International Council for the Exploration of the Sea

C.M. 1974/H: 25
Pelagic Fish (Northern) Committee

Occurrence and stock composition of North Sea sprat in 1973

by

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Investigations on North Sea sprat were carried out for some ten years but intensified since 1972. Some results of cruises of the FRV of the G.D.R. in the second half of 1973 are shown in this paper.

Material and methods

Investigations in 1973 were carried out only aboart the FRV. In the following times and areas works on sprat were done:

FRV	time	Areas
E. Haeckel	21. 6. - 10. 7.	Orkneys, The Gut, Farn Deeps, Dogger, Smith Knoll, Austern Ground
Eisbär	3. 7. - 23. 7.	Smith Knoll, SE Silver Pit, Austern Ground, Clay Deep, Farn Deeps
Eisbär	6. 9. - 12. 9.	The Gut, Farn Deeps, Dogger
	26. 9. - 19.10.	Farn Deeps, Bruceys Garden, Clay Deep
Eisbär	1.12. - 10.12.	Farn Deeps, Dogger, Deutsche Bucht

Samples were taken by pelagic trawls (1200 resp. 1370 meshes in the mouth) with a trawling speed of 3.5 resp. 3.8 knots. The mesh size of cod end was 11 mm. Sampling was in accordance with the methods of ICES.

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Occurrence of sprat shoals

In figure 1 areas are shown, where sprat concentrations were found in summer and autumn 1973.

In the last days of June and early in July the Farn Deeps/ Bruceys Garden-area pale shaped echo traces of sprat wide spreaded near the bottom were found. In the same time at Smith Knoll at first occurred dense, later weak concentrations of sprat. In the southern area the dispersion of concentrations was connected with generally observed increased feeding. Sprat shoals in that area were found only in the range of colder water, at a temperature of 12.5°C - 13.5°C mostly in midwater layers.

Opposite to the findings of Johnson and Hulme in 1969, in July 1973 sprat shoals off the English east coast were more scattered, didn't form stable concentrations for a longer time.

In the area of German Bight/Austern Grund only in summer sprat shoals were found, close to the bottom. Echo traces were like needles or thin pales. Echo traces of the same character in July were found on Botney Ground/SE Silver Pit.

Generally in all areas investigated in summer sprat shoals concentrated in the first half of day, but in the afternoon concentrations scattered and vertical movements were observed. Fishery on scattered echo traces in the afternoon, in evening and by nigth was without success. In summer sprat shoals were markedly movable, probably influencing the trawl catches.

In September on Farn Deeps strong to very strong pale shaped echo traces of sprat were found. This situation lasted up to October, In 1973 this concentrated sprat shoals occurred with some distances between shoals, whereas in last days of August in 1971 and in September 1972 in that area short needle and pale shaped echo traces, combined to "ribbons" were observed.

On Clay Deep in October were found the densest sprat concentrations of the whole investigations in 1973, but catches of FRV often were mixed by herring. Echo traces of sprat were needle or pale shaped from bottom up to 18 m above the bottom. Echo traces of herring in the same area were more point or plume shaped. East of Clay Deep on White Bank (about 6°30'E) in that time only scattered shoals of smaller sprat with a total length of 9-11 cm occured.

Early in December only on Lower Scruff concentrated shoals of 0-group sprats (3-4 cm l_t) were found. Older sprats nowhere formed concentrations of commercial interest in that time.

Observations of occurrence of sprat showed ,that sprat shoals were found in summer at a range of temperature between 8.0 °C and 15.0 °C.

In autumn shoals occurred in the range between 13.0 °C and 8 °C. There seems not to be a relation between the concentrations and the temperature possibly with exception of Smith Knoll area.

In summer (July/August) the sprat seems to form more or less scattered single shoals whereas at the end of the feeding period, in September/October, in some places in 1973 dense concentrations occurred. This observation doesn't agree with Johnsons (1970) assumption that offshore sprat concentration scatter in September/October.

