# FISKERITEKNOLOGISK FORSKNINGSINSTITUTT
### INSTITUTE OF FISHERY TECHNOLOGY RESEARCH

# OPPDRAGSRAPPORT
### *Fangstseksjonen*

## A Comparison of the Selectivity in Codends used by the Soviet and Norwegian Trawler Fleet in the Barents Sea

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**PROSJEKT:**

Joint Selectivity Experiment USSR/Norway in 1989

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**EKSTRAKT:**

This report describes the joint Soviet-Norwegian selectivity experiment performed east of Rybackya bank (Østbanken) in August/September 1989.

Of the two methods used to establish the selectivity parameters, bag type cover and trouser trawl, the last method were used to compare the results, indicating slightly better selectivity properties of the Soviet codend, roughly a 0.2 higher selection factor, and a selection range that was 3-4 cm narrower than for the Norwegian codend. This difference is explained by the different kind of codend material used by the Soviet and Norwegian trawler fleet.

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4 STIKKORD:

| Trawl | Selectivity |
|---|---|
| Methods | Codend material |

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Joint Soviet Norwegian selectivity experiments

August/September 1989


A Comparison of the Selectivity in Codends
used by the Soviet and Norwegian Trawler Fleet
in the Barents Sea


By

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ratio, width of bags, twine thickness and structure of the twine. Both sides came, however, to the conclusion that the ICES top cover produces considerable effect on the gear selectivity (Anon 1989).

During a joint meeting in Murmansk 24 - 25 April 1989, detailed plans for further experiments were worked out. Selectivity of trawl bags should be estimated by using the USSR-specified bag type cover (whole cover) and the modified trouser trawl specified by Norway. The 135 mm trawl bags used should be representative for the national fisheries. If possible there should be an exchange of specialists during the cruise.

## MATERIAL AND METHODS

The main characteristics of ships and gear used are as follows:

|  | R/V "Persey III" (USSR) | M/Tr "Anny Kræmer" (Norway) |
|---|---|---|
| **Vessel data** | | |
| Gross tonnage | | |
| Brt | 1047 | 477 |
| Nrt | 556 | 176 |
| Length | 84 m | 51 m |
| Width | 14 m | 10.3 m |
| Depth | 5.5 m | 4.7 m |
| HP | 1700 | 2400 |
| **Gear and rigging** | | |
| Trawl | 41.7/39.6 bottom trawl | "Alfredo-3" |
| Material | Polyamid (Kapron) | Polyethylen |
| Vertical opening | 6.5 m | 4 m |
| Horizontal opening | 24 m | 27 m |
| Otterboards | Oval-plain | V-shaped rectangular |
| Area | 5.5 m$^2$ | 7.4 m$^2$ |
| Weight | 1500 kg | 1750 kg |
| Total sweep/bridle length | 120 m | 150 m |

| | R/V "Persey III" | M/Tr "Anny Kræmer" |
|---|---|---|
| **Extension piece** | | |
| Material | Polyamid | Polyamid |
| Constr./thickness | Twisted 2x3.lmm | Plaited 2x5mm |
| | | |
| **Codend** | | |
| Material | Polyamid | Polyamid |
| Constr./thickness | Twisted 2x3.lmm | Plaited 2x7mm |
| | | |
| **Covers** | | |
| Bagtype | | |
| Material | Polyamid | Polyethylen |
| Constr./thickness | Single twisted | Plaited |
| | 2.4mm/3.lmm | 3.5mm |
| | | |
| Trouser trawl | | |
| Material | Polyamid | Polyethylen |
| Constr./thickness | Single twisted 2.2mm | Plaited 2.5mm |

Before the two boats started joint work, underwater observation of the gear used onboard "Anny Kræmer" were carried out at the east coast of Finnmark. At the same time "Persey III" was searching for suitable areas for selectivity experiments.

On 28 August the vessels met east of Rybachya Bank (Østbanken), and in the following week more than 50 hauls were done in this area in water depths of 130 to 270 m (Table 3 and 4). Except for a few hauls, the tows were done as parallel haulings, with a duration of approx. 2 hours and at a speed of 3.5 knots. Before the experiments started, there was an exchange of specialists between the vessels, as well as a short discussion of the practical details of the joint work.

