	56	15	14	3 + 12	9	9	8
9	29.2	♂♀	V-VI	24	32	56	14	15	3 + 15	9	8	c. 5
10	28.3	♂♀	III	24	33	57	13	15	4 + 14	9	9	5
11	29.0	♂♀	IV	23	34	57	14	16	3 + 15	9	9	6
12	30.5	♂♀	V-VI	25	32	57	19	15	3 + 13	?	9	8—9
13	28.2	♂♀	III	24	34	58	15	15	3 + 15	9	9	9
14	29.2	♂♀	III	24	33	57	14	16	3 + 14	9	9	4(+)
15	28.0	♂♀	III	25	32	57	15	15	3 + 15	9	9	9
16	28.8	♂♀	IV-VI	23	33	56	16	15	2 + 14	9	9	8
17	28.8	♂♀	IV-VI	24	33	57	15	15	3 + 14	9	9	6
18	29.7	♂♀	V-VI	23	33	56	15	15	3 + 14	9	9	7
19	29.0	♂♀	IV	23	33	56	14	15	3 + 15	9	9	7
20	28.8	♂♀	V-VI	23	34	57	14	16	4 + 14	9	9	6—7
21	28.5	♂♀	V-VI	25	33	58	16	15	3 + 12	9	9	8—12
22	26.6	♂♀	IV	24	33	57	15	15	3 + 11	9	9	7
23	28.0	♂♀	IV-VI	23	33	56	15	15	3 + 13	9	9	?
24	28.0	♂♀	IV-VI	24	32	56	14	16	3 + 16	9	9	4
25	29.3	♂♀	IV	23	33	56	15	15	3 + 14	8	9	c. 4
26	30.2	♂♀	V-VI	23	34	57	15	15	3 + 14	9	9	7
27	31.0	♂♀	IV-VI	25	32	57	14	15	3 + 15	9	9	c. 7—8
28	27.2	♂♀	IV	24	33	57	14	15	3 + 14	9	9	7
29	28.5	♂♀	V-VI	24	32	56	15	15	3 + 15	9	9	c. 5
30	29.5	♂♀	III	24	33	57	15	16	3 + 14	9	9	8
31	28.4	♂♀	IV-VI	23	34	57	15	15	3 + 15	9	9	5
32	27.5	♂♀	IV-VI	24	33	57	15	16	4 + 15	9	9	7
33	28.0	♂♀	V-VI	24	33	57	14	16	3 + 15	9	9	4
34	27.0	♂♀	V-VI	25	32	57	15	15	3 + 14	9	9	7
35	28.7	♂♀	V-VI	25	31	56	15	16	3 + 13	9	9	8
36	28.3	♂♀	V-VI	23	33	56	15	15	3 + 13	9	8	8
37	30.7	♂♀	IV	26	30	56	15	15	3 + 13	9	9	9
38	29.5	♂♀	IV	25	32	57	14	15	3 + 14	9	9	10
39	29.6	♂♀	V-VI	24	34	58	15	15	3 + 14	9	9	7
40	28.0	♂♀	III	24	32	56	15	16	3 + 14	9	9	6
41	28.2	♂♀	IV	25	32	57	17	14	3 + 15	9	9	6
42	30.0	♂♀	IV-VI	24	33	57	14	16	3 + 13	9	9	9
43	31.2	♂♀	V-VI	24	33	57	15	15	4 + 14	9	9	9
44	26.7	♂♀	III	24	32	56	16	16	4 + 13	9	8	7
45	29.7	♂♀	IV-VI	23	33	56	14	15	3 + 13	9	9	7
46	25.8	♂♀	IV-VI	23	34	57	14	15	3 + 13	9	9	(6-)7
47	26.3	♂♀	IV-VI	24	33	57	15	15	2 + 15	9	9	4
48	26.7	♂♀	IV-VI	24	32	56	15	15	3 + 14	9	9	7
49	27.8	♂♀	IV-VI	24	32	56	16	15	3 + 14	9	9	8
50	27.0	♂♀	IV	23	34	57	16	15	3 + 15	9	9	c. 5
51	28.0	♂♀	IV-VI	24	32	56	14	14	3 + 14	9	9	6
52	31.4	♂♀	V-VI	24	32	56	15	15	4 + 14	9	9	?
53	28.0	♀	III	24	32	56	15	16	4 + 15	9	9	7
54	28.5	♀	IV-VI	22	34	56	15	15	3 + 13	8	8	6—7
55	28.2	♀	III	24	32	56	15	15	3 + 14	9	9	6
56	29.2	♀	IV	25	32	57	15	15	4 + 13	9	9	?
57	28.2	♀	IV-VI	24	34	58	16	?	3 + 14	9	9	5
58	26.3	♀	IV	24	33	57	15	16	3 + 14	9	9	5
59	28.5	♀	IV-VI	24	33	57	15	14	4 + 15	9	9	7-(8)
60	28.0	♀	V-VI	27	30	57	17	15	2 + 16	8	8	?
61	29.0	♀	V-VI	24	33	57	15	14	3 + 15	9	9	7
62	28.5	♀	IV-VI	25	32	57	13	14	3 + 14	9	9	c. 6
63	30.0	♀	V-VI	24	33	57	15	15	3 + 15	?	9	7(-8)
64	29.5	♀	V-VI	23	33	56	13	15	2 + 16	9	?	6—7
65	27.5	♀	IV	24	32	56	15	15	3 + 14	9	9	5
66	27.5	♀	IV-VI	23	33	56	16	15	4 + 13	9	8	7
67	27.5	♀	III	24	31	55	15	15	3 + 13	9	9	6
68	28.7	♀	IV	24	33	57	15	15	3 + 13	9	8	?
69	27.3	♀	V-VI	26	31	57	13	15	3 + 13	8	8	5
70	29.5	♀	V-VI	24	32	56	15	16	3 + 15	9	9	6
71	31.0	♀	V-VI	23	34	57	13	15	3 + 14	9	9	8
72	29.4	♀	V-VI	24	32	56	17	15	3 + 14	9	9	8
73	27.5	♀	IV	24	34	58	14	15	3 + 15	9	9	c. 6
74	27.2	♀	III	24	33	57	14	14	3 + 15	9	9	7
75	29.2	♀	V-VI	24	32	56	14	15	3 + 13	9	9	7
76	29.2	♀	IV-VI	25	32	57	14	?	3 + 13	8	8	8
77	29.2	♀	IV-VI	23	33	56	16	15	3 + 13	9	9	6
78	28.5	♀	IV-VI	24	33	57	16	16	3 + 15	9	9	8
79	27.3	♀	IV	24	33	57	16	15	3 + 12	9	9	7
80	28.5	♀	IV	24	32	56	14	16	3 + 15	9	9	5
81	29.6	♀	IV-VI	22	33	55	14	15	3 + 14	10	9	10
82	28.5	♀	V-VI	23	33	56	15	15	3 + 14	9	9	10
83	28.0	♀	IV	24	32	56	14	15	3 + 14	9	9	c. 5
84	27.0	♀	V-VI	26	30	56	15	15	3 + 14	9	9	6
85	28.5	♀	IV-VI	23	33	56	15	14	3 + 13	9	9	5—6
86	28.3	♀	IV	23	33	56	16	14	3 + 15	8	8	5
87	29.8	♀	V-VI	24	33	57	16	16	3 + 14	8	9	7
88	27.5	♀	IV-VI	24	32	56	15	15	3 + 14	9	9	5
89	27.5	♀	IV-VI	24	32	56	14	15	3 + 13	9	9	9
90	28.0	♀	IV	24	32	56	15	15	3 + 15	9	8	6—7
91	27.0	♀	IV-VI	25	32	57	16	15	3 + 14	9	9	5
92	30.1	♀	V-VI	24	32	56	13	16	3 + 14	8	8	5
93	28.8	♀	IV-VI	23	33	56	14	16	3 + 15	9	9	8
94	27.2	♀	IV-VI	25	32	57	15	15	3 + 13	8	9	6
95	27.8	♀	III	25	32	57	15	15	3 + 15	9	9	5
96	27.2	♀	III	23	33	56	14	15	3 + 15	9	9	7
97	29.5	♀	IV	24	32	56	15	15	3 + 12	9	9	8
98	28.0	♀	IV	23	34	57	16	16	3 + 14	9	9	6—7
99	28.0	♀	IV-VI	24	33	57	15	15	4 + 14	9	9	8
100	28.7	♀	III	23	33	56	15	14	3 + 14	9	9	8
101	31.5	♀	IV-VI	23	34	57	16	16	3 + 13	8	8	8
102	27.8	♀	III	23	33	56	15	15	3 + 13	9	9	5
103	28.5	♀	IV-VI	23	33	56	13	15	3 + 14	9	9	(5-)6
104	27.0	♀	V-VI	24	32	56	15	15	3 + 14	9	9	4

[1] Unbranched plus branched rays.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched Rays in Dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
105	26.5	♀	III	25	32	57	15	14	3 + 14	9	9	5
106	27.8	♀♀	V-VI	24	32	56	14	17	3 + 15	8	8	7
107	29.2	♀♀	V-VI	23	33	56	15	16	3 + 14	8	9	9
108	30.1	♂♂	IV-VI	22	35	57	15	14	3 + 14	9	9	6
109	29.4	♀♀	IV-VI	24	34	58	15	16	3 + 15	9	9	6
110	29.2	♂♂	V-VI	24	32	56	15	15	3 + 13	8	9	6
111	30.2	♀♀	IV-VI	24	34	58	15	14	? + 13	9	9	c. 6
112	27.5	♂♂	IV-VI	23	33	56	16	15	3 + 15	9	9	3—4
113	28.5	♀♀	IV-VI	24	32	56	15	16	3 + 15	9	9	8
114	28.4	♂♂	V-VI	23	33	56	15	16	3 + 15	9	9	7—8
115	27.1	♂♂	IV-VI	23	34	57	13	16	3 + 14	8	9	8
116	30.5	♂♂	VII	23	32	55	14	15	3 + 13	9	8	8
117	29.0	♀♀	V-VI	24	32	56	14	15	3 + 14	9	9	6
118	29.0	♀♀	IV-VI	24	31	56	15	16	3 + 14	9	9	6
119	28.6	♂♂	IV	24	32	56	15	16	3 + 14	9	9	6
120	29.2	♂♂	V-VI	24	32	56	15	16	4 + 15	9	9	8
121	27.0	♂♂	IV-VI	24	32	56	17	16	?	9	9	6—7
122	28.0	♀♀	V-VI	22	34	56	16	16	4 + 13	9	9	7
123	29.5	♂♂	IV-VI	24	34	58	14	16	3 + 15	9	9	5
124	29.2	♀♀	IV	24	32	56	15	15	3 + 14	9	9	7
125	28.8	♂♂	V-VI	24	33	57	14	15	4 + 15	9	9	6
126	27.2	♂♂	IV-VI	24	34	58	15	15	4 + 13	9	9	4
127	26.0	♀♀	IV-VI	23	34	57	16	15	2 + 15	9	10	?
128	30.5	♀♀	V-VI	26	31	57	15	15	3 + 13	8	8	8
129	29.0	♀♀	IV	23	34	57	14	15	3 + 12	8	8	8
130	28.5	♂♂	IV-VI	24	33	57	15	15	4 + 14	9	9	7
131	28.7	♀♀	V-VI	23	34	57	15	14	3 + 15	9	9	?
132	30.0	♀♀	V-VI	23	33	56	16	15	2 + 13	8	8	8
133	29.5	♀♀	IV	24	33	57	14	?	4 + 15	9	9	8
134	28.4	♀♀	IV	23	33	56	15	15	3 + 14	9	9	8
135	30.6	♂♂	IV-VI	23	33	56	15	15	4 + 14	9	9	9—10
136	27.5	♀♀	III	24	33	57	15	15	3 + 15	9	9	5
137	29.2	♀♀	V-VI	23	34	57	15	16	3 + 14	8	8	6
138	28.0	♀♀	IV	25	31	56	15	15	3 + 13	9	9	9
139	27.3	♀♀	IV	24	33	57	14	15	3 + 14	9	9	4
140	29.0	♀♀	V-VI	25	31	56	14	14	3 + 15	9	9	7
141	29.5	♀♀	V-VI	24	32	56	17	15	3 + 15	9	9	7
142	29.0	♀♀	V-VI	23	33	56	15	15	3 + 13	9	9	9
143	27.5	♂♂	IV-VI	24	33	57	15	14	3 + 14	9	9	7(-8)
144	27.8	♂♂	IV-VI	24	33	57	15	14	3 + 14	9	9	7
145	28.0	♀♀	V-VI	24	33	57	15	15	2 + 15	9	9	8
146	26.2	♀♀	V-VI	24	33	57	15	15	3 + 14	9	9	4
147	27.0	♂♂	IV-VI	24	32	56	15	15	4 + 13	9	9	4
148	29.0	♀♀	V-VI	25	33	58	16	15	3 + 13	9	9	5
149	29.5	♂♂	IV-VI	24	32	56	15	15	3 + 15	9	9	7
150	26.8	♀♀	IV	25	32	57	14	15	3 + 15	9	9	6
151	29.2	♀♀	IV	23	34	57	15	15	2 + 14	8	8	9—10
152	28.2	♀♀	V-VI	23	32	55	14	14	3 + 14	9	9	5
153	27.2	♀♀	IV	24	33	57	15	15	3 + 13	9	9	6
154	27.8	♂♂	IV-VI	24	33	57	14	15	3 + 13	9	9	7
155	30.5	♀♀	V-VI	24	32	56	16	16	3 + 13	9	9	8
156	28.0	♂♂	IV-VI	25	32	57	14	15	3 + 16	9	10	6
157	29.5	♂♂	IV-VI	24	32	56	16	15	3 + 14	9	9	5
158	27.1	♀♀	IV	24	32	56	15	16	2 + 15	9	9	6
159	29.5	♂♂	IV-VI	24	33	57	15	16	3 + 14	9	9	6(+)
160	26.6	♂♂	IV-VI	23	34	57	15	15	3 + 14	8	9	5
161	28.2	♀♀	IV	24	32	56	15	15	3 + 14	9	9	7
162	30.2	♀♀	V-VI	24	32	56	15	14	3 + 14	9	9	7—8
163	28.4	♀♀	IV	23	34	57	16	15	3 + 14	9	8	?
164	27.5	♀♀	V-VI	24	32	56	15	16	?	9	9	4
165	25.9	♀♀	III	24	33	57	14	15	3 + 14	9	9	5
166	29.3	♀♀	V-VI	24	32	56	14	16	3 + 15	9	8	6
167	28.5	♀♀	IV	24	33	57	15	15	4 + 13	9	9	c. 5
168	26.6	♂♂	IV-VI	23	33	56	14	15	3 + 13	9	9	7
169	29.0	♀♀	V-VI	24	33	57	14	16	3 + 15	9	9	8
170	28.0	♀♀	V-VI	24	32	56	15	16	3 + 15	9	9	5
171	28.8	♀♀	V-VI	23	33	56	15	16	3 + 15	9	9	5—6
172	29.2	♀♀	IV	24	32	56	14	14	3 + 13	9	9	7
173	28.3	♀♀	V-VI	24	34	58	15	15	3 + 14	9	9	5
174	28.0	♂♂	IV-VI	24	33	57	15	15	3 + 13	9	9	9
175	29.0	♂♂	IV-VI	25	32	57	15	16	4 + 13	9	9	c. 8
176	30.4	♂♂	IV-VI	23	33	56	14	15	3 + 13	9	9	8—9
177	28.7	♀♀	V-VI	23	34	57	15	15	3 + 15	9	8	7
178	27.0	♂♂	IV-VI	23	33	56	14	16	3 + 14	9	9	5
179	28.5	♂	IV-VI	26	32	58	15	17	3 + 15	9	9	4—5
180	27.0	♀♀	V-VI	24	33	57	15	15	2 + 15	9	9	4
181	26.5	♀♀	IV	24	32	56	15	15	3 + 13	9	9	5
182	28.2	♀♀	IV	23	34	57	15	14	4 + 13	9	9	6
183	29.7	♂♂	IV-VI	24	32	56	13	15	2 + 15	9	9	5
184	28.8	♂♂	IV-VI	20	31	51	14	14	3 + 13	9	9	8
185	27.8	♂♂	III	23	33	56	15	16	3 + 14	9	9	6
186	27.0	♀♀	IV	26	30	56	14	16	2 + 15	9	9	5
187	28.4	♂♂	IV-VI	23	33	56	15	16	3 + 15	9	9	c. 7
188	27.0	♂♂	IV-VI	24	33	57	15	15	4 + 15	9	9	5—6
189	28.0	♂♂	IV-VI	24	33	57	15	15	3 + 14	9	9	5
190	28.8	♂♂	IV-VI	23	33	56	14	16	3 + 16	9	9	9
191	27.7	♂♂	IV-VI	25	32	57	15	15	3 + 14	8	8	7
192	30.6	♂♂	V-VI	23	33	56	15	15	3 + 14	9	9	c. 8
193	27.8	♀♀	IV	24	33	57	14	16	3 + 14	9	9	7
194	30.6	♀♀	V-VI	23	34	57	14	14	3 + 15	9	9	11
195	30.2	♀♀	V-VI	25	32	57	14	15	3 + 15	9	9	6
196	28.0	♀♀	IV	25	32	57	15	15	3 + 14	9	9	8
197	31.0	♂♂	V-VI	24	32	56	14	15	3 + 15	9	9	4—5
198	29.5	♂♂	IV-VI	24	33	57	15	15	3 + 16	9	9	6
199	27.0	♂♂	IV-VI	25	31	56	15	..	3 + 14	9	9	7
200	27.6	♂♂	IV-VI	24	33	57	16	15	3 + 15	9	9	4
201	27.6	♂♂	V-VI	24	32	56	17	16	3 + 13	9	9	5
202	28.0	♂♂	IV-VI	23	33	56	16	15	3 + 14	8	8	8
203	31.0	♂♂	IV-VI	23	32	55	16	16	3 + 14	8	8	6
204	27.0	♂♂	IV-VI	24	32	56	14	15	4 + 13	9	9	6
205	28.7	♀♀	V-VI	24	32	56	14	15	3 + 15	9	9	4
206	30.8	♀♀	V-VI	24	33	57	14	15	3 + 14	8	7	9
207	29.2	♀♀	V-VI	23	34	57	15	15	2 + 15	9	9	5
208	29.8	♀♀	V-VI	23	34	57	15	14	2 + 15	9	9	9
209	28.0	♀♀	V-VI	22	34	56	17	16	3 + 14	9	9	5
210	28.2	♀♀	V-VI	22	34	56	15	14	?	8	9	8
211	29.4	♀♀	V-VI	23	33	56	15	14	3 + 14	9	9	7
212	27.0	♂♂	IV-VI	26	31	57	15	16	3 + 14	9	9	5
213	27.3	♂♂	IV-VI	24	32	56	16	16	3 + 14	9	9	?
214	28.2	♀♀	III	24	34	58	15	14	4 + 14	9	9	6
215	29.0	♀♀	V-VI	22	35	57	15	15	3 + 15	9	9	5
216	29.8	♀♀	V-VI	26	31	57	14	14	3 + 15	9	10	5
217	29.0	♂♂	IV-VI	25	31	56	15	14	3 + 13	9	9	10
218	27.5	♂♂	IV	24	32	56	14	15	3 + 14	9	9	?
219	28.0	♂♂	V-VI	23	33	56	15	16	3 + 14	9	9	5
220	27.2	♂♂	IV-VI	24	34	58	17	16	3 + 15	9	9	7
221	26.6	♀♀	V-VI	24	32	56	15	16	3 + 14	9	10	5
222	28.5	♀♀	IV	24	33	57	14	15	3 + 13	9	8	7
223	28.5	♀♀	IV	24	32	56	13	15	3 + 15	9	9	5—6
224	28.4	♂♂	IV-VI	24	33	57	15	16	3 + 15	9	9	5
225	27.0	♂♂	IV-VI	23	33	56	16	15	4 + 13	9	8	8
226	28.7	♀♀	V-VI	24	33	57	14	14	3 + 13	9	9	7
227	27.2	♂♂	IV-VI	24	33	57	15	15	3 + 14	9	9	5
228	26.5	♂♂	IV-VI	22	33	55	17	14	3 + 14	9	9	5
229	29.0	♂♂	IV-VI	24	33	57	15	16	3 + 15	9	9	?
230	28.4	♀♀	IV	24	33	57	15	15	2 + 13	9	9	9
231	29.0	♀♀	V-VI	23	34	57	16	15	3 + 14	8	8	8
232	28.5	♀♀	V-VI	25	32	57	15	16	3 + 15	9	9	9
233	31.0	♀♀	V-VI	23	33	56	14	15	3 + 15	9	9	7
234	30.8	♀♀	V-VI	24	33	57	14	16	4 + 14	8	8	6—9
235	28.7	♀♀	IV	23	34	57	14	15	4 + 13	8	8	8
236	27.5	♀♀	IV	24	32	56	16	15	3 + 14	9	9	?
237	28.7	♀♀	IV	24	32	56	15	15	3 + 14	9	9	7
238	28.5	♀♀	IV	24	32	56	14	15	3 + 13	9	9	4(-5)
239	28.6	♀♀	III	24	32	56	15	15	3 + 14	9	9	5—6
240	28.2	♀♀	IV	24	33	57	14	15	3 + 13	9	9	8
241	29.3	♀♀	V-VI	24	33	57	15	15	3 + 14	9	8	7—8
242	29.5	♀♀	V-VI	26	33	59	16	16	?	9	8	5
243	28.5	♂♂	IV-VI	23	34	57	15	14	4 + 14	9	9	5
244	27.5	♂♂	IV-VI	22	34	56	14	15	3 + 14	9	9	6
245	30.6	♂♂	V-VI	23	34	57	16	15	3 + 13	8	8	9
246	28.2	♀♀	IV	23	33	56	16	15	3 + 14	9	9	5
247	30.0	♀♀	V-VI	26	31	57	15	15	2 + 15	9	9	9
248	30.3	♂♂	IV-VI	24	34	58	14	14	3 + 15	9	9	c. 7
249	29.5	♂♂	V-VI	24	32	56	14	15	3 + 15	9	9	c. 7
250	28.3	♂♂	IV-VI	25	32	57	14	15	3 + 15	9	9	5
251	26.8	♂♂	V-VI	24	32	56	15	15	3 + 14	9	9	3
252	29.4	♀♀	IV	24	32	56	15	15	3 + 15	9	9	c. 7
253	28.8	♀♀	IV	24	32	56	15	15	3 + 14	8	8	6
254	27.3	♂	IV-VI	25	32	57	16	16	4 + 14	9	9	6

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched Rays in Dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
255	26.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	23	31	54	16	16	3 + 14	8	8	c. 8
256	29.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	25	32	57	14	14	3 + 13	9	9	8
257	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	III	23	33	56	15	15	3 + 13	9	9	5—6
258	29.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	15	3 + 12	9	8	9—10
259	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	15	15	3 + 15	9	9	4
260	27.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	15	15	3 + 15	9	9	5
261	29.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	16	16	3 + 14	9	9	7
262	27.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	31	56	15	15	3 + 15	9	9	5
263	27.6	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	14	15	3 + 13	9	9	5
264	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	16	15	3 + 14	9	9	6
265	26.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	16	4 + 13	9	9	5
266	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	14	16	3 + 15	9	9	7
267	28.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	15	15	3 + 13	9	9	(6-)7
268	26.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	14	16	3 + 16	9	9	5
269	29.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	III	24	34	58	14	14	3 + 15	9	9	5
270	27.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	15	14	3 + 14	9	9	5(-6)
271	26.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	16	16	3 + 13	9	9	6
272	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	13	16	3 + 15	9	9	6
273	28.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	22	34	56	15	15	4 + 13	9	9	?
274	29.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	34	57	15	15	2 + 14	9	9	6
275	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	34	58	16	15	3 + 15	9	9	7
276	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	32	56	14	15	3 + 14	8	8	7
277	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	15	14	4 + 13	9	9	7
278	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	16	15	3 + 14	9	9	c. 6
279	28.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	23	33	56	14	16	3 + 16	8	9	5(-6)
280	29.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	22	35	57	15	15	2 + 13	9	9	9
281	28.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	34	57	14	15	3 + 15	9	9	7
282	28.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	33	57	13	16	? + 14	9	9	8
283	26.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	15	15	2 + 14	9	9	6
284	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	26	31	57	15	14	4 + 13	9	8	5
285	29.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	III	23	33	56	15	15	3 + 13	9	9	7
286	29.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	4 + 13	9	9	8
287	28.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	15	15	3 + 15	10	9	4
288	30.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	15	15	3 + 15	9	9	8
289	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	III	24	32	56	14	15	3 + 14	9	9	?
290	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	14	14	4 + 14	8	9	6
291	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	III	24	32	56	16	16	3 + 13	9	9	?
292	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 14	9	9	7
293	26.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	14	14	4 + 13	9	9	?
294	27.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	15	14	3 + 14	9	8	6
295	27.4	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	34	57	14	16	3 + 14	9	8	?
296	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	32	56	14	15	3 + 16	9	9	5
297	29.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	16	14	3 + 13	9	9	6
298	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	15	14	3 + 12	9	9	9
299	27.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	14	15	3 + 13	8	8	5
300	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 12	9	9	7
301	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	31	56	15	16	3 + 14	9	9	7
302	29.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	34	57	14	16	3 + 15	9	9	7
303	28.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	13	15	3 + 16	8	8	7
304	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	15	15	3 + 13	9	9	?
305	27.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	15	15	2 + 14	9	9	5
306	31.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	31	56	15	15	3 + 14	10	10	8
307	27.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	16	15	4 + 13	9	9	?
308	30.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	14	15	3 + 15	9	9	7
309	29.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	16	15	3 + 13	9	9	6
310	30.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	32	57	15	15	2 + 15	8	8	?
311	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	32	57	14	15	3 + 15	9	9	4
312	29.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	31	56	15	15	3 + 12	9	9	5
313	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	16	15	3 + 15	9	9	3
314	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	15	14	3 + 14	9	9	6
315	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	15	16	3 + 15	9	9	?
316	29.6	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	33	57	16	15	3 + 14	8	8	7
317	26.1	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	32	55	16	16	3 + 14	9	9	7
318	26.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 14	9	9	5
319	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	33	56	14	14	3 + 14	8	8	5
320	30.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	15	15	3 + 14	9	9	c. 5
321	27.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	23	34	57	16	15	3 + 14	9	8	6
322	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 13	9	9	8
323	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	25	32	57	14	16	3 + 14	8	8	8—9
324	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 12	9	8	4
325	28.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 14	9	9	7
326	27.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV-VI	24	32	56	14	15	3 + 12	9	9	7
327	30.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	VII	23	33	56	15	16	3 + 17	9	9	6—7
328	29.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	15	3 + 14	9	9	5
329	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	22	34	56	14	14	3 + 14	9	9	8
330	30.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	16	15	3 + 15	8	8	c. 8
331	27.1	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	16	14	3 + 13	8	8	6
332	28.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	34	58	15	14	3 + 16	9	9	7
333	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	16	?	9	9	?6
334	27.4	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	14	?	9	9	9
335	29.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	22	34	56	17	15	3 + 14	9	9	7
336	30.6	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	32	57	14	15	3 + 16	9	9	8
337	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	30	55	14	14	4 + 15	8	8	8
338	28.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	15	4 + 14	9	9	5
339	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	15	15	2 + 14	9	9	5
340	29.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	15	16	3 + 14	9	9	8
341	30.8	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	31	56	14	15	4 + 14	9	9	c. 7
342	29.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	22	34	56	15	14	3 + 14	9	9	5
343	29.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	15	16	3 + 14	9	8	c. 8
344	29.1	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	15	15	3 + 14	9	8	7
345	26.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	32	57	15	14	3 + 14	9	9	?
346	30.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	15	16	3 + 14	8	8	8
347	27.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	33	57	14	14	3 + 13	9	9	7
348	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	16	14	3 + 14	9	9	6
349	29.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	33	56	15	15	3 + 13	9	9	7
350	27.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	23	34	57	15	15	4 + 13	9	9	6
351	27.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	26	31	57	14	16	3 + 13	9	9	6
352	27.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	25	32	57	15	14	3 + 13	9	9	6
353	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	23	34	57	15	16	3 + 16	9	9	6
354	28.7	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	26	29	55	13	14	3 + 13	8	9	9
355	29.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	25	32	57	15	15	4 + 13	9	9	8
356	29.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	14	15	3 + 14	9	9	7
357	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	16	15	3 + 15	9	9	?8
358	28.3	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	23	33	56	15	15	3 + 14	9	9	7
359	29.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	32	56	15	15	2 + 15	9	9	5—6
360	28.5	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	33	57	14	14	3 + 15	9	9	6
361	30.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	23	34	57	15	16	3 + 16	9	8	10
362	28.2	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	IV	24	33	57	15	15	3 + 15	9	9	4
363	28.0	♀♀♀♀♀↖↖♀♀↖↖♀↖♀♀	V-VI	24	33	57	17	15	?	9	9	5—6

B. Young Herrings from South West of Graadeep.

Nov. 30. 1922. Maturity I. Caught by Herring Trawl from the "Dana".

