MEDDELELSER

FRA

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BY

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Introduction.

THE material of fish eggs and larvæ, dealt with in the present paper, was collected on two excursions with the Danish inspecting vessel S/S "Falken" in March 1922. Dr. A. C. Johansen was the scientific leader of the excursions in which I took part as a biologist, and Cand. A. Jensen as a hydrographer.

The plankton samples were collected by vertical hauls with the Hensen net (opening diameter 67 cm). The net was lowered from the stem of the ship and hauled up by means of the steam whinch, at the same time as water samples were taken with the Knudsen water bottle, worked by a hand whinch astern. At each station two or three hauls were made from the bottom to the surface. In the meanwhile, the hydrographer determined the position of the boundary layer through observations of the temperature of the water and preliminary determinations of the salinity by means of areometers. When the boundary layer was localized, another haul was made with the net from just above the boundary layer to the surface, sometimes also from just below the boundary layer, passing through the latter and the surface layers. A laboratory was established in the deck house, and here the fish eggs and larvæ were picked out from the samples, and the material examined on the spot. The larvæ were identified and measured. The eggs were placed under a microscope with ocular micrometer, and measured as exactly as possible. This was, of course, frequently a somewhat difficult task, owing to the shaking and rolling of the ship, but it gave us at once an approximate idea of the number of eggs of each species, and I may add that the results, derived from the examinations onboard, were only slightly altered by subsequent revision in the laboratory in Copenhagen. The stages of development of the eggs were likewise determined onboard. Distinction between fertilized and unfertilized eggs is more easily and exactly made on fresh than on preserved material. On the other hand, it is sometimes difficult to distinguish the first slight traces of pigmentation in living embryos. By the revision of the preserved eggs the number of eggs with pigmented embryos was in fact somewhat increased to the disadvantage of the number of eggs with "young embryos".

The two excursions started from Nyborg and passed east of Langeland and south of Ærø into the southern part of the Little Belt, following the deep channels. At stat. III, March 28th, we did not at once find the deepest point (32 m) of the channel; the first haul was made from the bottom at 26 m depth; it only contained half the number of eggs of the other hauls which were made from 30 and 32 m. This demonstrates that the bulk of the floating eggs follow the very deepest parts of the channels, i. e.: they are crowded within very narrow limits, so that it is of great importance, when we want to compare the number of eggs at a certain place at different times, to make the hauls each time in almost the same depth.

As mentioned above, the opening diameter of the net used was 67 cm, which gives an opening area of 3526 cm^2 or very nearly $^1/_3$ m^2. The number of eggs per m^2 surface in a certain locality is, therefore, very nearly three times the average number of eggs, taken by the hauls, made in that locality.

Hydrographical Conditions.

(Table I and fig. 1.)

It will be remembered that the weather was unusually cold during the first two months of the year 1922. Even on March 15th big masses of ice were observed on the east coast of Als. In accordance herewith the temperature of the upper water layers in the Baltic was very low, below 1° C at stat. II

Table I. Position of Stations. — Hydrographical Observations.

St. I. March 15th 55°02′ N. 10°03′ E. West of Lyö Depth 38 m			St. II. March 15th 54°49′ N. 10°12′ E. South-west af Ærö Depth 30 m			St. III. March 15th 54°45′ N. 10°31′ E. South of Marstal Depth 21 m			St. IV. March 14th 54°43′9 N. 10°46′4 E. East of Kjelsnor lighthouse Depth 31 m			St. V. March 14th 54°57′5 N. 10°56′ E. South-east of Tranekjær lighthouse Depth 40 m			St. VI. March 14th 55°11′9 N. 11°05′3 E. West of Agersö Depth 38 m			St. VII. March 14th 55°15′ N. 10°51′ E. Outside Nyborg Fjord Depth 20 m		
Depth m	Tp. °C	Sal. ‰	Depth m	Tp. °C	Sal. ‰	Depth m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰
0	2.20	19.20	0	1.11	18.60	0	1.12	18.35	0	1.80	18.26	0	1.84	18.82	0	2.11	19.67	0	2.60	22.59
5	1.38	19.24	5	0.79	18.66	5	0.96	18.30	5	1.66	18.28	5	1.67	18.93	5	1.96	19.72	5	2.66	22.61
7.5	1.09	19.45	7.5	0.87	18.75	7.5	0.93	18.35	..	..	..	..	..	..	..	..	..	..	..	..
10	1.09	19.65	10	0.86	18.93	10	0.98	18.35	10	1.68	19.56	10	1.64	19.07	10	2.10	20.81	10	3.10	24.94
12.5	1.40	21.73	12.5	0.67	19.29	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..
15	1.87	22.77	15	0.67	20.50	15	1.91	21.37	15	1.99	21.76	15	2.26	22.20	15	2.57	23.08	15	3.60	29.31
20	2.18	23.66	20	2.22	24.05	20	2.14	22.52	20	2.36	24.31	20	2.97	25.52	20	2.88	25.44	16.5	3.61	29.45
25	2.40	24.31	22.5	2.58	25.25	..	..	..	25	2.50	25.07	25	3.44	27.43	25	3.69	29.27	..	..	..
30	2.50	24.92	..	..	..	..	..	..	30	2.56	25.30	30	3.70	28.57	30	4.15	30.28	..	..	..
35	2.56	25.01	..	..	..	..	..	..	..	..	..	..	..	..	35	4.06	31.04	..	..	..
..	..	..	..	..	..	..	..	..	..	..	..	40	3.84	29.18	..	..	..	..	..	..

St. I A. March 29th 55°09′ N. 9°45′ E. South of Aarö Depth 26 m			St. I. March 28th 55°02′ N. 10°03′ E. West of Lyö Depth 38 m			St. II. March 28th 54°49′ N. 10°12′ E. South-west of Ærö Depth 32 m			St. III. March 28th 54°45′ N. 10°31′ E. South of Marstal Depth 26—32 m			St. IV. March 27th 54°43′9 N. 10°46′4 E. East of Kjelsnor lighthouse Depth 26 m			St. V. March 27th 54°57′5 N. 10°56′ E. South-east of Tranekjær lighthouse Depth 42 m			St. VI. March 27th 55°11′9 N. 11°05′3 E. West of Agersö Depth 40 m			St. VII. March 27th 55°15′ N. 10°51′ E. Outside Nyborg Fjord Depth 20 m		
Depth m	Tp. °C	Sal. ‰	Depth m	Tp. °C	Sal. ‰	Depth m	Tp. °C	Sal. ‰	Depth m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰	Dep. m	Tp. °C	Sal. ‰
0	1.43	15.19	0	1.54	15.12	0	1.58	12.90	0	1.78	12.90	0	1.79	12.41	0	1.81	9.96	0	1.55	10.54	0	1.66	13.96
..	..	..	..	..	..	..	..	..	..	..	..	2.5	1.63	12.67	2.5	1.70	9.90	..	..	..	2.5	1.50	14.00
5	1.38	15.30	5	1.48	15.19	5	1.50	16.69	5	1.68	12.94	5	1.60	13.12	5	1.49	10.48	5	1.38	10.70	5	1.49	14.00
7.5	1.43	15.95	7.5	1.41	15.26	7.5	1.49	16.98	7.5	1.60	13.68	7.5	1.58	13.53	7.5	1.38	10.88	7.5	1.33	11.24	..	..	..
10	1. 23	..	10	1.33	17.92	10	1.32	18.17	10	1.50	17.29	10	1.60 / 1.51	15.08 / 15.37	10	1.42	13.15	10	1.33 / 1.49	11.35 / 11.94	10	1.61	17.14
12.5	1.22	18.62	12.5	1.27	18.64	12.5	1.31	18.66	12.5	1.50	17.47	12.5	1.49	15.59	12.5	1.50	15.32	12.5	1.50	12.25	12.5	2.97	23.22
15	1.38	19.63	15	1.42	20.61	15	1.37	19.43	15	1.31 / 1.37	18.12 / 18.16	15	1.46	15.84	15	1.66	17.86	15	2.37	18.04	15	3.50	26.00
..	..	..	17.5	1.80	23.08	17.5	1.46	20.32	17.5	1.73	22.38	..	..	..	..	..	..	17.5	2.86	21.31	..	..	..
20	1.70	23.17	20	2.02	23.73	20	1.50	21.22	20	2.16	23.98	20	2.16	23.35	20	2.47	23.57	20	3.06	22.81	19	3.78	27.41
25	2.17	24.54	25	2.14	24.14	25	2.10	23.84	25	2.29	24.20	25	2.28	23.75	..	..	..	..	..	..	..	..	..
..	..	..	30	2.39	24.76	30	2.50	24.81	30	2.31	24.31	..	..	..	32	3.89	28.37	30	3.78	27.50	..	..	..
..	..	..	35	2.54	25.01	..	..	..	..	..	..	..	..	..	..	..	..	35	4.02	28.44	..	..	..