The trawl codends used onboard "Persey III" and "Anny Kræmer" were similar to those used in commercial fishery. The bagtype covers were 2.5 times wider than the codends used, while the inside blinders used in the trouser trawl method were 10% wider and about 1-1.5 m longer than the codend. For further details of the gear used, see Figur 1-4.

Measurements of mesh size were done with wedge shaped ICNAF-type gauges, with a 5 kg weigth attached to its lower part.

Whenever possible, a sample of 400 specimen of cod and haddock from both the cover and codend were measured, the rest of the fish were counted, and the different length-frequency distributions were raised by their respective numbers.

In the data analysis, all hauls containing less than 100 kg of mixed fish in the main codend were excluded. The fish measurements were grouped in 2 cm intervals, and the method of 3-point-moving averages (Pope et al. 1975) were used to establish the different selection curves.


## RESULTS

### Underwater observations - "Anny Kræmer"

During this part of the experiments, codends and covers were observed with different catch rate. When the codend was empty or contained very little fish (100-200 kg), it stayed close to or on the bottom of the 4-panels bag type cover, providing ample space for escaped fish to pass back into the cover. As the codend filled up and more fish went back into the cover, the space between codend and cover was reduced. When the codend catch was roughly 700-800 kg, there was hardly space left for fish to pass back into the cover. In one haul of 1.3 tons in the main codend and about 1.6 tons in the cover, the cover was squeezing the main codend, and a lot of fish escaped from the main codend were gathered just in front of the codend catch, thus most probably causing a masking effect in the important "escape zone".

Another notable observation was the erratic "behaviour" of the codend inside the cover. It stayed almost stationary inside on the bottom of the cover, and was not making undulating movements as the codend normally does.

Observations of the trouser trawl confirmed that the vertical split net in front of the two codends divided the extension piece in two apparently equal halves. The small meshed blinder inserted in one of the trouser legs did not affect

that codend or the trouser trawl system as a whole. Unfortunately no observations of big hauls with the trouser trawl were made.


**Comparative fishing experiments - "Persey III" - "Anny Kræmer"**

The parallel fishing started with the use of trouser trawls followed by a series with bag type cover. At the second half of the period this scheme was repeated, but some of the hauls with bag type covers were done individually by each vessel.

Quite soon after the parallel fishing started, it became evident that "Anny Kræmer" had a better fishing power than "Persey III". For cod the relative fishing power (in weight) was roughly 2.5:1, and for haddock 2:1. However, a comparison of the length distribution (cover and codend pooled) of fish taken during the first period with bag type cover, clearly demonstrates that the two vessels were sampling the same fish (Fig. 5).

Because of the difference in fishing power and catches, and the fact that selectivity can be affected by catch size (ICES 1964), for the analysis it was necessary to split the catches into weight groups.

The pooled catches are given in Table 5 and 6, and shown separately for cod and haddock in Figure 6 and 7. With a mesh size of 141 mm for "Persey III" and 137 mm for "Anny Kræmer", the 50% retention length - $l_{50}$, selection range - s.r., and selection factor - S.F., are given in Table 1.

During the preliminary analysis of the first series with trouser trawl (made onboard), it became evident that the two legs of the trouser trawl system did not fish equally. The difference was most obvious in the data from "Anny Kræmer". Therefore, before the second series of experiments with this method, the two legs, the ordinary one and the "blinded" one, were exchanged, and the data from the two series were treated separately (Table 7). The data from "Persey III"'s two series were pooled (Table 8). With an adjustment procedure as outlined by Pope et al (1975) for alternate hauls, the main parameters for catches less (I) or more (II) than 1.0 ton were calculated and shown in Figures 8 and 9 ("Persey III": meshsize 143 mm, "Anny Kræmer": 138 mm).

## DISCUSSION AND CONCLUSIONS

The underwater observations of the cover used onboard "Anny Kræmer" clearly showed that with a catch of about a ton or more in the codend, the cover would cause a masking effect and lower the selectivity of the codend. In addition, and perhaps more serious, the codend partly "stayed" on the bottom of the cover, and did not "work" as under normal fishing conditions. As recommended by ICES (1964), the cover was made of polyethylene, but it may be that a difference in material, and consequently bouyancy, of the cover and codend gives rise to a bias. Use of the same material in cover and codend as onboard "Persey III" is perhaps a better solution.

A comparison of the results from the bag type cover experiments and the trouser trawl experiments, further confirm a masking effect of the bag type cover used onboard "Anny Kræmer".

