ACTA ICHTHYOLOGICA ET PISCATORIA

Vol. III. Fasc. 1 1973

*Józef ŚWINIARSKI, Wiesław MAŁOLEPSZY*

Fishing Gear

# CHANGES IN MESH SIZES OF COD-END NATTING OF TRAWLS USED BY THE TRAWLERS TYPE B-18 DURING THEIR EXPLOITATION

# ZMIANY PRZEŚWITU OCZEK W JADRZE WORKÓW WŁOKÓW UŻYWANYCH NA TRAWLERACH B-18 W CZASIE ICH EKSPLOATACJI

**Institute of Marine Resources Exploitation**

The present paper describes studies on changes in mesh sizes of the cod-end netting of trawls used by the B-18 type freezing trawlers belonging to the Deep Sea Fisheries Company (PPDiUR) „Odra" in Świnoujście.

Measurements of the mesh sizes were taken from 6 cod-ends of bottom and pelagic trawlers, using a Polish Longitudinal-forse mesh gauge.

It was shown that a significant increase of mesh sizes in the trawl cod-ends occurred during the trawl exploitation.

Meshes of the upper part of trawls subjected to the greater deformations. Detailed results of investigations are given in Table 2 and 3.

## INTRODUCTION

Studies on the trawl selectivity are of special importance in view of a predominating role of this type of gear in fisheries. When investigating the fish behaviour in the trawl operation area, it is generally accepted that their selection is accomplished mainly in the cod-end. Thus, because of a smaller tendency of fish to pass through the meshes in the other parts of a trawl, the minimum mesh sizes are determined chiefly for the cod-ends.

Operating a fishing gear with a minimum mesh size allowed is one of methods of fisheries protection. Prolonged and frequently very significant tensions which occur during the trawl exploitation result in the dimensional deformations of the netting. A change in the mesh sizes seems to be one of them. It may cause a fishing gear deformation, thus lowering its efficiency; on the other hand, the mesh size is a decisive factor as far as the size and amount of fishes caught are concerned. Mesh sizes greater than those recommended by the documents (the convention regulations) should be discouraged, since they cause the gear selectivity greater than required by the protection regulations and in turn it leads to the smaller catches.

It turns out that the net materials used are rarely characterized by the constant mesh sizes and stability. The seawater and exploitation conditions tend to deform meshes to the great extent. The magnitude of these deformations depends upon a kind of the net material, gear and the netting final treatment technology; besides it is related to the magnitude of tension and its durance. The wide variety of materials used in trawls production and various methods of their final treatment act in favour of continuous studies on the changes in mechanical and exploitational properties of nettings during their use. Discrepancies in observations of various authors seem to increase the need of such studies. CLARK (1963) reports that after 190 hours of towing a polyamide trawl netting increases its mesh sizes by 8%.

According to the RICHERT'S results (1968) the cod-end mesh sizes increased by 4–11% due to the exploitation. On the other hand, however, results obtained by BRANDT (1963) and those of the investigations carried out by the Deep Sea Fisheries Company (further referred to as PPDiUR) „Odra" indicated a decrease in the mesh size caused by the trawl exploitation.

Under these circumstances it is of a great importance, from the standpoint of the proper exploitation of gear, that changes in the mesh sizes of the steelon bottom and pelagic trawls, finally treated according to the Polish technology, are determined in relation to the trawl exploitation time.

## METHOD

a) Place and time of investigations

The investigations were carried out during two fishing cruises of the B-18 type freezing trawlers. During the first cruise the investigations were carried out from m/t „Orka" operating in Georges Bank and a few adjacent fishing grounds from July till September 1970. During the second cruise the measurements were made on board of m/t „Sejwal" from March till May 1971. This vessel operated in the New York, Delaware and Chesapeake fishing grounds.

