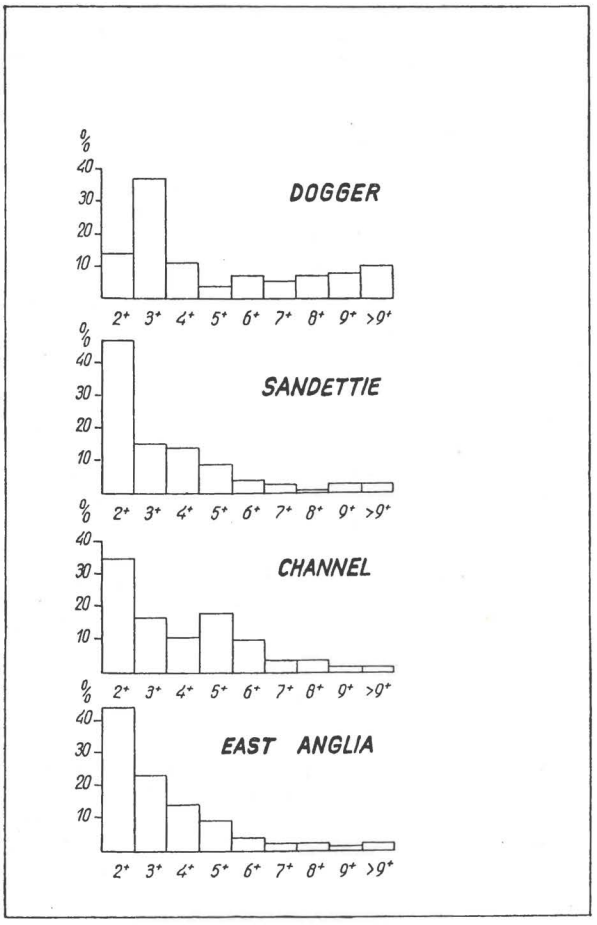

Figure 16. Age composition of spawning herring in the Dogger, Sandettié, and Channel areas (trawl), and age composition of herring from the East Anglian fishery (drift-net).

The Belgian Herring Fisheries in 1956—1957 (30. July 1956 — 19. January 1957)

(Figure 17; Tables 39–49)

The North Sea — English Channel

1. Regions — fishing gear

The statistics of the herring fishery distinguishes between three, more or less well-defined regions, viz., 1) the northern area, where the fishery is mainly centred in the Fladen Ground area; 2) the central area, where fishing is carried out on the Gut, the Dogger Bank, and in the waters west and south of this bank, and 3) the southern area, where fishing is carried out in a rather narrow zone situated between the "Hinders" Bank and the entrance to the eastern English Channel, including the Sandettié area.

In the northern and central areas of the North Sea fishing was carried out exclusively with the otter-trawl, whereas in the southern area nearly all catches were obtained by the pelagic trawl, towed by two trawlers fishing together.

This fishery yielded in all 3,277 tons of fish, of which 3,038 tons were herring; 616 tons of the herring were caught with otter-trawl (20.3%) and the pelagic trawl took 2,422 tons (79.7%).

2. Otter-trawl: fishing effort — landings

Tables 39—41 give records of fishing effort and yields obtained by vessels operating with the otter-trawl. Only 9 trawlers participated in the fishery and made 20 trips during the season (Table 39). The catches were mainly composed of herring (Table 40), the yield of which totalled 616 tons (Table 41) or 76.5% as against 1,228 tons in the previous season. The average catch per 100 F. H. x H. P. (47 kg.) was 35 kg. or 42.7% lower than in the previous season (82 kg.).

3. Pelagic trawl: fishing effort — landings

This fishery was localized in the extreme south of the North Sea and the eastern English Channel.

Owing to the lack of remunerative catches, the activity of the trawlers was very restricted. The first catches from this region were landed at the beginning of October and the last on 19. January 1957.

In Table 42, a survey is given of the fishery effort and yields, in comparison with the previous season. In the 1956 season 56 trawlers were engaged in the fishing (87 in 1955—56) and 381 (1,179) voyages were made.

The total catch amounted to 2,471 tons consisting of 2,422 tons herring, or 98.02%, 2 tons or 0.08% mackerel, 3 tons or 0.13% other pelagic species, and 44 tons or 1.77% demersal species.

Table 42 gives further details about the landings made with the pelagic trawl. The average catch per 100 F. H. x H. P. reached only 137 kg. as against 302 kg. in 1955—56, or 54.6% less. This average yield varied considerably from month to month. It reached its maximum in January 1957 with 194 kg. and its minimum in December with 126 kg.

