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Some data on effect of meshing and chafer on trawl selectivity in relation to redfish

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Study of trawl selectivity in relation to redfish is one of the problems of major interest for regulation of fisheries in the Northwest Atlantic.

In 1963 we conducted a series of investigations the results of which are given below. These investigations were aimed at collecting more experimental data on trawl selectivity in relation to redfish for trawls made of different materials and determining the effect of chafing gear and meshing of redfish on selective capacity of trawls.

Experiments were conducted on commercial vessels with trawls of conventional design and under normal conditions of trawling: average speed about 3.5-4.0 knots, towing time about 1.0-1.5 hours. The experiments were made with ICES type covers. Mesh-size was measured with Scottish gauge under tension of 4 kg. As a rule, all fish in the catch were measured. Length of fish was measured from the tip of the snout to the end of the caudal fin. Girth measurements were taken at random, mainly girth was measured maximum. Resilient rulers used for measuring girth enabled to obtain results with degree of accuracy up to 1 mm.

In order to exclude the effect of by catch on trawl selectivity in relation to redfish, only those trawlings were considered in which all other fish taken together made less than 10% of the total number of redfish.

Analysis of experimental data was made depending on specific tasks of the experiment, i.e. with regard to different species of redfish, separately for males and females etc. Meshed redfish specimens were calculated separately, although in final calculations they were added to the catch in the cod-end.

When size-composition of redfish in catch was represented over sufficiently wide range, the results of each trawling were treated separately. In small catches the data of several trawlings with the same cod-end were summarized.

In 1963, experiments conducted by BMRT "Kameta" covered the areas of Labrador (3K) and Flemish Cap (3M). So, comparable data are now available for the same trawls obtained by the same method and related to different areas of commercial fishing and to different redfish species.

1. Meshing of redfish and its effect on trawl selectivity

During all tests great importance was attached to the

study of meshing and its effect on trawl selectivity.

The observers were required not only to count the number of fish meshed, but also in each case to measure the girth of fish and the size of mesh. Furthermore, a special experiment was carried out "Goncharov", (1962) when the size of mesh in the trawl cod-end in the best way met the conditions of meshing redfish of a given size-compostion. Taking into account a considerable difference in the body form of deepwater redfish (Sebastes mentella Travin) and golden redfish (Sebastes marinus L.) they were observed separately. In different fishing areas we sometimes succeeded in taking catches redfish composed exclusively of one species, and practically without by-catch of other species.

Fig. 1 shows the relation between the number of meshed redfish in per cent and the ratio of fish girth (P_f) to the actual perimeter of mesh (P_m).

The shape that this relation takes and a scattered position of the dots show that in general meshing of redfish is similar to meshing of other fishes by gillnets, though in fact that redfish is easier to entangle is also of some importance.

This is clearly demonstrated by the presence of sufficiently marked initial, final and maximum meshing of redfish in trawl. As seen from Fig. 1, meshing starts with the ratio P_f: P_m = 0.8 and is practically over with P_f P_m = 1.3, its maximum value being at P_f: P_m = 1.07.

In our experimental data meshing of redfish amounted to 22.7% of their total number in catch.

For certain size-groups, where the size of the trawl mesh best corresponded to the girth of fish ratio P_f : P_m was from 1.0 to 1.1, meshing was even greater.

At the same time, comparison of selection factors calculated for separate, combined and summarized trawling has not produced any great discrepancies in the values of such factors as against the results of experiments where no meshing was observed.

The ratio of fish caught and escaped especially characteristic for mesh size and material of which the cod-end was made, was almost never disturbed even when meshing was the greatest. Selection factor was high enough.

The mean value of selection factor for all double manila cod-ends used in experiments in relation to both species of redfish together was about 2.6. Mean weighted selection factor of double manila trawl cod-ends was 2.83 for Sebastes mentella Travin and 2.48 for Sebastes m. marinus L.

This enables us to suppose that an intensive meshing of redfish occasionally observed in trawling takes place mainly

during the haul of the trawl and not during towing. It appears that redfish hauled from great depths due to an abrupt change of hydrostatic pressure at a certain moment tries to find an escape from the trawl and entangles in meshes

Observations on the distribution of meshing in trawls showed that it takes place mainly in the foreparts of the trawl (in front of the entrance of the cod-end) and is considerably less pronounced in the cod-end itself. Experiments with commercial trawl cod-ends showed that the number of fish meshed didn't exceed 3.8% of the number of fish in catch, and only in an experiment in which mesh size of the trawl cod-end corresponded to the optimum conditions of meshing catchable fish it reached 9.8%.

