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Investigations on By-Catch in the Herring Fishery in the North Sea in the Years 1966-1967

by
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The investigations are based on material collected by means of 70 and 90 feet nylon herring trawls aboard the research vessel m/t "Birkut" and the fish scouting vessels "Wałpusza", "Zięba" and "Zimorodek" during their trips to the North Sea. In total 10 trips were made in the period under consideration.

In 1966: 1st trip in January-February;
2nd trip in May-June;
3rd and 4th trips in July-August.

In 1967: 1st trip in April;
2nd in July-August;
3rd in August-September;
4th in September-October, and
2 trips in June-July.

In total 281 good hauls were analysed in respect of quantity and species composition (121 hauls were made in 1966 and 160 hauls in 1967). The measurements were performed on 242 samples of protected and non-protected fish. In total, 17,373 specimens of different fish species were measured. The analysed materiel was taken from different areas of the North Sea from the following ICES small squares:

C - 9, 10, 11, 12, 13, 14, 16, 17, 18.
D - 9, 10, 11, 12, 14, 15, 16.
E - 7, 8, 9, 10, 11, 12, 14, 15.
F - 5, 7, 8, 9, 10, 11, 12.
G - 7, 15.
H - 13, 15, 16, 17.
J - 15.
K - 13, 14, 15.
M - 13, 14.

I. Composition of the Ichthyofauna in Experimental Catches in the North Sea

During the investigations, carried out in the North Sea in 1966-67, 43 commercial and non-commercial fish species and 2 species of Crustacea were found.

The total catch examined amounted to a rounded figure of 131 tons. The percentage of particular families in the total catch is given in Table 1.

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Table 1. List of families and their percentage distribution in the total catch.

Families	Number of species	% of Catch
1. Clupeidae	2	51,88
2. Gadidae	6	32,13
3. Scombridae	1	7,78
4. Squalidae and Scyliorhinidae	2	4,12
5. Carangidae	1	1,14
6. Pleuronectidae	7	0,87
7. Triglidae	2	0,43
8. Rajidae	2	0,18
9. Bothidae	2	0,02
10. Anarrhichadidae	1	0,02
11. Soleidae	1	0,01
12. Others:		
Lophiidae	1	
Cyclopteridae	1	
Zoarcidae	1	
Argentinidae	1	
Bramidae	1	1,42
Agonidae	1	
Cottidae	1	
Chimaeridae	1	
Gobiidae	1	
Ammodytidae	1	
T o t a l		100,0 %
		130.705 kg

From the observations on the composition of the ichthyofauna of the North Sea it appears that the number of encountered species is not constant. Differences occur in quantity and species composition depending on the season of the year, depth, and area of investigation.

The classification and the nomenclature are as in ICES publications (Rapp.Proc.-Verb., et Bulletin Statistique).

II. Percentage composition by weight of mixed Catches in the Years 1966-67

The composition of the catches in relation to protected and non-protected species fluctuated in the two years. The data are given in Table 2.

Table 2. Weights and Percentage Composition in experimental Catches.

Item	Species	1966		1967		1966-67	
		kg	%	kg	%	kg	%
1	Herring	40.593	62,6	26.792	40.7	67.385	51,6
2	Protected Species	14.478	22,3	19.530	29,6	34.008	26,0
3	Non-protected commercial species	5.551	8,6	15.5o9	23,5	21.060	16,1
4	Non-protected and non-commercial species	4.169	6,4	4.083	6,2	8.252	6,3
5	Crustaceans	44	0,1	-	-	44	0,1
	T o t a l	64.835	100 %	65.914	100 %	130.749	100 %

Herring in the total catch decreased by 21,9% in 1967, while the percentage of non- protected fish increased by 14,9%. Among the latter, most of the fish caught were mackerel and coalfish. The catches of non-protected commercial fish showed large fluctuations in both years in respect of weight and percentage - from 5.551 kg (8,6 %) in 1966 to 15.509 (23,5 %) in 1967.