The Herring Stock

1. Southern North Sea

As the landings of herring from the northern and central areas of the North Sea were rather scarce and irregular it was not possible to obtain a sufficient number of samples for studying the biological composition of the stocks present there. Thus these studies have been limited to the stocks inhabiting the southern North Sea.

Table 39. Number of trips with otter-trawl and fishing effort

Months	Number of trips				Fishing effort (1,000 F.H. x H.P.)			
	North.	Centr.	South.	Total	North.	Centr.	South.	Total
July	1	—	—	1	171	—	—	171
August	6	1	—	7	793	27	—	820
September	—	—	—	—	—	—	—	—
October	1	—	—	1	54	—	—	54
November	4	—	7	11	232	—	35	267
Total 1956	12	1	7	20	1,250	27	35	1,312
Total 1955	8	25	19	52	512	889	91	1,492

Table 40. The total yields by otter-trawl vessels

Species	Tons	‰
Pelagic Herring	616	765
,, Mackerel	87	107
,, Horse Mackerel	3	4
Demersal Haddock	15	18
,, Cod	7	9
,, Saithe	21	26
,, Whiting	45	55
,, Others	12	16
Total pelagic species	706	876
Total demersal species	100	124
Grand Total	806	1,000

Table 42.
Fishing effort and yield of the fishery with pelagic trawl

Months	Number of trips	Total catch (tons)	Average catch per 100 F.H. × H.P. (kg.)	Fishing effort (1000 F.H. × H.P.)
October	32	193	137	141
November	241	1,585	137	1,160
December	87	503	126	401
Januar	21	141	194	72
Total 1956–57	381	2,422	Mean 137	1,774
Total 1955–56	1,179	11,528	Mean 302	3,813

Table 41. The yields of herring (otter-trawl)

Months	Total catch (tons)				Average catch per 100 F.H. × H.P. (kg.)			
	North.	Centr.	South.	Total	North.	Centr.	South.	Total
July	36	—	—	36	21	—	—	21
August	303	34	—	337	38	125	—	41
September	—	—	—	—	—	—	—	—
October	20	—	—	20	37	—	—	37
November	211	—	12	223	91	—	35	84
Total 1956	570	34	12	616	46	125	35	47
Total 1955	243	814	172	1,229	48	91	188	82

The material investigated consisted of 16 samples comprising 1,050 fish; they were collected in October (140), November (560), December 1956 (245), and in January 1957 (105).

Table 43 shows the size distribution of the herring from month to month during the season. The average weight and the percentage of males are also recorded. The average size of the fish (251 mm.) was lower than in 1955—56 (269 mm.), the average weight was 106 g. as against 134 g. in 1955—56.

As to the maturity, it is evident from Table 44 that stage V was greatly predominant during October and stages VIII—II in the other months. As in earlier investigations the quantity of intestinal fat was estimated. The results are shown in Table 45.

The age composition is shown in Table 46. It appears that the 3-year-old fish were predominant during all months. The sequence of the most important year-classes, as to their relative strength proved to be as follows:—1953 (523‰), 1952 (167‰), and 1951 (116 ‰).

The age composition of the catches from year to year is given in Table 47. This table deals with the 4-year period from 1953—54 to 1956—57. The youngest year-classes seem to predominate during this period.

The average length of the herring and the growth-rate during the first year (L_1) is given in in Table 48.

The number of vertebrae varies between 54 an 60 (Table 49). The spines with 57 vertebrae

Table 43. Size, weight, and sex (‰)

	Southern North Sea						E. Chan.
cm.	Oct.	Nov.	Dec.	Jan.	Total 1956–57	Total 1955–56	Dec.–Jan.
31	—	—	—	—	—	2	—
30	14	23	16	38	23	22	41
29	43	80	37	124	71	129	71
28	50	77	37	114	70	**185**	82
27	136	112	53	**172**	118	164	118
26	93	86	73	133	96	172	71
25	121	91	90	57	90	146	88
24	**293**	170	200	162	206	104	153
23	207	**236**	**294**	124	**215**	62	**253**
22	22	102	180	76	95	7	94
21	14	14	20	—	12	3	23
20	7	7	—	—	4	2	6
Total ..	1000	1000	1000	1000	1000	1000	1000
Average length, mm. .	253	254	246	264	251	269	254
Mode, cm. ..	24	23	23	27	23	28	23
Average weight, g.	141	127	99	121	106	134	110
Males ‰	521	477	539	457	495	479	471

Table 44. Stages of maturity (‰)

	Southern North Sea						E. Chan.
Stages	Oct.	Nov.	Dec.	Jan.	Total 1956–57	Total 1955–56	Dec.–Jan.
I	—	29	4	—	8	6	18
II	36	34	16	10	24	1	6
III ...	—	—	—	—	—	—	—
IV	57	2	4	—	16	1	—
V	**879**	266	8	—	288	153	—
VI	7	210	13	—	58	71	29
VII ...	—	29	16	—	11	40	35
VIII–II	21	**430**	**939**	**990**	**595**	**728**	**912**
Total ..	1000	1000	1000	1000	1000	1000	1000