This fact also shows that meshing cannot greatly influence the escapement of fish through the cod-end in the process of trawling.

2. Effect of chafer on trawl selectivity

Effect of chafer on trawl selectivity in relation to redfish was studied on board "Kameta" in February-March, 1963 in the Divisions 3K and 3M of the ICNAF area. The chafer was made of the same material and had the same mesh size and number of meshes widthwise as the cod-end. It was located in the rear part of the cod-end along 207 rows, with the total length of the cod-end made of 441 rows. It was attached to the cod-end mesh to mesh along the fore and side selvedges. To prevent displacement of the chafer in relation to the cod-end, the meshes of both were fastened with a strap which runs along the middle of the chafer and is forked at the end. Rear selvedges of chafer and cod-end were joined together and tied in a usual manner. Underside: the rear part of the cod-end a protective flap made of cow hide or other dense material was attached.

The designs of the cod-end and chafer are shown on Fig. 2.

In order to determine selectivity values, the same cod-end was tested with and without chafer. The above-mentioned method of top-side chafer was used for this purpose.

The results of the experiments are shown in Table 1.

As seen from Table 1, application of chafer of the above mentioned design almost did not influence the value of trawl selection factor in relation to redfish. However, the range of the cod-end selectivity decreased twofold.

In conclusion, it must be noted that a great deal of data on trawl selectivity in relation to redfish has by now been collected by various countries.

There are enough data now to analyse selection factors by areas of fishing, species of redfish, types of vessels and trawls, net materials etc.

A great volume of data was also obtained on the effect on selectivity of such factors as meshing, size of catch, chafers etc. It would be advisable if the Commission could now take care of treatment generalization of these data.

Enclosures:

1. Table 2. Summary data on selection of redfish, 1963. (Redbook, 1963, Part I).

2. Table 3 Maximum girths of redfish according to summarized data collected by the author and other investigators.

3. Design of trawl - 31.2 m.

ICNAF Mesh Selection Summary

Species - redfish. Gear-trawl, 31.2 m.

Author Source	Locality (ICNAF Div.)	Date (month, year)	Trawl type and size	Speed of tow (knots)	Material	Runnage m/kg	Method	Mesh size (mm)	Gauge used
Treschev A.I. (USSR)	3 K 3 M	III-1963	31.2 m	4.0	Double capron x/	198	Cover	102.8	ICES
" "	3 K 3 M	IV-1963	"	4.0	Double capron	"		107.2	"

x/ with chafer

Table 1.

RESULTS

of experiments on determination of the effect of chafer on the escapement of redfish from trawl (data for 1963).

Material and type of cod-end	Double capron 3 x 2, 100/102.8 (mm) with chafer	Double capron 3 x 2 110(107.2) without chafer
Number of trawlings	8	7
Total number of redfish in catches	10.613	15.752
Number of redfish within the selectivity range.	1.751	4.547
Mean length (cm) of redfish caught by 50%.	27.5	28.5
Selectivity factor	2.7	2.7
Selectivity range	3.2	7.2

Note: Both experiments were conducted with the same cod-end. Difference in mesh size explained by different strengthability of cod-end twine during trawling. The original mesh size was chosen in such a manner that selectivity of experimental cod-end of double capron in relation to redfish be identical to the selectivity of manila cod-end having the conventional mesh-size.

Table 2

Mean and variation of selection factor	Range 75-25 (cm)	No. of Hauls	Total No. Fish Exp.		Mean catch per one hour of trawling (kg)	Mean haul duration (min)
			Cod-end	Chafer		
2,7	3,2	8	8509	2104	1050	60
2.8	7.2	7	12771	2981	1700	70

Table 3

Maximum girths of redfish
(according to summary data)