In contrast, the experiments carried out with "Persey III" did not indicate any kind of masking effect by the bag type cover. Both the selection factors and selection ranges are quite similar for the two methods.

Possible explanations of the discrepancies between the findings for the bag type cover for the two vessels may be:

1.  The Norwegian codend does not "work" properly inside the cover, while the Soviet codend maintains the most of its characteristica inside the cover.

2.  Difference in width of the two codends and covers. While a typical Norwegian codend has a circumference of 6.0-6.5 m, a Soviet codend has a circumference of 10.0-10.5 m. It is reasonable to assume that in the Soviet codend an eventual masking effect by the cover will occur at a later stage during hauling, and mainly with big catches.

3.  The Soviet extention piece is slightly more tapered than the Norwegian one, thus possibly giving a greater distance between the cover and codend.

Exact explanations of this discrepancy, however, can only be obtained by further comparative studies aided by underwater observation of both gears.

Comparisons of the selection oogives for cod and haddock established for the trouser trawl method, indicate slightly better selectivity properties of the Soviet codend, roughly a 0.2 higher selection factor, and a selection range that is 3-4 cm narrower than for the Norwegian codend. This is slightly different from the more equal results obtained during the joint Soviet-Norwegian selectivity experiments in 1977 (Ponomarenko et al 1978).

Factors that may affect size selection in trawl and Danish seine have during the last thirty years been elucidated by numerous selectivity experiments, and may be summarized as:
1. Conditions of fish.
2. Degree of stomach content.
3. Towing speed.
4. Duration of tow.
5. Size of catch.
6. Codend material and construction.

Regarding point 1 to 4, these factors should give equal selection since the vessels were doing parallel hauls, and were fishing on fish of the same size composition. Point 5 should not cause any difference since the catches are divided into weight groups before the comparisons were made. The main reason for the difference in selectivity has therefore to be explained by the different kind of codend material used by the Soviet and Norwegian trawler fleet.

The Soviet trawler fleet is presently using almost the same codend material as 10 years back, i.e. twisted, double 3.1 mm Kapron (polyamid A), with no bonding material added, a quite soft and placable material. The most common codend material used by Norwegian trawlers is plaited, double, 7.0 mm polyamid, with a bonding material added. This material is much stiffer than the Soviet one, especially when new, and it may be classified as polyamid B.

These finding is similar to results obtained during the 50-ies (Boerema 1956, Lucas et al. 1954) where soft and light materials as cotton, hemp, or thin

single manila gave higher selection factors than the more heavy and stiff double manila and sisal, a finding that was termed "the light trawl" problem.

Anyhow, the selection parameters obtained during the joint experiments this year should be regarded as representative for the codends used by the national trawler fleet today, and as long as the codend material and construction remains as it is. However, if any change in codend construction or material thickness and construction occurs, this will most probably lead to a change in selectivity as well.

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Table 1.   Selection parameters for cod and haddock using the method with bag type cover.

| Weigth groups (kg) | Selection parameters | COD | | HADDOCK | |
|---|---|---|---|---|---|
| | | Persey III | Anny Kræmer | Persey III | Anny Kræmer |
| I 100–500 | $l_{50}$ (cm) | 58.5 | 52.2 | 55.4 | 46.8 |
| | s.r (cm) | 8.4 | 17.7 | 10.8 | – |
| | S.F. | 4.1 | 3.8 | 3.9 | 3.4 |
| II 500–1500 | $l_{50}$ (cm) | 56.6 | 47.6 | 51.6 | 43.0 |
| | s.r. (cm) | 7.8 | 16.4 | 9.2 | 16.1 |
| | S.F. | 4.0 | 3.5 | 3.6 | 3.1 |
| III 1500-> | $l_{50}$ (cm) | 59.8 | 47.0 | 49.2 | 43.0 |
| | s.r. (cm) | 9.2 | 16.0 | 7.2 | 16.1 |
| | S.F. | 4.2 | 3.4 | 3.5 | 3.1 |

Table 2.        Selection parameters for cod and haddock, when using the trouser trawl method.