III. Percentage of protected and non-protected Species in experimental Catches on Various Fishing Grounds of the North Sea

The observations carried out in various areas of the North Sea included 9 fishing grounds. Those regions in which only a few hauls were made are omitted in this paper. The fishing grounds marked with consecutive numbers and with names, are shown in Figure 1 (according to ICES).

Table 3. Percentages of protected and non-protected species in the total catches on particular fishing grounds.

Number of fishing ground	Name of Fishing ground	Species	
		protected	non-protected
202	Norwegian Channel S	18,4	81,6
203	Norwegian Channel N	15,4	84,6
211	Scotch waters	56,9	43,1
212	Fladen Ground	6,7	93,3
213	Aberdeen Ground	19,3	80,7
214	The Gut	23,2	76,8
219	Farn Deeps	16,1	83,9
220	Dogger Bank	28,5	71,5
225	Southern fishing grounds	3,2	96,8

As seen from the above Table 3 the participation of protected and non-protected fish in the total catches was different on the different fishing grounds. The highest percentage of protected fish species is noted from the fishing grounds Nos. 211, 214 and 220.

It must be kept in mind that the percentage composition as given here is based on samples taken from experimental hauls, and therefore the data have only guiding value.

IV. The Participation of Particular Species of Protected Fish

The weight and the percentage of particular species of protected fish in the catches are given in Table 4 below.

Table 4. Weight and percentage composition of the catches of protected species of fish.

Item	Species	1966		1967		1966-1967	
		kg	%	kg	%	kg	%
1.	Whiting	7.941	54,8	11.031	56,5	18.972	55,8
2.	Haddock	4.856	33,5	4.522	23.1	9,378	27.6
3.	Cod	1.531	10,6	3.283	16,8	4.814	14,2
4.	Flatfish	98	0,7	624	3,2	722	2,1
5.	Hake	52	0,4	70	0,4	122	0,3
	T o t a l	14.478	100 %	19.530	100 %	34.008	100 %

As it appears from the above figures the most abundant were: whiting (55,8%), secondly haddock (27,6%) and in the third place cod (14,2%). Of the other species caught either as single specimens or in very small quantities, only a percentage of 2,4% was found.

V. Length Composition of Protected and Major Commercial (Non-protected) Fish Species

The total length of the fish was measured (longitudo totalis) with an accuracy of 0,5 cm. During the period of investigations the following number of protected and non-protected commercial fish were measured:-

Protected Species	Number of Fish Measured
Whiting	6.837
Haddock	4.038
Cod	874
Hake	115
Other Species	593
T o t al	12.457 individuals

Non-protected commercial species	Number of Fish Measured
Herring	1.851
Coalfish	1.123
Mackerel	915
Horse-mackerel	437
Pollack	415
Sprat	171
T o t a l	4.916 individuals

In total, the present study include measurements of 17.373 fish.

1. Merlangius merlangus - Whiting

The length of captured fish ranged from 9 to 52 cm. The data are given below in Table 5.

Table 5. Quantitative participation of whiting of particular length-classes.

Length-classes in cm	Quantity of Fish	
	No. of fish individuals	In percentage
6-10	3	0,04
11-15	260	3,80
16-20	1.352	19,78
21-25	1.478	21,62
26-30	2.099	30,70
31-35	1.180	17,26
36-40	378	5,53
41-45	79	1,16
46-50	5	0,07
51-55	3	0,04
T o t a l	6.837	100,00 %

The measurements allow to conclude that most of the catches were specimens 16-35 cm long (total 89,36%). Most of these again were in the length-class 26-30 cm (30,70 %). The mean length was 25,9 and the mean weight 164,5 g (males: 160,9 g, females: 167,4 g).

It appears from the measurements that 30,5% of the whiting measured were undersized fish (below 23 cm). The weight of the undersized whiting amounted to 8,8% of the total landed of this species.