By observations of 1973 the offshore concentration of sprat shoals in some areas is more distinct in autumn than in summer.

Stock composition:

Table 1 summarizes in chronological order the percentages of the age composition, mean length, total numbers sampled within each age group and the overall mean age for each locality sampled.

Determination of age was carried out by means of otoliths. The change from one age group to another is dated on the first of January. In connection with Iles and Johnson (1962) there were defined two groups of sprat, one with both hyaline and opaque metamorphic otolith centre and small diameter up to the first winter ring (group A) and the other with hyaline metamorphic otolith centre and a wider diameter up to the first winter ring (group B).

By the assumption, that sprats of group B are hatching in late summer or autumn and overwintering as larvae, in ageing this group one year was added to the age determined by rings on the otolith.

The 1973 year class was available only in samples from December. The 1972 year class was scarce in June exept the southern North Sea. Its portion increased in Juli in nearly every areas. From September up to October the importance of this year class increased markedly.

The 1971 year class altogether was of moderate importance as well in the northern as in southern areas.

The age group 3 (year class 1970) predominated in June in north-western areas of the central North Sea whereas it took part in a lower number in the southern North Sea. This year class was described by Johnson and Hulme 1937 to have a very strong representation along the north eastern English coastal sector in July 1971. In 1973 it seems to form the main part of spawning shoals at Farn Deeps and in the Bruceys Garden area.

The 1969 year class was of moderate importance and 5 year old or older sprats appeared as a small proportion.

The importance of sprat groups A and B was changing between areas and time of sampling. But it seems group B is more numerous in southern areas than in the northern. For example the portion of group B on Farn Deeps was as follows: in June 14,4 %, in July 30,3 %, in September and October 29,3 %, whereas at Smith Knoll it was as follows: in June 47,8 % and in July 48,7 %.

Compared with the results of Johnson and Hulme of 1971-1972 the mean age of samples in 1973 was insignificantly different from previous years.

The age and length composition from sample to sample in one area was often markedly differing. That situation was observed at Smith Knoll, Austern-Ground, German Bight and at the more northern areas too.

Age composition showed the predominance of year class 1970 in June/July in the Farn Deeps area whereas in southern areas younger age groups predominated in summer. In September/October and in December generally one or two year old sprats were predominating.

References:

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ble 1: Percentage distribution and mean length by age groups 1973

cality	Month		Age groups (year classes) 0 (1973)	1 (1972)	2 (1971)	3 (1970)	4 (1969)	5 (1968)	6 (1967)	7 (1966)	8 (1965)	n ageing	Mean age	n Length measure-ments
ng Forties	June	%	-	3,2	26,2	52,0	16,2	2,4	-	-	-	93	2,88	245
		L	-	11,00	13.32	14.11	14.77	14.50	-	-	-			
of Farn	June	%	-	-	17.9	56.1	20.9	5,1	-	-	-	89	3.13	359
eps		L	-	-	13.82	14.28	15.26	15.49	-	-	-			
ıceys	June	%	-	3.5	28.7	44.1	16.2	6.8	-	-	0.7	83	2.98	418
rden area		L	-	10.65	13.04	13.64	14.69	15.49	-	-	16.75			
ate Hole	June	%	-	0.8	60.4	25.5	12.2	1.1	-	-	-	93	2.52	492
		L	-	9.50	12.89	13.16	14.40	15.66	-	-	-			
ter Silver	June	%	-	-	36.0	37.4	20.0	6.6	-	-	-	94	2.97	268
t		L	-	-	13.00	13.40	13.96	15.16	-	-	-			
ith Knoll	June	%	-	15.8	25.0	30.4	20.9	6.7	1.2	-	-	415	2.81	5637
		L	-	10.21	12.37	13.40	14.20	14.82	15.08	-	-			
of Orkneys	July	%	-	1.3	61.2	30.9	6.6	-	-	-	-	40	2.43	248
		L	-	10.63	12.50	13.44	14.62	-	-	-	-			
of Orkneys	July	%	-	2.2	37,3	42.6	14.4	3.5	-	-	-	97	2.80	440
		L	-	10.70	12.95	13.81	14.30	15.41	-	-	-			
tney Ground	July	%	-	28.2	50.2	16.4	4.5	0.6	0.1	-	-	602	1.99	4900
		L	-	9.81	11.77	12.71	14.16	14.67	15.50	-	-			
ıceys Garden	July	%	-	12.8	40.9	35.7	8.9	1.4	0.3	-	-	208	2.46	2528
		L	-	11.12	12.84	13.82	14.59	14.83	15.75	-	-			