| Weigth group | | Persey III | Anny Kræmer |
|---|---|---|---|
| | | COD | |
| | | w=270 kg | w=450/475 kg |
| | $l_{50}$ | 61.0 | 56.2 |
| I | s.r. | 7.6 | 11.8 |
| | S.F. | 4.3 | 4.1 |
| | | w=1700 kg | w=1900 kg |
| | $l_{50}$ | 58.4 | 43.2 |
| II | s.r. | 11.8 | 14.2 |
| | S.F. | 4.1 | 3.9 |
| | | HADDOCK | |
| | | w=270 kg | w=450/475 kg |
| | $l_{50}$ | 56.0 | 51.5 |
| I | s.r. | 8.6 | 11.1 |
| | S.F. | 3.9 | 3.7 |
| | | w=1700 kg | w=1900 kg |
| | $l_{50}$ | 51.2 | 47.0 |
| II | s.r. | 12.3 | 16.8 |
| | S.F. | 3.6 | 3.4 |

Table 3. Hauls made by M/Tr "Anny Kræmer" during the joint selectivity experiments in August/September 1989.

| Date | St.No. | Method | Area | Depth (m) | Haul duration | COD Codend No. | Cover No. | HADDOCK Codend No. | Cover No. | TOTAL CATCH Codend weigth | Cover weigth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 280889 | 1 | 2 | 70°27'N 32°28'E | 260 | 1905 1h30min | 233 | 185 | 103 | 134 | 670 | 530 |
| 280889 | 2 | 2 | 70°24'N 32°52'E | 260 | 2145 2h30min | 184 | 192 | 48 | 56 | 515 | 515 |
| 290889 | 3 | 2 | 70°20'N 33°20'E | 260 | 0135 1h30min | 111 | 105 | 25 | 20 | 300 | 258 |
| 290889 | 4 | 2 | 70°22'N 33°12'E | 260 | 0410 1h30min | 67 | 60 | 9 | 6 | 250 | 210 |
| 2980889 | 5 | 2 | 70°24'N 33°08'E | 255 | 0655 2h | 97 | 70 | 4 | 9 | 265 | 203 |
| 290889 | 6 | 2 | 70°16'N 32°25'E | 250 | 1005 2h | 370 | 282 | 244 | 287 | 1590 | 1200 |
| 290889 | 7 | 2 | 70°13'N 33°28'E | 155 | 1405 2h | 724 | 887 | 813 | 1106 | 2270 | 2550 |
| 290889 | 8 | 2 | 70°19'N 32°23'E | 130 | 1910 2h | 134 | 158 | 103 | 125 | 400 | 490 |
| 290889 | 9 | 2 | 70°10'N 32°26'E | 230 | 2225 2h | 696 | 586 | 591 | 522 | 2280 | 1900 |
| 300889 | 10 | 2 | 70°14'N 32°14'E | 250 | 0240 2h | 1300 | 888 | 576 | 500 | 3481 | 2375 |
| 300889 | 11 | 2 | 70°08'N 32°34'E | 210 | 0630 1h55min | 185 | 235 | 243 | 291 | 670 | 691 |
| 300889 | 12 | 2 | 70°11'N 32°15'E | 220 | 0905 2h | 408 | 425 | 455 | 513 | 1440 | 1425 |
| 300889 | 13 | 2 | 70°08'N 32°24'E | 230 | 1220 2h | 265 | 234 | 110 | 245 | 700 | 760 |
| 300889 | 14 | 2 | 70°09'N 32°21'E | 250 | 1615 2h | 69 | 85 | 64 | 81 | 235 | 246 |
| 300889 | 15 | 1 | 70°07'N 33°13'E | 170 | 2150 2h | 1826 | 405 | 301 | 171 | 5350 | 830 |
| 310889 | 16 | 1 | 70°13'N 33°02'E | 195 | 0120 2h | 666 | 59 | 175 | 59 | 1620 | 152 |

Table 3 cont.