Both in 1966 and 1967 large fluctuations were observed in the occurrence of undersized whiting, depending on the area and season of investigation.

2. Melanogrammus aeglefinus - Haddock

In the catches were found specimens from 15 to 66 cm long.

Table 6. Quantitative participation of haddock of particular length-classes.

Length-classes in cm	Quantity of Fish	
	Number of fish individuals	In percentage
11-15	4	0,10
16-20	105	2,60
21-25	810	20,06
26-30	717	17,76
31-35	816	20,21
36-40	876	21,69
41-45	468	11,59
46-50	173	4,28
51-55	49	1,21
56-60	16	0,40
60	4	0,10
T o t a l	4.038	100,00 %

The fish being 36-40 cm long (21,69 %) were most abundant. The mean length calculated from the measurements of 4.038 fish was 30,0 cm, with a mean weight of 257,5 g.

The quantitative participation of undersized haddock (below 27 cm) in the material investigated was 25,6 % of the number of fish measured. In spite of the seemingly large quantity of undersized haddock in the catches, this quantity, when considered in terms of weight, amounts only to 7,6% of the total landed.

3. Gadus morhua - Cod

Individuals being from 12 cm to 120 cm occurred in the catches. Most abundant were the small fish from 16 to 25 cm long (36,95%), and the large fish being above 60 cm (19,11%). The largest cod found was 120 cm long, and it weighed 17,5 kg.

Table 7. Quantitative participation of cod in particular length-classes.

Length-classes	Quantity of Fish	
	Number of fish individuals	In percentage
1	2	3
11-15	30	3,43
16-20	174	19,91
21-25	149	17,04
26-30	49	5,60
31-35	104	11,90
36-40	70	8,01
41-45	48	5,50
46-50	49	5,61
51-55	13	1,49
56-60	21	2,40
60	167	19,11
T o t a l	874	100,00 %

It should be mentioned that cod was rather frequently noted in the catches, though as a rule there were either single individuals or small quantities only.

The mean length (l.t.) of the measured cod was 39,2 cm.

In the period of investigations (1966-67) 55,5% of the 874 specimens were above protected size, while 45,5% were undersized (below 30 cm long). The percentage participation of undersized fish in the total weight of fish was 5,1%, while those above 30 cm made up 94,9% of the material investigated.

4. Merluccius merluccius - Hake

In the catches were found specimens from 14 to 60 cm long.

Table 8. Quantitative participation of hake in particular length-classes.

Length-classes cm	Quantity of Fish	
	Number of fish individuals	In percentage
11-15	2	1,74
16-20	6	5,22
21-25	41	35,65
26-30	45	39,13
31-35	10	2,61
41-45	-	-
46-50	1	0,87
51-55	5	4,35
56-60	2	1,74
T o t a l	115	100,00%

Table 8 shows that the following length-classes were most abundantly represented: 26-30 cm (39,13%), and 21.25 cm (35,65%), in total 74,78%. The mean length was 28,4 cm. The participation of undersized hake (below 30 cm) amounted to 74,8% of the material analysed.

5. Pleuronectes platessa - Plaice

Fish from 11 to 41 cm long were found in the catches. Most of the catches were plaice from 11 to 20 cm long (90,67% of the catch). Most abundant among these was the length-class 16-20 cm (64,16%).

The mean length was 16,8 cm, and the percentage participation of undersized fish (below 25 cm) was 97,3% of the number of fish measured.

Table 9. Quantitative participation of plaice in particular length-classes (in %).

Length-classes in cm	Participation in %
11-15	26,51
16-20	64,16
21-25	6,93
26-30	0,60
31-35	0,30
36-40	0,90
41-45	0,60
Mean Length	16,8 cm
No. of fish	332

6. Glyptocephalus cynoglossus - Witch

The length of witch caught ranged from 12 to 46 cm. Fish in the length-class 16-20 cm (41,38%) predominated. The mean length of the fish analysed was 24,0 cm. Undersized fish (below 28 cm) in the material made up 66,2% of the total quantity of measured fish.