Table 1

CHARACTERISTICS OF NETTING USED FOR THE INVESTIGATE COD-ENDS MANUFACTURING

| Element | Trawl | Bottom trawl 33/37 | Pelagic trawl 39/70x37/50 | Pelagic trawl 59/88x53/66 | Pelagic trawl 64/112x59/92 | Pèlagic trawl 64/112x59/92 | Pelagic trawl 75/115 |
|---|---|---|---|---|---|---|---|
| | | Twine characteristics | | | | | |
| | | double | double | double | double | double | double |
| Cod-end, | 1 st segment | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 |
| Cod-end, | 2 nd segment | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 |
| Cod-end, | 3 rd segment | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 | JR $\phi$ 2 mm $\neq$ 25 |
| Cover, | 1 st segment | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 |
| Cover, | 2 nd segment | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 |
| Cover, | 3 rd segment | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 | JR $\phi$ 3,5 mm $\neq$ 50 |

b) Materials

The investigations were carried out with steelon cod-ends of pelagic and bottom trawls employed by the B-18 trawlers belonging to PPDiUR „Odra". Nettings forg the cod-ends were manufactured in the Olsztyn Net Materials Factory in Korsze. The characteristics of materials used for the cod-ends examined are given in Table 1.

c) Procedure of measuring

The mesh size was measured with a Polish Longitudinal-force mesh gauge. This gauge allows a 1 mm accuracy of measurements, and a pre-tension may be controlled within a range of 1–5 kG. The measurements of the mesh sizes were taken for the cod-end as this segment of the gear was accepting the greatest tensions during the exploitation. The measurements were taken at a distance of 1,8–2,0 m and 4,8–5,0 m from the cod-end point. They were taken separately for the upper and lower parts of netting because of changes occurring in tensions in these elements, especially when hauling the catch up the stern slip.

Each time 30–60 meshes were measured in a following way: at first the mesh sizes were measured for a trawl before its use in a dry (during the both cruises) and a wet state, the latter resulted from soaking in water. Subsequent measurements were made for these trawls after the first haul and then after 5, 10, 25, 50 hours approximately in 25 hours intervals. The measurements were taken immediately after emptying the cod-ends. During the two cruises the changes of 6 exploited trawls cod-ends were being recorded.

As a whole there were 420 groups of measurements, what made 21 thousands of single mesh sizes measurements.

## RESULTS AND DISCUSSION

Table 2 summarizes the results obtained through the mesh size measurements of 6 trawl cod-ends taken during the two cruises of m/t „Orka" and m/t „Sejwal". For a better interpretation of results, changes in the mesh sizes are expressed as percentages assuming that the mesh size measured in a dry state before use amounts to 100%.

Data contained in Tables 2 and 3 indicate a similar character of changes in the mesh sizes of the six cod-ends analysed. The water action induces an increase in the mesh size, the increase in the wet mesh against the dry ones ranging from 1,57 to 2,22%. The anisotrope has much to do with these changes as well as the easier contracting of loose knots on wet. The anisotrope phenomenon gives rise to a polyamide fibres elongation (on wet) by 1–1,2% (**ROSNER**, 1968). It enables the netting yarn to shift in a knot even if tensions are small.

The magnitude of a wet netting yarn deformation (a net material is concerned here as well) against a dry one depends to a great extent upon a kind of fibr, orientation of its macromolecules, its final treatment and a netting yarn structure. According to the data