| Date | St.No. | Method | Area | Depth (m) | Haul duration | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend weigth | TOTAL CATCH Cover weigth |
|------|--------|--------|------|-----------|---------------|----------------|---------------|---------------------|-------------------|---------------------------|--------------------------|
| 310889 | 17 | 1 | 70°08'N 33°25'E | 150 | 0505 2h | 1880 | 786 | 2287 | 1430 | 5980 | 1900 |
| 310889 | 18 | 1 | 70°01'N 33°13'E | 200 | 0805 2h | 1197 | 534 | 1349 | 759 | 3510 | 1140 |
| 310889 | 19 | 1 | 70°01'N 33°10'E | 145 | 1545 2h | 759 | 252 | 558 | 806 | 1600 | 860 |
| 310889 | 20 | 1 | 70°07'N 33°18'E | 220 | 1840 2h | 1754 | 239 | 1315 | 286 | 4900 | 520 |
| 010989 | 21 | 1 | 70°09'N 33°33'E | 265 | 0215 2h | 299 | 35 | 86 | 47 | 840 | 120 |
| 010989 | 22 | 1 | 70°15'N 33°19'E | 260 | 0500 2h | 458 | 71 | 55 | 20 | 1090 | 170 |
| 010989 | 23 | 1 | 70°11'N 33°32'E | 270 | 0755 2h | 712 | 54 | 128 | 15 | 1700 | 114 |
| 010989 | 24 | 1 | 70°11'N 33°12'E | 205 | 1105 2h | 1972 | 316 | 455 | 206 | 4180 | 920 |
| 010989 | 25 | 1 | 70°08'N 33°22'E | 215 | 1710 1h | 558 | 145 | 125 | 94 | 1190 | 230 |
| 010989 | 26 | 1 | 70°05'N 33°37'E | 230 | 1850 1h | 76 | 66 | 6 | 53 | 160 | 150 |
| 010989 | 27 | 1 | 70°07'N 33°27'E | 220 | 2025 1h | 146 | 42 | 12 | 16 | 310 | 80 |
| 010989 | 28 | 1 | 70°05'N 33°37'E | 211 | 2220 1h | 106 | 59 | 19 | 40 | 240 | 120 |
| 010989 | 29 | 1x | 70°07'N 33°27'N | 212 | 2340 1h | 86 | | 10 | | | |
| 020989 | 30 | 1x | 70°05'N 33°35'E | 231 | 0125 1h | 145 | | 9 | | | |
| 020989 | 31 | 2 | 70°03'N 33°34'E | 190 | 0420 2h | 202 | 451 | 32 | 207 | 440 | 950 |
| 020989 | 32 | 2 | 70°10'N 33°15'E | 215 | 0750 2h | 194 | 367 | 27 | 102 | 450 | 803 |

Table 3 cont.

| Date | St.No. | Method | Area | Depth (m) | Haul duration | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend weigth | TOTAL CATCH Cover weigth |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 020989 | 33 | 2 | 70°05'N 33°35'E | 222 | 1030 2h | 142 | 282 | 30 | 123 | 493 | 963 |
| 020989 | 34 | 2 | 70°05'N 33°18'E | 150 | 1345 2h | 493 | 1066 | 327 | 1540 | 1288 | 3464 |
| 020989 | 35 | 2 | 70°03'N 33°20'E | 160 | 1820 2h | 89 | 180 | 24 | 89 | 300 | 530 |
| 020989 | 36 | 2 | 70°11'N 33°11'E | 210 | 2105 2h | 108 | 141 | 44 | 95 | 300 | 390 |
| 020989 | 37 | 2 | | 220 | 2345 2h | 130 | 222 | 68 | 160 | 410 | 630 |
| 030989 | 38 | 2 | 70°21'N 32°31'E | 206 | 0235 2h | 73 | 120 | 47 | 128 | 230 | 390 |
| 030989 | 39 | 2 | 70°18'N 33°01'E | 240 | 0530 2h | 229 | 417 | 41 | 96 | 600 | 970 |
| 030989 | 40 | 2 | 70°12'N 32°24'E | 170 | 0925 2h | 470 | 951 | 69 | 354 | 950 | 770 |
| 030989 | 41 | 2 | 70°09'N 32°41'E | 160 | 1225 2h | 201 | 618 | 128 | 657 | 580 | 1580 |
| 030989 | 42 | 2 | 70°14'N 32°20'E | 205 | 1515 2h | 162 | 395 | 92 | 492 | 400 | 950 |
| 030989 | 43 | 2 | 70°10'N 32°37'E | 138 | 1855 2h | 155 | 514 | 150 | 690 | 450 | 1370 |
| 030989 | 44 | 2 | 70°04'N 32°55'E | 162 | 2210 2h | 162 | 337 | 64 | 266 | 420 | 810 |
| 040989 | 45 | 2 | 70°10'N 32°28'E | 195 | 0130 2h | 222 | 370 | 51 | 155 | 520 | 850 |
| 040989 | 46 | 2 | 70°04'N 32°11'E | 140 | 0445 | 136 | 309 | 161 | 1074 | 390 | 1460 |
| 040989 | 47 | 2 | 70°10'N 32°54'E | 170 | 0830 2h | 260 | 452 | 98 | 592 | 650 | 1380 |
| 040989 | 48 | 1x | | | | | | | | | |