Length	Seb. Marinus L.			Seb. Mentella Travin			Mean value of maximum girth
	Girth of the head	Girth of the body	Number of fish measured	Girth of the head	Girth of the body	Number of fish measured	
19	13,6	13,5	1				
20							
21					13,6	1	13,6
22					14,2	3	14,2
23	15,6	15,3	1		15,4	5	15,4
24	17,3	17,4	2		16,2	5	16,7
25	17,9	18,1	6	17,6	17,6	8	17,8
26	18,4	18,6	9	18,1	18,0	12	18,2
27	19,1	18,8	52	18,5	18,3	11	18,8
28	20,1	19,6	58	19,2	19,4	32	19,6
29	20,8	20,5	57	19,8	20,1	28	20,4
30	21,8	21,5	72	21,1	21,0	44	21,4
31	22,3	22,0	82	21,5	21,7	52	21,9
32	22,8	22,5	91	22,0	21,9	39	22,4
33	23,7	23,6	80	23,1	23,2	26	23,5
34	24,2	24,2	93	23,8	23,8	27	24,1
35	25,5	24,8	102	24,5	24,4	18	25,0
36	26,3	25,8	83	25,2	25,3	23	25,9
37	26,4	26,3	103	25,4	25,8	28	26,2
38	26,9	26,8	113	-	26,3	13	26,8
39	27,3	27,3	115	-	27,0	22	27,3
40	29,6	29,3	115	28,4	28,9	25	29,3
41	29,0	29,0	109	29,4	29,5	37	29,1
42	31,5	31,2	100	30,6	30,4	70	31,0
43	29,8	30,2	77	31,0	31,2	60	30,5
44		31,0	74		31,7	83	31,4
45		32,1	64		32,8	63	32,4
46		32,5	52		32,9	36	32,7
47		33,5	63				33,5
48		34,0	54				34,0
49		34,5	47				34,5
50		35,5	44				35,5
51		35,9	20				35,9
52		36,6	32				36,6
53		37	37				37,8

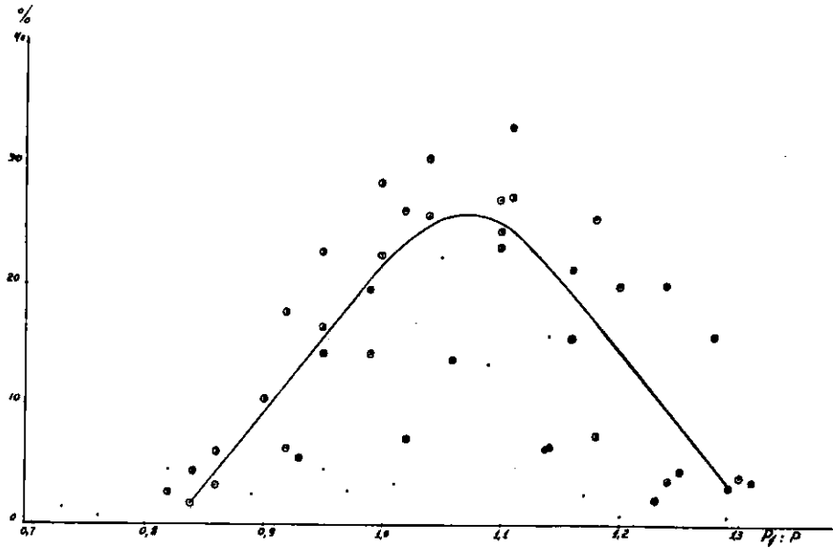

Рис. 1 Зависимость облавливания мерного окуня от отношения максимального обхвата его тела к периметру ячеи.

Fig. 1. The relation between the number of meshed redfish and the ratio of maximum fish girth to the perimeter of mesh.