Table 2

## Changes in mesh opening of codends during trawling

| Voyage No | Trawl | Measured part of codend netting | Nominal size of mesh bar mm | Mesh opening in codend netting before using the trawe: dry mm | wet mm | 5 | 10 | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 325 | 350 | Remarks: Trawling time |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Time of trawling (houers) — Mesh opening (mm) | | | | | | | | | | | | | | | | |
| 1st voyage m t „ORKA" | 39/70×39/50 | Upper half 1.8 – 2 m | 25 | 45.50 | – | 47.09 | 48.39 | 49.40 | | | | | | | | | | | | | | Trawling time 32 hrs |
| | | Lower half 1.8 – 2 m | 25 | 45.50 | – | 46.70 | 48.00 | 48.80 | | | | | | | | | | | | | | Haulings 11 |
| | | Upper half 4.8 – 5 m | 25 | 45.50 | – | 47.00 | 47.70 | 48.30 | | | | | | | | | | | | | | Catch 138 tons |
| | | Lower half 4.8 – 5 m | 25 | 45.50 | – | 46.81 | 47.49 | 48.00 | | | | | | | | | | | | | | |
| | 33/37 | Upper half 1.8 – 2 m | 25 | 47.60 | – | 50.86 | 51.45 | 52.15 | 53.35 | 54.38 | 55.12 | 55.20 | 55.15 | 55.42 | 56.30 | | | | | | | Trawling time 215 hrs |
| | | Lower half 1.8 – 2 m | 25 | 47.60 | – | 50.16 | 50.27 | 51.35 | 51.95 | 52.55 | 53.46 | 53.55 | 54.00 | 54.04 | 54.35 | | | | | | | Haulings 82 |
| | | Upper half 4.8 5 m | 25 | 47.60 | – | 50.17 | 50.75 | 51.63 | 52.50 | 53.35 | 53.50 | 53.70 | 54.60 | 55.00 | 55.44 | | | | | | | Catch – 269 tons |
| | | Lower half 4.8 5 m | 25 | 47.60 | – | 49.98 | 50.21 | 51.40 | 51.90 | 52.65 | 53.20 | 53.60 | 54.10 | 54.42 | 54.88 | | | | | | | |
| | 59/88×53/66 | Upper half 1.8 – 2 m | 25 | 47.30 | – | 50.24 | 50.97 | 51.50 | 52.00 | 52.19 | 52.12 | 52.90 | 54.10 | 54.35 | 54.58 | 55.00 | 55.08 | 55.40 | 55.60 | 55.80 | 56.48 | Trawling time 359 hrs |
| | | Lower half 1.8 2 m | 25 | 47.30 | – | 49.73 | 49.84 | 49.84 | 50.05 | 50.45 | 50.62 | 51.10 | 51.70 | 52.15 | 52.60 | 52.92 | 53.00 | 53.10 | 53.70 | 54.48 | 54.49 | Haulings – 102 |
| | | Upper half 4.8 5 m | 25 | 47.30 | – | 50.72 | 50.90 | 51.40 | 51.84 | 52.07 | 52.40 | 52.60 | 53.07 | 53.51 | 54.00 | 54.55 | 54.58 | 55.30 | 55.80 | 56.54 | 56.80 | Catch 616 tons |