No.	Length cm	Vertebrae			Keeled scales K_2	Rays in ventral fins		No. of winter-rings in scales	No.	Length cm	Vertebrae			Keeled scales K_2	Rays in ventral fins		No. of winter-rings in scales
		Pre-caudal	Caudal	Total		right	left				Pre-caudal	Caudal	Total		right	left	
1	10.1	25	32	57	16	9	9	0	7	9.8	23	33	56	14	9	9	0
2	9.2	23	33	56	14	8	9	0	8	9.7	24	32	56	15	9	9	0
3	10.8	24	32	56	15	9	9	0	9	10.9	26	31	57	14	9	9	0
4	10.0	24	32	56	16	9	9	0	10	9.6	23	32	55	15	9	9	0
5	11.2	24	33	57	15	9	9	0	11	9.2	25	31	56	16	9	9	0
6	9.4	23	33	56	14	9	9	0	12	9.1	24	33	57	14	9	9	0

No.	Length cm	Vertebrae			Keeled scales K_2	Rays in ventral fins		No. of winter-rings in scales
		Pre-caudal	Caudal	Total		right	left	
13	9.5	24	32	56	15	9	10	0
14	10.2	24	32	56	17	8	8	0
15	9.7	24	32	56	14	9	8	0
16	10.2	25	32	57	16	9	9	0
17	9.8	23	33	56	16	9	9	0
18	10.1	25	31	56	15	9	9	0
19	9.6	24	33	57	14	9	9	0
20	9.1	24	33	57	16	8	8	0
21	9.3	24	32	56	14	9	9	0
22	9.5	24	32	56	15	9	9	0
23	10.2	24	32	56	15	9	9	0
24	9.7	25	31	56	15	8	9	0
25	9.6	22	35	57	16	9	9	0
26	9.5	23	34	57	17	9	9	0
27	10.6	23	33	56	16	9	9	0
28	9.8	23	33	56	15	9	9	0
29	9.8	24	33	57	16	8	9	0
30	10.1	23	35	58	15	9	9	0
31	9.5	23	33	56	14	9	8	0
32	9.6	25	32	57	16	8	8	0
33	10.0	23	33	56	16	9	9	0
34	9.9	25	31	56	15	9	9	0
35	9.2	23	34	57	14	9	8	0
36	10.2	25	33	58	15	9	9	0
37	10.5	24	33	57	16	8	9	0
38	9.5	24	32	56	16	9	8	0
39	10.2	24	32	56	14	9	9	0
40	10.0	24	32	56	14	9	9	0
41	9.9	24	32	56	16	9	9	0
42	10.0	25	30	55	16	9	8	0
43	9.2	26	32	58	15	9	9	0
44	9.5	24	32	56	16	9	9	0
45	9.5	24	32	56	16	9	9	0
46	10.9	25	32	57	16	9	9	0
47	10.4	24	32	56	15	9	9	0
48	9.6	24	33	57	16	9	9	0
49	9.8	23	33	56	15	8	8	0
50	11.0	24	33	57	15	9	9	0

C. Herrings from N. W. of Hirshals. (c. 57° 45′ N. 9° 15′ E.)

March. 6. 1923. Caught in Purse Seine.

a. Young mixed Herrings. Maturity I—II.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	23	♂+♀	I	24	33	57	14	15	3+15	9	9	4
2	23	♂+♀	I	24	33	57	14	16	3+14	9	9	3r
3	23	♂+♀	I	22	34	56	14	15	3+17	9	9	3
4	23	♂+♀	I	25	33	58	14	17	3+15	9	9	4r
5	23	♂+♀	I	25	33	58	14	16	3+16	9	9	3r
6	22	♂+♀	I	24	33	57	14	16	3+15	8	9	3
7	22	♂+♀	I	24	33	57	14	15	3+15	9	9	3
8	22	♂+♀	I	23	33	56	14	15	3+15	10	9	3
9	22	♂+♀	I	25	31	56	13	15	4+15	9	9	3
10	22	♂+♀	I	23	34	57	14	14	?	9	9	3?
11	22	♂+♀	I	25	31	56	15	16	3+15	9	9	3r
12	22	♂+♀	I	25	32	57	13	15	3+15	9	9	5
13	22	♂+♀	I	25	32	57	14	15	4+15	9	9	4
14	22	♂+♀	I	24	33	57	13	15	3+15	9	8	3
15	22	♂+♀	I	23	34	57	17	15	3+16	9	9	3
16	22	♂+♀	I	24	33	57	14	15	3+14	9	9	?
17	22	♂+♀	I	24	33	57	14	16	3+17	9	9	3
18	22	♂+♀	I	23	33	56	?	16	3+14	9	9	3
19	22	♂+♀	I	24	32	56	15	16	3+14	8	8	3
20	22	♂+♀	I	24	32	56	15	15	3+15	7	7	?
21	22	♂+♀	I	22	34	56	15	16	3+15	8	8	4
22	22	♂+♀	I	23	34	57	13	15	3+16	9	9	3r
23	22	♂+♀	I	24	33	57	15	15	3+16	8	8	3r
24	22	♂+♀	I	25	31	56	14	16	3+16	8	8	4
25	22	♂+♀	I	24	33	57	15	15	3+15	9	9	3
26	22	♂+♀	I	23	34	57	15	15	4+14	9	9	3r
27	22	♂+♀	I	23	34	57	13	15	4+13	9	9	3
28	22	♂+♀	I	24	32	56	14	15	3+15	9	9	5r
29	22	♂+♀	I	24	33	57	13	15	3+15	8	9	3
30	21	♂+♀	I	24	33	57	15	15	3+14	9	9	4r
31	21	♂+♀	I	24	32	56	15	16	3+15	9	10	4r
32	21	♂+♀	I	24	33	57	14	16	3+15	9	9	3
33	21	♂+♀	I	25	32	57	15	15	3+13	9	9	3r
34	21	♂+♀	I	25	32	57	15	17	3+15	9	9	3
35	21	♂+♀	I	24	32	56	16	16	3+14	8	8	3
36	21	♂+♀	I	25	31	56	16	16	3+15	9	9	4
37	21	♂+♀	I	24	33	57	14	14	3+15	9	9	3r
38	21	♂+♀	I	23	34	57	14	15	3+14	9	9	4r
39	21	♂+♀	I	22	34	56	15	15	3+15	9	9	3
40	21	♂+♀	I	24	32	56	14	16	3+14	8	8	3
41	21	♂+♀	I	22	34	56	13	15	3+15	9	9	3
42	21	♂+♀	I	25	32	57	14	15	4+14	9	9	3
43	21	♂+♀	I	24	33	57	15	16	3+14	9	9	3
44	21	♂+♀	I	26	31	57	15	15	3+14	9	9	3r
45	21	♂+♀	I	25	32	57	16	15	3+14	9	9	3r
46	21	♂+♀	I	23	34	57	16	16	3+14	9	9	2
47	21	♂+♀	I	23	33	56	15	15	?	9	9	?
48	21	♂+♀	I	23	34	57	16	15	3+16	9	8	3r
49	21	♂+♀	I	26	32	58	14	15	4+13	9	9	4
50	21	♂+♀	I	25	32	57	13	15	3+16	9	9	4r
51	21	♂+♀	I	24	33	57	16	16	3+13	9	9	3r
52	21	♂+♀	I	23	34	57	14	15	3+15	9	9	3r
53	21	♂+♀	I	23	33	56	14	15	3+15	9	9	3r
54	21	♂+♀	I	24	33	57	14	14	3+14	9	9	3
55	21	♂+♀	I	23	34	57	15	15	3+14	8	8	4
56	21	♂+♀	I	24	33	57	15	16	3+14	9	9	3
57	21	♂+♀	I	24	33	57	14	16	3+14	9	9	3r
58	21	♂+♀	I	24	33	57	13	14	3+14	9	9	3r
59	20	♂+♀	I	24	32	56	15	15	3+13	8	8	4
60	20	♂+♀	I	24	33	57	16	16	3+14	9	9	3
61	20	♂+♀	I	23	33	56	15	14	3+13	9	9	3r
62	20	♂+♀	I	23	34	57	13	14	3+14	9	9	5
63	20	♂+♀	I	24	33	57	14	15	3+14	9	9	3r
64	20	♂+♀	I	24	32	56	14	15	3+15	9	9	3r
65	20	♂+♀	I	24	32	56	15	15	3+13	9	9	3
66	20	♂+♀	I	25	32	57	14	16	3+14	9	9	3
67	20	♂+♀	I	23	34	57	16	15	3+16	9	9	4r
68	20	♂+♀	I	27	30	57	16	15	?	8	8	3r
69	20	♂+♀	I	23	33	56	16	15	3+13	8	8	3
70	20	♂+♀	I	24	32	56	15	15	3+15	9	8	3r
71	20	♂+♀	I	23	34	57	14	15	3+13	9	9	4
72	20	♂+♀	I	25	33	58	15	16	3+14	9	9	3r
73	20	♂+♀	I	25	31	56	15	15	3+15	8	8	3r
74	20	♂+♀	I	24	34	58	16	15	4+15	8	9	3r
75	20	♂+♀	I	23	33	56	14	16	3+15	9	9	3
76	20	♂+♀	I	23	34	57	14	15	3+15	9	9	?
77	20	♂+♀	I	25	32	57	15	16	3+14	9	8	3r
78	20	♂+♀	I	24	33	57	16	14	3+14	9	9	3
79	20	♂+♀	I	24	33	57	14	16	3+15	8	9	5
80	20	♂+♀	I	25	31	56	14	15	3+14	8	8	?

No.	Length cm	Sex	Maturity	Vertebrae: Pre-caudal	Caudal	Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins: right	left	No. of winter-rings in scales approxim.
81	19	♂♂+♀♀	I	24	33	57	15	15	3+16	9	9	2r?
82	19	♂♂+♀♀	I	25	32	57	15	15	4+13	9	9	4
83	19	♂♂+♀♀	I	24	32	56	14	16	3+15	9	9	5
84	19	♂♂+♀♀	I	28	29	57	15	15	3+14	9	9	3r
85	19	♂♂+♀♀	I	24	33	57	15	15	3+15	9	9	2
86	19	♂♂+♀♀	I	23	33	56	15	15	3+14	9	9	3
87	19	♂♂+♀♀	I	24	33	57	15	16	3+14	9	9	3
88	19	♂♂+♀♀	I	23	32	55	15	15	3+14	9	9	3r
89	19	♂♂+♀♀	I	23	33	56	15	16	3+14	9	9	3r
90	19	♂♂+♀♀	I	23	33	56	17	13	3+13	9	9	4
91	19	♂♂+♀♀	I	23	33	56	15	15	3+15	9	9	3r
92	19	♂♂+♀♀	I	23	34	57	14	17	3+14	8	8	3
93	19	♂♂+♀♀	I	25	32	57	14	15	3+15	9	9	4r
94	19	♂♂+♀♀	I	24	34	58	15	16	3+14	9	9	3r
95	19	♂♂+♀♀	I	23	33	56	15	15	3+15	9	9	3r
96	19	♂♂+♀♀	I	24	31	55	13	16	3+14	9	9	3r
97	19	♂♂+♀♀	I	24	33	57	14	14	3+13	8	9	3r
98	19	♂♂+♀♀	I	24	33	57	15	16	4+15	9	9	3r
99	19	♂♂+♀♀	I	24	33	57	14	16	3+14	9	9	3r
100	18	♂+♀	I	24	33	57	14	15	3+15	9	9	3r
101	18	♂♂+♀♀	I	24	32	56	15	16	3+14	9	9	2
102	18	♂♂+♀♀	I	23	33	56	15	14	4+13	9	9	3
103	18	♂♂+♀♀	I	23	34	57	16	15	3+15	9	9	3r?
104	18	♂♂+♀♀	I	23	32	55	15	15	3+15	9	8	2r
105	18	♂♂+♀♀	I	27	29	56	13	15	3+14	9	9	2r
106	18	♂♂+♀♀	I	25	32	57	15	15	3+14	9	9	3
107	18	♂♂+♀♀	I	23	33	56	16	15	3+15	9	9	2r
108	18	♂♂+♀♀	I	24	33	57	15	15	3+14	9	9	2r
109	18	♂♂+♀♀	I	24	32	56	13	16	3+14	9	9	2r?
110	18	♂♂+♀♀	I	24	32	56	14	15	3+15	9	9	3r
111	18	♂♂+♀♀	I	24	33	57	15	15	3+15	8	8	2r
112	18	♂♂+♀♀	I	24	32	56	14	15	3+16	9	9	?
113	18	♂♂+♀♀	I	25	32	57	15	15	3+14	9	9	2r
114	18	♂♂+♀♀	I	23	33	56	15	15	3+15	9	9	2r
115	18	♂♂+♀♀	I	24	34	58	15	15	3+14	9	9	?
116	17	♂♂+♀♀	I	23	33	56	14	15	3+13	9	9	2r
117	17	♂♂+♀♀	I	24	33	57	14	16	3+14	8	8	2
118	17	♂♂+♀♀	I	23	34	57	14	15	4+13	8	9	3?
119	16	♂♂+♀♀	I	24	33	57	15	15	3+15	9	9	3
120	16	♂+♀♀	I	24	33	57	16	16	?	9	9	4r

No.	Length cm	Sex	Maturity	Vertebrae: Pre-caudal	Caudal	Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins: right	left	No. of winter-rings in scales approxim.
1	22.0	♂♀	I-II	23	33	56	15	14	3+14	9	9	5r
2	21.2	♂♂♀♀	I-II	25	32	57	13	15	3+15	9	9	3r
3	22.8	♂♂♀♀	I-II	26	30	56	17	16	3+14	9	8	3r
4	22.0	♂♂♀♀	I-II	24	32	56	14	15	3+14	9	9	3r
5	22.5	♂♂♀♀	I-II	24	33	57	14	16	4+15	9	9	3
6	22.0	♂♂♀♀	I-II	23	34	57	16	15	3+15	9	9	5r
7	23.2	♂♂♀♀	I-II	24	33	57	14	15	3+14	9	9	3r?
8	22.3	♂♂♀♀	I-II	23	33	56	15	15	3+14	9	9	4r
9	20.7	♂♂♀♀	I-II	24	32	56	15	15	4+14	9	9	?
10	23.2	♂♂♀♀	I-II	23	34	57	14	15	3+15	9	9	3r
11	20.7	♂♂♀♀	I-II	25	31	56	15	16	3+14	9	9	3r
12	21.7	♂♂♀♀	I-II	24	32	56	15	16	3+14	9	9	3r
13	23.4	♂♂♀♀	I-II	23	33	56	16	15	3+13	8	8	3r
14	22.4	♂♂♀♀	I-II	23	33	56	15	14	3+13	9	9	4r
15	20.8	♂♂♀♀	I-II	24	34	58	15	15	3+14	9	9	4r
16	22.3	♂♂♀♀	I-II	23	33	56	16	15	3+14	9	9	4r?
17	22.5	♂♂♀♀	I-II	23	33	56	15	15	3+16	9	9	3
18	23.5	♂♂♀♀	I-II	24	32	56	14	16	4+14	9	9	3r
19	21.7	♂♂♀♀	I-II	23	33	56	14	15	3+13	9	8	4r
20	22.1	♂♂♀♀	I-II	24	33	57	13	15	3+15	8	9	4r
21	21.7	♂♂♀♀	I-II	23	33	56	16	15	3+14	9	9	4r
22	22.2	♂♂♀♀	I-II	25	32	57	15	16	3+15	7	10	3r
23	21.5	♂♂♀♀	I-II	23	33	56	15	15	3+14	9	9	4r
24	23.5	♂♂♀♀	I-II	25	32	57	15	15	3+13	9	9	3r
25	24.1	♂♂♀♀	I-II	24	33	57	14	16	3+15	9	9	3r
26	21.3	♂♂♀♀	I-II	24	33	57	14	15	3+15	9	9	3?
27	23.2	♂♂♀♀	I-II	23	33	56	16	15	3+15	9	9	3r
28	22.4	♂♂♀♀	I-II	23	35	58	14	15	3+14	9	9	3
29	22.8	♂♂♀♀	I-II	23	34	57	14	15	3+14	9	9	4
30	22.1	♂♂♀♀	I-II	24	32	56	14	15	3+13	9	8	5r
31	22.5	♂♂♀♀	I-II	24	33	57	15	16	?	9	9	3
32	22.0	♂♂♀♀	I-II	22	34	56	15	16	3+13	9	9	4r
33	22.1	♂♂♀♀	I-II	24	33	57	16	15	3+14	8	9	4
34	22.5	♂♂♀♀	I-II	24	33	57	15	15	3+14	8	8	3r
35	22.1	♂♂♀♀	I-II	25	31	56	15	14	3+14	9	9	5r?
36	21.9	♂♂♀♀	I-II	23	34	57	14	16	3+13	8	9	3
37	22.3	♂♂♀♀	I-II	23	34	57	15	16	3+16	9	8	3r?
38	21.5	♂♂♀♀	I-II	24	33	57	15	16	3+13	9	9	3
39	22.0	♂♂♀♀	I-II	23	33	56	14	15	3+14	9	9	2
40	21.3	♂♂♀♀	I-II	23	33	56	15	15	3+13	8	9	4r
41	23.3	♂♂♀♀	I-II	23	33	56	16	?	3+13	9	9	4r
42	23.2	♂♂♀♀	I-II	23	34	57	14	16	4+14	9	9	6r
43	22.2	♂♂♀♀	I-II	24	33	57	15	16	3+14	9	9	3
44	22.6	♂♂♀♀	I-II	24	34	58	15	?	?	8	8	3
45	23.0	♂♂♀♀	I-II	24	32	56	14	15	4+13	9	9	4
46	21.4	♂♂♀♀	I-II	25	32	57	15	15	3+14	9	9	3

No.	Length cm	Sex	Maturity	Vertebrae: Pre-caudal	Caudal	Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins: right	left	No. of winter-rings in scales approxim.
1	18.6	♀♀	II	26	30	56	14	16	3+15	9	9	2r
2	19.5	♀♀♀♀	II	24	33	57	15	15	3+15	9	9	3r
3	22.5	♀♀♀♀	II	24	34	58	14	?	3+13	9	9	3
4	21.3	♀♀♀♀	II	24	32	56	16	15	3+13	9	9	2r
5	17.2	♀♀♀♀	II	23	34	57	15	15	4+13	8	8	4r
6	19.2	♀♀♀♀	II	24	33	57	14	15	3+15	9	9	3r
7	22.3	♀♀♀♀	II	24	33	57	14	14	4+15	9	9	3r
8	18.5	♀♀♀♀	II	25	31	56	15	14	3+16	9	8	3r
9	22.3	♀♀♀♀	II	25	31	56	13	15	3+15	9	9	3r
10	22.2	♀♀♀♀	II	25	32	57	14	16	3+16	9	9	4r
11	19.4	♀♀♀♀	II	24	33	57	14	16	3+14	9	9	?
12	21.6	♀♀♀♀	II	24	32	56	14	15	3+14	9	8	4r
13	19.2	♀♀♀♀	II	23	33	56	16	14	3+14	8	8	3r
14	23.0	♀♀♀♀	II	23	34	57	14	16	3+13	9	9	3(r)
15	22.5	♀♀♀♀	II	24	32	56	14	16	?	9	8	3r
16	22.2	♀♀♀♀	II	24	33	57	14	15	3+15	9	9	3r
17	21.6	♀♀♀♀	II	25	32	57	15	16	4+14	9	9	4r
18	21.6	♀♀♀♀	II	23	33	56	14	?	3+14	?	9	4r
19	24.0	♀♀♀♀	II	23	33	56	13	15	3+15	9	9	?
20	19.2	♀♀♀♀	II	23	34	57	15	15	3+14	9	9	3r
21	22.5	♀♀♀♀	II	24	34	58	14	15	3+14	9	9	3r
22	23.0	♀♀♀♀	II	24	32	56	14	15	3+16	9	9	3r
23	21.5	♀♀	II	24	33	57	14	15	3+15	9	9	3
24	20.0	♀♀	II	23	33	56	15	15	4+14	8	8	3r
25	20.6	♀♀♀♀	II	23	32	55	12	15	3+15	9	9	4r
26	21.5	♀♀♀♀	II	23	34	57	14	15	3+15	8	8	?
27	20.2	♀♀♀♀	II	25	31	56	15	16	4+15	9	9	3
28	24.3	♀♀♀♀	II	23	35	58	15	16	3+15	9	9	3
29	18.5	♀♀♀♀	II	24	32	56	15	15	3+13	9	9	3
30	21.3	♀♀♀♀	II	23	33	56	14	16	3+14	9	9	3r
31	22.0	♀♀♀♀	II	26	31	57	15	15	3+14	9	9	6r
32	22.2	♀♀♀♀	II	24	33	57	15	16	3+16	9	9	4r
33	21.2	♀♀♀♀	II	23	33	56	14	15	3+15	9	9	3
34	19.1	♀♀♀♀	II	23	33	56	16	15	3+13	9	9	2
35	22.3	♀♀♀♀	II	24	33	57	14	16	4+14	9	9	4r
36	21.7	♀♀♀♀	II	24	32	56	14	15	3+14	9	9	4r
37	22.6	♀♀♀♀	II	25	31	56	16	15	3+15	8	8	4r
38	20.3	♀♀♀♀	II	24	32	56	16	16	3+14	8	8	4r
39	24.3	♀♀♀♀	II	24	33	57	14	16	3+15	9	9	4r
40	19.2	♀♀♀♀	II	23	34	57	14	16	3+14	9	9	2r
41	22.0	♀♀♀♀	II	24	32	56	17	16	3+13	8	8	4r
42	23.6	♀♀♀♀	II	24	32	56	13	16	3+15	9	9	4r
43	19.0	♀♀♀♀	II	23	33	56	16	16	3+14	9	9	4r
44	21.6	♀♀♀♀	II	24	33	57	15	14	3+13	9	9	4
45	21.6	♀♀♀♀	II	24	33	57	14	15	3+15	9	9	3r
46	20.2	♀♀	II	23	33	56	15	16	3+15	9	9	4r

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
47	21.7	♀♂♀♂♀♂♀♂♀	II	24	33	57	15	16	3+16	9	9	3
48	18.5	♀♂♀♂♀♂♀♂♀	II	23	33	56	14	?	?	9	9	4r
49	23.2	♀♂♀♂♀♂♀♂♀	II	23	34	57	15	16	?+16	8	8	4r
50	21.5	♀♂♀♂♀♂♀♂♀	II	24	33	57	15	15	3+14	9	9	4
51	21.5	♀♂♀♂♀♂♀♂♀	II	25	31	56	16	?	3+13	9	9	4r
52	23.3	♂♂♂♂♂♂♂♂♂	II	25	33	58	13	15	3+15	9	9	3
53	20.5	♂♂♂♂♂♂♂♂♂	II	25	32	57	15	15	3+15	9	9	3
54	21.9	♂♂♂♂♂♂♂♂♂	II	23	33	56	13	15	3+15	9	9	4r?
55	22.5	♂♂♂♂♂♂♂♂♂	II	24	33	57	15	16	3+15	9	9	3
56	23.7	♂♂♂♂♂♂♂♂♂	II	25	32	57	14	15	3+14	9	9	3r
57	21.8	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3+16	9	9	4r
58	22.6	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3+16	9	9	3r
59	19.8	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3+14	9	9	3r
60	22.9	♂♂♂♂♂♂♂♂♂	II	24	32	56	16	16	3+14	9	9	5r
61	23.1	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3+15	9	9	3r
62	23.3	♂♂♂♂♂♂♂♂♂	II	24	34	58	14	16	4+15	9	9	3r
63	22.0	♂♂♂♂♂♂♂♂♂	II	24	34	58	14	15	3+15	9	9	4r
64	23.6	♂♂♂♂♂♂♂♂♂	II	23	33	56	14	?	3+14	9	9	3r
65	21.0	♂♂♂♂♂♂♂♂♂	II	23	34	57	14	16	3+14	9	9	3r
66	23.5	♂♂♂♂♂♂♂♂♂	II	22	34	56	15	15	3+15	9	9	4r
67	22.4	♂♂♂♂♂♂♂♂♂	II	23	34	57	15	16	3+15	9	9	3r
68	22.4	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	16	3+15	9	9	4r
69	22.7	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	4+14	9	9	3
70	21.0	♂♂♂♂♂♂♂♂♂	II	23	34	57	15	15	2+14	9	9	3r
71	22.8	♂♂♂♂♂♂♂♂♂	II	23	33	56	14	15	3+14	9	9	3r
72	22.5	♂♂♂♂♂♂♂♂♂	II	26	33	59	14	15	3+15	9	9	3r
73	20.7	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3+13	9	9	4r
74	23.2	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3+14	9	9	3r
75	22.4	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	16	3+14	9	9	3r
76	22.7	♂♂♂♂♂♂♂♂♂	II	23	34	57	13	16	3+15	9	9	4r
77	21.7	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3+16	9	9	3r
78	23.0	♂♂♂♂♂♂♂♂♂	II	26	31	57	13	16	3+16	9	9	3r
79	20.0	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3+15	9	9	3
80	20.5	♂♂♂♂♂♂♂♂♂	II	24	32	56	14	16	3+14	9	8	3r
81	22.3	♂♂♂♂♂♂♂♂♂	II	25	33	58	14	15	3+16	9	9	4r
82	24.8	♂♂♂♂♂♂♂♂♂	II	25	32	57	14	14	?	9	9	3r
83	22.9	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3+16	9	9	3r
84	21.8	♂♂♂♂♂♂♂♂♂	II	23	34	57	13	?	3+15	9	9	3r
85	24.0	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	16	3+16	9	9	3r
86	22.4	♂♂♂♂♂♂♂♂♂	II	24	32	56	16	16	3+13	7	7	4r
87	22.1	♂♂♂♂♂♂♂♂♂	II	24	34	58	13	16	3+16	9	9	4r
88	23.2	♂♂♂♂♂♂♂♂♂	II	23	34	57	13	?	3+15	9	9	4r
89	23.5	♂♂♂♂♂♂♂♂♂	II	25	32	57	14	16	3+13	9	9	3r
90	22.0	♂♂♂♂♂♂♂♂♂	II	24	33	57	15	16	3+14	8	8	3r?
91	19.0	♂♂♂♂♂♂♂♂♂	II	23	33	56	14	15	3+14	8	8	3
92	22.7	♂♂♂♂♂♂♂♂♂	II	23	33	56	15	?	3+15	8	8	3r
93	23.5	♂♂♂♂♂♂♂♂♂	II	24	33	57	16	15	3+15	8	9	3r
94	23.4	♂♂♂♂♂♂♂♂♂	II	23	33	56	15	15	3+14	8	8	3
95	20.2	♂♂♂♂♂♂♂♂♂	II	24	32	56	15	15	?	9	?	3
96	20.9	♂♂♂♂♂♂♂♂♂	II	23	34	57	15	15	3+13	9	9	4?
97	21.8	♂♂♂♂♂♂♂♂♂	II	24	32	56	13	16	3+14	?	?	4r
98	22.2	♂♂♂♂♂♂♂♂♂	II	24	33	57	15	15	3+13	10	9	3r
99	22.7	♂♂♂♂♂♂♂♂♂	II	24	33	57	15	15	?	8	8	3r
100	22.5	♂♂♂♂♂♂♂♂♂	II	24	33	57	14	14	3+14	9	9	3r