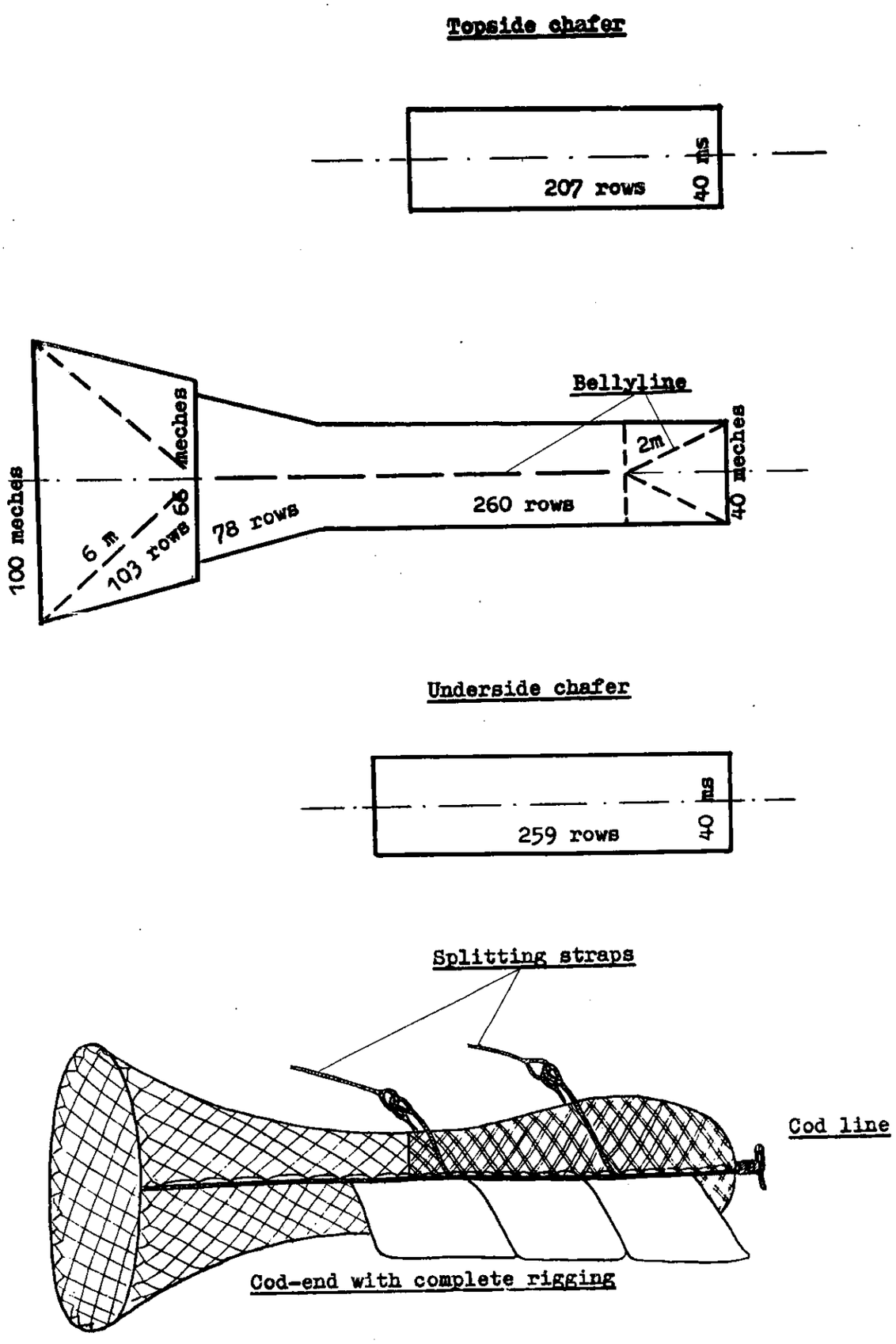

Fig. 2. The designs of the cod-end and chafer.

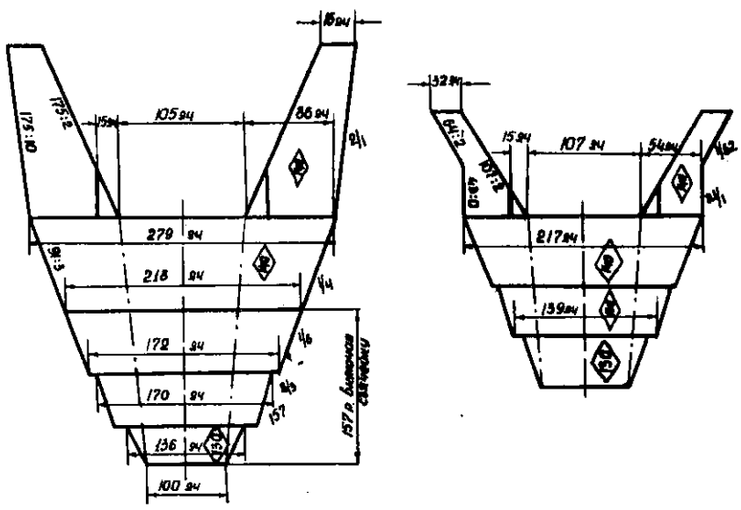

Fig. 3. The scheme of trawl, 31.2 m.