Table 3 cont.

| Date | St.No. | Method | Area | Depth (m) | Haul duration | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend weigth | TOTAL CATCH Cover weigth |
|------|--------|--------|------|-----------|---------------|----------------|---------------|--------------------|--------------------|----------------------------|---------------------------|
| 040989 | 49 | 1x | | | | | | | | | |
| 040989 | 50 | 1x | | | | | | | | | |
| 040989 | 51 | 1 | 70°32'N 32°14'E | 212 | 0430 2h | 368 | 103 | 163 | 147 | 930 | 180 |
| 040989 | 52 | 1 | 70°22'N 32°12'E | 250 | 0725 2h | 353 | 97 | 150 | 114 | 847 | 180 |

Table 4. Hauls made by R/V "Persey III" during the joint selectivity experiments in August/September 1989.

| Date | St.no. | Method | Area | Depth (m) | Haul duration | Correspondent to "Anny Kræmer" hauls no. | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend Weigth | TOTAL CATCH Cover Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | See Table 3 | | | 1 | 61 | 163 | 25 | 169 | 160 | 490 |
| | 2 | 2 | See Table 3 | | | 2 | 93 | 179 | 47 | 117 | 310 | 470 |
| | 3 | 2 | See Table 3 | | | 3 | 55 | 127 | 28 | 81 | 170 | 230 |
| | 4 | | No measurements | | | 4 | | | | | | |
| | 5 | 2 | See Table 3 | | | 5 | 35 | 61 | 10 | 10 | 110 | 110 |
| | 6 | 2 | See Table 3 | | | 6 | 111 | 204 | 73 | 268 | 370 | 670 |
| | 7 | 2 | See Table 3 | | | 7 | 516 | 791 | 250 | 563 | 1350 | 1930 |
| | 8 | 2 | See Table 3 | | | 8 | 17 | 106 | 6 | 167 | 48 | 340 |
| | 9 | 2 | See Table 3 | | | 9 | 202 | 310 | 146 | 380 | 680 | 1100 |
| | 10 | 2 | See Table 3 | | | 10 | 666 | 865 | 295 | 398 | 1930 | 2400 |
| | 11 | 2 | See Table 3 | | | 11 | 27 | 111 | 23 | 200 | 90 | 440 |
| | 12 | 2 | See Table 3 | | | 12 | 136 | 337 | 66 | 453 | 400 | 1160 |
| | 13 | 2 | See Table 3 | | | 13 | 35 | 89 | 7 | 123 | 80 | 250 |
| | 14 | 2 | See Table 3 | | | 14 | 33 | 96 | 13 | 62 | 90 | 210 |
| | 15 | 1 | See Table 3 | | | 15 | 330 | 261 | 65 | 158 | 790 | 430 |
| | 16 | 1 | See Table 3 | | | 16 | 246 | 138 | 90 | 76 | 710 | 255 |
| | 17 | | No measurements | | | - | | | | | | |
| | 18 | 1 | See Table 3 | | | 18 | 56 | 194 | 29 | 325 | 140 | 550 |
| 310889 | 19 | 1 | 70°06'N 33°25'E | 135 | 1330 2h10min | - | 29 | 97 | 11 | 167 | 75 | 215 |
| 310889 | 20 | 1 | No measurements | | | - | | | | | | |
| 310889 | 21 | 1 | 70°04'N 33°16'E | 130 | 2025 1h30min | - | 78 | 267 | 41 | 312 | 210 | 600 |
| 310889 | 22 | 1 | 70°04'N 33°14'E | 130 | 2340 1h40min | - | 395 | 387 | 79 | 192 | 790 | 590 |
| 010989 | 23 | 1 | No measurements | | | - | | | | | | |

Table 4 cont.