Table 1: (continued)

Locality	Month	Age groups (year classes) 0 (1973)	1 (1972)	2 (1971)	3 (1970)	4 (1969)	5 (1968)	6 (1967)	7 (1966)	8 (1965)	n ageing	Mean age	n Length measure-ments
Weiße Bank	July %	-	20.1	33.4	30.2	14.9	1.4	-	-	-	138	2.44	1046
	L	-	10.38	12.34	13.41	13.99	14.32	-	-	-			
Austern Ground	July %	-	39.5	32.2	17.1	9.7	1.1	-	0.4	-	368	2.02	5090
	L	-	9.76	12.15	13.12	14.36	14.69	-	15.25	-			
Smith Knoll	July %	-	31.5	37.8	18.0	9.8	2.7	0.2	-	-	416	2.15	7612
	L	-	10.02	11.36	12.95	14.00	13.96	16.25	-	-			
W of Orkneys	Aug. %	-	4.5	39.4	47.3	7.7	1.1	-	-	-	46	2.62	515
	L	-	10.1	13.00	13.76	14.44	15.75	-	-	-			
Clay Deep	Aug. %	-	8.1	36.2	33.6	20.9	1.2	-	-	-	44	2.71	775
	L	-	10.77	12.99	14.08	14.70	14.25	-	-	-			
Farn Deeps	Sept.%	-	37.6	55.7	5.1	1.6	-	-	-	-	285	1.71	2193
	L	-	11.12	11.82	12.74	13.09	-	-	-	-			
Whitby	Sept.%	-	-	26.1	46.3	25.5	1.5	0.6	-	-	98	3.04	557
	L	-	-	13.98	14.51	14.90	15.25	15.75	-	-			
Farn Deeps	Oct. %	-	67.3	27.9	4.8	-	-	-	-	-	149	1.38	1592
	L	-	9.55	12.00	12.46	-	-	-	-	-			
Bruceys Garden	Oct. %	-	32.6	33.4	28.3	5.7	-	-	-	-	200	2.07	1256
	L	-	11.21	13.00	14.30	14.24	-	-	-	-			
Whitby	Oct. %	-	35.2	46.8	16.1	1.9	-	-	-	-	149	1.85	1262
	L	-	11.46	12.47	13.57	15.33	-	-	-	-			

Table 1: (continued)

Locality	Month		Age groups (year classes) 0 (1973)	1 (1972)	2 (1971)	3 (1970)	4 (1969)	5 (1968)	6 (1967)	7 (1966)	8 (1965)	n ageing	Mean age	n Length measurements
Clay Deep	Oct.	%	-	48.5	43.9	6.5	1.1	-	-	-	-	250	1.57	2057
		L	-	11.84	12.35	13.30	14.41	-	-	-	-			
Weiße Bank	Oct.	%	-	88.9	9.3	1.8	-	-	-	-	-	99	1.13	1925
		L	-	10.24	11.98	13.45	-	-	-	-	-			
S of Dogger	Dec.	%	1.7	71.2	26.8	0.4	-	-	-	-	-	84	1.26	2343
		L	7.25	10.88	11.75	14.63	-	-	-	-	-			
Lower Scruff	Dec.	%	5.0	66.1	18.3	10.6	-	-	-	-	-	42	1.35	1610
		L	5.69	10.61	12.43	15.24	-	-	-	-	-			