and III on March 15th. At the surface proper the temperature was a little higher. The temperature increased towards the north, both in the Little Belt (stat. I) and in the Langelandsbelt and the Great Belt (stat. IV—VI). The temperature of the bottom layers was almost uniform from stat. I—IV (about 2°4), somewhat higher at stat. V—VI (about 4°). It will be observed (see table I and fig. 1) that the salinity of the upper strata was comparatively high and very uniform, only slightly increasing towards the belts. In 5 m depth at stat. I—IV the variation of the salinity was only 1.44 ‰ (18.28—19.72 ‰). In the bottom layers the salinity was almost regularly increasing from stat. I to stat. VI, i. e. from the Little Belt through the Baltic to the Great Belt. These facts are, I think, the combined results of a great inflow of water from the Great Belt and vertical convection currents in the Baltic. — I have purposely excluded stat. VII from the above discussion. This locality is in comparatively shallow water at the mouth of a bight. Its hydrographical conditions are characterized by the comparatively high temperature (2°60) and salinity (22.59 $^{0}/_{00}$) at the surface, both evenly increasing towards the bottom; we cannot discern a definite boundary layer separating an upper and a lower stratum.

A fortnight later (March 27th—29th) the hydrographical conditions were entirely altered. The temperature was, generally spoken, somewhat higher in the upper strata and a little lower in the bottom layers, compared with March 14th—15th. The salinity of the upper strata was very low, and the highest values (15.19 $^{0}/_{00}$ at the surface) were observed at stat. I A in the Little Belt (15.12 $^{0}/_{00}$ at stat. I), the lowest values (9.96 $^{0}/_{00}$ at the surface) at stat. V in the Langelandsbelt. In the western Baltic the salinity of the lower strata was practically unaltered, but in the Langelandsbelt and the Great Belt it had decreased considerably since March 14th—15th. As a rule, the boundary layer was fairly sharply defined and had a rather deep position, deeper in the Great Belt than in the Little Belt. Thus a considerable outflow of Baltic water must have occurred in the upper strata, passing mainly through the Great Belt, whereas the Little Belt has received a lesser part of this brackish water. The comparatively low salinity of the bottom layers and the deep position of the boundary layer indicate that the outgoing current in the surface layers was not accompanied by any considerable inflow of salt water from the Belts along the bottom.

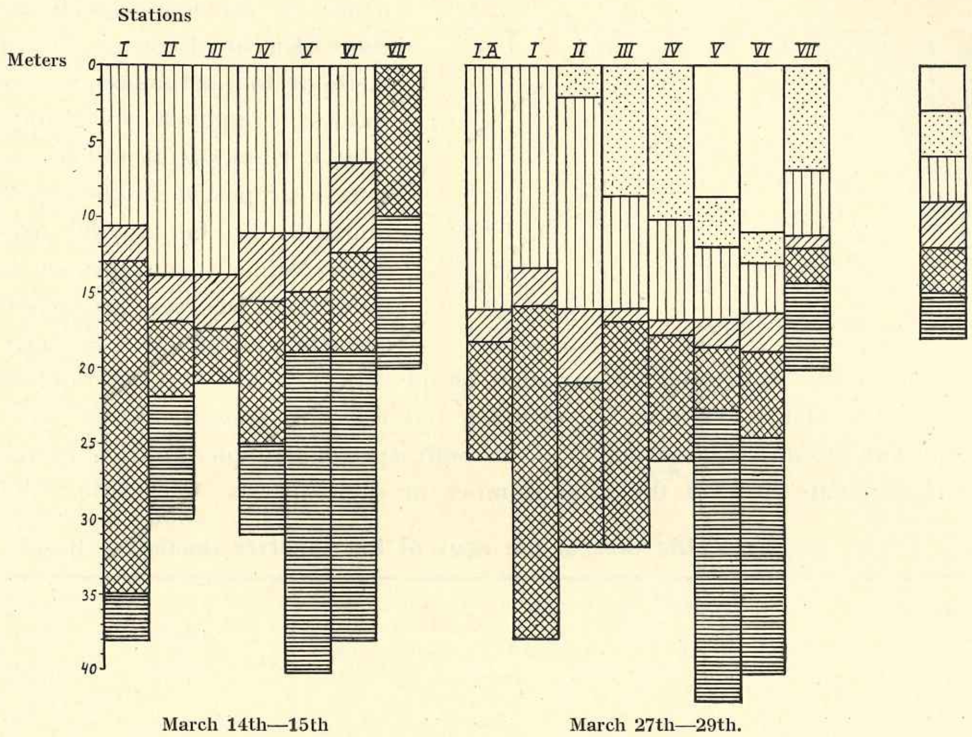

Fig. 1. Distribution of the salinity.

On the Identification of the eggs.

(Tables II—III.)

The material contains eggs of the following species of fish: *Pleuronectes platessa, flesus,* and *limanda, Drepanopsetta platessoides, Gadus callarias,* and *Onos cimbrius.* — The eggs of *Onos mustela* might very well be found in the Great Belt or the western part of the Baltic, but from the measures of the material in hand, I am convinced that all eggs with oil globules, found during the cruises with the "Falken", belong to *Onos cimbrius.* According to Ehrenbaum (1909, Nord. Plankton, p. 280) the diameter of the eggs of *Onos cimbrius* in the western Baltic ranges from 0.81 to 1.10 mm, average in February 1.04, in May 0.94 mm. The diameter of the 19 eggs in our material (all from March 27th—29th) varies between 0.88 and 1.08 mm, fairly regularly grouped on either side of the average, 0.98 mm (table II). Thus our measures are in very good accordance with the figures given by Ehrenbaum. The size of the eggs of *Onos mustela* varies between 0.66 and 0.98 mm. — The eggs of *Drepanopsetta platessoides* are easily identified by means of the large perivitelline space.

Table II. Size of eggs of Onos.

Diam. mm.	Stations IA	I	II	IV	VI	VII	Total
0.885 ...	1	..	..	..	..	..	1
0.90	..	..	..	..	..	..	..
	..	..	..	..	..	..	..
0.93	..	..	..	..	..	..	..
	1	1	..	..	..	1	3
0.96	1	..	..	..	..	1	2
	2	..	1	1	..	..	4
0.99	2	..	1	..	..	..	3
	1	..	..	..	1	..	2
1.02	..	..	..	1	1	..	2
	..	..	..	1	..	..	1
1.05	..	..	..	..	..	..	..
	..	..	..	..	..	..	..
1.08	..	..	..	..	1	..	1
Total...	8	1	2	3	3	2	19

Average diameter 0.98 mm.