b. Spring Spawners. Maturity III.—V.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventr. fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	20.5	♂♂♂♂♂♂♂♂♂	III	23	33	56	13	15	3+12	9	9	3r
2	24.0	♂♂♂♂♂♂♂♂♂	III	24	34	58	14	15	4+14	9	9	5r
3	23.4	♂♂♂♂♂♂♂♂♂	III	24	33	57	13	15	3+15	8	9	4
4	23.2	♂♂♂♂♂♂♂♂♂	III	24	33	57	15	15	3+14	9	9	4r
5	22.0	♂♂♂♂♂♂♂♂♂	III	24	33	57	15	15	3+14	9	9	4r
6	24.3	♂♂♂♂♂♂♂♂♂	III	23	33	56	14	15	4+15	9	9	3r
7	22.1	♂♂♂♂♂♂♂♂♂	III	25	32	57	14	15	4+14	9	9	3r?
8	22.9	♂♂♂♂♂♂♂♂♂	III	23	33	56	14	16	3+15	9	9	4r
9	23.0	♂♂♂♂♂♂♂♂♂	III	22	33	55	16	16	3+14	9	9	6r
10	21.8	♂♂♂♂♂♂♂♂♂	III	24	33	57	15	16	3+14	8	8	3r
11	22.0	♂♂♂♂♂♂♂♂♂	III	24	32	56	14	14	3+15	9	9	3r?
12	21.7	♂♂♂♂♂♂♂♂♂	III	23	33	56	13	15	3+14	9	9	3r
13	20.8	♂♂♂♂♂♂♂♂♂	III	24	30	54	14	15	3+14	9	9	4r
14	22.4	♂♂♂♂♂♂♂♂♂	III	24	31	55	15	15	4+14	9	9	4r
15	19.5	♂♂♂♂♂♂♂♂♂	III	24	31	55	13	15	3+14	9	9	3r
16	23.5	♂♂♂♂♂♂♂♂♂	III	25	32	57	14	15	4+14	9	9	3r
17	23.7	♀♂♀♂♀♂♀♂♀	III	24	32	56	13	16	3+15	9	9	3r
18	24.5	♀♂♀♂♀♂♀♂♀	III	24	32	56	14	16	3+14	9	9	3r
19	22.4	♀♂♀♂♀♂♀♂♀	III	23	32	55	14	15	3+13	9	9	3r
20	24.1	♀♂♀♂♀♂♀♂♀	III	26	32	58	14	16	3+15	9	9	4r
21	23.6	♀♂♀♂♀♂♀♂♀	III	24	33	57	14	15	3+16	9	9	3r
22	21.3	♀♂♀♂♀♂♀♂♀	III	23	33	56	15	14	3+14	9	9	4r
23	22.2	♀♂♀♂♀♂♀♂♀	III	23	33	56	15	?	3+13	9	?	3r
24	23.0	♀♂♀♂♀♂♀♂♀	III	24	32	56	13	16	3+15	9	9	3r
25	23.6	♀♂♀♂♀♂♀♂♀	III	23	34	57	14	15	4+15	9	9	3r?
26	22.3	♀♂♀♂♀♂♀♂♀	III	24	34	58	14	16	?	9	9	3r
27	23.6	♀♂♀♂♀♂♀♂♀	III	23	33	56	14	15	3+14	9	9	3r
28	23.5	♀♂♀♂♀♂♀♂♀	III	25	33	58	13	14	3+16	9	9	3r
29	22.3	♀♂♀♂♀♂♀♂♀	III	24	32	56	13	16	3+15	9	9	4r?
30	21.5	♀♂♀♂♀♂♀♂♀	III	25	32	57	15	?	3+14	9	9	. .
31	22.5	♀♂♀♂♀♂♀♂♀	III	25	33	58	14	16	3+14	9	9	3r
32	22.5	♀♂♀♂♀♂♀♂♀	III	22	34	56	15	?	3+14	9	9	3r
33	23.0	♀♂♀♂♀♂♀♂♀	III	25	32	57	14	15	3+15	9	9	3r?
34	23.0	♀♂♀♂♀♂♀♂♀	III	24	32	56	14	15	3+14	9	9	3r
1	21.0	♂♂♂♂♂♂♂♂♂	IV	23	32	55	15	14	4+13	8	9	4r
2	22.1	♂♂♂♂♂♂♂♂♂	IV	25	30	55	14	15	4+13	9	9	3r
3	23.9	♂♂♂♂♂♂♂♂♂	IV	26	31	57	14	15	4+14	9	9	3r
4	21.4	♂♂♂♂♂♂♂♂♂	IV	25	31	56	13	15	3+15	9	9	3r?
5	23,6	♂♂♂♂♂♂♂♂♂	IV	24	32	56	15	15	3+15	9	9	3r
6	22.2	♂♂♂♂♂♂♂♂♂	IV	23	34	57	13	15	3+14	9	9	3r
7	21.6	♂♂♂♂♂♂♂♂♂	IV	23	32	55	13	15	4+14	9	9	4r
8	23.6	♂♂♂♂♂♂♂♂♂	IV	25	33	58	15	15	4+14	9	9	4r
9	21.1	♂♂♂♂♂♂♂♂♂	IV	24	31	55	14	15	3+14	9	9	3r
10	20.6	♂♂♂♂♂♂♂♂♂	IV	24	32	56	14	15	4+13	9	9	3r
11	21.4	♂♀♂♀♂♀♂♀♂	IV	23	33	56	15	15	3+14	9	9	4r
12	21.7	♂♀♂♀♂♀♂♀♂	IV	23	33	56	14	15	3+13	9	9	3r?
13	21.8	♂♀♂♀♂♀♂♀♂	IV	23	31	54	13	15	3+13	9	9	3r?
14	24.1	♂♀♂♀♂♀♂♀♂	IV	25	32	57	14	15	3+15	9	9	4r
15	22.0	♂♀♂♀♂♀♂♀♂	IV	23	31	54	13	15	3+14	9	9	4r
16	22.5	♂♀♂♀♂♀♂♀♂	IV	24	33	57	14	15	3+13	9	9	5—6
17	21.4	♂♀♂♀♂♀♂♀♂	IV	23	33	56	14	15	3+13	9	9	3r?
18	21.7	♂♀♂♀♂♀♂♀♂	IV	23	34	57	14	15	3+13	9	9	4r
19	23.1	♂♀♂♀♂♀♂♀♂	IV	23	35	58	14	15	3+16	9	9	3r
1	22.6	♂♂♂♂♂♂♂♂♂	V	24	32	56	13	14	3+14	9	9	3r
2	24.3	♂♂♂♂♂♂♂♂♂	V	25	33	58	13	15	3+15	9	9	3r
3	23.3	♂♂♂♂♂♂♂♂♂	V	24	32	56	15	15	3+15	9	9	3r
4	22.0	♂♂♂♂♂♂♂♂♂	V	23	32	55	13	15	4+13	9	9	4r?
5	21.3	♂♂♂♂♂♂♂♂♂	V	25	32	57	14	14	2+15	9	9	3r
6	22.4	♂♂♂♂♂♂♂♂♂	V	23	33	56	15	15	3+14	7	8	3?
7	23.0	♂♂♂♂♂♂♂♂♂	V	23	33	56	15	15	3+14	9	9	3
8	23.2	♂♂♂♂♂♂♂♂♂	V	23	32	55	15	15	3+13	9	9	4r
9	21.7	♂♂♂♂♂♂♂♂♂	V	22	32	54	15	15	3+15	9	9	3r
10	24.1	♂♂♂♂♂♂♂♂♂	V	25	32	57	14	16	4+14	9	9	4r
11	20.5	♂♂♂♂♂♂♂♂♂	V	22	33	55	14	14	3+12	9	9	4r
12	21.1	♂♂♂♂♂♂♂♂♂	V	25	32	57	15	16	3+13	9	9	3r

c. Autumn Spawners. Recovering spents Maturity VIII.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	24.2	♂	VIII	24	33	57	15	15	3+15	9	9	5
2	23.7	♂	VIII	23	34	57	16	15	3+14	8	8	6r
3	23.0	♂	VIII	23	33	56	14	15	3+14	9	8	3
4	23.2	♂	VIII	23	33	56	16	16	3+15	9	9	4r?
5	26.6	♂	VIII	23	33	56	16	16	3+14	9	9	5r
6	25.6	♂	VIII	24	33	57	15	16	2+15	9	9	4r
7	28.4	♂	VIII	24	32	56	15	15	3+14	9	9	4r
8	26.1	♂	VIII	24	32	56	15	15	3+14	9	9	6r
9	24.0	♂	VIII	24	32	56	15	16	3+14	9	9	4r
10	26.5	♂	VIII	25	33	58	15	15	3+17	9	10	6
11	26.7	♂	VIII	24	33	57	15	15	3+14	9	8	6
12	27.0	♂	VIII	23	33	56	16	16	?	9	9	4
13	23.4	♂	VIII	28	29	57	15	15	3+13	9	9	5
14	21.6	♂	VIII	24	33	57	16	17	3+15	9	9	4
15	25.1	♂	VIII	25	32	57	15	15	3+13	9	8	5
16	26.9	♂	VIII	22	33	55	16	15	4+14	9	9	6
17	26.3	♂	VIII	24	32	56	15	15	3+15	9	9	6r
18	27.4	♂	VIII	25	32	57	15	16	3+13	9	9	6
19	24.6	♂	VIII	24	32	56	15	14	3+15	9	9	4r
20	26.0	♂	VIII	24	33	57	15	16	3+13	8	8	5
21	22.8	♂	VIII	24	33	57	14	16	3+14	9	9	4r
22	23.9	♂	VIII	24	32	56	13	14	3+15	9	9	5r
23	24.9	♂	VIII	23	34	57	15	16	4+14	9	9	4
24	24.6	♂	VIII	25	32	57	14	15	3+13	9	9	4r
25	22.2	♂	VIII	23	33	56	15	15	3+14	10	9	5
26	26.4	♂	VIII	26	30	56	15	14	3+14	9	9	7r
27	22.2	♂	VIII	24	31	55	17	15	3+13	9	9	4
28	26.6	♂	VIII	24	32	56	13	15	3+13	9	8	5
29	25.9	♂	VIII	23	33	56	15	14	3+15	9	9	5r
30	29.2	♂	VIII	24	32	56	14	16	3+14	9	9	6
31	23.4	♂	VIII	24	32	56	15	16	3+15	9	9	3r
32	26.5	♂	VIII	24	33	57	15	16	3+14	9	9	4
33	21.2	♂	VIII	23	32	55	14	14	3+12	8	8	3
34	24.3	♂	VIII	23	33	56	15	15	3+15	9	9	5
35	24.9	♂	VIII	24	33	57	15	16	3+17	9	9	4?
36	23.1	♂	VIII	23	33	56	15	15	3+14	8	8	5r
37	26.5	♂	VIII	23	33	56	16	16	4+14	9	9	5r
38	25.0	♂	VIII	22	34	56	14	15	3+13	9	9	5
39	22.6	♂	VIII	24	33	57	16	15	2+14	9	9	4
40	25.5	♂	VIII	24	32	56	15	15	3+15	9	9	5
41	23.0	♂	VIII	22	33	55	15	15	?	7	7	5
42	22.8	♂	VIII	23	33	56	14	15	3+14	9	9	4
43	25.5	♂	VIII	24	32	56	16	15	2+13	9	9	6
44	22.3	♂	VIII	24	33	57	16	15	3+15	9	9	5
45	26.2	♂	VIII	23	33	56	15	16	3+14	9	9	6?
46	23.2	♂	VIII	24	32	56	15	16	3+14	9	9	5r
47	21.7	♂	VIII	24	31	55	15	13	4+13	9	9	5
48	22.0	♂	VIII	23	32	55	15	15	3+13	9	9	4
49	22.0	♂	VIII	24	33	57	15	15	3+13	8	8	4r
50	23.9	♂	VIII	23	33	56	14	15	3+14	9	9	3
51	23.4	♂	VIII	23	33	56	15	15	3+14	9	9	4r
52	24.4	♀	VIII	24	33	57	15	15	3+13	9	9	4—5
53	27.2	♀	VIII	23	34	57	17	16	3+14	8	8	c. 8
54	21.2	♀	VIII	23	33	56	15	?	3+14	8	8	4
55	28.1	♀	VIII	24	32	56	15	?	3+13	9	9	4—6
56	21.2	♀	VIII	23	34	57	16	16	?	9	9	5
57	24.4	♀	VIII	23	33	56	15	15	3+15	9	9	4—5
58	25.3	♀	VIII	24	32	56	15	15	4+14	9	9	5
59	28.5	♀	VIII	23	34	57	14	15	3+14	9	9	11
60	24.0	♀	VIII	23	33	56	14	16	3+14	9	9	5r
61	25.5	♀	VIII	23	33	56	14	16	3+14	9	9	5
62	24.5	♀	VIII	22	34	56	14	15	4+12	9	9	5
63	27.5	♀	VIII	24	32	56	16	15	3+14	8	8	6r
64	23.2	♀	VIII	23	34	57	15	15	3+14	9	9	4r
65	25.6	♀	VIII	23	32	55	14	14	3+15	8	8	5
66	26.5	♀	VIII	23	33	56	17	15	3+16	9	9	5r
67	21.4	♀	VIII	24	32	56	15	15	3+14	9	9	4r
68	23.6	♀	VIII	24	32	56	16	16	3+13	8	8	5r
69	23.2	♀	VIII	23	33	56	16	16	?	9	9	4r
70	26.2	♀	VIII	25	32	57	15	15	4+14	9	9	6r
71	22.7	♀	VIII	23	34	57	14	16	3+15	9	9	4r
72	22.0	♀	VIII	25	31	56	16	14	3+14	9	9	5
73	24.2	♀	VIII	24	32	56	13	16	3+15	9	9	3
74	22.6	♀	VIII	23	33	56	?	15	3+13	7	8	4
75	25.6	♀	VIII	25	32	57	15	15	3+14	9	9	5r
76	26.2	♀	VIII	25	32	57	14	15	3+14	9	9	5
77	26.5	♀	VIII	24	33	57	15	15	3+13	9	9	5
78	29.3	♀	VIII	24	33	57	14	16	3+14	9	9	8
79	22.2	♀	VIII	22	34	56	14	?	3+15	9	9	4
80	27.2	♀	VIII	24	33	57	15	16	4+12	9	9	6
81	27.8	♀	VIII	24	33	57	15	15	3+14	9	9	5
82	22.0	♀	VIII	25	31	56	15	14	3+13	9	9	4
83	27.1	♀	VIII	23	33	56	14	15	3+13	9	9	3
84	23.9	♀	VIII	24	33	57	14	15	3+15	9	9	5r
85	22.5	♀	VIII	23	33	56	15	16	3+13	8	8	4r
86	26.6	♀	VIII	23	33	56	14	16	3+15	9	9	3
87	24.5	♀	VIII	24	32	56	15	14	3+16	9	9	5
88	27.0	♀	VIII	23	33	56	15	16	3+16	9	9	6r
89	27.5	♀	VIII	24	32	56	14	14	3+15	9	9	5
90	24.1	♀	VIII	24	33	57	14	14	3+14	9	9	4
91	23.6	♀	VIII	24	32	56	15	16	3+13	9	9	6r
92	25.0	♀	VIII	24	33	57	15	16	3+15	8	8	4
93	24.0	♀	VIII	24	32	56	14	?	3+13	9	9	5
94	27.9	♀	VIII	26	31	57	16	15	3+14	9	9	8
95	22.1	♀	VIII	23	34	57	17	15	3+13	9	9	4
96	23.2	♀	VIII	24	34	58	16	17	3+16	9	7	4
97	25.4	♀	VIII	24	33	57	14	16	3+14	9	9	3
98	22.2	♀	VIII	23	33	56	15	15	?	9	9	4—5
99	22.0	♀	VIII	24	33	57	15	16	3+15	9	9	3r
100	25.0	♀	VIII	23	33	56	14	16	3+13	8	9	4
101	21.7	♂	VIII	24	32	56	15	15	3+12	9	9	4r
102	23.8	♂	VIII	22	35	57	16	16	3+14	9	9	3
103	23.1	♂	VIII	23	33	56	15	15	3+13	8	8	4r
104	24.5	♂	VIII	23	33	56	15	14	3+14	9	9	4
105	20.9	♂	VIII	24	33	57	14	14	4+12	9	8	4r
106	24.2	♂	VIII	22	32	54	15	17	3+14	8	8	4
107	21.5	♂	VIII	23	34	57	15	15	3+14	9	9	3
108	22.8	♂	VIII	24	32	56	14	16	3+15	9	9	3r
109	21.1	♂	VIII	25	32	57	16	15	3+13	9	9	4?
110	22.3	♂	VIII	23	32	55	14	15	3+14	9	9	4
111	23.5	♂	VIII	23	34	57	17	15	3+14	9	9	4r
112	24.0	♂	VIII	23	33	56	16	15	3+13	9	9	3
113	22.7	♂	VIII	24	32	56	14	16	3+14	8	9	4
114	23.7	♂	VIII	24	33	57	15	15	3+15	9	10	3r
115	23.1	♂	VIII	24	34	58	15	15	3+16	8	9	4
116	20.6	♂	VIII	24	32	56	15	15	3+13	9	8	4
117	25.6	♂	VIII	22	34	56	15	16	3+15	9	9	4r
118	24.1	♂	VIII	25	31	56	15	15	3+14	9	9	6
119	25.0	♂	VIII	24	33	57	15	15	3+14	9	9	4
120	26.2	♂	VIII	24	32	56	14	16	3+14	9	9	6

D. Young Herrings from Lild Strand. E. of Hanstholm.

Aug. 23. 1921. Maturity I. Caught in Young Plaice Trawl.

No.	Length cm	Vertebrae			Keeled scales K_2	Rays in ventral fins		No. of winter-rings in scales	No.	Length cm	Vertebrae			Keeled scales K_2	Rays in ventral fins		No. of winter-rings in scales
		Pre-caudal	Caudal	Total		right	left				Pre-caudal	Caudal	Total		right	left	
1	9.6	22	35	57	15	9	6	0	9	9.0	24	32	56	15	9	9	0
2	10.3	25	32	57	14	9	9	0	10	10.5	23	33	56	14	8	9	0
3	9.5	24	33	57	14	9	9	0	11	8.6	23	32	55	?	8	8	0
4	9.7	24	32	56	16	9	9	0	12	9.1	23	33	56	15	9	9	0
5	10.2	23	34	57	15	9	9	0	13	9.5	24	32	56	14	9	9	0
6	9.8	24	32	56	13	9	9	0	14	9.4	24	33	57	14	9	9	0
7	9.8	22	34	56	15	9	9	0	15	9.7	24	33	57	15	9	9	0
8	11.1	24	32	56	14	9	9	0	16	8.8	22	34	56	16	9	9	0

E. Herrings from W. by S. of Vinga. (N. E. Kattegat).

Febr. 10. 1915. Caught in Purse Seine.

a. Spring Spawners Maturity III—IV.

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	No.	Length cm	Sex	Vertebrae			Keeled scales K_2
			Pre-caudal	Caudal	Total					Pre-caudal	Caudal	Total	
1	22	♂	23	33	56	13	33	23	♂♀	24	32	56	15
2	22	♂	26	31	57	14	34	24	♂♀	24	33	57	15
3	25	♂	23	34	57	14	35	21	♂♀	23	33	56	16
4	21	♂	24	32	56	15	36	23	♂♀	25	33	58	13
5	22	♂	24	31	55	15	37	23	♂♀	24	32	56	13
6	25	♂	26	33	59	15	38	21	♀	24	32	56	14
7	21	♂	25	32	57	16	39	21	♀	23	33	56	14
8	21	♂	24	32	56	13	40	21	♀	25	31	56	14
9	22	♂	24	31	55	13	41	22	♀	23	33	56	14
10	22	♂	23	33	56	13	42	22	♀	23	32	55	14
11	24	♂	25	34	59	13	43	22	♀	25	30	55	14
12	20	♂	24	32	56	14	44	22	♀	24	33	57	14
13	22	♂	22	32	54	14	45	22	♀	24	33	57	14
14	22	♂	25	31	56	14	46	22	♀	23	33	56	14
15	22	♂	25	32	57	14	47	23	♀	24	32	56	14
16	22	♂	25	31	56	14	48	23	♀	25	31	56	14
17	22	♂	24	33	57	14	49	24	♀	25	31	56	14
18	22	♂	25	32	57	14	50	24	♀	24	32	56	14
19	22	♂	23	33	56	14	51	21	♀	24	32	56	15
20	22	♂	24	32	56	14	52	21	♀	25	31	56	15
21	22	♂	22	33	55	14	53	23	♀	24	32	56	15
22	22	♂	24	32	56	14	54	23	♀	24	33	57	15
23	23	♂	24	32	56	14	55	24	♀	23	32	55	15
24	23	♂	25	31	56	14	56	26	♀	24	32	56	15
25	24	♂	24	32	56	14	57	21	♀	23	33	56	16
26	27	♂	23	33	56	14	58	22	♀	22	34	56	16
27	21	♂	25	31	56	15	59	21	♀	25	33	58	13
28	22	♂	24	32	56	15	60	23	♀	24	31	55	13
29	22	♂	25	32	57	15	61	23	♀	24	32	56	14
30	22	♂	24	32	56	15	62	23	♀	23	32	55	14
31	22	♂	25	30	55	15	63	32	♀	25	33	58	14
32	23	♂	24	32	56	15	64	26	♀	25	33	58	15

b. Autumn Spawners. Maturity VIII.

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins	No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins
			Pre-caudal	Caudal	Total						Pre-caudal	Caudal	Total		
1	22	♂	22	34	56	14	18	6	20	♂	24	34	58	14	17
2	24	♂	24	33	57	14	18	7	24	♂	24	32	56	15	18
3	24	♂	22	33	55	14	18	8	25	♂	24	33	57	15	18
4	25	♂	23	33	56	14	18	9	26	♂	23	33	56	15	18
5	28	♂	25	31	56	14	17	10	27	♂	25	32	57	15	16

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins	No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins
			Pre-caudal	Caudal	Total						Pre-caudal	Caudal	Total		
11	21	♂	23	33	56	15	17	31	24	♀	23	33	56	15	18
12	27	♂	24	32	56	15	17	32	24	♀	24	32	56	15	18
13	17	♂	23	33	56	16	18	33	24	♀	25	32	57	15	18
14	21	♂	26	30	56	16	18	34	24	♀	25	32	57	15	18
15	23	♂	25	33	58	16	18	35	25	♀	26	33	59	15	18
16	25	♂	24	32	56	16	18	36	25	♀	23	34	57	15	18
17	27	♂	24	34	58	16	18	37	25	♀	24	33	57	15	18
18	21	♂	24	33	57	16	17	38	26	♀	26	30	56	15	18
19	27	♂	23	34	57	16	17	39	28	♀	24	34	58	15	18
20	27	♂	24	33	57	16	17	40	21	♀	23	33	56	15	16
21	21	♀	23	31	54	14	18	41	22	♀	24	32	56	15	16
22	23	♀	24	33	57	14	18	42	23	♀	24	31	55	15	17
23	23	♀	24	33	57	14	18	43	23	♀	25	31	56	15	17
24	24	♀	24	32	56	14	18	44	24	♀	24	32	56	15	17
25	26	♀	24	32	56	14	18	45	24	♀	23	34	57	16	18
26	29	♀	24	33	57	14	18	46	25	♀	24	32	56	16	18
27	22	♀	24	32	56	14	17	47	25	♀	24	32	56	16	18
28	25	♀	23	33	56	14	17	48	26	♀	24	32	56	16	18
29	22	♀	24	33	57	15	18	49	26	♀	24	32	56	16	18
30	24	♀	24	33	57	15	18								

F. Herrings from N. of Skagen.

March 17. 1915. Caught in Purse Seine.

a. Spring Spawners. Maturity III—IV.

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins	No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins
			Pre-caudal	Caudal	Total						Pre-caudal	Caudal	Total		
1	23	♀	25	31	56	14	17	8	23	♂	23	33	56	15	17
2	20	♀	22	33	55	13	18	9	24	♂	23	32	55	14	18
3	22	♀	23	32	55	14	18	10	23	♂	24	32	56	13	18
4	21	♀	21	32	53	14	18	11	23	♂	24	32	56	14	18
5	24	♀	24	32	56	15	18	12	24	♂	23	32	55	15	17
6	21	♀	26	33	59	14	18	13	21	♂	22	33	55	15	18
7	24	♂	24	32	56	14	18								

b. Autumn Spawners. Maturity VIII.

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	Rays in both ventral fins	No.	Length cm	Sex	Vertebrae			Keeled scales K_2
			Pre-caudal	Caudal	Total						Pre-caudal	Caudal	Total	
1	25	♂	23	34	57	14	18	18	24	♂	26	31	57	14
2	24	♀	23	33	56	14	18	19	24	♂	23	34	57	14
3	26	♀	24	33	57	16	18	20	24	♂	24	32	56	14
4	25	♀	23	32	55	14	18	21	24	♂	24	31	55	14
5	27[1])	♂	23	33	56	15	17	22	25	♂	25	32	57	14
6	25	♂	24	32	56	15	18	23	25	♂	23	33	56	14
7	25	♀	23	34	57	14	18	24	25	♂	24	32	56	14
8	25	♀	25	32	57	16	18	25	25	♂	25	32	57	14
9	25	♂	23	33	56	14	18	26	25	♂	22	34	56	14
10	25	♀	24	34	58	14	18	27	25	♂	25	31	56	14
11	25	♂	24	33	57	16	18	28	25	♂	24	33	57	14
12	27[1])	♂	23	32	55	15	17	29	26	♂	25	31	56	14
13	27[1])	♂	26	31	57	15	16	30	27	♂	26	31	57	14
14	27[2])	♂	23	33	56	15	18	31	27	♂	24	32	56	14
15	22	♂	23	33	56	13	..	32	21	♂	24	32	56	15
16	26	♂	24	31	55	13	..	33	22	♂	24	34	58	15
17	22	♂	24	33	57	14	..	34	23	♂	25	32	57	15

[1]) age 7 r.

[2]) age 8 r.

No.	Length cm	Sex	Vertebrae			Keeled scales K_2	No.	Length cm	Sex	Vertebrae		
			Pre-caudal	Caudal	Total					Pre-caudal	Caudal	Total
35	23	♂	24	32	56	15	109	24	♀	23	33	56
36	23	♂	23	34	57	15	110	24	♀	25	32	57
37	23	♂	25	32	57	15	111	24	♀	24	33	57
38	24	♂	24	32	56	15	112	24	♀	24	33	57
39	24	♂	24	33	57	15	113	24	♀	23	33	56
40	24	♂	25	31	56	15	114	24	♀	23	33	56
41	24	♂	25	31	56	15	115	24	♀	23	33	56
42	24	♂	25	31	56	15	116	24	♀	23	33	56
43	24	♂	24	32	56	15	117	24	♀	24	33	57
44	24	♂	23	33	56	15	118	24	♀	25	32	57
45	24	♂	24	32	56	15	119	24	♀	24	33	57
46	24	♂	24	33	57	15	120	25	♀	23	33	56
47	24	♂	23	32	55	15	121	25	♀	25	31	56
48	25	♂	24	33	57	15	122	25	♀	25	32	57
49	25	♂	25	31	56	15	123	25	♀	24	33	57
50	25	♂	25	32	57	15	124	25	♀	25	32	57
51	25	♂	25	33	58	15	125	25	♀	25	32	57
52	25	♂	24	33	57	15	126	25	♀	24	33	57
53	25	♂	24	32	56	15	127	25	♀	23	34	57
54	25	♂	24	33	57	15	128	25	♀	25	32	57
55	25	♂	24	33	57	15	129	25	♀	23	33	56
56	25	♂	24	32	56	15	130	25	♀	23	33	56
57	26	♂	24	33	57	15	131	25	♀	24	33	57
58	26	♂	24	32	56	15	132	25	♀	23	34	57
59	26	♂	25	32	57	15	133	25	♀	25	32	57
60	26	♂	25	32	57	15	134	25	♀	24	34	58
61	26	♂	25	32	57	15	135	25	♀	24	32	56
62	26	♂	24	32	56	15	136	25	♀	24	33	57
63	26	♂	25	33	58	15	137	25	♀	23	33	56
64	26	♂	24	33	57	15	138	25	♀	24	32	56
65	26	♂	23	34	57	15	139	25	♀	24	32	56
66	26	♂	24	33	57	15	140	25	♀	24	32	56
67	28	♂	25	31	56	15	141	25	♀	24	33	57
68	28	♂	25	31	56	15	142	26	♀	24	32	56
69	30	♂	24	34	58	15	143	26	♀	24	32	56
70	21	♂	23	32	55	16	144	26	♀	23	33	56
71	22	♂	24	32	56	16	145	26	♀	24	33	57
72	22	♂	25	31	56	16	146	26	♀	24	33	57
73	23	♂	23	33	56	16	147	26	♀	24	33	57
74	24	♂	24	34	58	16	148	26	♀	25	31	56
75	24	♂	24	33	57	16	149	26	♀	23	33	56
76	24	♂	23	32	55	16	150	26	♀	23	33	56
77	24	♂	25	32	57	16	151	26	♀	25	31	56
78	24	♂	24	32	56	16	152	26	♀	24	32	56
79	24	♂	24	33	57	16	153	26	♀	25	32	57
80	25	♂	24	33	57	16	154	26	♀	23	34	57
81	25	♂	24	33	57	16	155	26	♀	24	33	57
82	26	♂	24	32	56	16	156	26	♀	25	33	58
83	26	♂	23	33	56	16	157	26	♀	24	33	57
84	26	♂	23	33	56	16	158	26	♀	24	33	57
85	26	♂	24	32	56	16	159	26	♀	22	34	56
86	29	♂	24	32	56	16	160	26	♀	24	32	56
87	26	♂	25	32	57	17	161	26	♀	23	33	56
88	22	♀	24	33	57	..	162	26	♀	24	32	56
89	22	♀	25	32	57	..	163	26	♀	23	33	56
90	22	♀	23	33	56	..	164	27	♀	24	33	57
91	22	♀	24	33	57	..	165	27	♀	24	32	56
92	22	♀	23	35	58	..	166	27	♀	24	32	56
93	22	♀	26	31	57	..	167	27	♀	24	33	57
94	22	♀	24	34	58	..	168	27	♀	23	34	57
95	22	♀	24	33	57	..	169	27	♀	25	32	57
96	23	♀	26	31	57	..	170	27	♀	23	34	57
97	23	♀	25	31	56	..	171	27	♀	25	32	57
98	23	♀	24	33	57	..	172	27	♀	23	32	55
99	23	♀	25	32	57	..	173	27	♀	23	34	57
100	23	♀	24	33	57	..	174	27	♀	24	33	57
101	23	♀	23	33	56	..	175	27	♀	24	33	57
102	23	♀	24	33	57	..	176	27	♀	24	32	56
103	23	♀	25	31	56	..	177	27	♀	24	33	57
104	24	♀	25	31	56	..	178	27	♀	24	33	57
105	24	♀	23	33	56	..	179	28	♀	24	33	57
106	24	♀	24	33	57	..	180	28	♀	24	32	56
107	24	♀	24	32	56	..	181	30	♀	24	33	57
108	24	♀	23	32	55	..						