Table 45. Quantity of intestinal fat (‰)

	Southern North Sea						E. Chan.
Quant.	Oct.	Nov.	Dec.	Jan.	Total 1956–57	Total 1955–56	Dec.–Jan.
o	164	184	139	114	150	167	265
1	**743**	**738**	**829**	**876**	**797**	**818**	**712**
+	79	46	24	10	40	13	12
M	14	32	8	—	13	2	12
Total ..	1000	1000	1000	1000	1000	1000	1000
Index .	1.94	1.93	1.90	1.90	1.92	1.85	1.76

dominate and the vertebral average was found to be 56.595.

Finally Table 50 gives the number of keeled scales (K_2) for each month. The average number for the whole season was 14,820.

Stomach analyses were made on all herring investigated. Only 1.7 contained food, mostly remains of copepods.

2. The English Channel

The three samples investigated were taken from catches made off Dieppe during the period December 1956 to January 1957. A total of 170 herrings was studied.

The size distribution, the average size, and the weight of the herring can be seen in Table 43. The average length of the fish was 254 mm., the average weight 110 g.

The maturity and the quantity of intestinal fat are given in Tables 44 and 45. The greatest part of the stock was just spent or recovering spents, and the small quantity of fat is in good agreement with that fact.

The age composition is shown in Table 46. Here also the 3-year-old fish is predominant (520‰). The 3-5-year-old herring (year-classes 1953—1951) contributed altogether 792 ‰ of the total catch.

The number of vertebrae varies between 54 and 58 (Table 49), with mode 57 and average 56.659.

Table 46. Age (‰)

		Southern North Sea					E. Chan
	Year-class	Oct.	Nov.	Dec.	Jan.	Total 1956–57	Dec.–Jan.
2 ...	1954	15	17	9	—	10	6
3 ...	1953	**564**	**466**	**679**	**384**	**523**	**520**
4 ...	1952	143	175	131	221	167	136
5 ...	1951	120	119	70	154	116	136
6 ...	1950	98	70	65	39	68	65
7 ...	1949	30	53	5	29	29	78
8 ...	1948	23	24	9	19	14	32
9 ...	1947	—	34	14	67	29	7
10 ...	1946	7	27	9	39	25	7
>10 ...	<1946	—	15	9	48	18	13
Total ...		1000	1000	1000	1000	1000	1000

Table 47. Age composition of the catches during 1953/54–1956/57 (‰)

Southern North Sea

	Season			
Age	1953—54	1954—55	1955—56	1956—57
2	4	6	2	13
3	**268**	**298**	203	**524**
4	225	222	**258**	164
5	128	116	176	111
6	114	87	109	69
7	122	82	73	35
8	82	90	66	20
9	23	51	63	28
10	18	24	36	21
>10	16	24	14	15

Table 48. Average lengths by age and the value of L_1 (mm.)

Southern North Sea

Brood	Oct.	Nov.	Dec.	Jan.	Mean 1956—57	Mean 1955—56
1954	210	225	231	—	223	205
1953	241	238	235	239	238	245
1952	260	260	238	265	260	261
1951	271	273	268	277	272	277
1950	282	284	283	278	283	283
1949	283	290	286	296	289	288
1948	294	294	292	305	295	290
1947	—	296	298	291	295	290
1946	294	296	294	296	296	294

Table 48a. Value of L_1 (mm.)

Southern North Sea

L_1	Oct.	Nov.	Dec.	Jan.	Mean 1956—57	Mean 1955—56
1954	130	161	148	—	153	135
1953	129	126	122	123	125	126
1952	126	125	124	131	126	122
1951	120	128	119	132	126	110
1950	128	127	130	118	127	108
1949	121	117	118	133	119	113
1948	110	116	111	134	116	111
1947	—	108	103	110	108	114
1946	113	116	89	117	113	—

Table 49. Vertebrae (V.S. $^0/_{00}$)

	Southern North Sea						Channel
V.S.	Oct.	Nov.	Dec.	Jan.	Total 1956—57	Total 1955—56	Dec.—Jan.
60	—	—	4	—	1	—	—
59	—	—	9	10	5	1	—
58	52	44	82	30	52	67	67
57	**545**	**490**	**517**	**574**	**532**	**510**	**591**
56	373	429	362	366	382	393	281
55	22	35	22	20	25	28	55
54	8	2	4	—	3	1	6
Total	1000	1000	1000	1000	1000	1000	1000
Average	56.612	56.540	56.694	56.644	56.595	56.619	56.659
Standard error	0.6584	0.6481	0.7396	0.6243	0.6531	0.6642	0.7890
Fluctuation mean ...	0.1917	0.0941	0.1638	0.2095	0.0694	0.0686	0.2077