The idenfication of the eggs of the other species, mentioned above, was carried out by means of the egg diameters. Only in very few cases I have been in doubt as to the separation between eggs of plaice and cod, and between eggs of cod and flounder. In each case only 7 eggs are doubtful. — On the other hand, in most cases exact distinction between eggs of flounder and dab has proved impossible. In my paper on the fish eggs from the Langelandsbelt in 1909 (Kramp 1913) I have discussed the various methods for distinction between the eggs of the two species, employed by Ehrenbaum & Strodtmann (1904), Ehrenbaum (1905), and Heinen (1912), and I have proposed another method which proved very practical, as far as the material in question was concerned. In the present case, however, none of these methods are practicable. Table III gives the diameters of the dab + flounder eggs from each station. In the western Baltic the range of variation of the dab-eggs is 0.78—1.05 mm, that of the flounder-eggs 0.95—1.38 mm. At stat. I—IV none or very few dab-eggs are present, and we may separate the two species with hardly any doubt. But at stat. V—VII both species are plentifully represented, and we may only form an approximate idea of the total number of each species. Very little can be said concerning the

Table III. Size of the eggs of Pleuronectes limanda + flesus.

Diam. mm.	March 14th—15th III	IV	V	VI	VII	March 27th—29th IA	I	II	III	IV	V	VI	VII
0.855	..	..	..	..	..	..	..	..	..	..	..	1	2
0.870	..	..	..	..	..	..	..	..	..	..	..	2	2
0.885	..	..	1	1	..	..	..	1	..	..	..	2	2
0.900	..	..	..	4	..	..	..	..	1	..	..	..	2
0.915	..	..	2	2	..	..	..	1	..	..	..	2	5
0.930	..	..	1	5	..	..	..	..	..	..	2	1	1
0.945	..	..	1	6	..	..	..	..	..	..	1	3	2
0.960	..	..	3	8	..	..	..	..	1	..	..	3	..
0.975	..	..	2	16	2	..	..	..	..	1	1	4	..
0.990	..	..	4	10	2	..	..	..	..	..	1	6	2
1.005	..	1	4	6	2	..	1	..	..	..	1	6	1
1.020	..	1	6	5	..	..	1	2	1	..	..	5	2
1.035	..	2	4	7	..	1	..	..	1	3	1	3	2
1.050	..	3	4	4	..	..	2	1	2	1	..	4	3
1.065	..	4	1	4	1	2	1	1	..	1	4	3	1
1.080	..	3	1	..	..	2	..	3	..	1	5	3	..
1.095	..	2	1	1	..	..	1	2	..	2	5	..	..
1.110	..	2	..	..	1	..	..	2	1	..	6	1	..
1.125	..	2	1	1	..	1	1	..	..	1	7	1	..
1.140	..	1	..	..	..	..	..	..	..	..	6	1	..
1.155	1	..	1	..	..	..	2	..	..	..	2	1	..
1.170	..	..	..	..	..	..	1	1	..	..	..	..	..
Total...	1	21	37	80	8	6	10	14	7	10	42	52	27
probable number of limanda..	0	0	(16)	(53)	0	0	0	2	2	?1	(3)	(23)	15
probable number of flesus....	1	21	(21)	(27)	?8	6	10	12	5	9	(39)	(29)	12

numbers of the various developmental stages of each species. The figures in brackets represent the probable numbers of eggs of each species, calculated by the method of Heinen. These figures may be nearly correct, as far as stat. V and VI are concerned. In the case of stat. VII (27th March) the method of Heinen would give 25 dabs and 2 flounders, but I feel sure that the number of flounder-eggs must be much larger; one of the two eggs of 0.945 mm diameter is a certain flounder (identified by means of the pigmented embryo), the other is a certain dab. Probably the real numbers of dab- and flounder-eggs at this station are 15 and 12, respectively, as stated in the table.

The limitation of the stages of development of the eggs is the same as used by me in my paper of 1913 (p. 20), with the exception only that I have not distinguished between dead eggs and eggs containing no embryos, but still alive. The latter will, in any case, die very soon, and it is not easy to state with certainty, whether they are already dead or not. The matter of importance is that these eggs are unfertilized; they are, therefore, united in one column.

Explanation of the marks:

nE = eggs containing no embryo.
G = „ „ germinative disk.
yE = „ „ young embryo.
pE = „ „ pigmented embryo.
pO = „ „ embryo with pigmented eyes.

Gadus callarias.

(Table IV—VIII and fig. 2).

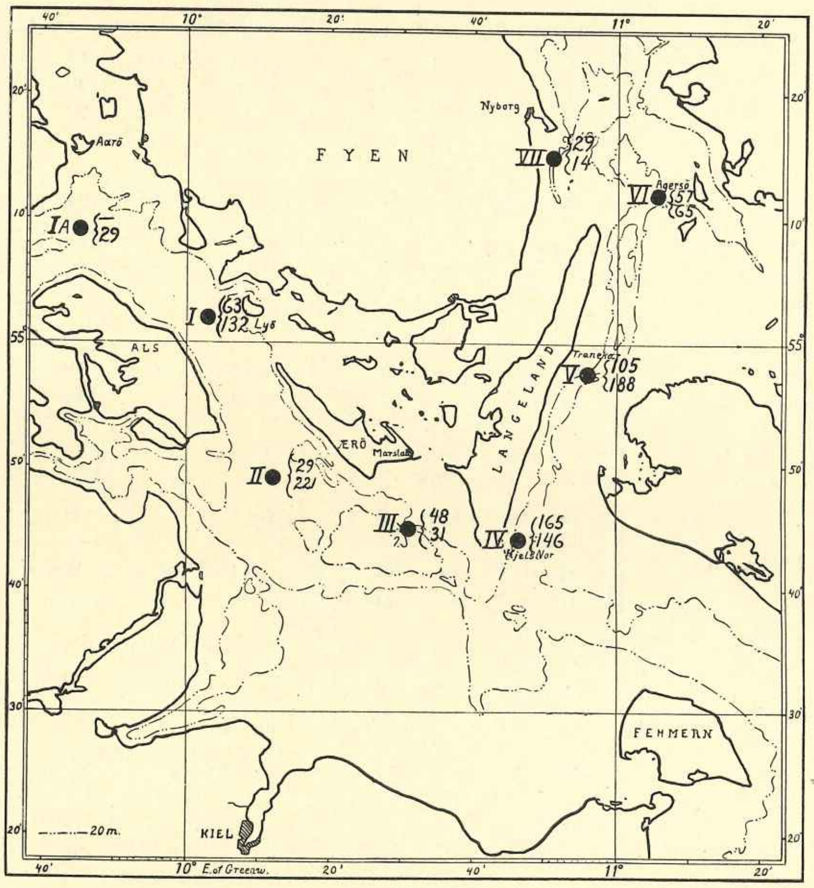

Fig. 2. Number of living eggs of *Gadus callarias* per m² surface. — The uppermost figure at each station represents the number of eggs from the first cruise (March 14th—15th), the lowermost figure that from the second cruise (March 27th—29th).

The cod lives and breeds everywhere in the Belt Sea and the western Baltic. The spawning begins in January and continues until May. As a rule the maximal spawning takes place in March, but the spawning time is somewhat variable; e. g. in 1911 the maximum was reached in February (53 eggs per m² surface in the western Baltic), and the spawning almost ceased in April (Heinen 1912). During the cruises of the "Falken" cod eggs were found abundantly at every station. Table IV gives the actual numbers of cod eggs taken by each haul. Table V and fig. 2 present the number of living eggs pr. m² surface at each station. It will be observed that at some stations the number increased, at other stations it decreased during the fortnight between the two cruises. The average number of eggs of all stations taken together increased from 71 to 114 per m² surface. This indicates that the maximal spawning took place at a time nearer by the date of the second than by that of the first cruise. There are, however, several circumstances to be taken into consideration. Table VI shows that in the Great Belt, as well as in the western Baltic, the number of unfertilized eggs and eggs with pigmented embryos was much higher in relation to the number of eggs in young stages at the middle of March than at the end of the month. A large number of unfertilized eggs indicates, as

Table IV. Gadus callarias. — General view of the material.