G. Herrings from 3 miles North of Skagen. (57° 47′N. 10° 36′ E.).

January 5. 1924. Caught in Purse Seine.

a. Young Herrings of Maturity I and II.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	22.5	♂♂♂♂♂♂♂♂♂♂	I	24	34	58	12	15	3 + 14	8	8	3r
2	19.8	♂♂♂♂♂♂♂♂♂♂	I	23	34	57	15	16	4 + 14	9	8	3r
3	19.8	♂♂♂♂♂♂♂♂♂♂	I	24	33	57	14	16	3 + 15	9	9	3r
4	24.7	♂♂♂♂♂♂♂♂♂♂	I	24	32	56	13	16	3 + 15	9	9	3r
5	23.6	♂♂♂♂♂♂♂♂♂♂	I	24	31	55	15	15	3 + 15	9	9	3r
6	22.0	♂♂♂♂♂♂♂♂♂♂	I	23	33	56	14	14	3 + 13	9	9	4r
7	21.8	♂♂♂♂♂♂♂♂♂♂	I	24	33	57	15	16	3 + 15	9	9	3r
8	20.0	♂♂♂♂♂♂♂♂♂♂	I	24	32	56	15	15	3 + 15	9	9	4r
9	22.2	♂♂♂♂♂♂♂♂♂♂	I	23	33	56	15	15	3 + 13	9	9	3r
10	21.0	♂♂♂♂♂♂♂♂♂♂	I	24	32	56	13	16	3 + 14	9	9	3r
11	20.2	♂♂♂♂♂♂♂♂♂♂	I	23	32	55	14	14	3 + 13	9	9	3r
12	23.2	♂♂♂♂♂♂♂♂♂♂	I	24	32	56	15	14	3 + 14	9	9	3r
13	20.8	♂♂♂♂♂♂♂♂♂♂	I	24	33	57	14	16	3 + 15	9	9	3r
14	23.0	♂♂♂♂♂♂♂♂♂♂	I	26	32	58	14	15	4 + 15	9	9	4r
15	20.2	♂♂♂♂♂♂♂♂♂♂	I	23	34	57	15	16	3 + 14	9	9	3r
16	19.5	♂♂♂♂♂♂♂♂♂♂	I	25	31	56	15	16	3 + 12	9	9	3r
17	21.7	♂♂♂♂♂♂♂♂♂♂	I	24	33	57	15	15	3 + 15	9	9	3r
18	21.3	♂♂♂♂♂♂♂♂♂♂	I	23	34	57	15	16	3 + 13	9	9	3r
19	22.6	♂♂♂♂♂♂♂♂♂♂	I	24	33	57	15	15	3 + 13	9	9	4r
20	21.3	♂♂♂♂♂♂♂♂♂♂	I	25	31	56	15	15	3 + 14	9	9	4r
21	22.5	♂♂♂♂♂♂♂♂♂♂	I	23	33	56	14	16	3 + 15	9	9	3r
22	22.6	♂♂♂♂♂♂♂♂♂♂	I	23	33	56	15	16	3 + 13	9	9	3r
23	22.1	♂♂♂♂♂♂♂♂♂♂	I	25	32	57	15	17	3 + 14	8	8	3r
24	20.2	♂♂♂♂♂♂♂♂♂♀	I	24	33	57	15	16	3 + 15	9	9	2r
25	22.2	♂♂♂♂♂♂♂♂♂♀	I	22	34	56	14	16	3 + 15	9	9	3r
26	21.7	♂♂♂♂♂♂♂♂♂♀	I	24	32	56	15	15	3 + 14	9	9	3r
27	22.5	♂♂♂♂♂♂♂♂♂♀	I	23	34	57	16	16	3 + 16	9	9	3r
28	22.3	♂♂♂♂♂♂♂♂♂♀	I	25	32	57	16	16	3 + 15	9	9	3r
29	22.8	♂♂♂♂♂♂♂♂♂♀	I	24	abn.	?	16	15	3 + 13	9	9	4r
30	21.3	♂♂♂♂♂♂♂♂♂♀	I	23	33	56	15	14	3 + 14	9	9	3r
31	22.0	♂♂♂♂♂♂♂♂♀♀	I	23	34	57	15	16	3 + 15	9	8	4r
32	19.3	♂♂♂♂♂♂♂♂♀♀	I	23	32	55	14	15	3 + 14	9	9	2r
33	21.3	♂♂♂♂♂♂♂♂♀♀	I	24	33	57	14	15	2 + 14	9	9	3r
34	21.5	♂♂♂♂♂♂♂♂♀♀	I	24	32	56	15	15	4 + 13	9	9	3r
35	20.5	♂♂♂♂♂♂♂♂♀♀	I	23	34	57	14	16	3 + 13	9	8	3r
36	20.5	♂♂♂♂♂♂♂♂♀♀	I	24	32	56	14	15	3 + 14	9	9	4r
37	22.6	♂♂♂♂♂♂♂♂♀♀	I	25	31	56	14	16	3 + 15	9	9	3r
38	21.8	♂♂♂♂♂♂♂♂♀♀	I	22	34	56	14	15	3 + 15	9	9	3r
39	18.5	♂♂♂♂♂♂♂♂♀♀	I	23	33	56	15	15	4 + 15	9	8	3
40	20.5	♂♂♂♂♂♂♂♂♀♀	I	24	32	56	15	16	3 + 14	9	9	3r
41	21.2	♂♂♂♂♂♂♂♂♀♀	I	23	33	56	14	16	3 + 15	abn.	8	3r
42	19.2	♂♂♂♂♂♂♂♂♀♀	I	25	32	57	14	16	3 + 15	9	9	5r
43	19.0	♂♂♂♂♂♂♂♂♀♀	I	23	33	56	14	16	3 + 14	9	9	2r
44	20.5	♂♂♂♂♂♂♂♂♀♀	I	23	33	56	13	15	4 + 14	9	9	3r
45	19.2	♂♂♂♂♂♂♂♂♀♀	I	23	34	57	14	15	3 + 13	9	9	2r

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	23.6	♂♂♂♂♂♂♂♂♂♂	II	27	29	56	17	17	3 + 15	9	9	3r
2	24.0	♂♂♂♂♂♂♂♂♂♂	II	23	34	57	15	15	3 + 16	9	9	4r
3	24.5	♂♂♂♂♂♂♂♂♂♂	II	25	32	57	15	15	3 + 13	9	9	5r
4	24.0	♂♂♂♂♂♂♂♂♂♂	II	25	32	57	14	15	3 + 15	8	8	4r
5	25.3	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	16	15	3 + 13	9	9	4r
6	23.6	♂♂♂♂♂♂♂♂♂♂	II	24	32	56	14	15	3 + 16	9	9	3r
7	20.2	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3 + 13	9	9	3r
8	25.6	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	15	14	3 + 15	9	9	4r
9	22.2	♂♂♂♂♂♂♂♂♂♂	II	26	31	57	15	14	3 + 15	9	9	4r
10	23.5	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	14	15	3 + 14	9	9	3r
11	23.4	♂♂♂♂♂♂♂♂♂♂	II	24	32	56	15	15	4 + 14	9	8	4r
12	24.3	♂♂♂♂♂♂♂♂♂♂	II	23	33	56	14	16	3 + 14	9	8	4r
13	22.8	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	16	15	3 + 14	9	9	3r
14	25.2	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	16	15	2 + 13	9	9	4r
15	22.3	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	16	15	3 + 15	8	8	3r
16	24.8	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	16	16	3 + 14	9	8	4r
17	24.5	♂♂♂♂♂♂♂♂♂♂	II	24	33	57	15	16	3 + 15	9	9	4r
18	22.6	♂♂♂♂♂♂♂♂♂♂	II	23	34	57	15	16	4 + 15	9	9	3r
19	22.5	♂♂♂♂♂♂♂♂♂♂	II	23	34	57	15	16	3 + 14	9	9	4r
20	24.5	♂♂♂♂♂♂♂♂♂♂	II	23	34	57	15	16	3 + 13	8	9	4r
21	24.7	♂♂♂♂♂♂♂♂♂♂	II	23	33	56	15	15	3 + 14	9	9	4r
22	27.0	♂♂♂♂♂♂♂♂♂♀	II	23	34	57	14	16	4 + 15	9	9	5r
23	21.6	♂♂♂♂♂♂♂♂♂♀	II	25	33	58	15	14	3 + 15	8	9	3r
24	24.2	♂♂♂♂♂♂♂♂♂♀	II	23	33	56	16	16	3 + 14	9	9	4r
25	25.2	♂♂♂♂♂♂♂♂♂♀	II	23	33	56	14	16	3 + 14	8	8	4r
26	21.5	♀♀♀♀♀♀♀♀♀♀	II	25	31	56	14	15	3 + 15	9	9	3r
27	24.8	♀♀♀♀♀♀♀♀♀♀	II	22	34	56	15	14	3 + 13	9	9	5r
28	25.2	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	13	16	3 + 12	9	9	4r
29	24.2	♀♀♀♀♀♀♀♀♀♀	II	25	32	57	14	16	3 + 14	9	9	3r
30	26.8	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	13	15	3 + 15	9	9	4r
31	24.8	♀♀♀♀♀♀♀♀♀♀	II	23	34	57	16	14	3 + 15	9	9	4r
32	22.8	♀♀♀♀♀♀♀♀♀♀	II	27	30	57	14	15	3 + 14	8	8	3r
33	21.7	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	14	16	3 + 12	9	9	6r
34	28.0	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	15	16	3 + 15	9	9	4r
35	25.5	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	14	15	3 + 16	9	9	5r
36	22.0	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	15	15	3 + 15	9	9	4r
37	22.3	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	14	16	3 + 16	9	9	3r
38	26.0	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	14	15	3 + 16	9	9	5r
39	23.6	♀♀♀♀♀♀♀♀♀♀	II	23	33	56	14	15	3 + 14	9	9	4r
40	24.0	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	14	15	3 + 16	8	8	4r
41	28.0	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	15	15	4 + 14	9	9	7r
42	22.2	♀♀♀♀♀♀♀♀♀♀	II	23	34	57	15	14	3 + 13	9	9	3r
43	25.0	♀♀♀♀♀♀♀♀♀♀	II	24	32	56	14	14	3 + 14	9	9	4r
44	23.0	♀♀♀♀♀♀♀♀♀♀	II	23	34	57	14	15	3 + 14	8	8	4r
45	26.0	♀♀♀♀♀♀♀♀♀♀	II	24	33	57	15	15	3 + 14	9	9	4r
46	21.8	♀♀♀♀♀♀♀♀♀♀	II	25	32	57	15	15	3 + 14	9	9	4r
47	21.3	♀♀♀♀♀♀♀♀♀♀	II	25	32	57	14	15	3 + 15	9	9	3r
48	23.7	♀♀♀♀♀♀♀♀♀♀	II	23	33	56	16	15	3 + 13	9	9	4r
49	24.8	♀♀♀♀♀♀♀♀♀♀	II	23	33	56	14	15	3 + 14	9	8	4r
50	22.7	♀♀♀♀♀♀♀♀♀♀	II	23	33	56	16	15	3 + 13	8	8	4r

b. Spring Spawners. Maturity III and IV.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	23.0	♂♂♀♀♀♀♀♀♀♀	IV	25	33	58	14	15	3 + 15	9	9	6r
2	23.2	♂♂♀♀♀♀♀♀♀♀	IV	23	34	57	15	14	3 + 14	9	9	3r
3	26.0	♂♂♀♀♀♀♀♀♀♀	IV	25	32	57	14	16	4 + 15	9	9	3r
4	21.7	♂♂♀♀♀♀♀♀♀♀	IV	23	32	55	14	14	3 + 14	9	9	4r
5	23.5	♂♂♀♀♀♀♀♀♀♀	IV	22	35	57	14	15	4 + 15	9	9	4r
6	23.8	♂♂♀♀♀♀♀♀♀♀	IV	25	31	56	14	13	3 + 15	9	9	4r
7	24.2	♂♂♀♀♀♀♀♀♀♀	IV	22	34	56	16	16	3 + 13	9	9	5r
8	22.4	♂♂♀♀♀♀♀♀♀♀	IV	23	32	55	14	15	3 + 14	9	9	4r
9	26.0	♂♂♀♀♀♀♀♀♀♀	IV	24	33	57	15	15	3 + 15	9	9	4r
10	21.0	♂♂♀♀♀♀♀♀♀♀	IV	26	29	55	14	15	3 + 14	9	9	3r
11	25.5	♂♂♀♀♀♀♀♀♀♀	IV	23	34	57	14	15	4 + 15	9	9	4r
12	26.5	♂♂♀♀♀♀♀♀♀♀	IV	22	35	57	15	15	3 + 15	9	9	4r
13	20.8	♂♂♂♀♀♀♀♀♀♀	III	23	33	56	14	14	3 + 14	9	9	3r
14	20.4	♂♂♂♀♀♀♀♀♀♀	III	24	31	55	15	16	3 + 14	9	9	4r
15	22.5	♂♂♂♀♀♀♀♀♀♀	III	25	32	57	14	15	3 + 13	9	9	4r
16	24.5	♂♂♂♀♀♀♀♀♀♀	III	23	34	57	14	15	3 + 15	9	9	3r
17	25.0	♂♂♂♀♀♀♀♀♀♀	III	24	32	56	13	15	3 + 15	9	9	4r
18	23.1	♂♂♂♀♀♀♀♀♀♀	III	24	32	56	13	15	3 + 12	9	9	4r
19	21.8	♂♂♂♀♀♀♀♀♀♀	III	21	34	55	13	16	?	9	9	3r
20	22.6	♂♂♂♀♀♀♀♀♀♀	III	22	32	54	14	16	3 + 15	9	9	3r
21	21.7	♀♀♀♀♀♀♀♀♀♀	III	23	32	55	14	14	?	9	9	3
22	22.0	♀♀♀♀♀♀♀♀♀♀	III	24	33	57	14	14	3 + 15	9	9	3r
23	23.2	♀♀♀♀♀♀♀♀♀♀	III	24	33	57	15	15	3 + 15	9	9	4r
24	21.4	♀♀♀♀♀♀♀♀♀♀	III	22	34	56	15	15	3 + 12	9	9	3r
25	26.6	♀♀♀♀♀♀♀♀♀♀	III	23	31	54	15	15	4 + 15	9	9	4r
26	25.0	♀♀♀♀♀♀♀♀♀♀	III	22	33	55	15	15	3 + 14	9	9	4r
27	21.5	♀♀♀♀♀♀♀♀♀♀	III	22	33	55	14	15	3 + 11	9	9	4r
28	23.8	♀♀♀♀♀♀♀♀♀♀	III	22	32	54	14	15	3 + 12	9	9	4r
29	22.4	♀♀♀♀♀♀♀♀♀♀	III	23	33	56	15	15	3 + 13	9	9	3r
30	24.0	♀♀♀♀♀♀♀♀♀♀	III	24	33	57	15	15	3 + 14	9	9	4r
31	22.8	♀♀♀♀♀♀♀♀♀♀	III	24	32	56	14	14	3 + 14	9	9	4r
32	23.0	♀♀♀♀♀♀♀♀♀♀	III	25	32	57	14	16	3 + 15	9	9	4r
33	26.8	♀♀♀♀♀♀♀♀♀♀	III	24	32	56	14	15	3 + 15	9	9	4r
34	19.8	♀♀♀♀♀♀♀♀♀♀	III	24	32	56	14	15	4 + 14	9	9	3r
35	21.5	♀♀♀♀♀♀♀♀♀♀	III	24	32	56	15	15	3 + 14	9	9	4r
36	23.4	♀♀♀♀♀♀♀♀♀♀	III	23	33	56	14	15	3 + 15	9	10	4r
37	22.8	♀♀♀♀♀♀♀♀♀♀	III	23	32	55	14	15	3 + 13	9	9	3r
38	21.3	♀♀♀♀♀♀♀♀♀♀	III	23	32	55	14	15	3 + 13	9	9	4r
39	21.5	♀♀♀♀♀♀♀♀♀♀	III	24	31	55	14	14	3 + 13	9	9	4r

c. Spring Spawners and Winter Spawners of Maturity IV—VI.

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	26.2	♀	V	24	33	57	15	15	3 + 14	9	9	3r
2	26.8	♀	V	25	33	58	14	15	3 + 15	9	9	5r
3	22.4	♂♀	IV-VI	24	33	57	14	14	3 + 15	9	9	7r
4	21.0	♂♂	IV-VI	22	33	55	15	16	3 + 13	9	8	8r
5	24.0	♂♂	IV-VI	23	32	55	14	16	3 + 14	9	9	4r
6	22.6	♂♂	IV-VI	23	33	56	14	15	3 + 15	9	9	4r
7	20.5	♂♂	IV-VI	22	33	55	15	16	2 + 13	9	9	4r
8	22.5	♂♂	IV-VI	23	33	56	14	16	2 + 13	9	9	3r
9	23.7	♂♂	IV-VI	23	33	56	14	15	3 + 16	9	9	3r
10	25.5	♂♂	IV-VI	23	34	57	15	15	3 + 14	9	9	4r
11	21.5	♂♂	IV-VI	23	32	55	15	14	3 + 13	9	9	3r
12	23.0	♂♂	IV-VI	24	33	57	14	14	3 + 15	9	9	4r
13	24.0	♂♂	IV-VI	24	34	58	14	15	3 + 14	9	9	4r
14	22.7	♂♂	IV-VI	23	32	55	14	13	3 + 15	9	9	4r
15	22.2	♂♂	IV-VI	22	34	56	15	15	3 + 13	7	7	4r
16	23.8	♂♂	IV-VI	23	33	56	13	15	3 + 15	9	9	4r
17	24.5	♂♂	IV-VI	24	33	57	14	14	4 + 15	9	9	4r
18	25.0	♂♂	IV-VI	26	31	57	15	15	3 + 15	9	9	4r
19	24.7	♂	IV-VI	25	29	54	12	15	3 + 13	9	9	4r
20	23.0	♂♂♂	IV-VI	24	32	56	13	16	3 + 13	9	9	6r
21	23.5	♂♂♂	IV-VI	23	33	56	14	15	4 + 15	9	9	4r
22	22.7	♂♂♂	IV-VI	23	32	55	13	14	3 + 14	9	9	4r
23	23.2	♂♂♂	IV-VI	24	32	56	15	15	3 + 13	9	9	3r
24	27.0	♂♂♂	IV-VI	24	34	58	15	14	3 + 15	9	9	6r
25	21.2	♂♂♂	IV-VI	24	31	55	14	14	3 + 13	9	9	3r
26	25.5	♂♂♂	IV-VI	24	32	56	14	16	3 + 16	9	9	3r
27	23.5	♂♂♂	IV-VI	24	31	55	15	15	3 + 12	9	9	4r
28	26.8	♂♂♂	IV-VI	24	33	57	14	15	3 + 16	9	9	4r
29	23.6	♂♂♂	IV-VI	24	32	56	15	14	3 + 15	9	9	5r
30	22.5	♂♂♂	IV-VI	23	32	55	13	15	3 + 15	9	9	3r
31	23.3	♂♂♂	IV-VI	23	31	54	15	15	3 + 13	9	9	5r
32	26.7	♂♂♂	IV-VI	23	34	57	13	16	4 + 16	9	9	5r
33	23.0	♂♂♂	IV-VI	23	33	56	14	14	4 + 14	9	9	4r
34	22.1	♂♂♂	IV-VI	23	32	55	15	15	3 + 13	9	9	4r
35	21.7	♂♂♂	IV-VI	23	30	53	14	15	3 + 12	9	9	3r
36	23.0	♂♂♂	IV-VI	25	31	56	13	15	3 + 14	9	9	3r
37	22.3	♂♂♂	IV-VI	24	30	54	15	16	2 + 14	9	9	4r
38	21.6	♂♂	IV-VI	22	31	53	15	15	3 + 15	9	9	4r

d. Autumn spawners of Maturity VII—VIII.

Nr. 1—94: fat contents 0. (practically no fat).
Nr. 95—107: fat contents 1. (a little fat).

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
1	27.2	♂♂	VII-VIII	24	33	57	14	15	4 + 14	9	8	4r
2	27.5	♂♂♂	VII-VIII	24	33	57	16	16	3 + 16	8	8	5r
3	27.1	♂♂♂	VII-VIII	23	34	57	15	15	3 + 14	9	9	5r
4	27.2	♂♂♂	VII-VIII	23	34	57	16	16	3 + 15	9	9	5r
5	25.5	♂♂♂	VII-VIII	24	33	57	15	16	3 + 13	8	9	4r
6	26.0	♂♂♂	VII-VIII	23	33	56	15	15	3 + 13	10	10	5r
7	28.2	♂♂♂	VII-VIII	24	33	57	15	15	3 + 14	8	8	5r
8	26.5	♂♂♂	VII-VIII	23	34	57	15	15	4 + 12	9	9	4r?
9	28.1	♂♂♂	VII-VIII	24	33	57	14	16	4 + 15	9	9	6r
10	27.8	♂♂♂	VII-VIII	23	32	55	15	15	3 + 15	9	9	6r
11	25.6	♂♂♂	VII-VIII	24	34	58	15	15	3 + 15	8	8	5
12	26.8	♂♂♂	VII-VIII	26	30	56	14	16	3 + 14	8	8	7r
13	27.5	♂♂♂	VII-VIII	25	31	56	15	15	3 + 13	9	9	6r
14	27.7	♂♂♂	VII-VIII	24	33	57	16	15	3 + 16	9	8	5r
15	20.5	♂♂♂	VII-VIII	25	32	57	15	16	3 + 16	9	9	3r
16	24.2	♂♂♂	VII-VIII	23	33	56	15	15	3 + 14	9	8	4r
17	24.5	♂♂♂	VII-VIII	25	32	57	16	16	3 + 14	8	8	4r
18	22.5	♂♂♂	VII-VIII	25	31	56	16	15	2 + 14	8	8	3r
19	24.5	♂♂♂	VII-VIII	23	32	55	15	15	3 + 14	8	8	3r
20	24.3	♂♂♂	VII-VIII	25	32	57	13	16	3 + 16	9	9	3r
21	23.8	♂♂♂	VII-VIII	23	34	57	15	15	3 + 15	9	9	3r
22	23.0	♂♂♂	VII-VIII	24	33	57	16	15	3 + 16	9	9	3r
23	22.0	♂♂♂	VII-VIII	25	30	55	14	15	3 + 15	8	9	4r
24	28.3	♂♂♂	VII-VIII	25	33	58	16	15	3 + 12	8	9	6r
25	20.0	♂♂♂	VII-VIII	25	30	55	14	15	3 + 15	8	8	3r
26	25.0	♂♂♂	VII-VIII	24	32	56	14	15	2 + 14	9	9	4r
27	21.5	♂♂♂	VII-VIII	25	32	57	14	16	4 + 15	9	9	3r
28	29.2	♂♂♂	VII-VIII	24	32	56	15	15	3 + 15	9	9	6r
29	28.5	♂♂♂	VII-VIII	23	33	56	14	15	3 + 15	9	9	ca. 9
30	24.1	♂♂♂	VII-VIII	23	34	57	14	14	?	8	8	4r
31	27.2	♂♂♂	VII-VIII	25	32	57	16	16	3 + 14	9	9	5r
32	23.1	♂♂♂	VII-VIII	26	30	56	12	15	3 + 15	9	9	3r
33	25.5	♂♂♂	VII-VIII	24	33	57	14	16	2 + 15	9	9	5r
34	25.1	♂♂♂	VII-VIII	25	32	57	16	16	4 + 14	9	9	6r
35	23.5	♂♂♂	VII-VIII	24	33	57	15	16	3 + 15	9	9	4r
36	24.8	♂♂♂	VII-VIII	22	35	57	16	16	3 + 15	9	9	5r
37	23.5	♂♂♂	VII-VIII	25	31	56	16	16	3 + 13	9	9	5r
38	24.6	♂♂♂	VII-VIII	25	32	57	14	17	3 + 16	8	9	4r
39	25.1	♂♂♂	VII-VIII	23	34	57	17	15	3 + 13	9	9	5r
40	24.6	♂♂♂	VII-VIII	23	34	57	16	?	3 + 16	9	9	3r
41	23.8	♂♂♂	VII-VIII	23	33	56	15	14	4 + 15	9	9	4r
42	24.2	♂♀	VII-VIII	25	31	56	16	15	3 + 13	9	9	5r
43	25.5	♀♀	VII-VIII	24	32	56	15	16	3 + 13	9	9	5r
44	29.2	♀♀	VII-VIII	24	33	57	16	15	2 + 14	9	9	6r
45	27.6	♀♀	VII-VIII	24	34	58	15	15	3 + 14	9	9	4r
46	25.3	♀♀	VII-VIII	23	32	55	15	15	?	6	8	5r
47	26.2	♀♀	VII-VIII	24	32	56	15	16	3 + 14	9	9	5r?
48	29.2	♀♀	VII-VIII	24	33	57	14	15	3 + 14	9	9	8r
49	27.3	♀♀	VII-VIII	25	32	57	16	15	3 + 14	9	9	5r
50	26.8	♀♀	VII-VIII	24	32	56	15	15	3 + 14	9	9	4r
51	26.0	♀♀	VII-VIII	24	33	57	15	15	3 + 13	9	9	4r
52	27.7	♀♀	VII-VIII	24	32	56	15	17	3 + 14	9	9	4r?
53	27.8	♀♀	VII-VIII	24	33	57	14	15	3 + 15	9	9	4r
54	27.5	♀	VII-VIII	24	33	57	16	16	2 + 13	9	9	6r
55	28.2	♀♀♀	VII-VIII	23	33	56	15	15	3 + 14	9	9	ca. 5
56	25.1	♀♀♀	VII-VIII	25	31	56	15	16	3 + 16	9	9	3r
57	25.8	♀♀♀	VII-VIII	24	33	57	15	16	3 + 15	9	9	4r
58	23.5	♀♀♀	VII-VIII	23	34	57	15	16	3 + 15	9	9	4r
59	23.5	♀♀♀	VII-VIII	23	33	56	14	14	3 + 15	9	9	3r
60	26.0	♀♀♀	VII-VIII	24	35	59	15	15	4 + 14	9	9	4r
61	22.7	♀♀♀	VII-VIII	24	32	56	15	15	3 + 14	9	9	3r
62	22.7	♀♀♀	VII-VIII	26	31	57	16	16	3 + 14	9	9	3r
63	23.6	♀♀♀	VII-VIII	24	32	56	15	16	3 + 15	8	8	3r
64	23.6	♀♀♀	VII-VIII	24	32	56	15	15	4 + 13	8	9	4r
65	23.5	♀♀♀	VII-VIII	25	32	57	12	16	3 + 15	9	9	3r
66	22.8	♀♀♀	VII-VIII	26	30	56	14	14	3 + 15	8	8	3r
67	28.3	♀♀♀	VII-VIII	24	33	57	14	15	3 + 14	9	9	5r
68	27.6	♀♀♀	VII-VIII	24	33	57	16	14	3 + 14	9	9	6r
69	23.3	♀♀♀	VII-VIII	23	34	57	13	16	3 + 15	9	9	4r
70	23.0	♀♀♀	VII-VIII	26	30	56	14	16	3 + 15	9	9	5r
71	24.3	♀♀♀	VII-VIII	24	32	56	13	16	3 + 15	9	9	4r
72	23.5	♀♀♀	VII-VIII	24	31	55	15	15	3 + 15	9	9	3r
73	25.6	♀♀♀	VII-VIII	23	33	56	15	15	3 + 14	8	8	ca. 5
74	29.2	♀♀♀	VII-VIII	23	34	57	15	15	3 + 13	9	9	5r?
75	27.7	♀♀♀	VII-VIII	24	32	56	15	15	3 + 14	8	9	6r
76	25.5	♀♀♀	VII-VIII	24	32	56	15	16	3 + 14	9	9	4r
77	25.3	♀♀♀	VII-VIII	23	34	57	15	16	2 + 17	9	9	4r
78	27.3	♀♀♀	VII-VIII	24	33	57	14	15	3 + 13	9	9	5r?
79	29.2	♀♀♀	VII-VIII	23	33	56	17	15	3 + 15	9	9	5r?
80	23.8	♀♀♀	VII-VIII	25	32	57	15	14	3 + 13	8	8	4r
81	25.8	♀♀♀	VII-VIII	24	33	57	15	14	3 + 15	9	9	3r
82	24.5	♀♀♀	VII-VIII	24	33	57	16	16	3 + 15	9	9	3r
83	24.5	♀♀♀	VII-VIII	24	32	56	14	15	3 + 14	9	9	4r
84	25.5	♀♀♀	VII-VIII	24	33	57	15	14	3 + 12	8	7	6r
85	26.0	♀♀♀	VII-VIII	24	33	57	15	16	3 + 15	9	9	5r
86	25.1	♀♀♀	VII-VIII	23	33	56	15	15	3 + 14	9	9	5r
87	26.3	♀♀♀	VII-VIII	26	30	56	14	16	3 + 15	9	8	4r
88	26.8	♀♀♀	VII-VIII	24	32	56	15	15	3 + 15	9	9	4
89	27.0	♀♀♀	VII-VIII	23	33	56	16	16	3 + 13	8	8	4r
90	24.7	♀♀♀	VII-VIII	24	34	58	14	15	3 + 16	9	9	3r
91	23.0	♀♀♀	VII-VIII	24	32	56	15	15	3 + 15	8	8	4r
92	23.3	♀♀♀	VII-VIII	23	32	55	15	15	3 + 14	9	9	5r
93	22.3	♀♀♀	VII-VIII	24	32	56	13	abn.	3 + 16	9	9	3r
94	21.6	♀♀♀	VII-VIII	26	30	56	15	16	3 + 15	8	8	3r
95	27.5	♂♂♂	VIII	24	33	57	16	16	3 + 14	9	9	4r
96	27.5	♂♂♂	VIII	24	32	56	15	15	3 + 14	9	9	3r
97	28.8	♂♂♂	VIII	23	33	56	15	15	3 + 13	9	9	8r
98	28.8	♂♂♂	VIII	24	33	57	14	14	3 + 15	9	9	6r
99	28.0	♂♂♂	VIII	23	32	55	14	15	3 + 15	9	9	3r
100	26.3	♂♂♂	VIII	24	34	58	15	16	4 + 13	8	8	5r
101	27.0	♂♂♂	VIII	24	31	55	17	15	3 + 14	8	8	5r
102	26.6	♂♂♂	VIII	24	33	57	16	15	3 + 14	8	9	6r
103	25.8	♂♂♂	VIII	23	33	56	13	15	3 + 15	9	9	5r
104	27.6	♂♂♂	VIII	23	33	56	16	15	3 + 13	9	9	3r?
105	26.4	♂♂♂	VIII	26	31	57	15	16	3 + 17	9	9	3r
106	26.8	♂♂♂	VIII	25	32	57	16	15	3 + 16	9	9	7r?
107	26.2	♂♂♂	VIII	23	33	56	16	15	3 + 13	9	9	5r

