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The Effect Of Chafers On Strength, Durability And Selectivity Of Trawls In Relation To Cod

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In 1964 laboratories of commercial fishery technics of VNIRO (Moscow) and PINRO (Murmansk) developed and tested some experimental capron cod-end of a new design with a view of investigating material of higher strength which could be used for making trawl cod-ends.

Preliminary laboratory experiments on the choice of the most suitable net twine were conducted. The main requirement laid to those experiments was to provide the maximum strength of webbing, when the diameter of the twine is not more than 4.5 mm and relative stretching does not exceed that of usually used capron trawl nets.

Two patterns of twisted trawl twine R 8500 tex 80 S and R 9500 tex 71 S were picked out by means of laboratory dynamometric tests.

The strength of the knot of double webbing made of the twine of the first pattern was 540 kg, that of the second pattern - about 620 kg. Those webbings were used for making experimental cod-ends (Fig. 1) which were extensively (until were completely worn out) tested on board the large stern trawler "Severnoe siyanie", pertaining to vessels of the "Pushkin" type.

Testings were made under normal conditions of trawling : speed about 3.5-4.0 knots, duration - from 1.5 to 3 hours.

During those testings observations were made on wear-proof capacity of the material and on changes in mesh sizes of experimental codends in the process of their exploitation. Mesh size was measured before testing codends and then with interval in ten trawlings. The ICNAF wedge-shaped gauge and the ICES spring-loaded-mesh gauge were used. In every cod-end thirty consecutive meshes in series to be ten meshes from bellyline were measured.

In order to determine the weariness of the material of cod-ends used without chafers, samples of webbing with size 5 x 5 meshes were periodically cut out from cod-ends for analyzing.

The results of determination of mesh size and of its strength are given in Table 1.

TABLE 1. Sizes and strength of meshes of experimental trawl cod-ends

Indices	A				B			
	Before using (dry)	After ten trawlings	After twenty trawlings	Average	Before using (dry)	After ten trawlings	After twenty trawlings	Average
Inner size of mesh (mm)	99.9	106.6	114.0	106.8	96.2	102.8	107.2	102.1
Strength (kg)	540	560	507	535.7	620	630	570	606.6

A - cod-end, twine : R 8500 tex 80 S
B - cod-end, twine : R 9500 tex 71 S

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In addition experimental codends, were tested in selectivity investigations. For this purpose five trawlings were made with every cod-end with standard small mesh sized cover.

Diagrams of the selectivity of tested cod-ends are given in Figs. 2 and 3. Of interest is to compare the selectivity of tested cod-ends with that of cod-ends with chafing gears.

Table 2 shows the summary of the results of experiments on the determination of effect of chafers on the selectivity of bottom trawls in relation to cod which were conducted by the Soviet Union in the North West Atlantic.

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TABLE 2 Results of experiments on determination of the effect of chafers on trawl selectivity in relation to cod

Vessel	Date fished	Fishing area	Trawl	Cod-end	Chafer	No. of trawlings	Average catch per trawling hour (kg)	Selection length (cm)	Selection factor	Selection range
Stern trawler "Goncharov" 1900 Hp	July 1962	Iceland	Standard commercial	Double capron, 108mm	ICNAF type	5	2027	41.5	3.3	13.0
"	"	Iceland	"	"	"	3	1850	44.0	4.1	7.0
Stern trawler "Cometa" 1900 Hp	March-April	Labrador-Flemish Cap	"	Double capron, 104 mm	type USSR	5	3040	39.8	3.8	9.2
Stern trawler "Severnoe siyanie" 1900 Hp	December, 1964-January, 1965	Labrador	"	Double capron, A type (107mm)	-	5	4289	42.2	3.9	11.8
"	"	"	"	Double capron	-	5	7869	41.4	4.0	11.5

Discussion of results and conclusions

Results of mesh measurements in experimental codends showed that stretching of trawl twisted twine used without chafer took place much greater than with chafer.