| | | Lower half 4.8 5 m | 25 | 47.30 | – | 49.20 | 49.45 | 50.08 | 50.39 | 50.70 | 51.08 | 51.57 | 51.90 | 52.23 | 52.60 | 53.08 | 53.28 | 54.00 | 54.70 | 54.95 | 55.53 | |
| 2nd voyage m t „SEJWAL" | 64/112×59/92 | Upper half 1.8 2 m | 20 | 39.60 | 40.40 | 41.80 | 42.30 | 42.68 | 43.20 | 43.55 | 43.80 | 43.18 | 44.58 | 44.80 | 45.05 | 45.30 | 45.35 | 45.55 | 45.55 | 45.60 | | Trawling time ·329 hrs |
| | | Lower half 1.8 2 m | 20 | 39.60 | 40.40 | 41.40 | 41.90 | 42.35 | 42.60 | 42.80 | 43.05 | 43.55 | 43.65 | 43.85 | 44.10 | 44.30 | 44.38 | 44.46 | 44.55 | 44.58 | | Haulings - 86 |
| | | Upper half 4.8 5 m | 20 | 39.60 | 40.40 | 41.50 | 41.80 | 42.50 | 42.80 | 43.11 | 43.20 | 43.62 | 43.86 | 44.27 | 44.45 | 44.60 | 44.60 | 44.85 | 44.05 | 45.10 | | Catch 820 tons |
| | | Lower half 4.8 5 m | 20 | 39.60 | 40.40 | 41.30 | 41.60 | 42.15 | 42.40 | 42.55 | 42.80 | 43.07 | 43.36 | 43.63 | 43.82 | 43.95 | 44.05 | 44.25 | 44.40 | 44.50 | | |
| | 64/112×59/92 | Upper half 1.8 2 m | 25 | 54.65 | 55.55 | 57.03 | 57.10 | 57.30 | 57.73 | 58.20 | 58.30 | 58.42 | 58.75 | 59.20 | 59.25 | 59.30 | 59.40 | | | | | Trawling time - 272 hrs |
| | | Lower half 1.8 2 m | 25 | 54,65 | 55.55 | 56.75 | 56.85 | 56.88 | 57.10 | 57.18 | 57.19 | 57.35 | 57.44 | 57.53 | 57.70 | 57.80 | 58.05 | | | | | Haulings – 74 |
| | | Upper half 4.8 5 m | 25 | 54.65 | 55.55 | 56.68 | 56.70 | 57.15 | 57.23 | 57.51 | 57.60 | 57.80 | 57.85 | 58.10 | 58.13 | 58.30 | 58.40 | | | | | Catch 963 tons |
| | | Lower half 4.8 5 m | 25 | 54.65 | 55.55 | 56.28 | 56.65 | 57.00 | 57.04 | 57.24 | 57.20 | 57.30 | 57.45 | 57.55 | 57.56 | 57.70 | 57.70 | | | | | |
| | 77/115 | Upper half 1.8 - 2 m | 25 | 54.10 | 54.95 | 55.80 | 56.10 | 56.58 | 57.60 | 58.35 | 58.40 | 58.74 | 58.86 | 59.35 | | | | | | | | Trawling time 175 hrs |
| | | Lower half 1.8 – 2 m | 25 | 54.10 | 54.95 | 55.70 | 56.00 | 56.50 | 57.00 | 57.50 | 57.90 | 58.05 | 58.10 | 58.30 | | | | | | | | Haulings – 61 |
| | | Upper half 4.8 – 5 m | 25 | 54.10 | 54.95 | 55.68 | 55.98 | 56.40 | 57.20 | 57.63 | 57.96 | 58.25 | 58.54 | 58.93 | | | | | | | | Catch – 836 tons |
| | | Lower half 4.8 – 5 m | 25 | 54.10 | 54.95 | 55.56 | 56.00 | 56.20 | 56.65 | 57.35 | 57.70 | 57.85 | 57.88 | 58.02 | | | | | | | | |