H. Herrings from N.W. of Skagen.

January 26. 1924. Caught in Purse Seine.

a. Autumn Spawners of Maturity VII—VIII.

Fat contents 0. (practically no fat).

No.	Length cm	Vertebrae			Keeled Scales K_2	Rays in ventral fins		No. of winter-rings in scales approxim.
		Pre-caudal	Caudal	Total		right	left	
1	28.9	23	33	56	15	9	9	8 r
2	25.3	24	32	56	15	9	9	5 r
3	26.5	25	32	57	16	8	8	ca. 5 r
4	22.4	22	33	55	15	9	9	3 r?
5	26.9	24	32	56	15	9	9	8 r
6	27.5	23	33	56	15	9	9	7 r
7	26.8	25	31	56	14	9	9	8 r
8	28.2	23	34	57	15	9	9	6 r
9	28.4	22	33	55	15	8	9	8 r
10	27.8	24	33	57	15	9	9	6 r
11	24.9	24	33	57	15	9	9	5 r
12	27.2	26	31	57	16	9	9	6 r
13	27.4	24	34	58	16	9	9	6 r
14	25.7	25	32	57	13	8	9	6 r
15	27.3	24	33	57	15	9	9	7 r
16	27.8	24	33	57	15	9	9	7 r
17	28.3	24	32	56	15	9	9	8 r
18	32.2	24	32	56	15	9	9	7 r
19	21.0	22	33	55	14	8	8	3 r
20	27.7	25	31	56	15	9	9	4 r
21	25.0	24	32	56	15	8	8	5 r
22	25.5	..	..	..	15	9	9	5 r
23	27.8	23	33	56	14	7	9	7 r
24	23.1	..	..	..	15	9	9	3 r
25	23.5	25	32	57	14	8	8	4 r?
26	27.0	24	33	57	14	9	9	7 r
27	22.8	23	33	56	14	9	abn.	3 r
28	27.6	23	34	57	15	9	9	7 r
29	27.3	23	33	56	15	9	9	ca. 7 r
30	21.6	..	..	..	15	9	9	3 r
31	28.8	24	32	56	14	9	9	?
32	28.8	24	32	56	15	9	9	7 r
33	21.6	24	32	56	14	9	9	4 r
34	27.8	23	34	57	15	9	9	?
35	25.7	25	32	57	13	9	9	6 r
36	30.1	23	33	56	16	9	9	9 r
37	34.2	23	33	56	16	9	9	5 r
38	28.1	23	33	56	14	9	9	8 r
39	28.7	23	33	56	14	9	9	7 r
40	25.7	26	30	56	15	8	8	5 r
41	26.5	23	32	55	16	8	9	5 r
42	27.0	23	33	56	16	9	9	5 r?
43	24.5	23	34	57	14	9	9	5 r
44	25.4	24	33	57	15	9	8	5 r
45	27.0	23	33	56	15	9	9	7 r
46	26.9	23	33	56	15	9	9	7 r
47	25.1	25	32	57	14	9	9	5 r
48	23.5	..	..	..	16	9	9	4 r
49	25.6	24	33	57	15	8	9	6 r
50	28.0	24	33	57	13	9	8	6 r
51	26.1	24	32	56	15	9	8	5 r
52	26.2	24	33	57	16	9	8	4 r
53	23.2	25	32	57	14	9	9	4 r
54	25.5	24	32	56	15	8	8	6 r
55	28.5	23	34	57	15	8	8	8 r
56	24.4	24	32	56	15	9	9	5 r
57	23.0	..	..	..	15	9	9	3 r
58	24.0	..	..	..	15	9	9	4 r
59	29.2	24	33	57	14	9	9	7 r +
60	23.8	23	33	56	15	9	9	4 r
61	27.0	23	33	56	15	9	9	9 r
62	28.7	23	34	57	15	9	8	ca. 11 r
63	28.9	24	33	57	14	9	9	8 r
64	25.8	24	32	56	16	9	9	5 r
65	26.6	23	34	57	16	8	8	6 r
66	25.0	24	32	56	15	9	9	?
67	26.9	24	33	57	14	9	9	7 r
68	24.6	23	33	56	14	9	9	4 r
69	26.8	23	33	56	16	8	8	5 r
70	26.7	23	33	56	14	9	9	6 r
71	27.4	24	33	57	14	9	9	8 r
72	27.4	23	33	56	15	9	9	6 r
73	25.4	26	31	57	15	9	9	6 r
74	25.3	24	32	56	15	9	9	7 r
75	25.1	24	34	58	16	8	8	5 r
76	25.7	24	31	55	16	9	9	5 r
77	26.8	25	33	58	15	9	9	7 r
78	27.9	24	33	57	15	8	9	8 r
79	28.3	24	32	56	15	9	9	?
80	21.9	25	31	56	14	9	9	3 r
81	26.2	23	33	56	16	9	9	5 r
82	25.2	23	33	56	16	9	9	6 r
83	28.9	23	34	57	16	9	9	8 r
84	26.5	24	33	57	16	9	9	4 r
85	25.2	23	33	56	14	9	8	5 r
86	25.2	25	32	57	15	9	9	6 r
87	23.7	23	32	55	15	9	9	4 r
88	23.2	..	..	..	16	abn.	8	5 r
89	23.2	24	32	56	16	8	8	5 r
90	24.1	..	..	..	15	9	9	5 r
91	27.2	23	33	56	13	9	9	6 r
92	27.1	23	33	56	15	8	9	6 r
93	26.9	25	32	57	14	9	9	?
94	21.4	25	30	55	15	8	8	3 r
95	26.1	24	33	57	15	8	8	ca. 6 r
96	28.7	22	34	56	15	9	9	9 r
97	25.6	22	35	57	16	9	9	5 r
98	26.3	23	32	55	14	7	8	5 r
99	21.6	..	..	..	16	9	9	4 r
100	23.8	24	32	56	16	9	9	4 r
101	27.2	24	33	57	15	8	9	9 r
102	25.4	24	32	56	14	9	9	ca. 4 r
103	25.7	23	33	56	15	9	9	5 r
104	23.7	23	33	56	15	9	9	5 r
105	25.4	24	33	57	14	9	8	7 r
106	23.3	22	34	56	16	8	8	4 r
107	28.9	24	32	56	16	9	9	8 r
108	22.2	24	32	56	15	9	9	4 r
109	24.7	..	..	..	15	9	9	5 r
110	28.2	25	32	57	16	9	9	7 r
111	27.1	24	33	57	15	9	9	ca. 6 r
112	29.2	24	32	56	15	9	9	10 r
113	23.9	24	31	55	16	8	8	5 r
114	21.9	25	31	56	15	8	8	4 r
115	25.1	23	33	56	14	9	9	ca. 5 r
116	25.0	24	33	57	15	9	9	?
117	24.7	24	32	56	15	9	9	ca. 7 r
118	25.5	24	33	57	15	8	8	5 r
119	25.5	..	..	..	16	9	9	ca. 6 r
120	22.2	..	..	..	15	9	10	3 r
121	27.7	24	32	56	15	9	9	8 r
122	24.0	23	33	56	16	9	9	4 r
123	26.2	24	33	57	13	9	9	6 r
124	24.1	24	33	57	15	9	8	5 r
125	24.7	23	33	56	15	8	8	6 r
126	27.2	25	32	57	15	9	9	5 r
127	22.8	24	33	57	16	9	8	5 r
128	24.2	24	33	57	15	9	9	5 r
129	24.7	23	33	56	15	9	9	5 r
130	22.3	22	33	55	16	9	9	5 r
131	26.1	24	33	57	14	9	9	8 r
132	25.6	24	32	56	14	9	9	6 r
133	27.0	24	33	57	16	9	9	7 r
134	25.1	23	33	56	14	8	9	4-5 r
135	27.8	24	32	56	14	9	9	7 r
136	25.0	23	33	56	15	9	9	5 r
137	24.9	24	32	56	15	9	9	6 r
138	24.6	24	33	57	15	8	8	5 r

No.	Length cm	Vertebrae			Keeled Scales K_2	Rays in ventral fins		No. of winter-rings in scales approxim.	No.	Length cm	Vertebrae			Keeled Scales K_2	Rays in ventral fins		No. of winter-rings in scales approxim.
		Pre-caudal	Caudal	Total		right	left				Pre-caudal	Caudal	Total		right	left	
139	25.5	22	34	56	15	9	9	7 r	145	24.9	23	33	56	15	9	9	4 r
140	26.8	24	32	56	15	9	abn.	6 r	146	21.4	..	..	..	14	9	8	4 r
141	24.3	24	32	56	15	9	9	6 r	147	27.0	23	33	56	16	8	9	7 r
142	27.5	25	32	57	16	9	9	7 r	148	27.6	24	33	57	16	9	9	6 r
143	26.1	23	33	56	15	9	9	6 r	149	27.2	23	34	57	14	9	9	5 r
144	26.1	24	32	56	15	9	9	8 r	150	24.7	24	32	56	15	9	9	5 r

b. Autumn Spawners of Maturity VIII.

Fat contents 1 and + (a little fat and middling fat).

No.	Length cm	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.	No.	Length cm	Vertebrae			Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim
		Pre-caudal	Caudal	Total				right	left				Pre-caudal	Caudal	Total				right	left	
1	23.7	23	34	57	16	16	3 + 12	9	9	6 r	51	25.2	23	34	57	14	16	3 + 15	8	9	5 r
2	27.2	24	33	57	15	15	?	9	9	6 r	52	25.0	23	32	55	15	15	3 + 14	8	8	5 r
3	24.9	23	33	56	15	16	3 + 15	9	9	6 r	53	25.3	24	32	56	14	15	3 + 15	9	9	4 r
4	27.5	24	33	57	14	16	3 + 14	9	9	6 r	54	25.9	25	31	56	15	16	3 + 14	9	9	5 r
5	25.4	25	30	55	15	16	3 + 14	9	9	6 r	55	24.8	23	34	57	16	14	3 + 13	9	9	4 r
6	26.5	23	33	56	14	15	3 + 14	9	9	5 r	56	26.2	23	34	57	13	15	3 + 14	9	9	6 r
7	28.6	24	32	56	14	14	3 + 14	8	8	6 r	57	27.3	23	33	56	15	16	3 + 15	9	9	6 r
8	27.1	24	33	57	16	15	3 + 13	8	9	6 r?	58	24.8	24	32	56	15	16	3 + 15	9	9	5 r
9	27.0	24	33	57	14	15	3 + 15	9	9	5 r	59	24.9	22	33	55	15	15	3 + 14	9	9	5 r
10	29.9	24	33	57	15	15	4 + 14	9	9	8 r	60	25.4	23	33	56	15	15	?	9	9	6 r?
11	29.0	25	31	56	15	15	3 + 14	9	8	6 r	61	27.1	23	33	56	14	15	3 + 11	8	7	7 r
12	25.0	23	33	56	13	15	3 + 15	9	8	6 r	62	25.6	24	32	56	15	15	3 + 13	8	8	4 r
13	24.7	23	33	56	14	15	?	9	9	6 r	63	24.9	22	34	56	15	16	3 + 15	9	9	5 r?
14	26.4	24	32	56	15	15	?	8	9	6 r	64	24.8	23	34	57	15	16	4 + 14	9	9	5 r?
15	24.7	23	34	57	16	16	3 + 15	9	9	5 r	65	26.7	24	32	56	14	16	3 + 15	8	8	6 r
16	25.4	23	34	57	15	15	?	9	9	4 r	66	25.8	24	33	57	14	16	3 + 13	8	8	5 r
17	25.2	24	33	57	15	15	3 + 13	9	9	5 r	67	27.1	23	33	56	14	?	3 + 14	9	9	6 r
18	27.3	24	33	57	13	14	3 + 13	8	8	7 r	68	24.2	22	35	57	14	16	3 + 14	9	9	4 r
19	25.4	25	31	56	15	15	3 + 14	8	8	6 r	69	24.8	24	32	56	15	16	?	8	abn.	5 r
20	24.8	24	32	56	15	15	3 + 15	9	abn.	4 r	70	27.6	23	33	56	15	16	4 + 14	9	9	7 r?
21	24.2	..	..	..	16	16	3 + 14	9	9	5 r?	71	26.5	23	34	57	15	16	?	9	9	5 r
22	25.9	25	31	56	13	16	3 + 15	9	9	6 r	72	25.5	26	30	56	14	15	3 + 15	8	9	5 r
23	25.1	25	32	57	15	15	?	9	9	4 r	73	24.8	25	31	56	13	15	3 + 15	9	9	5 r
24	24.0	25	33	58	13	15	3 + 15	9	9	4 r	74	25.1	24	33	57	15	15	3 + 14	9	9	5 r
25	24.9	23	33	56	14	16	3 + 14	9	9	5 r?	75	27.1	25	32	57	16	15	3 + 15	9	9	9 r?
26	27.7	24	32	56	16	15	3 + 15	9	9	c. 6 r	76	23.6	23	32	55	15	15	3 + 13	9	9	6 r
27	25.1	24	33	57	13	15	4 + 13	9	9	6 r	77	24.7	23	33	56	15	15	3 + 14	9	9	c. 4 r
28	27.1	23	33	56	16	14	3 + 14	9	9	7 r	78	24.4	24	32	56	14	16	3 + 15	9	9	6 r
29	29.1	22	34	56	14	15	3 + 15	9	9	7 r	79	25.2	24	34	58	16	15	3 + 14	9	9	5 r?
30	23.3	25	31	56	16	16	3 + 15	9	8	6 r	80	24.1	23	33	56	15	15	3 + 15	9	9	5 r
31	27.0	24	32	56	15	15	?	9	9	6 r	81	22.9	25	31	56	14	15	3 + 13	9	9	5 r
32	26.2	26	30	56	15	16	4 + 14	9	9	5 r	82	23.7	22	34	56	14	16	3 + 15	8	8	5 r?
33	25.2	24	33	57	16	16	3 + 15	8	8	6 r	83	24.7	24	33	57	15	14	3 + 14	8	8	4 r
34	25.2	23	33	56	15	16	3 + 14	9	9	6 r	84	25.5	24	33	57	15	15	3 + 16	8	9	5 r
35	23.9	24	32	56	15	16	3 + 14	9	9	4 r	85	23.2	23	34	57	15	16	3 + 14	9	9	5 r
36	29.0	24	33	57	15	15	3 + 15	9	9	8 r	86	25.5	23	33	56	15	14	3 + 13	9	9	6 r
37	25.5	24	33	57	14	13	3 + 13	9	9	5 r	87	25.6	24	32	56	14	15	3 + 15	9	9	4 r
38	24.2	24	33	57	15	16	3 + 15	9	9	6 r	88	25.5	23	33	56	14	15	4 + 12	9	9	5 r
39	26.4	22	34	56	17	15	4 + 14	8	8	4 r	89	27.6	25	32	57	15	14	3 + 14	9	9	6 r
40	25.0	24	33	57	14	16	4 + 13	9	9	4 r	90	27.2	24	33	57	14	16	3 + 13	9	9	7 r
41	24.8	25	32	57	15	15	3 + 15	8	8	5 r	91	26.5	23	33	56	14	15	3 + 15	9	9	6 r
42	24.7	24	32	56	13	15	3 + 14	8	8	4 r	92	26.2	23	34	57	13	14	3 + 14	9	9	6 r
43	26.3	23	34	57	16	15	3 + 16	9	9	6 r	93	25.3	23	33	56	15	15	3 + 15	9	9	6 r
44	24.2	24	32	56	14	16	3 + 14	9	8	5 r	94	27.7	23	33	56	16	14	4 + 14	9	9	6 r
45	24.7	24	33	57	14	15	4 + 15	9	9	6 r	95	27.1	24	32	56	14	15	3 + 14	9	9	6 r?
46	28.4	24	32	56	14	15	3 + 14	9	9	6 r	96	27.2	23	33	56	16	16	3 + 16	9	9	5 r?
47	25.0	24	33	57	16	16	4 + 15	9	9	5-6 r	97	24.1	24	33	57	16	15	4 + 13	9	9	4 r
48	26.9	24	33	57	14	16	4 + 13	9	9	5 r	98	24.3	23	33	56	14	16	3 + 14	8	9	5 r
49	27.9	22	34	56	15	15	3 + 15	9	9	5 r	99	29.5	23	32	55	14	16	3 + 13	9	9	8 r
50	26.0	23	34	57	13	16	3 + 14	9	9	6 r	100	25.8	23	33	56	15	16	3 + 15	9	9	6 r

J. Herrings from 12 miles W. of Cape Wrath.

March 5. 1923. — Caught in drift nets.

Ripe Spring Spawners.