Station no.	March 14th—15th							March 27th—29th						
	Depth m	nE	G	yE	pE	pO	Total	nE	G	yE	pE	pO	Total	Depth m
IA	—	—	—	—	—	—	—	..	..	..	..	..	0	10—0
	—	—	—	—	—	—	—	..	..	..	..	..	0	26—0
	—	—	—	—	—	—	—	..	8	2	8	1	19	26—0
	—	—	—	—	—	—	—	..	4	2	4	..	10	26—0
I	10—0	..	1	..	..	..	1	..	..	..	..	..	0	7—0
	20—0	..	8	4	5	..	17	1	15	..	..	..	16	15—0
	38—0	..	9	1	10	..	20	..	47	1	6	2	56	38—0
	38—0	..	6	4	11	1	22	..	34	..	7	..	41	38—0
	—	—	—	—	—	—	—	..	26	3	6	..	35	38—0
II	10—0	..	1	..	..	..	1	..	..	..	..	..	0	10—0
	30—0	1	10	..	2	..	13	..	13	1	9	2	25	20—0
	30—0	1	3	1	1	..	6	1	52	..	11	4	68	32—0
	30—0	..	8	2	2	..	12	1	52	10	15	3	81	32—0
III	10—0	..	..	..	..	..	0	..	..	..	..	..	0	10—0
	21—0	1	11	..	7	..	19	..	4	1	1	..	6	26—0
	21—0	..	7	1	6	..	14	..	4	2	1	1	8	30—0
	—	—	—	—	—	—	—	..	8	1	2	..	11	30—0
	—	—	—	—	—	—	—	..	9	1	1	1	12	32—0
IV	10—0	1	2	..	1	..	4	..	..	..	..	..	0	10—0
	—	—	—	—	—	—	—	..	..	..	..	..	0	14—0
	31—0	11	33	3	11	1	59	2	51	1	..	1	55	26—0
	31—0	38	39	5	17	1	100	3	41	1	2	..	47	26—0
V	10—0	..	2	..	3	..	5	..	2	1	..	..	3	20—0
	40—0	..	22	4	13	..	39	4	56	1	7	..	68	42—0
	40—0	..	20	..	11	..	31	..	52	3	6	..	61	42—0
VI	10—0	..	3	..	3	..	6	..	..	..	..	..	0	10—0
	—	—	—	—	—	—	—	..	3	..	..	..	3	20—0
	38—0	..	10	1	7	..	18	2	17	1	1	1	22	40—0
	38—0	..	13	..	7	..	20	..	19	..	4	..	23	40—0
VII	10—0	..	3	..	8	..	11	..	..	..	..	..	0	10—0
	20—0	..	6	..	6	..	12	..	3	2	1	..	6	20—0
	20—0	..	1	..	6	..	7	1	1	1	1	..	4	20—0

a rule, that a shoal of spawning fish have been present in the immediate neighbourhood of the place where the haul was made. The number may, therefore, be somewhat dependent on incidental circumstances. As regards the relative number of the various developmental stages of living eggs, we may state, as a matter of course, that under equal circumstances the relative number of advanced stages of development will increase with the advancing season. In the area investigated we, however, find a decrease of the number of eggs with pigmented embryos and an increase of the younger stages, which means that the stock of cod eggs were further developed at the middle of March than a fortnight later. This peculiarity has its explanation in the hydrographical conditions. On March 14th—15th and before that time a considerable inflow of salt water from the Great Belt into the western Baltic took place, and there was evidently no outflow of Baltic water in the upper strata. The inflowing salt water has, undoubtedly, carried a great number of cod eggs southwards through the Belt. The stock of cod eggs, found at this time in the investigated areas, consisted, therefore, partly of eggs spawned in the same areas, partly of eggs originating further north, from the Great Belt or even, in some instances, from the southern Kattegat. It is evident that such eggs, having been carried by the current from distant places, must all be in older developmental stages. Thus, I think, it is the imported eggs which have caused the relatively larger number of older stages to be found in the Langelandsbelt and in the western Baltic. At the two northernmost stations also a few larvæ were found. During the subsequent time a large amount of brackish water forced its way from the Baltic proper into the Belt Sea, passing mainly into the Great Belt, where it caused a very low salinity in the upper strata. Probably this brackish water contained none or very few cod eggs, as in the Baltic proper the spawning of the cod takes place mainly in the deeper parts, where the water has a higher salinity, and where the eggs remain. It will also be observed (table VII) that during the second cruise practically no cod eggs occurred in the upper strata. Nevertheless the great outflow of Baltic water has influenced the stock of cod eggs in the southern Belt Sea, because it retained to a considerable degree the usual undercurrent of salt water. From the hydrographical observations it seems probable that the southern Belt Sea at that time received very little water from the north and, accordingly, that the import of older stages of cod eggs from the northern Belt Sea was stopped. The eggs, imported at the middle of the month, have now completed their development (larvæ were

Table V. Gadus callarias. Average number of living eggs per m^2 surface.

Station no.	14.—15. III	27.—29. III
IA	—	29
I..........	63	132
II..........	29	221
III.........	48	31
IV	165	146
V	105	188
VI	57	65
VII	29	14
Total average (stat. IA excl.)	71	114

Table VI. Gadus callarias. Absolute and percentage number of eggs in the various developmental stages, caught by the bottom—surface hauls.

Station no.	Number of eggs found											
	March 14th—15th						March 27th—29th					
	nE	G	yE	pE	pO	Total	nE	G	yE	pE	pO	Total
I—III	3	54	9	39	1	106	2	236	19	50	11	318
IV—VII	49	144	13	78	2	286	12	240	10	22	2	286
Total...	52	198	22	117	3	392	14	476	29	72	13	604

Station no.	% of unfertilized eggs	Per cent. of the stages of living eggs					% of unfertilized eggs	Per cent. of the stages of living eggs				
		G	yE	pE	pO	Total		G	yE	pE	pO	Total
I—III	3	52	9	38	1	100	1	75	6	16	3	100
IV—VII	17	61	5	33	1	100	4	87	4	8	1	100
Total...	13	58	7	34	1	100	2	81	5	12	2	100

Table VII. Gadus callarias. Average number of living eggs per one haul from different depths.

Station no.	March 14th—15th			March 27th—29th		
	upper strata	intermed. + upper strata	bottom —surface	upper strata	intermed. + upper strata	bottom —surface
IA	—	—	—	0	—	10
I.............	1	17	21	0	15	44
II............	1	—	9	0	25	74
III...........	0	—	16	0	—	10
IV	3	—	55	0	0	49
V	5	—	35	3	—	63
VI	6	—	19	0	3	22
VII	11	—	10	0	—	5

found at stat. I, III, and VI, see below), and no older stages have been imported. It is quite comprehensible, therefore, that the absolute, as well as the relative number of eggs in older stages decreased during the fortnight between the two cruises, at the same time as the total number of eggs was considerably increased.

We may state that the considerable increase of the total number of eggs per m² surface really means that the maximal spawning of the cod in the southern Belt Sea occurred nearer to the end of March than to the middle of the month.

Table VIII. Gadus callarias. — Average diameter (mm) of eggs caught by the bottom—surface hauls.

Station no. . .	IA	I	II	III	IV	V	VI	VII	I—VII
14.—15. III. .	—	1.40	1.45	1.42	1.41	1.42	1.38	1.38	1.42
27.—29. III. .	1.45	1.39	1.40	1.34	1.36	1.35	1.30	1.35	1.37

There still remain a few words to be said of the size of the cod eggs. Table VIII gives the average diameters of the eggs, caught by the bottom—surface hauls at each station. On the first cruise the size was slightly but evenly decreasing from stat. II in the Baltic towards both of the Belts. On the second cruise the largest eggs were found at stat. IA—II. The eggs from the other stations were somewhat smaller, with no regular decrease towards the Great Belt. All stations considered, the total average shows a decrease of the diameter of 0.05 mm during the fortnight between the two cruises.