In both tested cod-ends stabilization of meshes did not take place after the tenth trawling, as it, as a rule, takes place when chafer applies. A relative increase of inner size of mesh in the A cod-end between the tenth and twentieth trawlings was 7% and that in the B cod-end - about 4%. A relative increase of mesh after the tenth trawling in comparison with a new webbing measured in dry condition was the same, making up approximately 6.5%.

The selectivity of the A and B cod-ends (Table 2) is practically the same.

The mean value of selection factor of tested cod-ends (3.95) in relation to cod is higher than that of commercially used cod-ends provided with the ICNAF type chafers.

$\frac{(3.3 + 4)}{2} = 3.7$) and the "U.S.S.R." type chafer (3.8).

It has to noted that in relation to cod as well as to redfish a mean value of the selection range of cod-ends provided with chafers is much lesser than without chafers.

In the A cod-end as well as in the B cod-end mesh strength increased after the tenth trawling as compared with a new material. Apparently it can be explained by the fact that dynamometry was conducted under different conditions : in dry and wet conditions. Mesh strength in both cod-ends considerably decreased between the tenth and twentieth trawlings. Decreasing in the strength caused by the weariness of the cod-end material greatly affected the durability of the cod-ends tested.

When testings were conducted with the A cod-end seven damages were made in the underside of the rear cod-end. The cod-end became completely worthless (broken down when the catch was hauled on the sleep) after fifty three hours of trawling.

When the B cod-end was tested eight damages were made also in the underside of the rear cod-end.

The B cod-end allowed to lift catches up to 15 tons and it broke down when catches about 20 tons were hauled on the sleep. In total this cod-end was exploited for 77 hours of trawling.

Thus, with comparatively big average strength of mesh (606.7 kg), operations made without chafer are restricted by size of catches hauled as well as by the durability of cod-ends. It can be assumed that application of the underside chafer allows to increase greatly the strength and durability of cod-ends, not influencing their selectivity. Experimental cod-ends of this type should be made and tested.

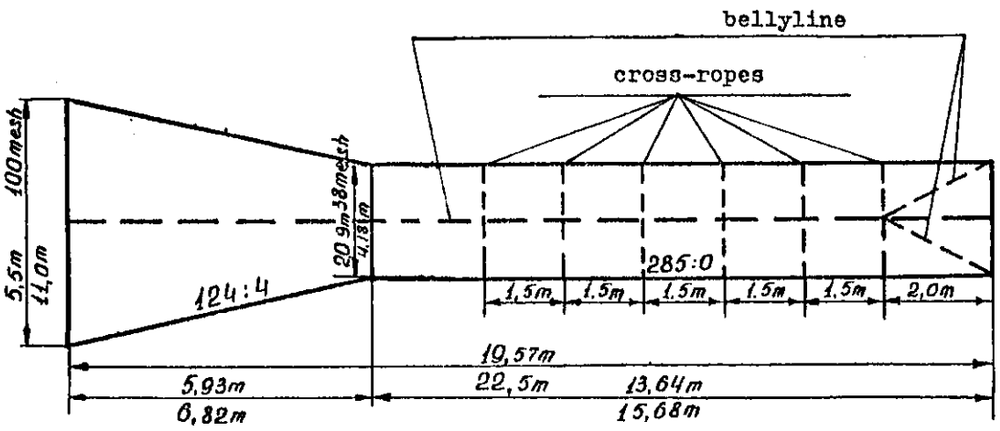

Fig. 1. Diagram of an experimental codend designed to operate without chafer.