No.	Length cm	Sex	Maturity	Vertebrae: Pre-caudal	Vertebrae: Caudal	Vertebrae: Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins: right	Rays in ventral fins: left	No. of winter-rings in scales approxim.
1	31.0	♂♂♂♂♂	VI	24	33	57	15	15	3 + 14	9	9	5 r
2	29.2	♂♂♂♂♂♂♂	VI	25	32	57	14	14	3 + 15	9	9	5 r
3	32.0	♂♂♂♂♂♂♂	VI	24	33	57	14	15	4 + 15	9	9	8 r
4	30.1	♂♂♂♂♂♂♂	VI	23	34	57	14	14	3 + 13	9	9	ca. 5 r
5	28.0	♂♂♂♂♂♂♂	VI	25	32	57	14	16	3 + 15	9	9	5 r
6	30.0	♂♂♂♂♂♂♂	VI	23	34	57	15	15	4 + 14	9	9	7 r
7	30.5	♂♂♂♂♂♂♂	VI	24	33	57	14	16	3 + 15	9	9	7 r
8	30.5	♂♂♂♂♂♂♀	VI	25	31	56	14	15	4 + 14	9	9	5 r
9	31.8	♂♂♂♂♂♂♀	VI	24	34	58	16	15	4 + 16	9	9	9 r
10	31.0	♂♂♂♂♂♂♀	VI	24	33	57	14	15	3 + 15	9	9	5 r
11	30.7	♂♂♂♂♂♂♀	VI	24	34	58	14	14	3 + 13	9	9	7 r
12	28.2	♂♂♂♂♂♂♀	VI	24	32	56	13	15	4 + 15	8	9	ca. 8 r
13	29.0	♂♂♂♂♂♂♀	VI	25	31	56	14	16	3 + 13	9	9	5 r
14	30.2	♂♂♂♂♂♂♀	VI	25	31	56	13	14	3 + 15	9	9	ca. 5 r
15	28.8	♂♂♂♂♂♂♀	VI	23	34	57	12	15	4 + 15	9	9	5 r
16	30.8	♂♂♂♂♂♂♀	VI	24	34	58	14	15	3 + 15	9	9	6 r
17	28.7	♂♂♂♂♂♂♀	VI	25	32	57	14	16	3 + 15	9	9	5 r
18	30.5	♂♂♂♂♂♂♀	VI	23	34	57	14	14	3 + 17	9	9	5 r
19	30.0	♂♂♂♂♂♂♀	VI	23	34	57	14	15	3 + 14	10	9	5 r
20	29.2	♂♂♂♂♂♂♀	VI	25	33	58	14	15	3 + 16	9	9	5 r
21	29.1	♂♂♂♂♂♂♀	VI	23	33	56	14	16	3 + 15	9	9	5 r
22	29.0	♂♂♂♂♂♂♀	VI	26	33	59	14	16	3 + 15	9	9	5 r
23	30.6	♂♂♂♂♂♂♀	VI	24	32	56	13	14	3 + 15	9	9	5 r
24	29.0	♂♂♂♂♂♂♂	VI	23	34	57	15	16	3 + 14	9	9	5 r
25	29.0	♂♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 14	9	9	6 r
26	27.7	♂♂♂♂♂♂♂	VI	25	33	58	14	15	3 + 15	9	9	5 r
27	30.2	♂♂♂♂♂♂♂	VI	24	32	56	14	15	3 + 15	9	9	6 r
28	29.2	♂♂♂♂♂♂♂	VI	25	31	56	13	15	3 + 14	9	9	5 r
29	29.2	♂♂♂♂♂♂♀	VI	23	33	56	13	15	3 + 15	9	9	6
30	30.0	♂♂♂♂♂♂♀	VI	24	33	57	14	15	3 + 14	9	9	6 r
31	31.8	♂♂♂♂♂♂♀	VI	25	32	57	15	15	3 + 14	9	9	8 r
32	30.2	♂♂♂♂♂♂♀	VI	24	34	58	14	15	3 + 16	9	9	5 r
33	30.5	♂♂♂♂♂♂♀	VI	24	34	58	15	15	3 + 16	9	9	5 r
34	29.2	♂♂♂♂♂♂♀	VI	24	33	57	15	16	4 + 15	9	9	5 r
35	30.1	♂♂♂♂♂♂♀	VI	26	31	57	15	15	3 + 14	10	9	6 r
36	30.0	♂♂♂♂♂♂♂	VI	24	34	58	16	15	4 + 15	9	9	5 r
37	29.8	♂♂♂♂♂♂♂	VI	25	32	57	15	16	3 + 15	9	8	5 r
38	28.0	♂♂♂♂♂♂♂	VI	25	32	57	13	16	3 + 15	9	8	5 r
39	26.5	♂♂♂♂♂♂♂	VI	26	31	57	16	16	3 + 16	9	9	6 r
40	30.5	♂♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 16	9	9	5 r
41	27.8	♂♂♂♂♂♂♂	VI	24	33	57	13	15	3 + 15	9	9	5
42	29.5	♂♂♂♂♂♂♀	VI	25	33	58	14	15	3 + 15	9	9	5 r
43	30.2	♂♂♂♂♂♂♀	VI	24	33	57	15	14	4 + 13	9	9	6 r
44	30.0	♂♂♂♂♂♂♀	VI	23	34	57	13	15	4 + 15	9	6	ca. 7 r
45	29.7	♂♂♂♂♂♂♂	VI	25	32	57	15	16	3 + 16	9	9	5 r
46	29.3	♂♂♂♂♂♂♂	VI	24	34	58	14	14	3 + 14	9	9	6 r
47	30.0	♂♂♂♂♂♂♂	VI-VII	25	32	57	13	16	3 + 15	10	9	5 r
48	29.5	♂♂♂♂♂♂♀	VI	24	33	57	15	15	3 + 15	9	9	5 r
49	30.0	♂♂♂♂♂♂♀	VI	24	32	56	14	16	4 + 15	9	9	5 r
50	29.7	♂♂♂♂♂♂♀	VI-VII	24	33	57	14	15	4 + 15	9	9	5 r
51	32.5	♂♂♂♂♂♂♀	VI	24	34	58	14	15	3 + 14	9	9	7 r
52	30.0	♂♂♂♂♂♂♀	VI	23	35	58	15	15	3 + 15	9	9	5 r
53	30.5	♂♂♂♂♂♂♀	VI	25	33	58	14	14	3 + 16	9	9	?
54	30.0	♂♂♂♂♂♂♀	VI	24	33	57	15	16	3 + 15	9	9	5 r
55	29.3	♂♂♂♂♂♂♂	VI	23	34	57	13	15	3 + 16	9	9	6 r
56	29.5	♂♂♂♂♂♂♂	VI	26	31	57	14	16	3 + 15	9	9	6 r
57	29.2	♂♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 13	9	9	5 r
58	29.5	♂♂♂♂♂♂♂	VI	23	34	57	15	15	3 + 16	9	9	6 r
59	29.8	♂♂♂♂♂♂♂	VI	26	31	57	13	16	3 + 16	9	9	5 r
60	30.3	♂♂♂♂♂♂♂	VI	23	33	56	13	16	3 + 16	9	9	5 r
61	30.2	♂♂♂♂♂♂♂	VI	24	34	58	14	16	3 + 16	9	9	5 r
62	32.2	♂♂♂♂♂♂♂	VI	24	33	57	15	15	3 + 14	9	9	ca. 8 r
63	30.3	♂♂♂♂♂♂♂	VI	23	34	57	15	16	3 + 15	9	9	5 r
64	30.5	♂♂♂♂♂♂♂	VI	23	34	57	15	15	3 + 15	9	9	5 r
65	29.7	♂♂♂♂♂♂♂	VI	23	34	57	14	15	3 + 15	9	9	5 r
66	29.0	♂♂♂♂♂♂♂	VI	24	32	56	13	15	3 + 15	9	9	5 r
67	31.0	♂♂♂♂♂♂♂	VI	25	32	57	14	15	3 + 15	9	9	ca. 6 r
68	30.2	♂♂♂♂♂♂♂	VI	25	32	57	13	15	3 + 15	9	9	5 r
69	28.0	♂♂♂♂♂♂♂	VI	24	33	57	14	15	4 + 13	8	9	7 r
70	30.5	♂♂♂♂♂♂♂	VI	24	33	57	13	15	3 + 16	9	9	6 r
71	29.0	♂♂♂	VI	25	31	56	13	16	3 + 16	9	9	5 r
72	29.8	♀♂♂♂♂	VI	25	32	57	14	16	3 + 17	9	9	5 r
73	30.5	♀♀♂♂♂♂♂♂	VI	23	34	57	16	16	3 + 16	9	9	5 r
74	29.3	♀♀♂♂♂♂♂♂	VI	23	33	56	14	16	3 + 15	9	9	5 r
75	31.2	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	4 + 15	9	9	5 r
76	32.8	♀♀♂♂♂♂♂♂	VI	25	32	57	12	15	3 + 15	9	9	7 r
77	29.5	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 15	9	9	ca. 6 r
78	28.0	♀♀♂♂♂♂♂♂	VI	24	33	57	13	15	3 + 15	9	9	6 r
79	30.0	♀♀♂♂♂♂♂♂	VI	25	32	57	15	16	3 + 14	9	9	5 r
80	30.5	♀♀♂♂♂♂♂♂	VI	23	33	56	14	15	3 + 16	9	9	6 r
81	28.8	♀♀♂♂♂♂♂♂	VI	25	32	57	13	15	3 + 15	9	9	5 r
82	30.0	♀♀♂♂♂♂♂♂	VI	23	34	57	14	16	4 + 15	9	9	5 r
83	28.8	♀♀♂♂♂♂♂♂	VI	25	33	58	14	15	3 + 15	9	9	7 r
84	30.4	♀♀♂♂♂♂♂♂	VI	25	32	57	14	15	2 + 15	9	9	5 r
85	29.3	♀♀♂♂♂♂♂♂	VI	24	33	57	14	16	4 + 14	9	9	5 r
86	30.3	♀♀♂♂♂♂♂♂	VI	24	34	58	14	15	3 + 15	9	9	5 r
87	29.2	♀♀♂♂♂♂♂♂	VI	27	32	59	15	15	3 + 14	8	9	5 r
88	30.2	♀♀♂♂♂♂♂♂	VI	25	32	57	13	16	4 + 14	9	9	7 r
89	29.3	♀♀♂♂♂♂♂♂	VI	24	33	57	13	15	2 + 16	9	9	5 r
90	26.8	♀♀♂♂♂♂♂♂	VI	24	32	56	13	15	4 + 14	9	9	4 r
91	29.5	♀♀♂♂♂♂♂♂	VI	23	33	56	15	15	3 + 16	9	10	5 r
92	30.0	♀♀♂♂♂♂♂♂	VI	25	32	57	13	15	3 + 15	9	9	5 r
93	30.2	♀♀♂♂♂♂♂♂	VI	25	32	57	13	16	3 + 16	9	9	5 r
94	28.0	♀♀♂♂♂♂♂♂	VI	25	32	57	13	16	3 + 16	9	9	5 r
95	29.0	♀♀♂♂♂♂♂♂	VI	24	34	58	13	?	3 + 16	9	9	6 r
96	30.0	♀♀♂♂♂♂♂♂	VI	24	33	57	13	16	3 + 16	9	9	6 r
97	29.3	♀♀♂♂♂♂♂♂	VI	23	34	57	13	15	3 + 16	9	9	5 r
98	29.0	♀♀♂♂♂♂♂♂	VI	26	31	57	14	16	3 + 15	9	9	5 r
99	29.2	♀♀♂♂♂♂♂♂	VI	23	33	56	14	16	3 + 15	9	9	5 r
100	30.0	♀♀♂♂♂♂♂♂	VI	25	32	57	14	16	4 + 15	9	9	5 r
101	29.3	♀♀♂♂♂♂♂♂	VI	25	32	57	13	16	3 + 15	10	10	5 r
102	30.7	♀♀♂♂♂♂♂♂	VI	24	32	56	14	14	3 + 16	9	9	5 r
103	30.0	♀♀♂♂♂♂♂♂	VI	25	33	58	13	15	3 + 14	9	9	5 r
104	29.5	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 15	9	9	5 r
105	29.4	♀♀♂♂♂♂♂♂	VI	24	33	57	15	16	4 + 14	9	9	6 r
106	28.8	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 16	9	9	5 r
107	30.6	♀♀♂♂♂♂♂♂	VI	24	34	58	14	14	3 + 14	9	9	6 r
108	29.8	♀♀♂♂♂♂♂♂	VI	25	33	58	14	15	3 + 15	9	9	ca. 5 r
109	27.8	♀♀♂♂♂♂♂♂	VI	24	33	57	15	15	3 + 15	9	9	7 r
110	29.6	♀♀♂♂♂♂♂♂	VI	24	33	57	14	16	3 + 16	9	9	5 r
111	29.6	♀♀♂♂♂♂♂♂	VI	23	34	57	14	15	3 + 15	9	9	5 r
112	29.5	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 16	9	9	5 r
113	30.0	♀♀♂♂♂♂♂♂	VI	24	34	58	14	16	4 + 15	9	9	5 r
114	29.5	♀♀♂♂♂♂♂♂	VI	24	33	57	13	15	3 + 15	9	9	5 r
115	28.7	♀♀♂♂♂♂♂♂	VI	23	34	57	14	16	3 + 15	9	9	5 r
116	32.1	♀♀♂♂♂♂♂♂	VI	23	34	57	13	15	4 + 14	9	9	8 r
117	28.1	♀♀♂♂♂♂♂♂	VI	24	32	56	14	15	3 + 15	9	9	4 r
118	30.2	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 14	9	9	5 r
119	30.2	♀♀♂♂♂♂♂♂	VI	24	33	57	14	16	3 + 15	9	9	5 r
120	30.6	♀♀♂♂♂♂♂♂	VI	24	32	56	14	15	3 + 15	9	9	5 r
121	30.2	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 15	9	9	5 r
122	30.0	♀♀♂♂♂♂♂♂	VI	24	35	59	14	16	3 + 15	9	9	5 r
123	30.0	♀♀♂♂♂♂♂♂	VI	25	32	57	13	15	3 + 15	9	9	6 r
124	32.7	♀♀♂♂♂♂♂♂	VI	25	33	58	15	15	3 + 15	9	?	6 r
125	29.3	♀♀♂♂♂♂♂♂	VI	23	34	57	14	16	3 + 16	9	9	6 r
126	28.5	♀♀♂♂♂♂♂♂	VI	24	33	57	14	16	3 + 15	9	9	5 r
127	28.5	♀♀♂♂♂♂♂♂	VI	25	33	58	14	14	3 + 16	9	8	6 r
128	29.2	♀♀♂♂♂♂♂♂	VI	26	31	57	14	16	3 + 15	9	9	5 r
129	29.7	♀♀♂♂♂♂♂♂	VI	24	33	57	14	15	3 + 14	10	10	5 r
130	29.6	♀♀♂♂♂♂♂♂	VI	24	34	58	14	16	3 + 15	9	9	5 r
131	29.7	♀♀♂♂♂♂♂♂	VI	24	32	56	13	15	3 + 16	9	9	5 r
132	29.7	♀♀♂♂♂♂♂♂	VI	24	33	57	13	16	3 + 17	9	9	5 r
133	28.3	♀♀♂♂♂♂♂♂	VI	25	33	58	15	17	3 + 15	9	9	4 r
134	28.5	♀♀♂♂♂♂♂♂	VI	24	33	57	13	15	3 + 15	9	9	5 r
135	29.5	♀♀♂♂♂♂♂♂	VI	24	33	57	13	14	3 + 14	9	9	5 r
136	30.4	♀♀♂♂♂♂♂♂	VI	24	34	58	14	16	3 + 15	9	9	5 r
137	29.0	♀♀♂♂♂♂♂♂	VI	24	32	56	14	15	4 + 14	9	9	5 r
138	31.2	♀♀♂♂♂♂♂♂	VI	23	34	57	14	?	3 + 16	9	9	5 r
139	29.6	♀♀♂♂♂♂♂♂	VI	23	34	57	14	15	3 + 14	9	9	5 r
140	29.3	♀♀♂♂♂♂♂♂	VI	23	34	57	15	16	3 + 16	9	9	5 r
141	29.5	♀♀♂♂♂♂♂♂	VI	25	32	57	15	15	3 + 15	9	9	5 r
142	29.8	♀♀♂♂♂♂♂	VI	25	31	56	13	15	3 + 13	9	9	5 r

No.	Length cm	Sex	Maturity	Vertebrae			Keeled scales K_2	Rays in dorsal fin	Rays in anal fin	Rays in ventral fins		No. of winter-rings in scales approxim.
				Pre-caudal	Caudal	Total				right	left	
143	29.7	♂♀	VI	25	32	57	13	15	4 + 15	9	9	5 r
144	30.5	♂♀	VI	26	32	58	14	15	3 + 15	9	9	5 r
145	29.4	♂♀	VI	24	33	57	14	15	3 + 15	9	9	5 r
146	29.5	♂♀	VI	23	33	56	14	15	3 + 16	10	9	5 r
147	30.5	♂♀	VI	24	32	56	14	16	3 + 15	9	9	5 r
148	29.8	♂♀	VI	25	33	58	14	15	3 + 16	9	9	5 r
149	30.1	♂♀	VI	24	33	57	14	15	3 + 15	9	9	ca. 5 r
150	29.7	♂♀	VI	24	33	57	14	15	3 + 15	?	9	5 r
151	28.6	♂♀	VI	26	32	58	15	15	3 + 14	9	9	5 r
152	31.5	♂♀	VI	24	33	57	14	15	3 + 16	9	9	6 r
153	30.2	♂♀	VI	24	33	57	14	16	3 + 13	9	9	5 r
154	30.4	♂♀	VI	26	32	58	14	15	3 + 15	9	9	5 r
155	28.7	♂♀	VI	23	34	57	15	16	3 + 14	9	9	5 r
156	28.4	♂♀	VI	24	33	57	14	15	3 + 16	9	9	5 r
157	29.2	♂♀	VI	24	33	57	13	15	3 + 14	9	9	5 r
158	30.0	♂♀	V-VI	24	33	57	13	15	4 + 16	9	9	5 r
159	29.8	♂♀	VI	24	34	58	14	15	3 + 14	9	9	6 r
160	29.7	♂♀	VI	23	34	57	14	14	3 + 15	9	9	5 r
161	28.7	♂♀	VI	24	34	58	13	16	3 + 15	9	9	5 r
162	29.2	♂♀	VI	25	32	57	13	15	3 + 15	9	9	5 r
163	29.0	♂♀	VI	24	33	57	14	15	3 + 15	9	9	5 r
164	28.5	♂♀	VI	24	33	57	14	15	3 + 15	9	9	5 r
165	29.2	♂♀	VI	24	33	57	14	15	3 + 15	9	9	?
166	28.9	♂♀	VI	23	34	57	14	15	3 + 15	9	9	5 r
167	29.3	♂♀	VI	24	33	57	15	15	3 + 14	9	9	5 r
168	30.9	♂♀	VI	24	34	58	15	15	3 + 16	9	9	5 r
169	27.6	♂♀	VI	24	33	57	13	15	3 + 15	9	9	5 r
170	27.6	♂♀	VI	23	34	57	15	16	3 + 15	9	9	6 r
171	29.7	♂♀	VI	24	34	58	15	14	3 + 15	9	9	5 r
172	28.7	♂♀	VI	25	32	57	14	15	4 + 15	9	9	5 r
173	29.2	♂♀	VI	23	34	57	15	15	4 + 15	9	9	6 r
174	29.4	♂♀	VI	23	34	57	14	15	4 + 15	9	9	ca. 5 r
175	29.5	♂♀	VI	24	34	58	15	15	3 + 15	9	9	6 r
176	29.0	♂♀	VI	24	33	57	14	16	2 + 14	9	9	5 r
177	29.8	♂♀	VI	24	34	58	13	14	4 + 15	9	9	5 r
178	29.8	♂♀	VI	24	33	57	14	14	3 + 15	9	9	5 r
179	28.8	♂♀	VI	24	33	57	15	15	3 + 15	9	10	5 r
180	29.5	♂♀	VI	24	33	57	14	16	3 + 15	9	9	5 r
181	33.0	♂♀	VI	23	35	58	15	4 + 15	3 + 15	9	9	ca. 7 r
182	28.5	♂♀	VI	24	32	56	13	4 + 16	3 + 15	9	9	5 r
183	30.5	♂♀	VI	23	34	57	14	4 + 17	4 + 15	9	9	6 r
184	30.0	♂♀	VI	24	33	57	13	4 + 15	3 + 15	9	9	5 r
185	28.6	♂♀	VI	23	34	57	14	4 + 14	3 + 14	9	9	ca. 5 r
186	33.5	♂♀	VI	24	34	58	14	3 + 15	3 + 15	9	9	8 r
187	29.3	♂♀	VI	24	33	57	13	4 + 16	3 + 15	9	9	5 r
188	29.5	♂♀	VI	25	33	58	14	4 + 15	4 + 14	9	9	5 r
189	29.2	♂♀	VI	25	32	57	14	5 + 15	4 + 14	9	9	5 r
190	30.8	♂♀	VI	23	34	57	15	5 + 15	4 + 15	9	9	7 r
191	30.3	♂♀	VI	24	33	57	14	5 + 14	3 + 15	9	9	ca. 8 r
192	28.8	♂♀	VI	26	32	58	14	5 + 15	3 + 14	9	9	?
193	28.6	♂♀	VI	24	33	57	15	4 + 16	3 + 15	9	9	5 r
194	30.5	♂♀	VI	24	33	57	12	4 + 16	3 + 15	9	9	5 r
195	29.4	♂♀	VI	24	33	57	14	4 + 15	3 + 16	9	9	5 r
196	28.8	♂♀	VI	25	32	57	14	4 + 15	3 + 15	9	9	7 r
197	29.6	♂♀	VI	25	32	57	13	4 + 15	3 + 15	9	9	5 r
198	28.5	♂♀	VI	25	34	59	14	5 + 15	3 + 14	9	9	5 r
199	33.0	♂♀	VI	26	32	58	13	4 + 14	3 + 14	9	9	7 r
200	29.4	♂♀	VI	24	33	57	14	4 + 16	4 + 16	9	9	5 r
201	28.8	♂♀	VI	25	32	57	14	4 + 15	3 + 14	9	9	5 r
202	30.0	♂♀	VI	23	34	57	15	5 + 14	3 + 15	9	9	ca. 7 r
203	28.8	♂♀	VI	24	33	57	14	4 + 15	3 + 13	9	8	5 r
204	29.7	♂♀	VI	24	33	57	13	4 + 16	3 + 16	9	9	5 r
205	29.8	♂♀	VI	24	32	56	13	4 + 15	3 + 16	9	9	5 r
206	29.3	♂♀	VI	23	35	58	15	4 + 15	3 + 14	9	10	5 r
207	29.2	♂♀	VI	24	33	57	14	3 + 16	2 + 16	9	9	5 r
208	30.8	♂♀	VI	24	33	57	13	4 + 15	3 + 15	9	9	5 r
209	30.2	♂♀	VI	25	32	57	14	3 + 16	3 + 14	8	9	6 r
210	27.9	♂♀	VI	24	33	57	14	4 + 15	4 + 14	9	9	ca. 5 r
211	28.5	♂♀	VI	24	33	57	14	4 + 16	3 + 15	9	9	4 r
212	30.5	♂♀	VI	25	33	58	14	5 + 14	3 + 15	9	9	5 r
213	30.5	♂♀	VI	23	34	57	13	4 + 15	3 + 14	9	9	ca. 5 r
214	29.6	♂♀	VI	24	33	57	15	4 + 14	4 + 15	9	9	5 r
215	29.7	♂♀	VI	25	33	58	15	4 + 15	4 + 15	9	9	5 r
216	29.3	♂♀	VI	25	32	57	13	4 + 15	3 + 14	9	9	5 r
217	30.0	♂♀	VI	24	33	57	13	4 + 15	3 + 16	9	9	5 r
218	30.5	♂♀	VI	25	33	58	13	4 + 15	3 + 15	9	9	5 r
219	30.8	♂♀	VI	23	34	57	14	4 + 16	3 + 16	9	9	5 r
220	30.2	♂♀	VI	24	33	57	13	4 + 16	3 + 16	9	9	5 r
221	29.2	♂♀	VI	24	33	57	14	4 + 15	3 + 15	9	9	5 r
222	30.2	♂♀	VI	25	32	57	13	4 + 16	4 + 15	8	9	5 r
223	29.0	♂♀	VI	23	34	57	14	4 + 15	3 + 16	9	9	6 r
224	30.5	♂♀	VI	25	33	58	14	4 + 16	3 + 15	9	9	5 r
225	32.0	♂♀	VI	25	31	56	14	5 + 15	4 + 15	9	9	?
226	29.4	♂♀	VI	25	32	57	14	4 + 15	3 + 16	9	10	6 r
227	30.2	♂♀	VI	25	32	57	14	4 + 16	3 + 16	9	9	5 r
228	28.6	♂♀	VI	23	34	57	15	4 + 15	3 + 14	9	9	4 r
229	30.8	♂♀	VI	25	33	58	15	4 + 15	3 + 14	9	9	5 r
230	30.0	♂♀	VI	24	33	57	13	?	3 + 14	9	9	5 r
231	30.2	♂♀	VII	24	33	57	14	5 + 15	3 + 15	9	9	5 r
232	31.5	♂♀	VI	24	33	57	14	4 + 14	3 + 13	9	9	7 r
233	28.8	♂♀	VI	24	32	56	12	5 + 14	3 + 15	9	9	5 r
234	29.6	♂♀	VI	24	33	57	14	4 + 15	3 + 16	9	9	5 r
235	32.4	♂♀	VI	24	34	58	14	4 + 15	3 + 15	9	9	6 r
236	29.5	♂♀	VI	24	34	58	14	5 + 15	4 + 16	9	9	5 r
237	30.0	♂♀	VI	24	33	57	14	4 + 15	3 + 16	9	9	5 r
238	29.7	♂♀	VI	24	33	57	14	4 + 16	3 + 15	9	9	5 r
239	29.3	♂♀	VI	24	33	57	14	5 + 14	3 + 15	9	9	5 r
240	30.0	♂♀	VI	25	33	58	13	4 + 14	3 + 15	9	9	5 r
241	30.4	♂♀	VI	25	33	58	14	4 + 16	3 + 15	9	9	5 r
242	28.0	♂♀	VI	23	34	57	14	4 + 15	4 + 15	9	9	ca. 5 r
243	30.2	♂♀	VI	26	31	57	14	5 + 16	3 + 17	9	9	5 r
244	29.6	♂♀	VI	23	34	57	13	4 + 16	4 + 14	9	9	5 r
245	28.2	♂♀	VI	24	33	57	13	4 + 15	3 + 14	9	9	5 r
246	30.6	♂♀	VI	24	33	57	14	5 + 15	3 + 14	9	9	5 r
247	31.8	♂♀	VI	24	33	57	14	4 + 16	3 + 14	9	9	ca. 6 r
248	28.2	♂♀	VI	25	33	58	14	5 + 15	3 + 16	9	9	5 r
249	31.3	♂♀	VI	25	33	58	13	5 + 16	4 + 17	9	9	5 r
250	29.5	♂♀	VI	24	34	58	13	4 + 16	3 + 15	9	9	5 r
251	30.3	♂♀	VI	24	33	57	13	4 + 15	3 + 14	9	9	5 r
252	30.2	♂♀	VI	26	32	58	14	5 + 15	3 + 15	9	9	5 r
253	29.5	♂♀	VI	23	33	56	15	4 + 16	3 + 15	9	9	7 r
254	29.4	♂♀	VI	23	33	56	13	4 + 15	4 + 15	9	9	5 r
255	30.4	♂♀	VI	25	32	57	14	4 + 14	3 + 14	9	9	5 r
256	30.5	♂♀	VI	23	35	58	13	4 + 13	3 + 15	9	9	5 r
257	29.0	♂♀	VI	24	33	57	14	4 + 15	3 + 15	9	9	5 r
258	30.6	♂♀	VI	23	34	57	14	4 + 16	3 + 15	9	9	5 r
259	28.4	♂♀	VI	24	33	57	14	4 + 16	3 + 15	9	10	5 r
260	29.3	♂♀	VI	25	32	57	13	4 + 16	3 + 15	9	9	5 r
261	30.4	♂♀	VI	25	33	58	15	4 + 16	3 + 16	9	9	7 r
262	29.2	♂♀	VI	23	34	57	13	4 + 14	3 + 14	9	9	6 r
263	30.6	♂♀	VI	25	33	58	15	4 + 15	3 + 15	9	9	7 r
264	30.2	♂♀	VI	24	33	57	14	4 + 15	3 + 15	9	9	5 r
265	31.2	♂♀	VI	23	34	57	13	5 + 16	3 + 15	9	9	5 r
266	29.5	♂♀	VI	24	33	57	14	4 + 15	3 + 16	9	9	5 r
267	31.2	♂♀	VI	25	33	58	13	4 + 15	3 + 13	9	9	5 r
268	28.7	♂♀	VI	24	33	57	14	4 + 15	3 + 14	9	9	5 r
269	28.2	♂♀	VI	25	33	58	15	4 + 16	3 + 16	9	9	5 r
270	31.5	♂♀	VI	25	32	57	14	4 + 16	3 + 13	9	9	ca. 6 r

K. Herrings from 9 miles N. of Flugga. (Shetland Isles).

March 21. 1923. Caught in drift nets.

Spring Spawners of Maturity VII.

No.	Length cm	Sex	Vertebrae: Pre-caudal	Vertebrae: Caudal	Vertebrae: Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins: right	Rays in ventral fins: left	No. of winter-rings in scales approxim.
1	29.0	♂♀	25	32	57	15	14	3 + 15	9	9	5 r
2	30.5	♂♀	24	32	56	13	15	3 + 15	9	9	5 r
3	29.5	♂♀	24	33	57	15	16	3 + 15	9	9	5 r
4	29.8	♂♀	24	33	57	13	17	3 + 14	9	9	5 r
5	29.8	♂♀	25	32	57	13	15	3 + 16	9	9	5 r
6	29.6	♂♀	24	33	57	14	15	3 + 14	9	9	4 r
7	29.5	♂♀	24	34	58	15	16	3 + 15	9	9	6 r
8	27.8	♂♀	24	32	56	13	15	3 + 15	9	9	5 r
9	30.4	♂♀	23	32	55	14	16	3 + 16	9	9	6 r
10	29.5	♂♀	24	33	57	14	16	3 + 15	9	9	5 r
11	28.0	♂♀	24	32	56	14	15	3 + 16	9	9	5 r
12	30.3	♂♀	23	34	57	13	16	3 + 15	9	9	ca. 5 r
13	29.2	♂♀	24	33	57	15	15	3 + 15	9	9	8 r
14	29.5	♂♀	26	32	58	14	16	4 + 15	9	9	6 r
15	29.5	♂♀	25	32	57	14	14	3 + 15	9	9	5 r
16	29.0	♂♀	24	32	56	14	15	3 + 15	9	9	5 r
17	29.7	♂♀	24	33	57	13	15	3 + 15	9	9	5 r
18	28.2	♂♀	24	33	57	14	15	3 + 14	9	9	5 r
19	30.2	♂♀	25	32	57	14	16	3 + 16	9	9	5 r
20	29.0	♂♀	24	34	58	14	15	3 + 16	9	9	5 r
21	29.4	♂♀	26	31	57	14	15	3 + 14	9	9	5 r
22	29.7	♂♀	26	31	57	14	16	3 + 14	9	9	5 r
23	28.5	♂♀	25	33	58	14	16	3 + 14	9	9	5 r
24	29.5	♂♀	24	33	57	13	15	3 + 15	9	9	5 r
25	29.0	♂♀	24	33	57	13	16	4 + 15	9	9	5 r
26	30.0	♂♀	24	33	57	14	15	4 + 14	9	9	5 r
27	28.7	♂♀	22	33	55	14	15	3 + 14	9	9	5 r
28	28.8	♂♀	25	32	57	14	15	3 + 15	9	9	5 r
29	30.0	♂♀	25	32	57	14	14	3 + 15	9	9	5 r
30	30.3	♂♀	25	33	58	14	15	3 + 15	9	9	5 r
31	28.5	♂♀	23	34	57	13	15	4 + 14	9	9	ca. 5 r
32	30.8	♂♀	25	31	56	14	15	3 + 15	9	9	5 r
33	29.0	♂♀	23	33	56	13	15	3 + 16	9	9	6 r
34	29.5	♂♀	23	34	57	14	15	3 + 14	9	9	6 r
35	30.6	♂♀	24	33	57	12	14	3 + 16	9	9	5 r
36	30.2	♂♀	24	33	57	15	15	4 + 15	9	9	5 r
37	29.5	♂♀	24	33	57	13	15	4 + 16	9	9	5 r
38	29.5	♂♀	26	31	57	14	15	3 + 14	9	9	5 r
39	30.4	♂♀	24	33	57	14	15	4 + 15	9	9	6 r
40	25.5	♂♀	26	31	57	14	16	3 + 16	9	9	4 r
41	33.0	♂♀	25	31	56	14	16	3 + 15	9	9	8 r
42	26.4	♂♀	23	34	57	14	15	4 + 14	9	9	ca. 6 r
43	29.2	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
44	29.6	♂♀	23	33	56	14	16	3 + 15	9	9	5 r
45	29.3	♂♀	24	33	57	13	16	3 + 16	9	9	4 r
46	25.6	♂♀	25	32	57	14	16	3 + 15	9	9	5 r
47	27.7	♂♀	23	35	58	14	15	3 + 14	9	9	5 r
48	25.3	♂♀	23	34	57	13	15	3 + 15	9	9	5 r
49	29.8	♂♀	24	32	56	13	15	3 + 15	9	9	5 r
50	29.0	♂♀	25	32	57	16	14	4 + 14	9	9	ca. 6 r
51	28.5	♂♀	24	33	57	14	16	3 + 15	9	9	5 r
52	30.2	♂♀	24	34	58	13	15	4 + 15	9	9	6 r
53	29.8	♂♀	26	31	57	14	16	3 + 16	9	9	5 r
54	29.4	♂♀	25	32	57	13	15	3 + 15	9	9	5 r
55	28.7	♂♀	25	32	57	14	?	3 + 15	9	9	5 r
56	30.0	♂♀	24	34	58	13	15	3 + 14	9	9	5 r
57	29.5	♂♀	23	33	56	13	15	3 + 15	9	9	5 r
58	30.0	♂♀	26	31	57	13	15	3 + 16	9	9	7 r
59	28.5	♂♀	25	32	57	15	16	4 + 15	9	9	5 r
60	30.5	♂♀	25	32	57	13	15	3 + 16	9	9	5 r
61	29.0	♂♀	25	33	58	13	15	4 + 14	9	9	8 r
62	30.8	♂♀	25	33	58	14	14	3 + 16	9	9	5 r
63	28.6	♂♀	25	33	58	14	14	3 + 16	9	9	5 r
64	30.2	♂♀	26	32	58	13	16	3 + 16	9	9	5 r
65	29.3	♂♀	25	32	57	13	16	3 + 15	9	9	5 r
66	29.5	♂♀	23	34	57	15	16	3 + 14	9	9	5 r
67	29.3	♂♀	25	32	57	13	15	3 + 16	9	9	5 r
68	30.0	♂♀	25	32	57	14	15	3 + 15	9	9	5 r
69	30.8	♂♀	26	32	58	13	15	3 + 14	9	9	ca. 3 r
70	29.5	♂♀	25	33	58	13	14	3 + 15	9	9	5 r
71	29.7	♂♀	23	34	57	13	16	3 + 15	9	9	5 r
72	30.5	♂♀	24	33	57	13	15	3 + 16	9	9	5 r
73	30.1	♂♀	25	32	57	13	15	4 + 15	9	9	5 r
74	30.0	♂♀	24	34	58	13	15	3 + 15	9	10	5 r
75	30.5	♂♀	25	32	57	13	15	3 + 14	9	9	5 r
76	28.5	♂♀	24	33	57	15	16	4 + 15	9	10	5 r
77	29.2	♂♀	25	32	57	15	15	3 + 15	9	9	5 r
78	29.8	♂♀	25	32	57	14	16	3 + 15	9	9	5 r
79	30.2	♂♀	25	32	57	14	16	3 + 15	9	9	6 r
80	30.8	♂♀	25	32	57	14	15	4 + 15	9	9	5 r
81	27.0	♂♀	24	32	56	13	15	4 + 15	9	9	5 r
82	28.5	♂♀	24	33	57	13	16	3 + 15	9	9	5 r
83	28.5	♂♀	27	30	57	15	14	4 + 13	9	9	5 r
84	29.4	♂♀	24	33	57	14	16	3 + 15	9	9	5 r
85	31.4	♂♀	26	32	58	15	14	4 + 14	9	9	6 r
86	27.8	♂♀	24	32	56	15	16	3 + 14	9	9	5 r
87	33.8	♂♀	25	33	58	14	15	3 + 15	9	9	7 r
88	29.2	♂♀	24	33	57	13	15	3 + 15	9	9	ca. 7 r
89	29.7	♂♀	25	32	57	13	14	3 + 15	9	9	?
90	29.7	♂♀	25	31	56	14	16	3 + 15	9	9	5 r
91	30.6	♂♀	25	32	57	14	16	3 + 15	9	9	6 r
92	29.5	♂♀	25	34	59	14	15	4 + 15	8	9	6 r
93	30.3	♂♀	25	32	57	13	15	3 + 16	9	9	5 r
94	29.3	♂♀	24	33	57	14	15	3 + 17	9	9	5 r
95	29.6	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
96	29.2	♂♀	24	33	57	14	14	3 + 15	8	9	6 r
97	27.5	♂♀	26	31	57	13	15	3 + 15	9	9	4 r
98	28.5	♂♀	25	32	57	13	16	3 + 16	9	9	6 r
99	29.8	♂♀	25	32	57	14	14	4 + 15	9	9	5 r
100	29.5	♂♀	25	32	57	14	15	3 + 14	9	9	6 r
101	32.5	♂♀	26	31	57	14	16	3 + 15	9	10	ca. 6 r
102	29.7	♂♀	24	33	57	14	15	3 + 16	9	9	5 r
103	29.5	♂♀	24	34	58	13	16	3 + 15	9	9	5 r
104	28.5	♂♀	26	30	56	14	16	3 + 16	10	10	5 r
105	29.5	♂♀	25	33	58	14	16	3 + 16	9	9	5 r
106	28.8	♂♀	24	32	56	13	15	3 + 16	10	9	5 r
107	30.0	♂♀	26	32	58	15	17	3 + 16	9	9	6 r
108	29.0	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
109	31.3	♂♀	24	33	57	12	15	4 + 15	9	9	5 r
110	28.5	♂♀	25	32	57	14	15	3 + 15	9	9	5 r
111	30.0	♂♀	25	32	57	14	15	3 + 15	9	8	6 r
112	30.2	♂♀	24	33	57	12	16	3 + 16	9	9	5 r
113	28.5	♂♀	26	31	57	14	15	3 + 15	9	9	5 r
114	31.0	♂♀	24	33	57	14	15	4 + 15	9	9	6 r
115	29.7	♂♀	24	33	57	14	15	4 + 14	9	9	4 r
116	32.5	♂♀	25	32	57	13	16	3 + 15	10	10	ca. 8 r
117	31.0	♂♀	25	33	58	14	15	4 + 15	9	9	5 r
118	29.7	♂♀	24	33	57	14	16	3 + 15	9	8	5 r
119	30.2	♂♀	25	33	58	13	15	3 + 16	9	9	6 r
120	30.5	♂♀	24	33	57	14	16	3 + 15	9	9	5 r
121	30.5	♂♀	25	33	58	15	16	3 + 16	9	9	6 r
122	30.5	♂♀	24	33	57	14	16	3 + 15	9	9	5 r
123	30.5	♂♀	25	32	57	14	15	3 + 16	9	9	5 r
124	26.2	♂♀	24	34	58	14	16	3 + 15	9	9	3 r
125	30.0	♂♀	24	33	57	14	15	3 + 14	9	9	5 r
126	25.5	♂♀	24	33	57	13	16	3 + 16	9	9	4 r
127	30.0	♂♀	26	30	56	14	15	3 + 15	9	9	6 r
128	29.0	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
129	31.0	♂♀	25	32	57	13	16	3 + 15	9	9	5 r
130	30.0	♂♀	24	33	57	15	16	3 + 15	9	9	5 r
131	30.8	♂♀	25	32	57	15	16	3 + 17	9	9	6 r
132	29.0	♂♀	24	32	56	14	15	3 + 15	9	9	5 r
133	29.8	♂♀	23	34	57	14	15	3 + 15	9	9	6 r
134	29.5	♂♀	24	33	57	15	15	3 + 15	9	9	6 r
135	30.2	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
136	29.0	♂♀	25	32	57	14	15	3 + 14	9	9	6 r
137	30.8	♂♀	25	32	57	14	15	3 + 15	9	9	6 r
138	30.3	♂♀	24	33	57	14	14	3 + 14	9	9	ca. 4 r
139	29.6	♂♀	24	32	56	13	16	3 + 14	9	8	5 r
140	29.7	♂♀	25	33	58	14	15	3 + 16	9	9	5 r
141	27.5	♂♀	25	32	57	15	16	3 + 15	9	9	4 r
142	29.2	♂♀	24	33	57	14	15	3 + 14	9	9	6 r
143	31.0	♂♀	25	33	58	13	16	3 + 15	9	9	5 r
144	29.9	♂♀	24	33	57	13	15	3 + 16	9	9	5 r
145	30.0	♂♀	24	33	57	14	15	3 + 15	9	9	5 r
146	30.5	♂♀	24	33	57	15	15	3 + 14	9	9	5 r