| Date | St.no. | Method | Area | Depth (m) | Haul duration | Correspondent to "Anny Kræmer" hauls no. | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend Weigth | TOTAL CATCH Cover Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 010989 | 24 | 1 | 70°07'N 33°11'E | 150 | 0725 1h45min | - | 162 | 200 | 103 | 205 | 450 | 380 |
| 010989 | 25 | 1 | 70°06'N 33°26'E | 175 | 1020 1h30min | - | 453 | 366 | 152 | 378 | 1150 | 800 |
| 010989 | 26 | 1 | 70°09'N 33°15'E | 180 | 1320 2h | - | 351 | 458 | 611 | 456 | 1540 | 1040 |
| 010989 | 27 | 1 | No measurements | | | - | | | | | | |
| 010989 | 28 | 1 | 70°09'N 33°17'E | 175 | 1940 1h20min | - | 127 | 124 | 39 | 94 | 300 | 210 |
| 010989 | 29 | 1 | 70°03'N 33°29'E | 160 | 2205 2h | - | 420 | 360 | 375 | 671 | 1330 | 1080 |
| 020989 | 30 | 1 | 70°09'N 33°07'E | 160 | 0145 2h15min | - | 386 | 265 | 148 | 203 | 962 | 475 |
| | 31 | 2 | See Table 3 | | | 31 | 112 | 300 | 35 | 312 | 310 | 780 |
| | 32 | 2 | See Table 3 | | | 32 | 95 | 215 | 25 | 174 | 220 | 370 |
| | 33 | 2 | See Table 3 | | | 33 | 80 | 115 | 27 | 146 | 220 | 330 |
| | 34 | 2 | See Table 3 | | | 34 | 116 | 208 | 83 | 473 | 350 | 790 |
| | 35 | 2 | See Table 3 | | | 35 | 48 | 121 | 18 | 212 | 120 | 350 |
| | 36 | 2 | See Table 3 | | | 36 | 102 | 156 | 27 | 118 | 270 | 400 |
| | 37 | 2 | See Table 3 | | | 37 | 116 | 141 | 29 | 118 | 330 | 430 |
| | 38 | 2 | See Table 3 | | | 38 | 63 | 72 | 9 | 35 | 180 | 210 |
| | 39 | 2 | See Table 3 | | | 39 | 25 | 65 | 10 | 79 | 80 | 200 |
| | 40 | 2 | See Table 3 | | | 40 | 252 | 604 | 18 | 138 | 550 | 1090 |
| | 41 | 2 | See Table 3 | | | 41 | 30 | 309 | 18 | 338 | 90 | 630 |
| | 42 | | No measurements | | | 42 | | | | | | |
| | 43 | 2 | See Table 3 | | | 43 | 72 | 264 | 29 | 396 | 190 | 620 |
| | 44 | 2 | See Table 3 | | | 44 | 106 | 214 | 14 | 138 | 230 | 440 |

Table 4 cont.

| Date | St.no. | Method | Area | Depth (m) | Haul duration | Correspondent to "Anny Kræmer" hauls no. | COD Codend No. | COD Cover No. | HADDOCK Codend No. | HADDOCK Cover No. | TOTAL CATCH Codend Weigth | TOTAL CATCH Cover Weight |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 45 | 2 | See Table 3 | | | 45 | 65 | 141 | 12 | 69 | 155 | 310 |
| | 46 | 2 | See Table 3 | | | 46 | 55 | 110 | 33 | 516 | 180 | 500 |
| | 47 | 2 | See Table 3 | | | 46 | 47 | 19 | 19 | 200 | 140 | 111 |
| 040989 | 48 | 2 | 70°02'N 33°18'E | 100,5 | 1535 1h30min | - | 36 | 118 | 12 | 168 | 115 | 250 |
| 040989 | 49 | | 70°06'N 32°58'E | 150 | 1830 1h40min | - | 28 | 69 | | | | |
| 040989 | 50 | 1 | 70°10'N 32°51'E | 175 | 2210 2h | - | 81 | 70 | 11 | 304 | 175 | 165 |
| 050989 | 51 | 1 | 70°14'N 32°20'E | 200 | 0130 2h | - | 237 | 124 | 25 | 103 | 580 | 180 |
| 050989 | 52 | 1 | 70°25'N 32°13'E | 260 | 0430 1h40min | - | 117 | 66 | 46 | 59 | 345 | 120 |
| 050989 | 53 | 1 | 70°29'N 32°24'E | 260 | 0800 2h | - | 199 | 93 | 12 | 24 | 505 | 130 |
| 050989 | 54 | 1 | 70°20'N 32°48'E | 260 | 1120 3h | - | 154 | 115 | 23 | 30 | 360 | 140 |
| 050989 | 55 | 1 | 70°23'N 32°20'E | 220 | 1740 2h20min | - | 182 | 148 | 124 | 120 | 550 | 270 |
| 050989 | 56 | 1 | 70°31'N 32°47'E | 270 | 2230 2h10min | - | 355 | 55 | 29 | 31 | 885 | 100 |