Very few larvæ of the cod were found, all of which were newly hatched, 4 mm long (see table XVIII). During the first cruise 3 larvæ were found at stat. VI and VII (in the Great Belt). During the second cruise larvæ were present in the Baltic, *viz.* at stat. I (1 specimen) and stat III (2 specimens); moreover one specimen was found at stat. VI in the Great Belt.

Onos cimbrius.

(Table IX.)

I the western Baltic the spawning of *Onos cimbrius* begins in January or February, and reaches its maximum in May. The species is fairly common in the Belt Sea. During the first cruise of the "Falken" eggs of *Onos* were missing. During the second cruise altogether 19 eggs were found. One was unfertilized and one contained young embryo. The remaining 17 eggs were in the stage of germinative disk. Eggs of this species occurred at almost every station, particularly in the lower strata. The size of the *Onos* eggs is mentioned above. Table IX gives a general view of all the eggs found.

Table IX. Number of eggs of Onos cimbrius.

Stat. no.	Date	Depth m	nE	G	yE
IA	29. III	26—0	. .	1	. .
		26—0	. .	5	. .
		26—0	1	1	. .
I.	28. III	38—0	. .	1	. .
II.	—	32—0	. .	1	. .
		20—0	. .	1	. .
IV	27. III	26—0	. .	1	. .
		26—0	. .	1	. .
		14—0	. .	1	. .
VI	—	40—0	. .	. .	1
		40—0	. .	2	. .
VII	—	20—0	. .	2	. .
Total. . .			1	17	1

Drepanopsetta platessodeis.

This species is common in the Belt Sea and the western Baltic. The spawning period lasts from January to May, maximum in March—April. During the cruises of the "Falken" only four eggs of the long rough dab were found:

Stat.	Date	Depth m	Number of eggs	Stage	Diam. mm
V	14.III	40—0	1	*yE*	1.85
VI.	—	38—0	1	*G*	1.80
,, ...	—	38—0	1	*pE*	2.10
II	28.III	32—0	1	*G*	1.75

Pleuronectes platessa.

(Table X—XV and fig. 3.)

The Belt Sea is the part of the Danish waters in which the greatest number of plaice eggs are generally found. The spawning takes place in this area from November to the beginning of May, with maximum in February—March. In February frequently more than 100 eggs have been found per m² surface, on one occasion (1908) even as many as 1505. In March 1922 the number of plaice eggs was comparatively small, only on one occasion (stat. V, March 27th) the number exceeded 100 eggs per m² surface. A great deal of the eggs found in the Belt Sea are spawned there, but besides, a considerable number are, as a rule, carried in from the Kattegat by the undercurrent through the channels of the Belts. And as the development of the plaice eggs is comparatively slow (by 2° C. about 38 days from spawning to hatching) there is a possibility of the eggs being carried away over fairly great distances.

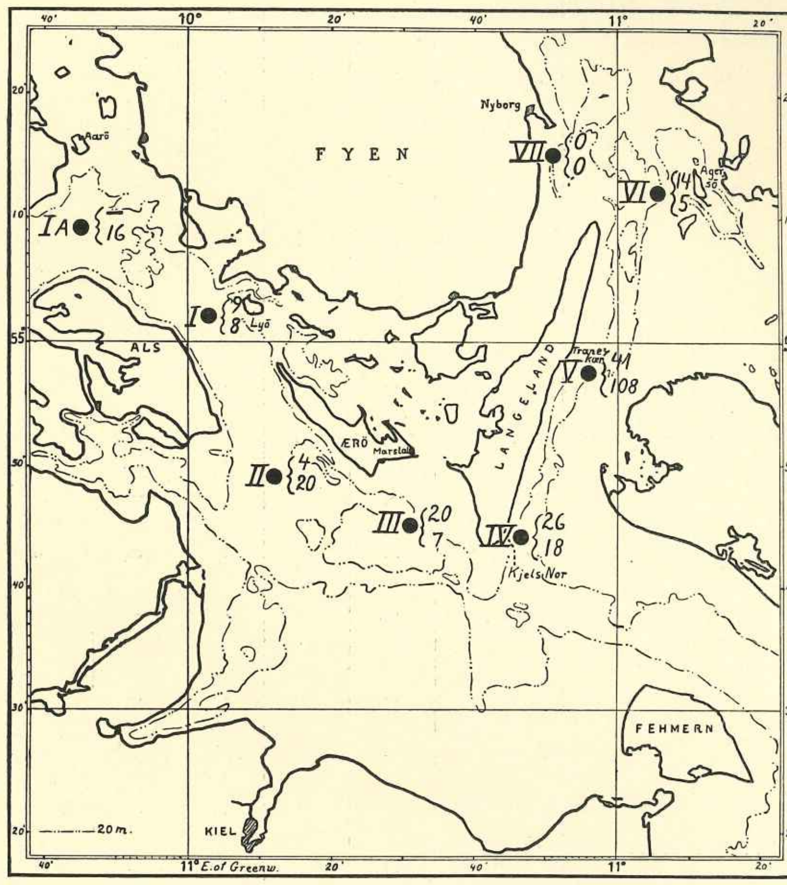

Fig. 3. Number of living eggs of *Pleuronectes platessa* per m² surface. — The uppermost figure at each station represents the number of eggs from the first cruise (March 14th—15th), the lowermost figure that from the second cruise (March 27th—29th).

Table X gives the actual numbers of eggs in the various developmental stages, taken by each haul. Table XI and fig. 3 give the average number of eggs per m² surface at each station. At both of the cruises the greatest number of eggs were found at station V in the Langelandsbelt; generally spoken, the number was decreasing towards the Great Belt, as well as towards the Baltic and the Little Belt. About the middle of March a considerable inflow of salt water took place from the Great Belt into the Baltic. The small number of plaice eggs, found at the stations in the Great Belt, indicates that very few eggs of this species (in contradistinction to the cod, see above) were carried southwards by this inflowing water, so that we may suppose that practically all the eggs, found at the other stations, have been spawned in no considerable distance from the localities where found. Towards the end of March practically no inflow of salt water took place, which means that in both cases we have to do with a stock of plaice eggs, indigenous to the southern Belt Sea. The facts are, accordingly, not so complicated as in the case of the cod (see above).

Tabel XI demonstrates that the general average number of eggs was somewhat larger at the end of March than at the middle of the month. This is due, however, only to two of the stations, and mainly to stat. V. At all other stations the number had decreased during the fortnight between the two cruises. This indicates that the time of maximal spawning was in most localities nearer to the first than to the second cruise, though at stat. V the opposite might have been the case. We must, however, take into consideration the developmental stages of the eggs (see table XII). We will find then that in the case of stat. I—IV (the Baltic and the southern part of the Langelandsbelt) the absolute as well as the percentage

Table X. Pleuronectes platessa. — General view of the material.

Station no.	March 14th—15th						March 27th—29th					
	Depth m	nE	G	yE	pE	Total	nE	G	yE	pE	Total	Depth m
IA	—	—	—	—	—	—	..	1	..	1	2	10—0
	—	—	—	—	—	—	..	1	..	..	1	26—0
	—	—	—	—	—	—	..	4	1	5	10	26—0
	—	—	—	—	—	—	..	1	2	2	5	26—0
I	10—0	..	..	..	..	0	..	..	..	..	0	7—0
	20—0	..	1	..	..	1	..	2	..	1	3	15—0
	38—0	..	4	..	..	4	..	..	..	2	2	38—0
	38—0	..	2	..	..	2	..	4	..	..	4	38—0
	—	—	—	—	—	—	..	1	1	..	2	38—0
II	10—0	..	1	..	..	1	..	..	..	..	0	10—0
	30—0	1	1	..	..	2	..	1	1	4	6	20—0
	30—0	..	2	..	..	2	..	3	..	5	8	32—0
	30—0	..	1	..	..	1	..	2	..	3	5	32—0
III	10—0	..	..	..	..	0	..	..	..	..	0	10—0
	21—0	1	7	..	..	8	..	..	..	..	0	26—0
	21—0	1	5	1	..	7	..	1	2	1	4	30—0
	—	—	—	—	—	—	..	..	1	1	2	30—0
	—	—	—	—	—	—	..	..	..	1	1	32—0
IV	10—0	..	3	..	..	3	..	..	..	..	0	10—0
	—	—	—	—	—	—	..	..	..	1	1	14—0
	31—0	..	4	2	2	8	..	6	..	1	7	26—0
	31—0	..	7	1	1	9	..	3	..	2	5	26—0
V	10—0	..	3	..	..	3	..	..	2	1	3	20—0
	40—0	..	12	3	..	15	..	19	9	4	32	42—0
	40—0	..	9	2	1	12	..	26	8	6	40	42—0
VI	10—0	..	3	..	..	3	..	..	..	..	0	10—0
	—	—	—	—	—	—	..	..	..	..	0	20—0
	38—0	..	1	3	..	4	1	..	..	3	4	40—0
	38—0	..	3	2	..	5	..	..	..	..	0	40—0
VII	10—0	..	..	..	1	1	..	..	..	..	0	10—0
	20—0	..	..	..	..	0	..	..	..	..	0	20—0
	20—0	..	..	..	..	0	..	..	..	..	0	20—0