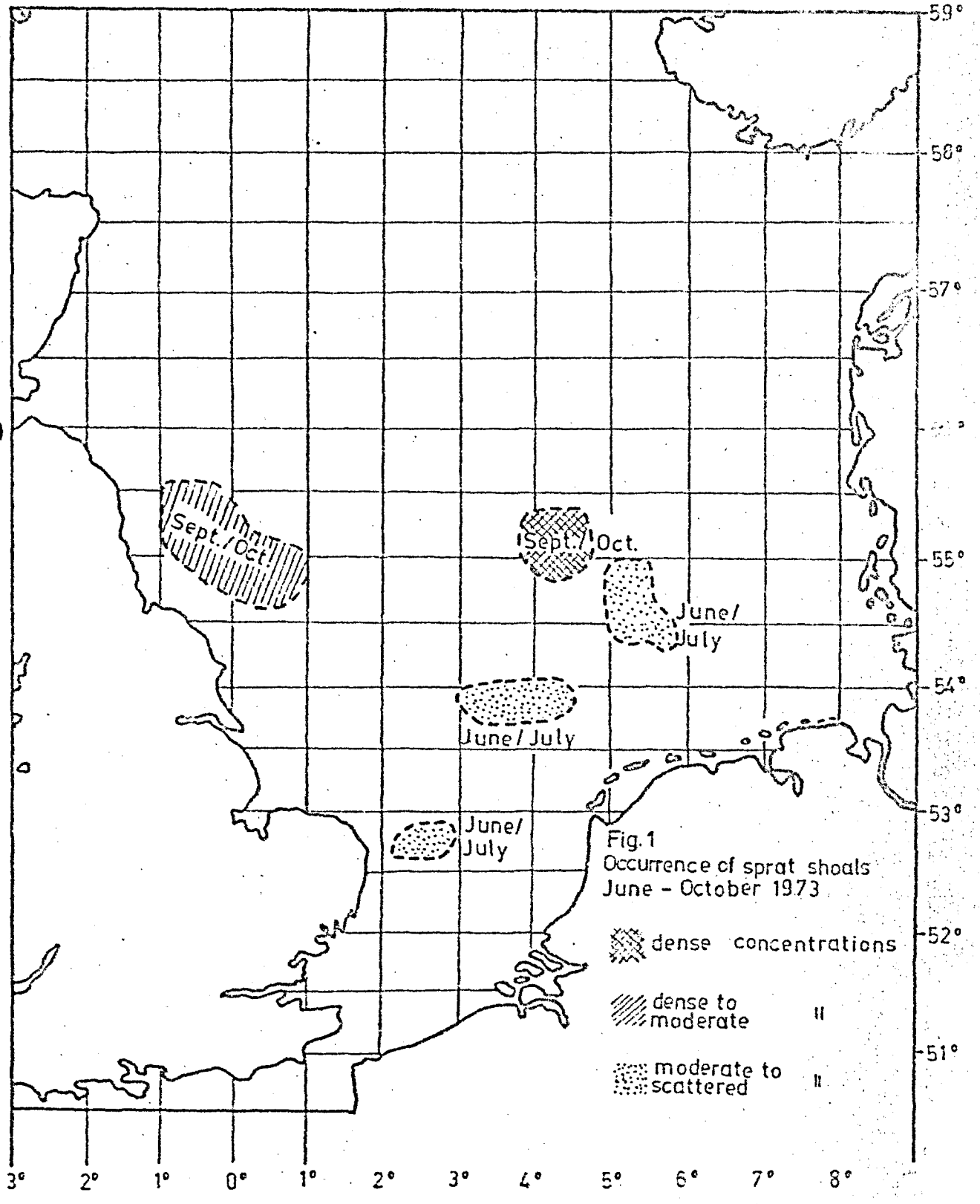

Fig. 1
Occurrence of sprat shoals
June - October 1973