## Percent changes in mesh opening of codends during trawling (in relation to mesh opening in dry condition before using)

| Trawl | Measured part of codend netting | Mesh opening in codend netting before using the trawe (percent) | | Time of trawling (honer) | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 5 | 10 | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | 275 | 300 | 325 | 350 |
| | | dry | wet | Mesh opening in percent in relation to mesh opening in dry condition | | | | | | | | | | | | | | | |
| 39/70X39/50 | Upper half 1.8 – 2 m | 100 | – | 104.85 | 106.82 | 109.30 | | | | | | | | | | | | | |
| | Lower half 1.8 – 2 m | 100 | – | 102.61 | 104.84 | 108.10 | | | | | | | | | | | | | |
| | Upper half 4.8 – 5 m | 100 | – | 103.28 | 104.96 | 106.75 | | | | | | | | | | | | | |
| | Lower half 4.8 – 5 m | 100 | – | 102.87 | 104.71 | 106.58 | | | | | | | | | | | | | |
| 33/37 | Upper half 1.8 – 2 m | 100 | – | 106.66 | 108.10 | 109.80 | 113.00 | 114.80 | 115.70 | 116.50 | 115.80 | 117.20 | 117.75 | | | | | | |
| | Lower half 1.8 – 2 m | 100 | – | 105.40 | 105.60 | 108.20 | 109.05 | 110.70 | 112.20 | 112.50 | 113.40 | 114.00 | 114.05 | | | | | | |
| | Upper half 4.8 – 5 m | 100 | – | 105.39 | 106.61 | 108.60 | 110.50 | 112.10 | 112.43 | 113.00 | 114.80 | 116.40 | 117.40 | | | | | | |
| | Lower half 4.8 – 5 m | 100 | – | 104.83 | 105.50 | 107.60 | 109.20 | 111.20 | 112.00 | 112.50 | 114.00 | 115.80 | 116.10 | | | | | | |
| 59/88X53/66 | Upper half 1.8 – 2 m | 100 | – | 106.05 | 107.53 | 108.64 | 109.75 | 110.09 | 109.95 | 111.50 | 113.85 | 114.50 | 114.49 | 116.00 | 116.20 | 116.80 | 117.10 | 117.70 | 119.10 |
| | Lower half 1.8 – 2 m | 100 | – | 104.92 | 105.14 | 105.13 | 105.60 | 106.43 | 106.80 | 107.50 | 109.00 | 109.50 | 110.13 | 111.67 | 111.84 | 112.40 | 113.50 | 114.80 | 114.90 |
| | Upper half 4.8 – 5 m | 100 | – | 107.00 | 107.38 | 108.43 | 109.36 | 109.85 | 110.54 | 111.00 | 111.90 | 113.00 | 113.67 | 115.10 | 115.80 | 117.00 | 17.20 | 119.25 | 119.80 |
| | Lower half 4.8 – 5 m | 100 | – | 103.79 | 104.32 | 105.65 | 106.30 | 106.30 | 107.76 | 108.80 | 109.40 | 109.70 | 111.14 | 112.00 | 113.00 | 114.10 | 115.00 | 115.60 | 116.55 |
| 64/112X59/92 | Upper half 1.8 – 2 m | 100 | 102.22 | 105.38 | 105.40 | 107.77 | 109.20 | 109.97 | 110.66 | 111.56 | 112.45 | 113.14 | 114.00 | 114.30 | 114.50 | 115.02 | 115.02 | 115.70 | |
| | Lower half 1.8 – 2 m | 100 | 102.22 | 105.38 | 105.43 | 107.32 | 108.10 | 108.86 | 109.13 | 110.10 | 110.75 | 111.66 | 112.00 | 112.00 | 112.70 | 113.25 | 113.85 | 114.04 | |
| | Upper half 4.8 – 5 m | 100 | 102.22 | 104.29 | 105.70 | 107.45 | 107.60 | 108.08 | 108.74 | 109.97 | 108.99 | 109.65 | 111.40 | 111.80 | 112.00 | 112.27 | 112.60 | 112.70 | |
| | Lower half 4.8 – 5 m | 100 | 102.22 | 104.20 | 104.95 | 106.47 | 107.20 | 107.40 | 108.08 | 108.76 | 109.47 | 110.17 | 110.66 | 110.80 | 111.20 | 111.74 | 112.10 | 112.65 | |
| 64/112X59/92 | Upper half 1.8 – 2 m | 100 | 101.66 | 104.37 | 104.55 | 104.75 | 105.66 | 106.40 | 106.70 | 106.80 | 107.61 | 108.20 | 108.50 | 108.60 | 108.70 | | | | |
| | Lower half 1.8 – 2 m | 100 | 101.66 | 102.50 | 104.00 | 104.10 | 104.58 | 104.63 | 104.70 | 104.85 | 105.20 | 105.28 | 105.50 | 105.80 | 106.31 | | | | |
| | Upper half 4.8 – 5 m | 100 | 101.66 | 103.92 | 104.10 | 104.25 | 104.72 | 105.23 | 105.40 | 105.80 | 106.00 | 106.25 | 106.40 | 106.70 | 107.01 | | | | |
| | Lower half 4.8 – 5 m | 100 | 101.66 | 103.10 | 103.70 | 104.33 | 104.80 | 104.79 | 104.60 | 104.90 | 105.10 | 105.25 | 105.40 | 105.50 | 105.70 | | | | |
| 77/115 | Upper half 1.8 – 2 m | 100 | 101.57 | 102.40 | 103.00 | 104.25 | 106.46 | 107.85 | 107.94 | 108.39 | 108.99 | 109.65 | | | | | | | |
| | Lower half 1.8 – 2 m | 100 | 101.57 | 102.60 | 105.00 | 104.10 | 105.36 | 106.28 | 107.02 | 107.30 | 107.39 | 107.78 | | | | | | | |
| | Upper half 4.8 – 5 m | 100 | 101.57 | 102.70 | 103.40 | 104.40 | 105.73 | 106.41 | 107.13 | 107.67 | 108.02 | 108.92 | | | | | | | |
| | Lower half 4.8 – 5 m | 100 | 101.57 | 102.80 | 103.50 | 104.00 | 104.71 | 106.01 | 106.65 | 106.93 | 106.98 | 107.24 | | | | | | | |