number of eggs, containing germinative disk, had decreased considerably during the fortnight between the two cruises, at the same time as the number of eggs with pigmented embryos had increased nearly 6 times (from 7 to 41 %). The figures clearly demonstrate that the first cruise must have been nearly contemporaneous with the time of maximal spawning in this region. As regards stat. V, we find also here a decrease in the number of the youngest stages and an increase in the number of advanced stages, though the difference is not so considerable as in the case of stat. I—IV. Still also here the maximal spawning must have occurred at a time nearer to the first than to the second cruise. The considerable increase of the number of eggs per m² surface at stat. V may be due to casual circumstances. In this locality the bottom of the channel forms a trough which may, in some way, act as a trap to the fish eggs, particularly when the usual undercurrent comes to a stand-still, as was really the case at the end of March.

The number of eggs, found at stat. VI (in the Great Belt) is too small to serve as a base for definite conclusions. On March 27th only 3 living eggs of the plaice were found in this locality, all of which contained pigmented embryos. — The very large percentage number of eggs in the youngest developmental stage (*G*), found at the first cruise, demonstrates that the maximal spawning of the plaice in the Belt Sea must have been almost contemporaneous with that cruise; if the maximum had been reached at any considerable time before the middle of March, we might have expected to find a larger number of eggs in older stages. The two principal results of our investigations, as far as the plaice is concerned, are as follows: 1) The spawning was somewhat retarded in 1922 in comparison with other years; this is probably due to the low temperature of the water in that severe winter. 2) The number of eggs per m² surface at the time of maximal spawning was comparatively small; the general average number was only 16, the largest number found was 41 per m² surface. This is considerably less than the number, found at the time of maximal spawning (in February) in most other years.

Table XI. Pleuronectes platessa. Average number of living eggs per m² surface.

Station no.	14.—15. III	27.—29. III
IA	—	16
I...........	9	8
II..........	4	20
III.........	20	7
IV	26	18
V	41	108
VI	14	5
VII	0	0
Total average (stat. IA excl.)	16	24

STRODTMANN (1918, p. 37) has given a tabular view of the number of plaice eggs per m² surface at the German plankton stations I—V in the western Baltic in different years. The positions of the German stations are not identical with those of the "Falken", but a general idea of the decrease in number of eggs may be gained by a comparison between the results from the German stations I—III, and the Danish stations I—IV, all of which are within the same area: between Als Sound and Fehmern Belt. In table XIII I have calculated the average number of eggs per m² surface from the said German stations (D. I.—III) in February and March in the years 1903, 4, 5, 6, 7, 9, and 11, and the average number found at the Danish stations (Da. I.—IV) on March 14th—15th and 27th—28th 1922 As stat. D. II is very near by Da. I, I have included in the table the actual numbers of eggs found at these stations. As seen from the table the average number of eggs per m² surface at the time of maximal spawning varied between 48 and 142 in the different years from 1903 to 1911; in 1922 it was only 15. In the latter half of March the number of plaice eggs usually greatly decrease; still, the numbers found at the German stations in March 1906, 1909, and 1911 in every instance surpass the numbers found in March 1922, although in that year the maximal spawning took place in that very month. Unfortunately we have no data for a similar comparison between the numbers of eggs found in the Great Belt and the Langelandsbelt in 1922 and in previous years; the only record is the one, mentioned above, from February 1908, when 1505 eggs per m² surface were found in the Langelandsbelt (comp. A. C. JOHANSEN 1911).

Table XII. Pleuronectes platessa. Absolute and percentage number of eggs in the various developmental stages, caught by the bottom—surface hauls.

Station no	Number of eggs found									
	March 14th—15th					March 27th—29th				
	nE	G	yE	pE	Total	nE	G	yE	pE	Total
I—IV	3	33	4	3	43	0	20	4	17	41
V	0	21	5	1	27	0	45	17	10	72
VI	0	4	5	0	9	1	0	0	3	4
Total...	3	58	14	4	79	1	65	21	30	117

Station no.	nE %	Per cent. of the stages of living eggs				nE %	Per cent. of the stages of living eggs			
		G	yE	pE	Total		G	yE	pE	Total
I—IV	7	83	10	7	100	0	49	10	41	100
V	0	78	18	4	100	0	62	24	14	100
VI	0	44	56	0	100	1	0	0	100	100
Total...	4	76	19	5	100	1	56	18	26	100

Table XIII. Pleuronectes platessa. — Number of living eggs per m² surface in the western Baltic in different years. (D. I—III: German seasonal stations, after Strodtmann 1918; Da. I—IV: Danish stations from the cruises of the "Falken" 1922).

Year	1903	1904	1905	1906			1907	1909		1911		Febr. 1903—1911	1922		
Date	Febr.	Febr.	30. Jan.—1. Febr.	2.—4. Febr.	28. Febr.—2. March	27.—28. March	4.—5. Febr.	7.—18. Febr.	20. March	27. Febr.	25. March		14.—15. March	27.—28. March	
Stat. D. II	5	77	97	118	51	35	21	57	24	132	24	81	9	8	Stat. Da. I.
Stat. D. I.—III.	142	79	53	56	64	118	36	48	48	93	16	80	15	13	Stat. Da. I-IV.

The considerable decrease in numbers of pelagic plaice eggs at the time of maximal spawning demonstrated in table XIII indicates that the stock of breeding plaice in the Belt Sea has greatly decreased. I have already pointed out that the number of eggs was particularly small in the Great Belt (stat. VI and VII).

As regards the vertical distribution of the eggs, we find (table XIV) that during the first cruise, when the salinity of the upper strata was comparatively high, nearly $^1/_3$ of the eggs were caught in the surface layers. During the second cruise, when the upper strata had a very low salinity, the surface layers contained practically no eggs. At stat. I—II most of the eggs seem to have occurred in the intermediate water layers.

Table XIV. Pleuronectes platessa. — Average number of living eggs per one haul from different depths.

Station no	March 14th—15th			March 27th—29th		
	upper strata	intermed. + upper strata	bottom —surface	upper strata	intermed. + upper strata	bottom —surface
IA	—	—	—	2	—	5
I	0	1	3	0	3	3
II	1	—	1	0	6	7
III	0	—	7	0	—	2
IV	3	—	9	0	1	6
V	3	—	14	3	—	36
VI	3	—	5	0	0	2
VII	1	—	0	0	0	0

As to the size of the eggs (table XV) we observe a very slight decrease of the general average diameter during the fortnight between the two cruises, but at some stations the opposite is the case. From most stations the material is, however, so small that we cannot lay much stress upon the results. Only the general average may be somewhat correct, and it shows a decrease in size of 0.03 mm.

Table XV. Pleuronectes platessa. — Average diameter (mm) of eggs caught by the bottom—surface hauls.