Table 10. Persent participation of witch in particular length-classes (in %).

Length-classes in cm	Participation in %
11-15	8,28
16-20	41,38
21-25	14,48
26-30	11,72
31-35	16,55
36-40	5,52
41-45	1,38
46-50	0,69
50	-
Mean Length	24,0 cm
Number of Fish	145

7. Limanda limanda - Dab

Dab from 14 to 24 cm occurred in the catches. Fish of the length-class 16-20 cm were most abundant, making up 76,47% of the material investigated. The mean length was 17,9 cm. The number of undersized fish (below 15 cm) was 12,9% of the quantity of fish measured.

8. Microstomus kitt -Lemon Sole

The small number of captured lemon soles(31 individuals) were from 19 to 40 cm long. Fish of the following length-classes predominated in the catches: 26-30 cm (48,39%), 31-35 cm and 36-40 cm (in each length-class 19,35%) - in total 87,09%.

The mean length was 31,7 cm. The participation of undersized fish (below 25 cm) did not exceed 6,5% of the number of individuals in the material obtained.

VI. Non-Protected Commercial Fish Species

1. Clupea harengus - Herring

In the samples herring occurred being from 13 to 34 cm, and mainly 16-30 cm (95,36%). In the period of investigation the mean length of the specimens was 23,5 cm.

Table 11. Quantitative participation of herring in particular length-classes (in %).

Length-classes in cm	Participation in %
11-15	0,32
16-20	33,06
21-25	28,31
26-30	33,99
31-35	4,32
Mean Length	23,5 cm
Number of Fish	1.851

2. Scomber scomber - Mackerel

Table 12. Quantitative participation of mackerel of particular length-classes (in %).

Length-classes in cm	Participation in %
21-25	4,26
26-30	34,43
31-35	24,70
36-40	30,82
41-45	5,79
Mean Length	32,9 cm
Number of Fish	915

In the catches were found specimens of a length of from 24 to 45 cm. Fish belonging to the length-class 26-30 cm (34,43%) were most abundant. The mean length was 32,9 cm.

3. Trachurus trachurus - Horse-Mackerel

In the catches were found specimens of 25 to 34 cm in length. Most abundant were fish 30 cm long. Most of the catches were composed of individuals of the length-classes 26-30 cm and 31-35 cm; in total 99,54%. The mean length was 29,6 cm.

Table 13. Quantitative participation of horse-mackerel in particular length-classes (in %).

Length-classes in cm	Participation in %
21-25	0,46
26-30	70,94
31-35	28,60
Mean Length	29,6 cm
Number of Fish	437

4. Pollachius virens - Coalfish

Fish of a wide range of length were found, i.e. from 41 to 97 cm. There was a large number of fish of the length-class 46-50 cm (28,05%) and also of large fish of a length above 60 cm (27,69%).

Table 14. Quantitative participation of coalfish of particular length-classes (in %).

Length-classes in cm	Participation in %
41-45	12,29
46-50	28,05
51-55	18,43
56-60	13,54
60	27,69
Mean Length	55,2 cm
Number of Fish	1,123

The mean length was 55,2 cm.

5. Pollachius pollachius - Pollack

Table 15. Quantitative participation of pollack in particular length-classes (in %).

Length-classes in cm	Participation in %
11-15	5,25
16-20	29,83
21-25	38,43
26-30	25,54
31-35	0,95
35	-
Mean Length	22,3 cm
Number of fish	419

The length-class 21-25 cm (38,43%) was most abundantly represented. The mean length was 22,3 cm.

6. Sprattus sprattus - Sprat

Most abundantly represented was the length-class 11-15 cm (94,74 %). The mean length of the 171 individuals measured was 13,7 cm.