No.	Length cm	Sex	Vertebrae Pre-caudal	Vertebrae Caudal	Vertebrae Total	Keeled scales K_2	Branched rays in dorsal fin	Rays in anal fin	Rays in ventral fins right	Rays in ventral fins left	No. of winter-rings in scales approxim.
147	28.7	♂	26	32	58	14	14	3 + 16	9	9	5 r
148	30.5	♂	23	34	57	15	14	3 + 15	9	9	5 r
149	29.0	♂	27	32	59	15	15	3 + 15	9	9	5 r
150	29.3	♂	24	32	56	14	16	4 + 13	8	8	4
151	30.3	♀	23	33	56	12	14	3 + 14	9	9	5 r
152	29.5	♂	23	34	57	14	14	3 + 16	9	9	5 r
153	29.8	♂	25	32	57	15	16	3 + 15	9	9	4 r
154	26.2	♂	26	31	57	13	14	3 + 15	9	9	5 r
155	28.7	♂	24	33	57	14	14	3 + 14	9	9	5 r
156	29.3	♀	24	33	57	15	15	4 + 13	9	9	4 r
157	29.2	♂	24	35	59	14	15	4 + 14	9	9	4
158	26.0	♂	24	33	57	13	15	3 + 15	9	9	5 r
159	29.5	♂	24	32	56	14	15	4 + 14	9	9	5 r
160	30.4	♂	25	32	57	14	16	3 + 16	9	9	5 r
161	29.4	♂	25	32	57	14	16	3 + 14	9	9	5 r
162	30.0	♂	24	32	56	14	15	3 + 14	9	9	5 r
163	29.0	♂	24	34	58	15	16	3 + 16	9	9	5 r
164	28.7	♂	24	33	57	14	15	3 + 15	9	9	4 r
165	29.3	♀	25	33	58	14	15	3 + 14	9	9	5
166	29.2	♀	24	33	57	14	17	3 + 16	9	9	5 r
167	28.6	♀	25	33	58	14	15	4 + 14	9	9	ca. 6 r
168	29.3	♀	23	33	56	13	15	3 + 16	9	9	ca. 5 r
169	30.5	♂	24	32	56	14	14	3 + 15	9	9	5 r
170	30.7	♀	23	34	57	15	15	3 + 13	9	9	ca. 7 r
171	29.2	♂	26	32	58	14	15	3 + 15	9	9	5 r
172	29.8	♂	25	32	57	13	16	3 + 15	9	9	6 r
173	30.2	♂	24	33	57	14	15	3 + 15	9	9	5 r
174	29.7	♀	24	33	57	14	14	4 + 14	9	9	6 r
175	27.6	♀	26	30	56	13	16	3 + 16	9	9	5 r
176	28.7	♂	25	32	57	14	15	3 + 15	9	9	5 r
177	29.3	♀	24	34	58	14	15	3 + 16	9	9	5 r
178	30.2	♀	24	33	57	13	15	4 + 16	9	9	5 r
179	28.4	♂	24	33	57	14	15	3 + 14	9	9	5 r
180	30.3	♂	25	32	57	13	15	3 + 16	10	9	5 r
181	28.5	♂	23	34	57	13	15	3 + 16	9	9	7 r
182	29.5	♀	26	31	57	13	15	4 + 16	9	9	5 r
183	27.7	♀	24	33	57	14	14	3 + 15	9	9	5 r
184	30.4	♂	24	33	57	14	15	4 + 15	9	9	5 r
185	28.5	♀	26	31	57	14	14	3 + 14	9	9	5 r
186	29.2	♂	24	34	58	15	16	3 + 15	9	9	5 r
187	28.8	♀	26	30	56	13	16	3 + 16	9	9	5 r
188	29.3	♂	24	34	58	13	16	3 + 14	9	8	5 r
189	29.8	♀	24	34	58	14	16	3 + 15	9	9	6 r
190	30.8	♂	24	33	57	14	16	3 + 15	9	9	5 r
191	29.8	♂	24	34	58	14	15	3 + 16	9	9	5 r
192	29.7	♀	23	34	57	13	15	3 + 15	9	9	5 r
193	29.7	♀	23	34	57	14	15	3 + 15	9	9	ca. 4 r
194	30.0	♀	25	32	57	15	15	3 + 15	9	9	5 r
195	30.0	♂	26	31	57	14	15	3 + 15	9	9	6 r
196	29.0	♂	25	32	57	14	15	3 + 16	9	9	5 r
197	30.2	♂	24	32	56	15	15	3 + 15	9	9	5 r
198	29.2	♀	25	32	57	13	15	4 + 15	9	9	5 r
199	30.0	♂	26	31	57	13	16	3 + 15	9	9	6 r
200	30.7	♂	26	32	58	15	16	4 + 16	9	9	6 r
201	29.2	♀	26	31	57	14	16	3 + 15	9	9	5 r
202	28.6	♀	25	32	57	14	15	3 + 16	9	9	5 r
203	29.4	♂	24	33	57	14	15	3 + 14	9	9	5 r
204	28.0	♂	24	33	57	13	16	3 + 15	10	10	5 r
205	28.0	♀	25	32	57	14	15	3 + 15	9	9	5 r
206	29.3	♀	26	31	57	13	16	3 + 15	9	9	5 r
207	29.3	♀	25	31	56	14	16	3 + 15	9	9	5 r
208	28.0	♀	24	33	57	14	15	3 + 16	9	9	5 r
209	30.0	♀	25	32	57	12	15	3 + 16	9	9	6 r
210	29.3	♂	24	33	57	13	15	4 + 15	9	9	5 r
211	30.1	♂	25	33	58	14	14	3 + 14	9	9	6 r
212	30.7	♂	25	32	57	14	15	3 + 14	9	9	7 r
213	31.0	♂	24	33	57	14	15	3 + 15	9	9	5 r
214	30.1	♀	23	34	57	13	15	3 + 14	9	9	5 r
215	28.5	♀	25	32	57	14	16	3 + 14	9	9	5 r
216	29.3	♀	24	33	57	13	16	3 + 16	9	9	5 r
217	31.0	♂	24	33	57	14	16	3 + 16	9	9	5 r
218	30.3	♂	24	33	57	14	15	3 + 15	9	9	5 r
219	30.2	♀	25	31	56	14	16	3 + 16	9	9	5 r
220	28.7	♂	24	33	57	13	15	3 + 16	9	9	5 r
221	30.2	♀	25	32	57	14	14	3 + 15	9	9	5 r
222	29.3	♀	23	33	56	13	16	3 + 16	9	9	5 r
223	29.6	♂	23	34	57	14	14	3 + 15	9	9	5 r
224	29.0	♂	25	33	58	13	15	3 + 15	9	9	5 r
225	30.0	♂	25	33	58	15	15	3 + 15	9	9	5 r
226	29.5	♀	25	33	58	14	16	3 + 16	9	9	5 r
227	26.7	♂	25	32	57	14	15	3 + 15	9	9	5 r
228	28.7	♀	24	33	57	14	16	3 + 15	9	9	5 r
229	29.2	♀	24	32	56	14	15	3 + 14	9	9	5 r
230	29.2	♂	24	33	57	14	16	3 + 17	9	9	5 r
231	31.2	♀	23	34	57	13	16	3 + 15	9	9	5 r
232	30.1	♂	23	34	57	12	14	3 + 14	8	8	5 r
233	30.5	♀	24	33	57	14	15	4 + 14	9	9	5 r
234	29.2	♂	25	32	57	14	16	4 + 14	9	9	5 r
235	29.0	♂	25	32	57	14	15	3 + 15	9	9	5 r
236	29.2	♂	24	33	57	14	15	3 + 15	9	9	6 r
237	29.6	♀	23	34	57	15	16	3 + 16	9	9	5 r
238	31.7	♂	23	34	57	14	14	4 + 14	9	9	ca. 5 r
239	29.5	♂	24	35	59	14	15	3 + 15	9	9	5 r
240	31.0	♂	27	30	57	14	14	3 + 16	9	9	ca. 6 r
241	32.5	♂	24	33	57	14	15	3 + 14	9	9	5 r
242	30.2	♂	24	34	58	14	15	4 + 14	9	9	5 r
243	29.8	♀	24	34	58	14	15	3 + 15	9	9	5 r
244	28.8	♀	24	33	57	13	16	3 + 14	9	8	5 r
245	29.6	♀	25	32	57	14	16	4 + 15	9	9	5 r
246	31.2	♀	23	33	56	13	16	3 + 16	9	9	6 r
247	30.5	♂	24	32	56	13	15	3 + 16	9	9	5 r
248	30.2	♂	24	34	58	14	15	3 + 16	9	9	6 r
249	33.6	♂	24	34	58	14	15	3 + 15	9	9	8 r
250	29.0	♂	24	34	58	14	16	3 + 15	9	9	5 r
251	29.8	♂	24	32	56	13	16	3 + 14	10	10	7 r
252	25.3	♂	24	33	57	15	?	3 + 15	9	9	4 r
253	29.2	♂	24	34	58	14	16	4 + 16	9	9	5 r
254	29.8	♂	24	34	58	14	15	3 + 15	9	9	5 r
255	29.2	♂	23	34	57	13	14	3 + 15	9	9	5 r
256	28.7	♂	26	31	57	13	15	3 + 15	9	9	5 r
257	29.2	♂	23	34	57	14	15	3 + 15	8	8	5 r
258	29.8	♂	23	35	58	15	16	3 + 15	9	9	5 r
259	29.5	♀	28	29	57	15	15	3 + 15	9	9	5 r
260	30.0	♂	25	32	57	14	15	3 + 14	9	9	5 r
261	29.9	♀	24	33	57	14	15	4 + 13	9	9	5 r
262	30.2	♂	25	33	58	13	15	4 + 16	9	9	7 r
263	28.7	♀	23	34	57	14	15	3 + 15	9	9	5 r
264	29.0	♂	24	33	57	13	15	3 + 15	9	9	5 r
265	29.5	♀	25	32	57	14	15	3 + 15	9	8	5 r
266	29.2	♂	25	33	58	14	16	3 + 14	9	9	5 r
267	30.2	♂	24	32	56	14	15	3 + 15	9	9	5 r
268	28.0	♂	26	32	58	14	15	3 + 14	9	9	4 r
269	28.5	♂	24	33	57	14	15	3 + 16	9	9	5 r
270	29.7	♀	23	33	56	14	15	3 + 15	9	9	7 r
271	28.5	♀	24	33	57	14	15	3 + 14	9	9	5 r
272	28.3	♂	25	32	57	13	14	3 + 14	9	9	ca. 6 r
273	30.0	♂	24	34	58	15	16	3 + 15	9	9	5 r
274	30.5	♂	25	32	57	13	16	3 + 15	9	9	5 r
275	27.2	♂	24	33	57	14	15	3 + 14	9	9	5 r
276	31.3	♀	25	32	57	13	14	3 + 14	9	9	5 r
277	29.5	♂	25	32	57	13	16	3 + 16	9	9	5 r
278	30.0	♂	25	32	57	14	15	3 + 15	9	9	5 r
279	28.7	♂	24	34	58	15	16	3 + 15	9	9	5 r
280	29.7	♀	26	32	58	13	15	3 + 16	9	9	5 r
281	29.5	♀	24	32	56	13	15	4 + 15	9	9	5 r
282	29.9	♂	25	32	57	15	16	3 + 15	9	9	5 r
283	29.4	♀	24	33	57	13	15	3 + 14	9	9	4 r
284	30.7	♂	25	32	57	13	14	4 + 16	9	9	5 r
285	29.4	♂	23	33	56	13	15	3 + 15	9	9	5 r
286	28.5	♀	24	33	57	14	14	3 + 16	9	9	5 r
287	29.5	♂	23	34	57	13	16	3 + 16	9	9	5 r
288	30.4	♂	24	33	57	14	16	3 + 15	9	9	6 r
289	28.7	♀	25	32	57	14	16	3 + 14	9	9	5 r
290	30.2	♂	23	34	57	14	16	3 + 15	9	9	5 r
291	29.2	♀	24	32	56	14	15	3 + 14	9	9	5 r
292	28.9	♂	25	32	57	13	15	4 + 16	9	abn.	5 r
293	29.0	♀	23	34	57	15	15	4 + 14	9	9	7 r
294	30.3	♂	24	34	58	15	16	3 + 15	9	9	5 r
295	28.8	♂	26	31	57	14	15	4 + 14	9	9	5 r
296	29.5	♂	24	32	56	14	15	3 + 15	9	9	5 r
297	30.2	♂	25	32	57	14	15	3 + 15	9	9	6 r
298	28.8	♂	23	34	57	14	15	3 + 15	9	9	5 r
299	30.1	♂	24	34	58	14	15	3 + 15	9	9	5 r
300	29.0	♂	25	32	57	14	15	3 + 14	9	9	5 r

Age and Lengths of mature Spring Spawners from Cape Wrath and North of Flugga (p. 111—114).

Cape Wrath March 5. 1923.

Length cm.....		26	27	28	29	30	31	32	33	Total No. of specimens	Average length cm	+ 0.5
Year class	No. of winter rings											
1919	4	1	..	4	..	..	..	..	..	5	27.60	28.10
1918	5	..	3	29	83	65	7	..	..	187	29.24	29.74
1917	6	1	1	2	15	12	1	2	..	34	29.32	29.82
1916	7	..	1	3	1	7	1	2	1	16	29.88	30.38
1915	8	..	..	..	..	..	1	2	1	4	32.0	32.5
1914	9	..	..	..	..	..	1	..	..	1	31.0	31.5
..	ca. 5	..	1	2	2	4	..	..	..	9	29.0	29.5
..	ca. 6	..	..	..	1	..	3	..	..	4	30.5	31.0
..	ca. 7	..	..	..	..	2	..	..	1	3	31.0	31.5
..	ca. 8	..	..	1	..	1	..	1	..	3	30.0	30.5
..	?	..	..	1	1	1	..	1	..	4	29.75	30.25
	Total....	2	6	42	103	92	14	8	3	270	..	..

North of Flugga. March 21. 1923.

Length cm.....		25	26	27	28	29	30	31	32	33	Total No. of specimens	Average length cm	+ 0.5
Year class	No. of winter rings												
1920	3	..	1	..	..	..	..	..	..	..	1	26.0	26.5
1919	4	3	..	2	2	8	..	..	..	..	15	27.80	28.30
1918	5	2	3	7	40	97	58	8	1	..	216	29,03	29,53
1917	6	..	..	..	1	15	20	3	..	..	39	29.64	30.14
1916	7	..	..	..	1	3	3	..	..	1	8	29.75	30.25
1915	8	..	..	..	..	2	..	..	..	2	4	31.00	31.5
..	ca. 3	..	..	..	..	..	1	..	..	..	1	30.0	30.5
..	ca. 4	..	..	..	..	1	1	..	..	..	2	29.5	30.0
..	ca. 5	..	..	..	1	1	1	1	..	..	4	29.5	30.0
..	ca. 6	..	1	..	2	1	..	1	1	..	6	29.0	29.5
..	ca. 7	..	..	..	..	1	1	..	..	..	2	29.5	30.0
..	ca. 8	..	..	..	..	..	..	..	1	..	1	32.0	32.5
..	?	..	..	..	..	1	..	..	..	..	1	29.0	29.5
	Total....	5	5	9	47	130	85	13	3	3	300	..	..

List of Tables of Analyses of Herrings caught in the North Sea and the Skagerak.

List of Literature.

Andersson, K. A.: Undersökningar rörande det Bohuslänske sillfisket. — Svensk Fiskeri-Tidskrift. 1916.

Bjerkan, Paul: Age, Maturity and Quality of North Sea Herrings during the years 1910—1913. — Report on Norwegian Fishery and Marine Investigations Vol. III. No. 1. Bergen 1917.

Boeck, Axel: Beretning om Sildefisket ved den norske og den bohuslenske Kyst. — Tidsskrift for Fiskeri. 5te Aarg. 1870.

— Det bohuslenske Sildefiskeries Historie. — Nordisk Tidsskrift for Fiskeri. 1. Aarg. 1874.

Boecke, J.: Eier und Jugendformen von Fischen der suedlichen Nordsee. — Verh. uit het Rijksinstituut voor het Onderzoek der Zee. Eerste Deel IV. 1906.

Borley, J. O. and Russell, E. S.: Report on Herring Trawling. — Fishery Investigations. Ser. II. — Sea Fisheries. Vol. IV. No. 4. London 1922.

Bowman, Alexander: Spawny Haddocks. The Occurrence of "Spawny" Haddock and the Locus and Extent of the Spawning Grounds. — Fisheries, Scotland, Sci. Invest. 1922. IV. April 1923.

Broch, Hj.: Norwegische Heringsuntersuchungen während der Jahre 1904—1906. — Bergens Museums Aarbog 1908. No. 1.

— Förteckning öfver Göteborgs Museums sillsamlingar etc. — Svenska Hydrografisk-Biologiska Kommissionens Skrifter III. 1908.

Brown, C. H.: Report on the Deep Currents of the North Sea as ascertained by Experiments with Drift Bottles. — North Sea Fisheries Invest. Committee. Fourth Report (Northern Area). Hydrography. London 1909.

Böhnecke, G.: (v. Schumacher).

Canu, Eugène: (v. Sauvage et Canu).

Cligny, M.: Contribution à l'étude biologique du hareng. — Annales de la Station de Boulogne-sur-Mer. Vol. I. 1905.

Cowan, Dorothy: (v. Storrow & Cowan).

Dahl, Knut: The scales of the Herring as a means of determining Age, Growth and Migration. — Report on Norwegian Fishery and Marine Investigations Vol. II. 1909. No. 6.

Danois Le, Ed. et Henri Heldt: Les Harengs des Smalls et les Conditions hydrologiques de leurs migrations. — Notes et Mémoires Nr. 36. Office Sci. et Tech. d. Pêches Maritimes. Paris. Janvier 1924.

Delsman, H. C.: Über das Wachstum von Nordseehering und Zuiderseehering etc. — Rapporten en Verhandelingen uitg. door het Rijksinstitut voor Visscherijonderzoek Deel I. Afh. 2. 1914.

Duge: Heringseier im Magen der Schellfische. — Mitteilungen d. deutschen Seefischerei-Vereins, 1903 p. 460.

Duncker, Georg: Über einige Lokalformen von Pleuronectes platessa L. — Mitteilungen aus dem Naturhistorischen Museum. XXX. Hamburg 1913.

Ehrenbaum E.: Eier und Larven von Fischen der deutschen Bucht III. — Wissensch. Meeresuntersuchungen N F. VI. Bd. Abt. Helgoland 1904.

— Ueber den Elbhering. — Der Fischerbote. März 1911.

— Entwicklung und jetziger Stand des deutschen Trawlherings-Fanges. — Der Fisherbote. Septbr. 1923.

Ehrenbaum, E. und Peters, N.: Ueber den Trawlhering. — Der Fischerbote 1922 Nr. 11.

Ekman, G., Otto Pettersson, F. Trybom: Resultaten af den internationella hafsforskningens arbete under åren 1902—1906. — Stockholm 1907.

Ewart, J. Cossar: Natural History of the Herring. — Report II Fishery Bd. Scotl. for 1883. Edinburgh 1884.

Fulton, T. Wemyss: The Chief Fishing Grounds on the East Coast of Scotland. — Report IX. Fishery Board for Scotland. Edinburgh 1891.

— The Currents of the North Sea and their Relation to Fisheries, ibd. Report XV, Edinburgh 1897.

Gehrke, J.: Über die Sauerstoff-Verhältnisse der Nordsee. — Ann. d. Hydr. 1916.

Heincke, Fr.: Die Varietäten des Herings. — Jahresb. d. Komm. z. wiss. Unters. d. deutschen Meere in Kiel, Jahrg. IV—VI, 1874—76. 1876.

— Die Varietäten des Herings II Teil. — IV. Jahresb. der Komm. z. wiss. Unters. d. deutschen Meere in Kiel, Jahrg. VII—XI, 1877—81. 1882.

— Naturgeschichte des Herings I. — Die Lokalformen und die Wanderungen des Herings in den europäischen Meeren. — Abhandlungen d. deutschen Seefischerei-Vereins. Bd. II. Berlin 1898.

Heldt, Henri: (v. Ed. Le Danois).

Hjort, Johan: Norsk Havfiske. Norges Fiskerier, I. — Bergen 1905.

— Report on Herring Investigations until January 1910. — Publications de Circonstance No. 53. 1910.

JACOBSEN, J. P.: Mittelwerte von Temperatur und Salzgehalt . . . . in dänischen Gewässern. — Medd. Komm. f. Havunders., Serie Hydrografi. Bd. 1 No. 10. 1908.

JEE, EDWIN C.: Lightship Observations. Board of Agricult. and Fisheries. — Fishery Investigations. Series III, Vol. II. London. 1919.

— The English Channel. — Board of Agriculture and Fisheries. Fishery Investigations, Series III, Vol. I. London. 1919—1921.

JENKINS: The Difference between Spring and Autumn Herring. — Report for 1902 Lanc. Sea Fish. Lab. Liverpool 1903 (cited after Williamson, 1914).

JESPERSEN, P.: On the occurrence of the postlarval stages of the Herring and the "Lodde" (*Clupea harengus* L., and *Mallotus villosus* O. F. M.) at Iceland and the Faroes. — Medd. Kommissionen f. Havundersøgelser, Ser. Fiskeri. Bd. VI. No. 1. 1920.

JOHANSEN, A. C.: Bericht über die dänischen Untersuchungen über den Schollenbestand etc. — Medd. Komm. f. Havundersøgelser. Ser. Fiskeri. Bd. III. Nr. 8. 1910.

— Om Sildens Vandringer. — Dansk Fiskeritidende No. 7. 1915.

— Om Sildebestanden og Snurpenotfiskeriet i Farvandene omkring Danmark. — Dansk Fiskeritidende No. 9. 1916.

— On the Large Spring-Spawning Sea Herring (*Clupea harengus* L.) in the North-West European Waters. — Medd. Kommissionen f. Havundersøgelser. Ser. Fiskeri. Bd. V. No. 8. 1919.

— On the Summer-Spawning Herring (*Clupea harengus* L.) of Iceland. — ibd. Bd. VI. No. 3. 1921. (a).

— The Atlanto-Scandian Spring Herring spawning at the Faroes. — ibd. Bd. VI. No. 4. 1921. (b).

— Ueber die Winterheringe des Kattegats. — Festschrift für Friedrich Heincke. Nr. 12. 1923. Wiss. Meeresunters. N. F. XV. Bd. Abt. Helgoland.