from Table 2, the tension occurring throughout the trawl exploitation causes the deformation of net meshes, the greatest changes appearing in a preliminary period ot the exploitation. They are induced by straightening the fibres along the axis of a twine serving as a mesh side as well as by the contraction of konts.

The magnitude of this changes will be greatly related to the kind of twine, type and extent of the knots contraction and to the final treatment technology.

It is to be stated, while analysing the measurements results from the both cruises, that the changes in mesh sizes of the trawl cod-ends used in the firs cruise are greater than those in the second one.

Direct observations show the magnitude of mesh sizes deformation depending greatly on a kind and size of cod-ends covers employed. The 33/37 bottom trawl and the 39/70x37/50 pelagic trawl which were both exploited in the first cruise, were equipped with one cover only, while two covers were supplied to the 59/88x53/66 pelagic trawl. Furthermore, the covers used during the first cruise were somewhat greater (more ample) than the cod-ends themselves. Under such circumstances the cod-end accepted in the first step the majority of forces resulting from the pressure of water and the mass of fish captured and above all those occurring when hauling the trawl in.

The second set of measurements which was made in the second cruise on board of m/t „Sejwal" indicates smaller changes in the mesh sizes. It results mainly from the fact that the cod-ends were equipped with two covers each, and the 77/115 trawl was even given a third cover. The covers were tightly fitted to the cod-ends. It was also noted that the mesh sizes deformations were evidently related to the weight of fish in particular hauls: the greater the fish weight, the more marked was the increase in the mesh size. These changes resulted mainly from tensions occuring when hauling the cod-end in, moving it over and emptying it.

The mesh sizes were measured simultaneously for the upper and lower part of the netting at a distance of 1,8–2,0 m and 4,8–5,0 m from its end. The analysis of data presented in Table 2 and 3 for the whole period of exploitation of trawls tested leads to a conclusion of much greater deformations occurring in the upper part of trawl. It is primarily due to the greater forces involved in this part; these forces are particularly effective when hauli when hauling the trawl up the slip and shifting the trawl with its content on the deck.

It is taken for granted that the magnitude of forces and thus the magnitude of mesh deformation are closely related to the amount of fish in the cod-end. These loads may be additionally increased when trawling proceeds in the bad meterological conditons during the vessel rolling. The fact that the selection of fish occurs chiefly in the trawl upper part, especially in the pelagic trawling, makes the greater mesh deformations in this part become more harmful.

**STRZYŻEWSKI** (1970) showed that in the herring fisheries approximately 87% of fishes entered the trawl through the upper part of its mouth. Measurements taken at 2 m and 5 m distances from the trawl end showed greater changes in mesh sizes occurring in the vicinity of the trawl end. In this part of gear the catch contributed too to the greater tensions because of gathering the fish in the terminal part mainly, especially when in smaller amounts.

The investigations show that the netting deformations, appearing as changes in the mesh sizes, are of considerable significance and the mesh sizes in the trawls exploited for the longest time tend to increase by as much as 19,8%. Such a deformation indicates at the same time the technology of netting production not being the best one. It appears to be an undesirable fact from the vessel owner's standpoint as well, since it introduces the gear selectivity greater than necessary and, in due course, leads to lower catches.