Table 50. Keeled scales (K_2) in $^0/_{00}$

	Southern North Sea						Channel
K_2	Oct.	Nov.	Dec.	Jan.	Total 1956—57	Total 1955—56	Dec.—Jan.
19	—	—	—	—	—	1	—
18	—	2	4	10	4	—	—
17	29	22	13	29	23	16	41
16	169	152	195	114	157	155	149
15	**478**	**472**	**448**	**514**	**478**	**483**	**488**
14	280	307	278	314	295	302	286
13	44	43	62	19	42	41	36
12	—	2	—	—	1	1	—
Total	1000	1000	1000	1000	1000	1000	1000
Average	14.860	14.801	14.830	14.848	14.820	14.804	14.875
Standard error	0.8497	0.8462	0.8837	0.8292	0.8520	0.8205	0.8624
Fluctuation mean ...	0.2458	0.1213	0.1920	0.2728	0.0893	0.0836	0.2244

Table 50 gives the number of keeled scales (K_2). The average number for this area was found to be 14.875.

All stomachs were empty when examined.

General observations

Comparison of numerical and biological values of herring from the southern North Sea with those from the English Channel, shows a similarity in composition of the populations present there during December 1956 and January 1957.

The difference between the average lengths observed in the two areas is 3 mm. only (251 mm. in the North Sea and 254 mm. in the Channel). The difference between the average weights is also very small, 4 g. (106 g. against 110 g.).

The frequency of recently spawned herring maturity stages VII and VIII-II) differs hardly ($965^0/_{00}$ and $947^0/_{00}$). In both areas, the 2 to 6-year-old herring formed the majority ($884^0/_{00}$ and $863^0/_{00}$). In consequence the older year-classes were abnormally poorly represented.

The vertebral average of the herring in the two areas was also of the same value, 56.68 and 56.66

Conclusions

The results of the investigations tend to show:—

(1) that after spawning, the herring of the North Sea penetrated very deeply into the English Channel, where they probably mixed with the Channel herring populations;

(2) that the majority of herring 6 and more years old were absent in the extreme south of the North Sea, through causes which are yet to be elucidated.

It is presumed that these two facts may be held largely responsible for the poor results of the past herring season in this area.

If these phenomena were to happen again next year, the success of the southern North Sea herring fishery in 1957—58 may once again be highly endangered.

CH. GILIS

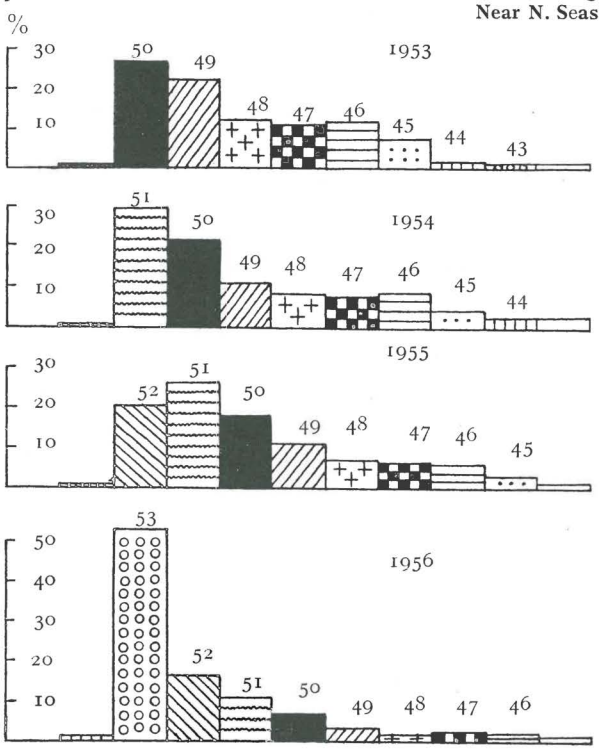

Figure 17. Biological scale of the full-herring concentrations exploited by the Belgian trawlers in 1953-1956.

C. Baltic-Belt Seas

YOUNG STAGES

Larvae in the Kattegat and the Belt Sea

The quantity of herring larvae was investigated in April by fishing with a ring-net at some few stations in the Belts and the southern Kattegat. No larvae of winter or spring spawning herring were caught. Atsome stations near the spawning places of the autumn spawning herring, north and east of Læsø in the northern Kattegat, great quantities of larvae were obtained in November.

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