KEILHACH, LUDWIG: Rassen-Untersuchungen an Nordsee-Schollen. — Wiss. Meeresunters. deutschen Meere. N. F. X. Bd. Abt. Helgoland. Oldenburg in Gr. 1913.

KNUDSEN, MARTIN: Résumé de l'hydrographie des mers explorées par le conseil. — Conseil Permanent Internat. Bulletin des Resultats etc. Année 1906—1907. Partie supplémentaire. København 1909.

KYLE, H. M.: Contributions towards the Natural History of the Plaice. — 18. Report. Fishery Board for Scotland. — Glasgow 1900.

— Monthly Data and Charts over the Herring Fishery in 1903. — Bulletin Statistique. Vol. I. 1906.

LEA, E.: On the Methods used in the Herring Investigations. — (See Hjort's Report in Publications de Circonstance No. 53 1910).

— Report on "Age and Growth of the Herring in Canadian Waters". — Canadian Fisheries' Expedition 1914—15. Ottawa 1918.

LJUNGMAN, A. V.: Om sillens och skarpsillens fortplantning och tillväxt. — Nordisk Tidsskrift for Fiskeri 5. Aarg. 1879 (a).

— Bidrag till lösningen af frågan om de stora sillfiskenas sekulära periodicitet. — ibd. 1879. (b).

— Om sillens och skarpsillens racer med serskild hänsyn till Sveriges vestkust. — Nordisk Tidsskr. f. Fiskeri 6. Aargang 1881 & 7. Aargang 1882.

MASTERMAN, A. T.: On the Rate of Growth of the Food Fishes. — Report XIV. Fishery Board for Scotland. Edinburgh 1896.

MATTHEWS, J. DUNCAN: Report as to Variety among the Herrings of the Scottish Coasts. — Part I & II. Reports Fishery Bd. Scotl. 4th and 5th for 1885 and 1886.

MEEK, ALEXANDER: Herring Races. A. Morphological Features. — Report Dove Marine Laboratory. 1914.

— Summary and General Report. — Report Dove Marine Laboratory. 1919.

MITCHELL, J. M.: The Herring. Its Natural History and National Importance. — Edinburgh 1864.

MOLANDER, ARVID, R.: Studies in the Growth of the Herring etc. — Svenska Hydrografisk-Biologiska Kommissionens Skrifter VI. 1918.

NILSSON, S.: Skandinavisk Fauna. — IV. Fiskarna. Lundae 1855.

ORTON, J. H.: An account of the Researches on Races of Herrings. — Journal Marine Biol. Association. Plymouth, N. S. Vol. XI. No. 1. 1916.

PAULSEN, OVE: Studies on the Biology of *Calanus finmarchicus* in the Waters round Iceland. — Medd. Komm. f. Havunders., Ser. Plankton Bd. I. No. 4. 1906.

PETERS, N.: (v. EHRENBAUM, E., und PETERS, N.).

PETERSEN, C. G. JOH.: De danske Farvandes Plankton i Aarene 1898—1901. I. — K. Danske Vid. Selsk. Skrifter. 6. R. nat. & mat. Afd. XII 3. København 1903.

PETTERSSON, OTTO, och GUSTAF EKMAN: Grunddragen af Skageraks och Kattegats hydrografi. — Kgl. Sv. Vet. Akad. Handlinger. Bd. 24. Stockholm 1891. (See also: G. Ekman, O. Pettersson, F. Trybom).

PETTERSSON, OTTO: Studien über die Bewegungen des Tiefenwassers und ihren Einfluss auf die Wanderung der Heringe. — Der Fischerbote 1911, No. 7, 8, u. 9.

— Kosmiska orsaker till rörelserna uti hafvets och atmosfärens mellanskikt. — Svenska Hydrografisk-Biologiska Kommissionens Skrifter, vol. VII. 1922.

REDEKE, H. C.: Bijdrage tot de Kennis van de Noordzee-Haringstammen. — Rapporten en Verhandelingen uitgegeven door het Rijksinstituut voor Visscherijonderzoek. Deel I. Afl. 4. 1918.

REDEKE, H. C. und P. J. VAN BREEMEN: Die Verbreitung der planktonischen Eier und Larven einiger Nutzfische in der suedlichen Nordsee. — Verhandelingen uit het Rijksinstituut voor het Onderzoek der Zee. Deel II. 1907—1908.

ROSÉN, N.: Det bohuslänske fiskets nuvarande laga. — Lysekil 1920.

RUSSELL, E. S.: Report on Market Measurements in relation to the English Haddock Fishery during the years 1909—1911. — Fishery Investigations. Series II. — Sea Fisheries. Vol. I. Part I. London 1914.

— (v. BORLEY, J. O. and RUSSELL, E. S.).

SAUVAGE et CANU: Le hareng des côtes de Normandie en 1891 et 1892. — Annales de la Station Aquicole de Boulogne-sur-Mer. Vol. 1. 1892.

SCHMIDT, JOHS.: Fiskeriundersøgelser ved Island og Færøerne i Sommeren 1903. — Skrifter, Komm. f. Havunders., No. 1. København 1904.
— First report on eel investigations. — Rapports et Procès-Verbaux Cons. perm. internat. Vol. XVIII. 1914.
— Second report on eel investigations. — ibd. Vol. XXIII. 1916.
— Racial Investigations I, *Zoarces viviparus* L., and local races of the same. — Comptes-rendus des travaux du Laboratoire de Carlsberg. 13 vol. 1917. (a).
— Racial Investigations II. Constancy Investigations continued. — ibd. vol. 14, No. 1. 1917. (b).
— Racial Investigations III. Experiments with *Lebistes reticulatus* (Peters) Regan. — ibd. vol. 14. No. 5. 1919.
— Racial Investigations V. Experimental investigations with *Zoarces viviparus* L. — ibd. Vol. 14. No. 9. 1920.
— Racial Investigations. VII. Annual Fluctuations of Racial Characters in *Zoarces viviparus* L. — ibd. vol. 14. No. 15. 1921.
SCHOTT, G.: Geographie des Atlantischen Oceans. — Hamburg 1912.
SCHUMACHER, A.: Die Oberflächenströmmungen in der Nordsee, nach G. Böhnecke. — Der Fischerbote. Heft 12. 1923.
SHERRIFF, CATHERINE: Herring Investigations. — Fisheries, Scotland, Sci. Invest. 1922 I (Sept. 1922).
SMITT, F. A.: Om sillracernes betydelse. — Bihang till K. Svenska Vet. Akad. Handlingar, Bd. 14. Afd. IV No. 12. Stockholm 1888.
STORROW, B. & DOROTHY COWAN: Herring Investigations I & II. — Dove Marine Laboratory. Report for the Year ending June 30th. 1920.
SÆMUNDSSON, BJARNI: Oversigt over Islands Fiske. — Skrifter. Komm. for Havunders. No. 5. København 1908.
THOMPSON, D'ARCY WENTWORTH: Report on the Salinity of the North Sea. — North Sea Fisheries Invest. Committee. Fourth Report (Northern Area). Hydrography. London 1909.
THOMPSON, D'ARCY W. & CATHERINE SHERRIFF: Herring Investigations. — Fisheries Scotland, Sci. Invest. 1922 I (Sept. 1922).
TRYBOM, FILIP: Iakttagelser vid sillfisket i Bohuslän vintrarne 1880—81 och 1881—82. — Nordisk Tidsskrift for Fiskeri. 7. Aarg. 1882.
— (v. G. EKMAN, O. PETTERSSON, F. TRYBOM).
TÖRLITZ, HEINRICH: Anatomische und entwicklungsgeschichtliche Beiträge zur Artfrage unseres Flussaales. — Zeitschrift für Fischerei, 21. Bd. Heft 1—2. Berlin 1922.
WILLIAMSON, H. CHARLES: A short Résumé of the researches into the European Races of Herrings. — Fisheries, Scotland Sci. Invest. 1914. I (April 1914).
WOOD, HENRY: Observations on the Scottish Summer Herring Fishing of 1922. — Fisheries, Scotland, Sci. Invest. 1923. No. II. June 1923.

LIST OF FIGURES

CONTENTS

550. 5/VII 24.

MEDDELELSER FRA KOMMISSIONEN FOR HAVUNDERSØGELSER

Serie: Fiskeri.

Bd. I, Nr. 1 C. G. Joh. Petersen: On the larval and post-larval stages of the Long Rough Dab and the Genus Pleuronectes. 2 Plates 1904. 13 p. Kr. 1.00.

» I, » 2 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. I. 12 Plates. 1905. 70 p. Kr. 5,25.

» I, » 3 Johs. Schmidt: On pelagic post-larval Halibut. (Hippoglossus vulgaris Flem. and H. hippoglossoïdes Walb.) 1 Plate. 1904. 13. p. Kr. 0.75.

» I, » 4 Johs. Schmidt: De atlantiske Torskearters (Gadus-Slægtens) pelagiske Yngel i de post-larvale Stadier. Med 3 Tavler og 16 Figurer. 1905. 74 S. Kr. 3.00.

» I, » 4 Johs. Schmidt: The pelagic post-larval stages of the Atlantic Species of Gadus. A Monograph with 3 Plates and 16 Figures in the Text. 1905. 77 p. Kr. 3.00.

» I, » 5 C. G. Joh. Petersen: Larval Eels (Leptocephalus brevirostris) of the Atlantic coasts of Europe. 1905. 5 p.

» I, » 6 A. C. Johansen: Remarks on the life history of the young post-larval Eel (Anguilla vulgaris Turt.) 1904. 9 p. Kr. 0.50.

» I, » 7 Adolf Sev. Jensen: On fish-otoliths in the bottom-deposits of the Sea. I. Otoliths of the Gadus-Species deposited in the Polar Deep. 4 Fig. 1905. 14 p. Kr. 0,50.

» I, » 8 Johs. Schmidt: On the larval and post-larval stages of the Torsk (Brosmius brosme [Ascan.]) 1 Plate. 1905. 12 p. Kr. 0.75.

» II, » 1 C. G. Joh. Petersen: On the larval and post-larval stages of some Pleuronectidæ (Pleuronectes, Zeugopterus.) 1 Pl. 1906. 10 p. Kr. 0.50.

» II, » 2 Johs. Schmidt: The pelagic post-larval stages of the Atlantic species of Gadus. A monograph. Part II. 1 Pl. 1906. 20 p. Kr. 1.00.

» II, » 3 Johs. Schmidt: On the pelagic post-larval stages of the Lings (Molva molva [Linné] and Molva byrkelange [Walbaum]). With 1 Pl. and 3 Figures. 1906. 16 p. Kr. 0.75.

» II, » 4 Johs. Schmidt: On the larval and post-larval development of the Argentines (Argentina silus [Ascan.] and Argentina sphyræna [Linné]) with some Notes on Mallotus villosus [O. F. Müller]. 2 Pl. 1906. 20 p. Kr. 1.50.

» II, » 5 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. II. The marking and transplantation experiments with Plaice in the years 1903—06. 9 Pl. and 10 Figures. 1907. 122 p. Kr. 5.25.

» II, » 6 Johs. Schmidt: Marking experiments on Plaice and Cod in Icelandic waters. 2 Charts. 23 p.

» II, » 7 Johs. Schmidt: On the post-larval development of the Hake (Merluccius vulgaris Flem.) 1 Pl. 4 Figures. 1907. 10 p. Kr. 1.75.

» II, » 8 Johs. Schmidt: On the post-larval development of some North Atlantic Gadoids (Raniceps raninus [Linné] and Molva elongata [Risso]). 1 Pl. and 1 Fig. 1907. 14 p. Kr. 0.75.

» II, » 9 Johs. Schmidt: On the post-larval stages of the John Dory (Zeus Faber L.) and some other Acanthopterygian Fishes. 1 Plate. 1908. 12 p. Kr. 0.75.

» III, » 1 C. G. Joh. Petersen: On the larval and post-larval stages of some Pleuronectidæ (Zeugopterus, Arnoglossus, Solea.). 2 Plates. 1909. 18 p. Kr. 1.25.

Bd. III, Nr. 2 J. P. Jacobsen and A. C. Johansen: Remarks on the changes in specific gravity of pelagic fish eggs and the transportation of same in Danish waters. 2 Figures. 1908. 24 p. Kr. 0.75.

» III, » 3 Johs. Schmidt: Remarks on the metamorphosis and distribution of the larvae of the Eel (Anguilla vulgaris Turt.). 1 Pl. and 1 Chart. 1909. 17 p. Kr. 1.00.

» III, » 4 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. III. On the variation in frequency of young Plaice in Danish waters in 1902—07. 12 Figures. 1908. 48 p. Kr. 1.50.

» III, » 5 A. C. Johansen: Do. do. do. IV. Is the Plaice indigenous to the true Baltic? 2 Fig. 1908 23 p. Kr. 0.75.

» III, » 6 Johs. Schmidt: On the occurrence of Leptocephali (Larval Muraenoids) in the Atlantic W. of Europe. 2 Pl. & 1 Chart. 1909. 19 p. Kr. 1.50.

» III, » 7 Johs. Schmidt: On the distribution of the fresh-water Eels (Anguilla) throughout the world. I. Atlantic Ocean and adjacent regions. A bio-geographical investigation. 1 Chart. 1909. 45 p. Kr. 1.75.

» III, » 8 A. C. Johansen: Bericht über die dänischen Untersuchungen über die Schollenfischerei und den Schollenbestand in der östlichen Nordsee, dem Skagerak und dem nördlichen Kattegat. Mit 10 Figuren im Text. 1910. 142 S. Kr. 4.50.

» IV, » 1 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. V. The supposed migrations of plaice from the Kattegat and Belt Sea to the true Baltic. 5 Figures. 1912. 34 p. Kr. 1.25.

» IV, » 2 Johs. Schmidt: On the identification of Muraenoid larvae in their early (»Preleptocephaline«) stages. 1 Plate 1913. 14. p Kr. 0.75.

» IV, » 3 A. Strubberg: The metamorphosis of elvers as influenced by outward conditions. Some experiments. 1913. 11 p. Kr. 0.50.

» IV, » 4 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. VI. On the immigration of plaice to the coastal grounds and fiords on the west coast of Jutland. 1913. 26 p. Kr. 1.00.

» IV, » 5 P. L. Kramp: Report on the fish eggs and larvæ collected by the Danish research steamer »Thor« in the Langelandsbelt in 1909. With 6 Figures in the text. 1913 39 p. Kr. 1.25.

» IV, » 6 Bjarni Sæmundsson: Continued marking experiments on plaice and cod in Icelandic waters. 7 Fig. 1913. 35 p. Kr. 1.25.

» IV, » 7 Johs. Schmidt: On the classification of the fresh-water Eels (Anguilla). 1915. 19 p. Kr. 0.75.

» IV, » 8 Ö. Winge: On the value of the rings in the scales of the Cod as a means of age determination. Illustrated by marking experiments. 1915. 21 p. Kr. 0.75.

» IV, » 9 A. C. Johansen: Contributions to the biology of the Plaice with special regard to the Danish Plaice-Fishery. VII. Marking experiments with Plaice in the North Sea off the west coast of Jutland during the years 1906—1912. With supplementary observations on the previous Danish experiments. 27 Fig. 1915. 60 p. Kr. 2.00.

» V, » 1 Johs. Schmidt: Marking experiments with Turtles in the Danish West Indies. With 5 Tables and 11 Fig. 1916. 26 p. Kr. 1.00

Bd. V, Nr. 2 A. C. Strubberg: Marking Experiments with cod at the Færoes. 24 Fig. 1916. 126 p. Kr. 4.00.

» V, » 3 A. C. Johansen: Marking Experiments with Sole (Solea vulgaris Quensel) and Turbot (Rhombus maximus L.) in the Kattegat and Baltic Waters: 4 Fig. 1916. 18 p. Kr. 0.50.

» V, » 4 Johs. Schmidt: On the early larval stages of the Fresh-Water Eels (Anguilla) and some other North Atlantic Murænoids. 4 Plates and 14 Fig. 1916. 20 p. Kr. 1.75.

» V, » 5 P. Jespersen: Contributions to the Life-History of the North Atlantic Halibut (Hippoglossus vulgaris Flem.) 1 Plate and 16 Fig. 1917. 32 p. Kr. 1.50.

» V, » 6 A. C. Strubberg: Marking Experiments with Plaice and Lemon Soles at the Færoes in 1910—12. 28 Fig. 1918. 64 p. Kr. 2.25.

» V, » 7 Johs. Schmidt: Stations in the Atlantic, etc. 1911—15. With two Charts and introductory remarks. 1919. 27 p. Kr. 1.50.

» V, » 8 A. C. Johansen: On the large spring-spawning Sea Herring (Clupea harengus L.) in the north-west European waters. 14 Fig. 1919. 56 p. Kr. 1.75.

» V, » 9 A. C. Johansen and Kirstine Smith: Investigations as to the effect of the restriction on fishing during the war on the plaice of the eastern North Sea. 10 Fig. 1919. 53 p. Kr. 1.75.

» VI, » 1 P. Jespersen: On the occurrence of the post-larval stages of the Herring and the »Lodde« (Clupea harengus L., and Mallotus villosus O. F. M.) at Iceland and the Færoes. 1920. 10 Fig. 24 p. Kr. 1.25.

» VI, » 2 Kirstine Smith: Danish Investigations of Plaice from the North Sea July 1919—July 1920. 1921. 2 Fig. 68 p. Kr. 4.75.

» VI, » 3 A. C. Johansen: On the Summer-spawning Herring (Clupea harengus L.) of Iceland. 1921. 4 Fig. 40 p.

» VI, » 4 A. C. Johansen: The Atlanto-Scandian Spring Herring spawning at the Faroes 1921. 11 p. Kr. 3.75.

» VI, » 5 J. P. Jacobsen and A. C. Johansen: On the Causes of the Fluctuations in the Yield of some of our Fisheries.

I. The Salmon and Sea Trout Fisheries. 1921. 11 Fig. 18 Tab. 48 p. Kr. 3.50.

» VI, » 6 Johs. Schmidt: Contributions to the Knowledge of the Young of the Sun-Fishes (*Mola* and *Ranzania*). 1921. 1 Pl. 15 Fig. 13 p. Kr. 1.50.

» VI, » 7 Erik M. Poulsen: On the Frequency and Distribution of *Crangon vulgaris, Carcinus mænas* and *Portunus holsatus* in the Danish coastal waters. 1922. 4 Fig. 2 Tab. 18 p. Kr. 1.65.

» VI, » 8 A. C. Johansen: On the Density of the Young Plaice Population in the eastern part of the North Sea and the Skagerak in pre war and in post war years. 1922. 10 Fig. 10 Tab. 31 p. Kr. 2.50.

» VI, » 9 J. P. Jacobsen and A. C. Johansen: On the Causes of the Fluctuations in the Yield of some of our Fisheries.

II. The Eel Fisheries. 1922. 20 Fig. 6 Tab. 32 p. Kr. 2.75.

» VII, » 1 A. C. Strubberg: Marking Experiments with Cod (Gadus callarias L.) in Danish Waters, 1905—1913. 1922. 17 Fig. 27 Tab. 60 p. Kr. 4.25.

» VII, » 2 Kirstine Smith: Investigations of Plaice from the Western Baltic June 1921—August 1922. 1923. 6 Fig. 14 Tab. 48 p. Kr. 3.50.

» VII, » 3 Bjarni Sæmundsson: On the Age and Growth of the Cod (Gadus callarias L.) in Icelandic Waters. 1923. 8 Fig. 35 p. Kr. 2.75.

Bd. VII, Nr. 4 Kirstine Smith: On the Plaice Population of the Horns Reef Area in the Autumn of 1922. 1923. 14 Fig. 78 p. Kr. 5.50.

Serie: Hydrografi.

Bd. I, Nr. 1 Martin Knudsen: On the organisation of the Danish hydrographic researches. 1904. 7 p.

» I, » 2 H. J. Hansen: Experimental determination of the relation between the freezing point of sea-water and its specific gravity at 0° C. 1904. 10 p.

» I, » 3 N. Bjerrum: On the determination of Chlorine in sea-water and examination of the accuracy with which Knudsen's pipette measures a volume of sea-water. 1904. 11 p. Kr. 1.25.

» I, » 4 J. N. Nielsen: Hydrography of the waters by the Faroe Islands and Iceland during the cruises of the Danish research steamer "Thor" in the summer 1903. 8 Plates. 1904. 29 p.

» I, » 5 Niels Bjerrum: On the determination of Oxygen in sea-water. 1904. 13 p. Kr. 3.50.

» I, » 6 Martin Knudsen: Contribution to the Hydrography of the North Atlantic Ocean. 21 Plates. 13 p. Kr. 5.75.

» I, » 7 J. N. Nielsen: Contributions to the Hydrography of the waters north of Iceland. 2 Plates 28 p.

» I, » 8 J. P. Jacobsen: Die Löslichkeit von Sauerstoff im Meerwasser durch Winklers Titriermethode bestimmt. 1905. 13 S. Kr. 2.00.

» I, » 9 J. N. Nielsen: Contribution to the Hydrography of the north-eastern part of the Atlantic Ocean. 3 Plates. 1907. 25 p. Kr. 1.75.

» I, »10 J. P. Jacobsen: Mittelwerte von Temperatur und Salzgehalt. Bearbeitet nach hydrographischen Beobachtungen in dänischen Gewässern 1880—1907. 11 Tafeln. 1908. 28 S. Kr. 3.50.

» I, »11 J. N. Nielsen: Contribution to the understanding of the currents in the northern part of the Atlantic Ocean. 1 Plate. 1908. 15 p. Kr. 0.75.

» I, »12 J. P. Jacobsen: Der Sauerstoffgehalt des Meereswassers in den dänischen Gewässern innerhalb Skagens. 5 Tafeln. 1908. 23 S. Kr. 2.00.

» I, »13 Kirstine Smith: Gezeitenstroeme bei den Feuerschiffen Vyl und Horns Rev. Mit 4 Textfiguren. 1910. 23 S. Kr. 0.75.

» I, »14 J. P. Jacobsen: Gezeitenstroeme und resultierende Stroeme im Grossen Belt in verschiedenen Tiefen im Monat Juni 1909. Mit 7 Figuren im Text. 1910. 19 S. Kr. 0.75.

» II, » 1 Martin Knudsen: Danish hydrographical investigations at the Faroe Islands in the spring of 1910. 2 Plates. 1911. 17 p. Kr. 1.00.

» II, » 2 J. P. Jacobsen: Beitrag zur Hydrographie der dänischen Gewässer. 47 Tabellen, 17 Textfiguren, 14 Tafeln. 1913. 94 S. Kr. 6.50.

» II, » 3 J. P. Jacobsen: Strommessungen in der Tiefe in dänischen Gewässern in den Jahren 1909—1910 und 1911. Mittlere Werte des Stroms und Konstanten der Gezeitenbewegung. 1913. 43 S. Kr. 1.25.

» II, » 4 J. P. Jacobsen: Hydrographical investigations in Faeroe Waters in 1913. 15 Fig. 1915. 47 p. Kr. 1.50.

» II, » 5 J. P. Jacobsen: Contribution to the Hydrography of the Atlantic. 7 Fig. 8 diagrams. 1916. 24 p. Kr. 0.75.

Bd. II, Nr. 6 Th. P. Funder: Hydrographic investigations from the Danish School Ship "Viking" in the Southern Atlantic and Pacific in 1913—14. 1916. 28 p. Kr. 1.00.

» II, » 7 J. P. Jacobsen: Hydrographische Untersuchungen im Randers Fjord (Jylland). 1918. 46 S. Kr. 2.50.

» II, » 8 Current Measurements from Danish Lightships. 1923. 78 p. Kr. 5.50.

Serie: Plankton.

Bd. I, Nr. 1 Ove Paulsen: Plankton-Investigations in the waters round Iceland in 1903. 2 Maps. 1904. 41 p.

» I, » 2 C. H. Ostenfeld: On two new marine species of Heliozoa occurring in the Plankton of the North Sea and the Skager Rak. 1904. 5 p. Kr. 2.00.

» I, » 3 Ove Paulsen: On some Peridineæ and Plankton-Diatoms. 1905. 7 p. Kr. 0.25.

» I, » 4 Ove Paulsen: Studies on the biology of Calanus finmarchicus in the waters round Iceland. 3 Plates. 1906. 21 p. Kr. 1.75.

» I, » 5 Ove Paulsen: The Peridiniales of the Danish Waters 1907. 26 p. Kr. 0.75.

» I, » 6 C. H. Ostenfeld: On the immigration of Biddulphia sinensis Grev. and its occurrence in the North Sea during 1903—07 and on its use for the study of the direction and rate of flow of the currents. 4 Charts and 5 Text-Figures. 1908. 44 p. Kr. 2.50.

Bd. I, Nr. 7 Aug. Brinkmann: Vorkommen und Verbreitung einer Planktonturbellarie *Alaurina composita* Mecz. in dänischen Gewässern. 12 Figuren und 1 Karte. 1909. 15 S. Kr. 0.50.

» I, » 8 Ove Paulsen: Plankton investigations in the waters round Iceland and in the North Atlantic in 1904 9 Figures. 1909 57 p. Kr. 1.75.

» I, » 9 Andreas Otterstrøm: Beobachtungen über die senkrechten Wanderungen des Mysisbestandes in der Ostsee bei Bornholm in den Sommermonaten 1906 und 1907. 1 Fig 1910. 10 S. Kr. 0.25.

» I, » 10 C. H. Ostenfeld: A revision of the marine species of Chætoceras Ehbg. Sect. Simplicia Ostf. With 24 Figures in the text. 11 p.

» I, » 11 J. P. Jacobsen and Ove Paulsen: A new apparatus for measuring the volume of plankton samples by displacement. 6 p. 1912. Kr. 0.50.

» I, » 12 P. L. Kramp: Medusæ, Ctenophora and Chætognathi. From the Great Belt and the Kattegat in 1909. 1915. 20 p. Kr. 0.75.

» I, » 13 Ove Paulsen: Plankton and other biological investigations in the Sea around the Færoes in 1913. 6 Figures 1918. 27 p. Kr. 2.00.

» II, » 1 Gustawa Adler et P. Jespersen: Variations saisonnières chez quelques Copépodes planctoniques marins. 1920. 21 Figures. 39 Tab. 46 p. Kr. 3.00.

SKRIFTER UDGIVNE AF KOMMISSIONEN FOR HAVUNDERSØGELSER

Nr. 1 Johs. Schmidt: Fiskeriundersøgelser ved Island og Færøerne i Sommeren 1903. 10 Tavler. 1904. VI + 148 S. Kr. 5.00. Udsolgt.

» 2 Martin Knudsen: Havets Naturlære. Hydrografi. Med særligt Hensyn til de danske Farvande. 10 Figurer, 4 Tavler. 1905. 41 S. Kr. 1.75. Udsolgt.

» 3 Johan Hjort og C. G. Joh. Petersen: Kort Oversigt over de internationale Fiskeriundersøgelsers Resultater med særligt Henblik paa norske og danske Forhold. 10 Tavler. 1905. 54 S. Kr. 3.50.

» 4 Martin Knudsen, C. G. Joh. Petersen, C. F. Drechsel, C. H. Ostenfeld: De internationale Havundersøgelser 1902—07. 1908. 28 S. Kr. 0.75.

» 5 Bjarni Sæmundsson: Oversigt over Islands Fiske med Oplysning om deres Forekomst, vigtigste biologiske Forhold og økonomiske Betydning. 1 Kort. 1909. 140 S. Kr. 2.25.

Nr. 6 Andreas Otterstrøm: Sildens Afhængighed af forskellige hydrografiske og meteorologiske Forhold i Store Bælt. 2 Textfigurer. 1910. 52 S. Kr. 1.00.

» 7 A. C. Johansen: Om Rødspætten og Rødspættefiskeriet i Beltfarvandet med nogle Bemærkninger om de øvrige Flynderarter og Flynderfiskerier i samme Farvand. 23 Tavler, 14 Textfigurer. 1912. 158 Sider. Kr. 3.00.

» 8 Johs. Schmidt: Danske Undersøgelser i Atlanterhavet og Middelhavet over Ferskvandsaalens Biologi. 3 Tavler, 5 Textfigurer. 1912. 33 Sider. Kr. 1.50.

» 9 A. C. Johansen og J. Chr. Løfting: Om Fiskebestanden og Fiskeriet i Gudenaaens nedre Løb og Randers Fjord. — With an English Resumé. 4 Tavler. 42 Textfigurer. 1919. 169 Sider. Kr. 3.75.