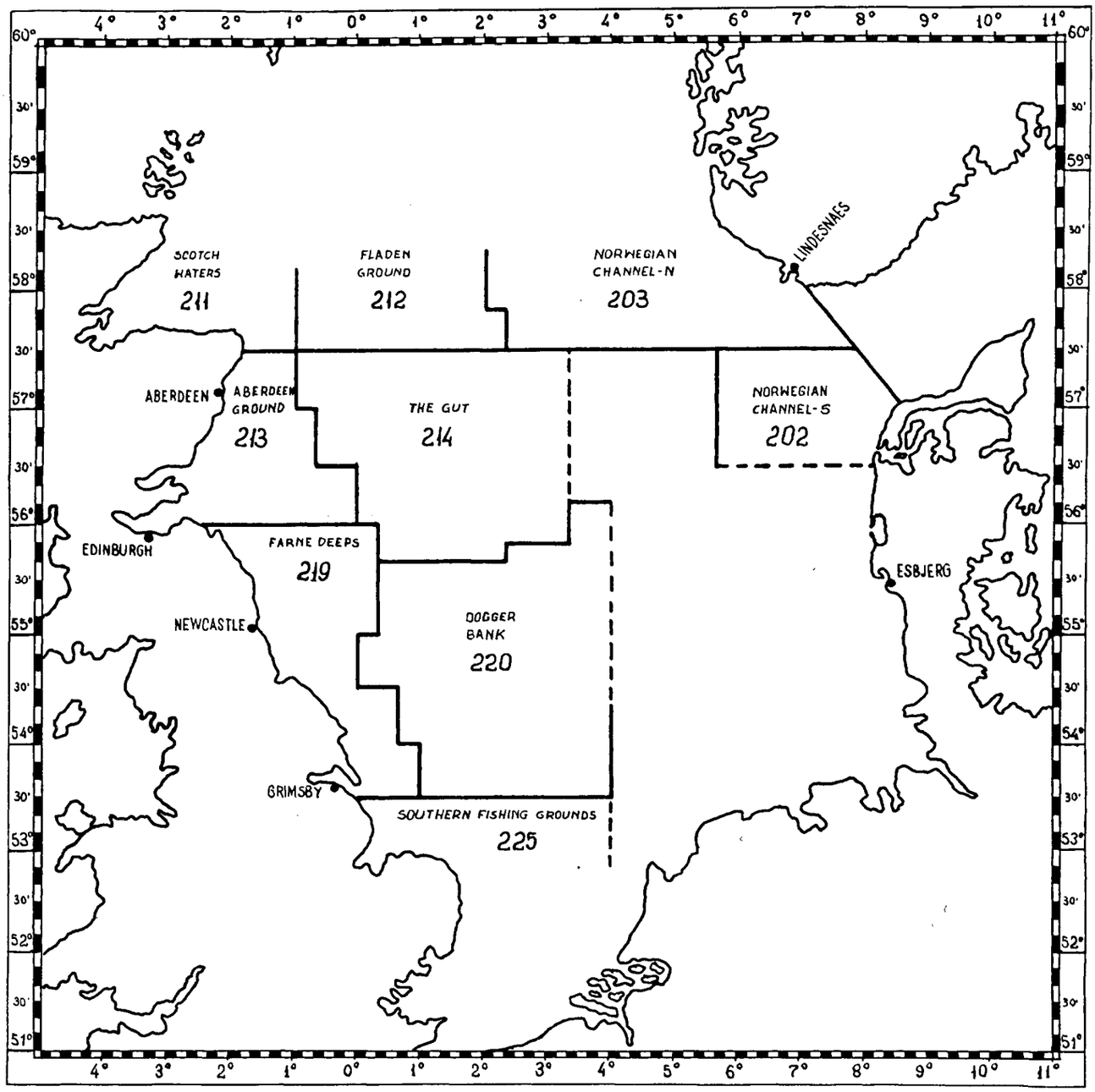

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Fig. 1 Numbers and names of investigated fishing grounds