Station no.	IA	I	II	III	IV	V	VI	VII	I—VII
14.—15. III	—	1.79	1.72	1.76	1.79	1.81	1.80	..	1.79
27.—29. III	..	1.76	1.81	1.80	1.73	1.74	1.83	..	1.76

Pleuronectes limanda + flesus.

(Table XVI—XVII and fig. 4.)

The dab is the most abundant of the flat fishes in the Belt Sea. It spawns from the end of January to July or somewhat later. The maximal spawning occurs in April—June. The flounder is likewise very common in the Belt Sea. The maximal spawning takes place in March—April. — As mentioned above, it is difficult to distinguish between the eggs of the two species. As far as stat. I—IV are concerned, we may, however, separate the species without much doubt, but as regards stat. V—VII we must restrict ourselves to state which of the species constitutes the main part of the eggs found, without giving precice data. — Table XVI and fig. 4 give the average number of eggs per m² surface. In table XVII is presented the actual number of eggs in each developmental stage contained in each of the hauls, in so far as the species in question were present at all.

During the first cruise the flounder eggs were missing at stat. I and II; at stat. III one single egg was found. In the Great Belt and the Langelandsbelt, on the other hand, the species was fairly common, and not a few of the eggs were in advanced stages of development. During the second cruise flounder eggs were found everywhere. They were somewhat rare at stat. I—IV, and most of the eggs found here were in the stage of germinative disk. In the northern part of the Langelandsbelt and in the Great Belt (stat. V —VII) the flounder eggs were common, and several eggs contained pigmented embryos. Considering that the flounder is known to be very abundant in the western Baltic we may conclude that the spawning commenced considerably earlier in the Great Belt than in the southern part of the area investigated, and, further, that in the western Baltic the spawning had only just commenced at the middle of March. The comparatively large number of flounder eggs at stat. IV on March 14th may, at least partly, be due to transport of eggs with the southgoing undercurrent. At this station the number of flounder eggs decreased considerably during the fortnight between the two cruises.

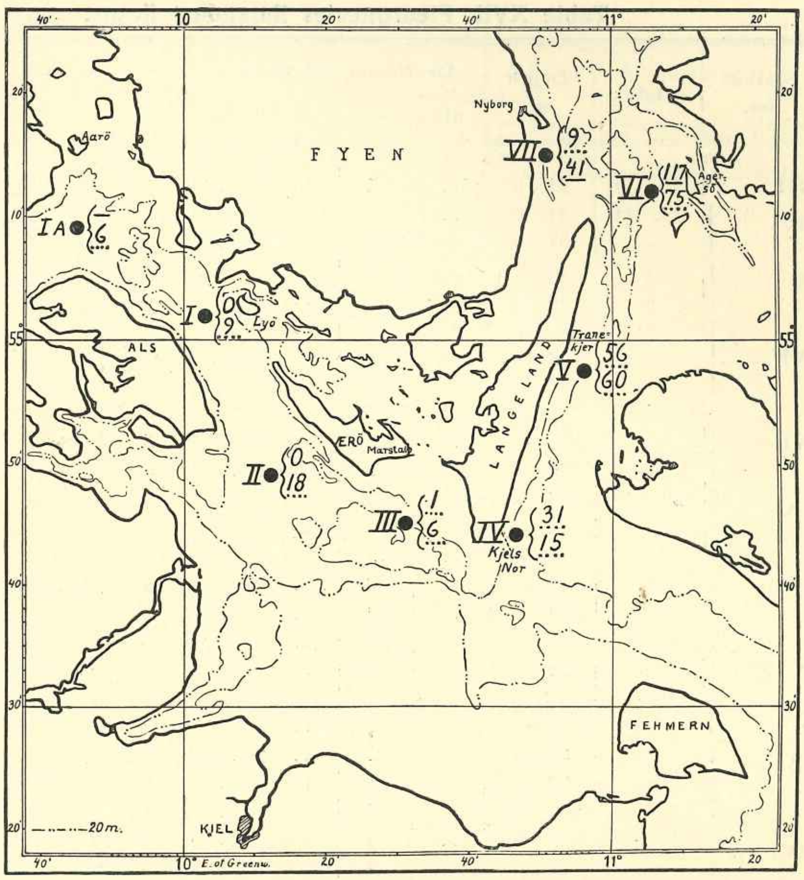

Fig. 4. Number of living eggs of *Pleuronectes limanda* + *flesus* per m² surface. — The uppermost figure at each station represents the number of eggs from the first cruise (March 14th—15th), the lowermost figure that from the second cruise (March 27th—29th). — A line below the figure indicates that *Pl. limanda* constitutes the main part of the eggs. Dots indicate that *Pl. flesus* exceeds the other species in number.

Table XVI. Pleuronectes limanda + flesus. Number of eggs pr. m² surface.

Station no.	March 14th—15th			March 27th—29th		
	limanda	flesus	limanda + flesus	limanda	flesus	limanda + flesus
IA	—	—	—	0	6	6
I	0	0	0	0	9	9
II	0	0	0	3	15	18
III	0	1	1	2	4	6
IV	0	31	31	?1	14	15
V	..	..	56	..	..	60
VI	..	..	**117**	..	..	75
VII	..	..	9	..	..	**41**

Fat types indicate that Pl. limanda constitutes the main part of the eggs, common types that Pl. flesus is the more numerous species.

At the middle of March no eggs of the dab were found in the western Baltic and the southern part of the Langelandsbelt at the same time as the species was common in the Great Belt (stat. VI), whence a considerable number of eggs were carried southwards with the undercurrent (until stat. V). During the second cruise a few dab eggs were found in the western Baltic (stat. II and III, young stages only). Still at stat. IV and V (in the Langelandsbelt) the dab eggs were scarce. Several eggs were found in the Great Belt (stat. VI) and at the mouth of the Nyborg Bay (stat. VII). A compara-

Table XVII. Pleuronectes limanda + flesus.

Station no.	Date	Depth m	Developmental stages				Total	Remarks
			nE	G	yE	pE		
III.....	15. III	21—0	..	1	..	..	1	flesus
IV.....	14. III	31—0	..	6	1	1	8	probably all flesus
	—	31—0	1	12	..	..	13	
V......	—	40—0	..	16	1	6	23	most flesus
	—	40—0	..	9	..	5	14	
VI.....	—	10—0	..	2	..	..	2	mainly limanda
	—	38—0	..	36	2	4	42	
	—	38—0	..	31	1	4	36	
VII....	—	10—0	..	3	..	..	3	probably most flesus
	—	20—0	..	3	..	..	3	
	—	20—0	..	2	1	..	3	
IA.....	29. III	26—0	..	2	..	..	2	flesus
	—	26—0	..	4	..	..	4	
I.......	—	15—0	..	..	1	..	1	probably all flesus
	—	38—0	..	3	..	1	4	
	—	38—0	..	4	..	1	5	
II......	28. III	20—0	..	2	..	..	2	mainly flesus
	—	32—0	..	4	..	1	5	
	—	32—0	..	6	..	1	7	
III.....	—	26—0	..	1	..	..	1	mainly flesus
	—	30—0	..	2	..	..	2	
	—	30—0	..	3	..	..	3	
	—	32—0	..	1	..	..	1	
IV.....	27. III	26—0	..	4	..	..	4	mainly flesus
	—	26—0	..	6	..	..	6	
V......	—	20—0	..	2	..	..	2	mainly flesus
	—	42—0	1	9	..	1	11	
	—	42—0	..	21	4	4	29	
VI.....	—	20—0	1	3	..	1	5	about equal number of limanda and flesus
	—	40—0	..	11	..	3	14	
	—	40—0	1	26	2	7	36	
VII....	—	20—0	3	8	3	5	19	mainly limanda
	—	20—0	..	7	..	1	8	

tively large number of the eggs found here were in advanced stages of development. Thus we find that also in the case of the dab the spawning began considerably earlier in the Great Belt than in the western Baltic. In the latter area it just commenced at the end of March.