## CONCLUSIONS

1. The exploitation conditions cause an increase, with the trawling time, in the mesh size of the cod-ends of bottom and pelagic trawls and this in turn contributes to their greater selectivity and to the lower fishing effects at the same time.
2. Greater tensions in the upper part of trawl result in greater deformations of the netting dimensions. It is particularly unfavourable as far as the pelagic trawling is concerned because the pelagic fishes enter the trawl mouth and the trawl itself through its upper part; besides the fishes escape mainly through the upper part too.
3. The fisheries protection regulations and the vessel owner's interests concentrate on the application of nettings characterized by the stable mesh sizes. Thus it is necessary to employ a proper technology of manufacturing and final treatment of netting. Tensions, temperatures and time involved in the netting stabilisation should be especially taken into consideration. The netting used at present for the manufacturing of trawls does not seem to fulfill these requirements.

## REFERENCES

**Brandt A.**, 1963: Selectivity data for synthetic fibres. The Selectivity of Fishing Gear. Special Publication, No 5, ICNAF Dartmouth,NS Canada.

**Clark J.R.**, 1963: Size selection of fish by otter trawls results recent experiments in the Northwest Atlantic. The Selectivity of Fishing Gear. Special Publication, No 5, ICNAF Dartmouth,NS Canada.

**Richert S.**, 1968: Zmiana wielkości oczek jadra sieciowego we włoku w czasie jego eksploatacji. (Change in the netting mesh size of trawl during its exploitation). Technika i Gospodarka Morska. Nr 7.

**Rosner T.**, 1968: Włókna sztuczne. (Synthetic fibres). W. N-T. Warszawa.

**Strzyżewski W.**, 1970: Badania selektywności i reakcji ryb na narzędzie połowu. Badanie zachowania się ryb w strefie wlotowej i korpusie włoka. cz.I. (Investigations on the selectivity and fish reaction towards fishing gear. Investigations on the fish behaviour in the trawl mouth area and within its trunk. Part I. MIR Gdynia (manuscript)

Translated: mgr T. Radziejewska

## ZMIANY PRZEŚWITU OCZEK W JADRZE WORKÓW WŁOKÓW UŻYWANYCH NA TRAWLERACH B–18 W CZASIE ICH EKSPLOATACJI

Streszczenie

W pracy badano zmiany wielkości prześwitu oczek w jadrze worków włoków eksploatowanych na trawlerach zamrażalniach B-18 w PPDiUR „Odra" w Świnoujściu.

Pomiary prześwitów oczek dokonywano przy użyciu suwmiarki. Badania wykazały, że w wyniku eksploatacji następuje znaczne powiększenie wymiaru prześwitu oczek we worku włoków. Większe odkształcenia wystąpiły w górnej partii włoka.

Szczegółowe wyniki badań zawierają tablice 1, 2 i 3

## ИЗМЕНЕНИЯ ПРОСВЕТА ЯЧЕЕК В КУТКЕ ТРАЛОВ, ПРИМЕНЯЕМЫХ НА ТРАУЛЕРАХ Б -18 ВО ВРЕМЯ ИХ ЭКСПЛУАТАЦИИ

Р е з ю м е

В работе исследованы изменения величины просвета ячеек в кутке сельдянных тралов, эксплуатируемых на траулерах-рефрижераторах Б-18 в ППДиУР „Одра" в Свиноустье.

Измерения величины просвета ячеек проводились в 6 кутках донных и пелагических тралов.

Измерения проствbooтов ячеек проведены при помощи штангенциркуля. Исследования показали, что в результате эксплуатации наблюдается значительное увеличение размера просвета ячеек в кутке трала. Более значительная деформация произошла в врехней части кутка.

Подробные результаты исследований представлены в таблицах 2 и 3.

Address:

Received 25 V 1972

Doc. dr Józef Świniarski
Mgr Wiesław Małolepszy
Instytut Eksploatacji Zasobów Morza AR

Szczecin ul. Broniewskiego, blok 34
Polska – Poland