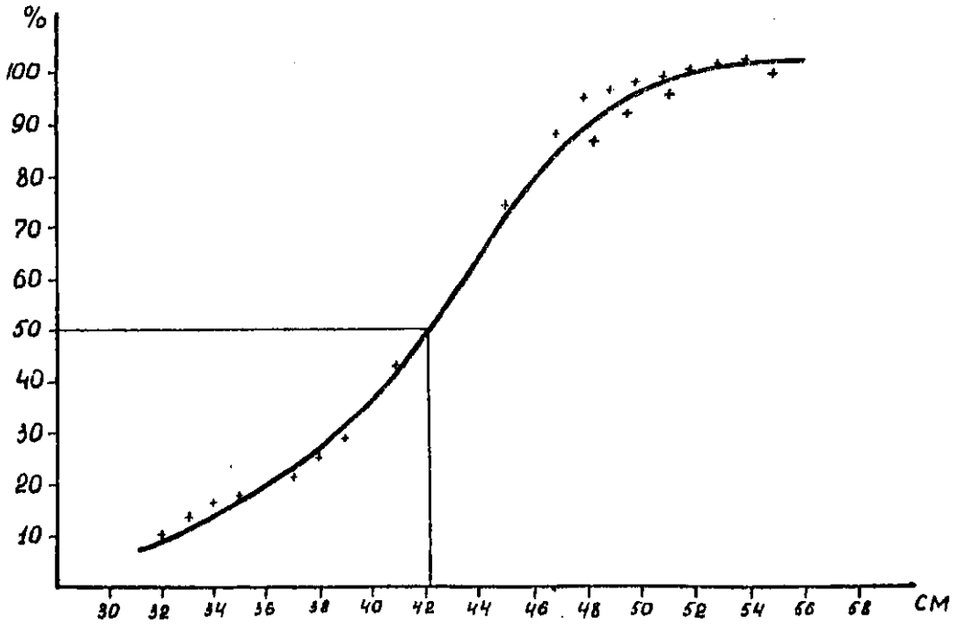

Fig. 2. Selection curve of a codend "A"

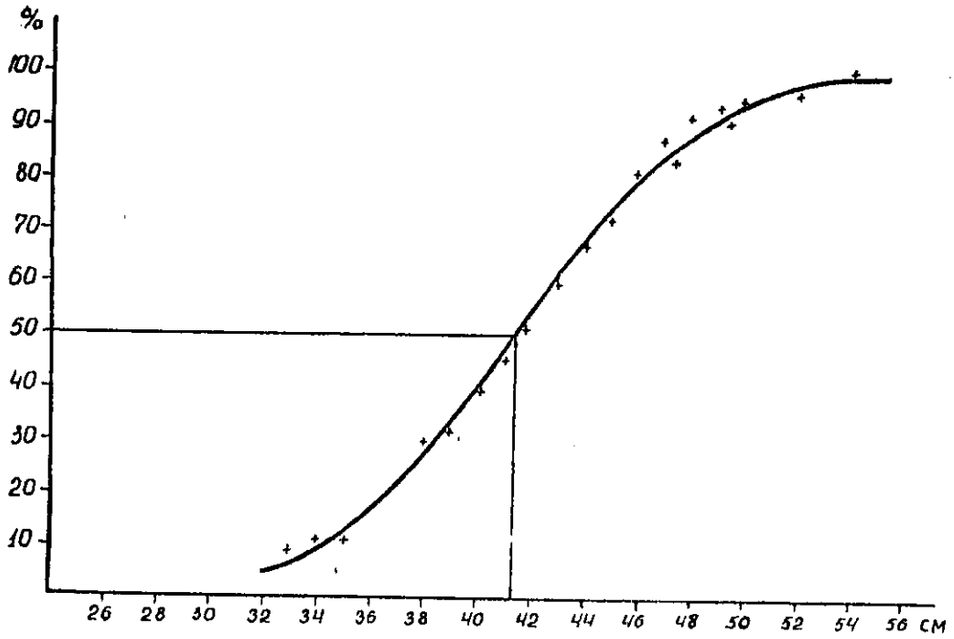

Fig. 3. Selection curve of a codend "B"