This peculiar fact may be due to the temperature of the water being much lower in the western Baltic and the southern part of the Langelandsbelt than in the Great Belt. The temperatures of the bottom layers were very little altered during the fortnight between the two cruises. At stat. I—IV the temperature at the bottom did not exceed 2°6 (average on March 14th 2°46, on March 27th—29th 2°41). In the Great Belt (stat. VI) the bottom temperature was about 4°.

Three newly hatched lærvæ of *Pleuronectes*, found at stat. VII on March 27th, probably belong to one of the species here mentioned.

Larvæ of demersal eggs.

(Table XVIII).

Lumpenus lampetræformis.

3 larvæ, 20—22 mm long, were found in bottom—surface hauls at stat. III, IV and V, March 27th—28th. This species is very common in the deeper parts of the Belt Sea, where the eggs are spawned in December—January.

Centronotus gunellus.

This common littoral species spawns during the winter from November to January. During the first cruise of the "Falken" one larva, 10 mm long, was found at stat. V. During the second cruise two larvæ were found at stat. III and V, length 14—16 mm.

Liparis sp.

Liparis montagui lives in the Kattegat and the Belts, but has not been found in the Baltic. The breeding time is from February to April. — *Liparis liparis* penetrates far into the eastern Baltic, it breeds

Table XVIII. Larvæ.

Station no.	Depth m	Date	Lumpenus lampetræformis		Centronotus gunellus		Liparis sp.		Pleuronectes sp.		Gadus callarias		Ammodytes sp.	
			number	size mm	number	size mm	number	size mm	number	size mm	number	size mm	number	size mm
I	10—0	15. III	..	..	..	..	..	..	..	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	..	..	..	..
II	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	30—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	30—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	30—0	—	..	..	..	..	..	..	..	..	..	..	..	..
III	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	21—0	—	..	..	..	..	..	..	..	..	..	..	1	9
	21—0	—	..	..	..	..	..	..	..	..	..	..	..	..
IV	10—0	14. III	..	..	..	..	..	..	..	..	..	..	..	..
	31—0	—	..	..	..	..	..	..	..	..	..	..	2	9, 11
	31—0	—	..	..	..	..	..	..	..	..	..	..	3	8, 9, 9
V	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	40—0	—	..	..	1	10	..	..	..	..	..	..	..	..
	40—0	—	..	..	..	..	..	..	..	..	..	..	..	..
VI	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	2	4	..	..
	38—0	—	..	..	..	..	..	..	..	..	..	..	1	10
VII	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	1	4	..	..
IA	10—0	29. III	..	..	..	..	..	..	..	..	..	..	..	..
	26—0	—	..	..	..	..	1	5	..	..	..	..	..	..
	26—0	—	..	..	..	..	..	..	..	..	..	..	2	13, 14
	26—0	—	..	..	..	..	..	..	..	..	..	..	..	..
I	7—0	28. III	..	..	..	..	..	..	..	..	..	..	..	..
	15—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	38—0	—	..	..	..	..	..	..	..	..	1	4	..	..
II	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	32—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	32—0	—	..	..	..	..	..	..	..	..	..	..	..	..
III	10—0	—	..	..	..	..	..	..	..	..	..	..	2	12, 12
	26—0	—	..	..	..	..	..	..	..	..	..	..	1	12
	30—0	—	1	20	1	16	..	..	..	..	..	..	..	..
	30—0	—	..	..	..	..	..	..	..	..	..	..	1	12
	32—0	—	..	..	..	..	..	..	..	..	2	4	1	9
IV	10—0	27. III	..	..	..	..	..	..	..	..	..	..	..	..
	14—0	—	..	..	..	..	..	..	..	..	..	..	1	12
	26—0	—	..	..	..	..	..	..	..	..	..	..	1	9
	26—0	—	1	22	..	..	..	..	..	..	..	..	4	9, 9, 11, 12
V	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	42—0	—	..	..	1	14	..	..	..	..	..	..	7	9,10,11,11,12,12,14
	42—0	—	1	20	..	..	1	6	..	..	..	..	1	13
VI	10—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
	40—0	—	..	..	..	..	..	..	..	..	1	4	4	9, 11, 12, 13
	40—0	—	..	..	..	..	..	..	..	..	..	..	4	8, 10, 10, 12
VII	10—0	—	..	..	..	..	..	..	..	..	..	..	1	9
	20—0	—	..	..	..	..	..	..	3	..	..	..	..	..
	20—0	—	..	..	..	..	..	..	..	..	..	..	..	..
Total...	..	14-15. III	0	..	1	10	0	..	0	..	3	4	7	8—11
— ..	..	27-29. III	3	20—22	2	14—16	2	5—6	3	..	4	4	30	8—14

from November to February. Two small larvæ (5—6 mm long) were found at stat. I A (March 29th), and stat. V (March 27th) in bottom—surface hauls. They probably belong to the latter species.

Ammodytes lancea.

Both species of *Ammodytes* are common in the Belt Sea, but as *A. lanceolatus* breeds in May—July (August), whereas *A. lancea* breeds in the autumn, and the eggs are hatched during the winter, it seems probable that the larvæ, found in the Belt Sea in March, all belong to the latter species. — During the first cruise only 7 larvæ of *Ammodytes* were found; they were all very small, 8—11 mm. During the second cruise *Ammodytes* larvæ were common, particularly at stat. III—IV. Altogether 30 specimens were found. Some of them were small (from 8 mm), but specimens up to 14 mm long were found. The average size was 11 mm.

Summary.

The eggs of cod, plaice, flounder, and dab are so plentifully represented in the present material that we can make a number of important conclusions concerning their occurrence in the Belt Sea in March 1922. The hydrographical conditions were somewhat peculiar and have influenced the occurrence of the fish eggs in different ways. The preceding winter was very severe, and the temperature of the water was still fairly low in March, particularly in the western Baltic. This low temperature has evidently retarded the spawning of all the above-mentioned species of fish. Before the middle of March the south-going undercurrent in the Great Belt was very strong and carried a considerable number of fish eggs southwards through the Belt. Towards the end of the month a considerable outflow of Baltic water took place in the surface layers, and there was only a very slight undercurrent, so that the import of fish eggs from the Great Belt was stopped.

The earliest spawning fish of the above four species is the plaice (*Pleuronectes platessa*). As a rule it has its maximal spawning in February, but in 1922 the spawning was retarded and did not reach its maximum until about the middle of March. The number of eggs found was comparatively small; at the time of maximal spawning the average number in the western Baltic (stat. I—IV) was only 15 eggs per m^2 surface. For the period 1903—1911 the total average number at the time of maximal spawning, found at the German stations within the same area, amounted to 80 per m^2 surface, varying between 48 and 142. — Practically no eggs of the plaice were imported by the undercurrent, evidently because very few spawning plaice were present in the Great Belt.

Also the spawning of the cod (*Gadus callarias*) was somewhat retarded in 1922. The maximum was reached towards the end of March. Eggs of the cod were abundant everywhere in the investigated area A great deal of the eggs, found at the middle of March, were imported from the Great Belt. At the end of the month (at the time of maximal spawning) the average number was 114 per m^2 surface, the greatest number observed was 221 (stat. II).

As regards the flounder (*Pleuronectes flesus*) and the dab (*Pl. limanda*) the spawning was somewhat advanced in the Great Belt at the middle of March, and not a few eggs were then carried from the Great Belt into the Langelandsbelt, but did not reach the Baltic. In the western Baltic, where the temperature of the water was particularly low, the spawning of the flounder just commenced at the middle of March, and the dab did not begin spawning until towards the end of the month. As the investigations took place a considerable time before the maximal spawning of the two species, we cannot draw any valuable conclusions from the absolute number of eggs found.

It is common to all species here mentioned that by far the greatest number of eggs were found in the bottom layers of the water. Various circumstances indicate that the bulk of the eggs are crowded within narrow limits along the deep channels, where they are carried away by the currents.

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