Table 5. Pooled selectivity data from M/Tr "Anny Kræmer"; bagtype cover (CD = Codend, CV = Cover).

| Species | COD | | | | | | HADDOCK | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight groups(kg) | 100-500 | | 500-1500 | | 1500- | | 100-500 | | 500-1500 | | 1500- | |
| No. of hauls | 3 | | 5 | | 8 | | 3 | | 5 | | 8 | |
| Fish length (cm) | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV |
| >31 | 0. | 0. | 1. | 3. | 2. | 12. | 0. | 26. | 9. | 179. | 78. | 1011. |
| 31-32 | 0. | 1. | 0. | 5. | 8. | 19. | 0. | 2. | 1. | 2. | 23. | 85. |
| 33-34 | 0. | 1. | 0. | 11. | 5. | 17. | 0. | 1. | 1. | 2. | 21. | 74. |
| 35-36 | 1. | 4. | 3. | 3. | 4. | 23. | 0. | 10. | 4. | 9. | 42. | 113. |
| 37-38 | 0. | 4. | 3. | 7. | 3. | 34. | 1. | 6. | 5. | 16. | 79. | 150. |
| 39-40 | 1. | 1. | 6. | 23. | 20. | 65. | 2. | 6. | 11. | 23. | 125. | 180. |
| 41-42 | 2. | 7. | 12. | 27. | 70. | 112. | 2. | 7. | 16. | 25. | 170. | 229. |
| 43-44 | 3. | 4. | 21. | 23. | 119. | 174. | 1. | 5. | 21. | 14. | 326. | 276. |
| 45-46 | 3. | 15. | 25. | 37. | 280. | 300. | 4. | 1. | 43. | 18. | 524. | 313. |
| 47-48 | 8. | 14. | 37. | 44. | 350. | 365. | 4. | 5. | 49. | 34. | 751. | 345. |
| 49-50 | 21. | 18. | 78. | 43. | 639. | 369. | 4. | 3. | 86. | 28. | 1004. | 317. |
| 51-52 | 20. | 21. | 97. | 49. | 860. | 320. | 8. | 9. | 111. | 32. | 1221. | 272. |
| 53-54 | 28. | 23. | 86. | 42. | 802. | 273. | 4. | 6. | 71. | 17. | 901. | 144. |
| 55-56 | 16. | 11. | 121. | 27. | 781. | 206. | 5. | 3. | 59. | 9. | 714. | 47. |
| 57-58 | 21. | 10. | 128. | 21. | 882. | 115. | 1. | 4. | 45. | 3. | 349. | 39. |
| 59-60 | 27. | 8. | 160. | 24. | 964. | 88. | 0. | 0. | 26. | 0. | 164. | 9. |
| 60-61 | 26. | 8. | 160. | 11. | 941. | 52. | 0. | 0. | 10. | 1. | 39. | 0. |
| 63-64 | 27. | 4. | 184. | 12. | 908. | 33. | 1. | 0. | 2. | 0. | 29. | 1. |
| 65-66 | 27. | 5. | 172. | 6. | 795. | 31. | 0. | 0. | 2. | 0. | 5. | 0. |
| 67-68 | 23. | 4. | 202. | 8. | 613. | 17. | 0. | 0. | 0. | 0. | 0. | 0. |
| 69-70 | 27. | 3. | 159. | 12. | 552. | 6. | 0. | 0. | 0. | 0. | 2. | 0. |
| 71-72 | 13. | 1. | 120. | 5. | 429. | 3. | 0. | 0. | 0. | 0. | 0. | 0. |
| 73-74 | 13. | 0. | 76. | 5. | 238. | 5. | 0. | 0. | 0. | 0. | 0. | 0. |
| ≥75 | 21. | 0. | 184. | 1. | 500. | 6. | 0. | 0. | 0. | 0. | 0. | 0. |

Table 6. Pooled selectivity data from R/V "PerseyIII"; bagtype cover (CD = Codend, CV = Cover).

| Species | COD | | | | | | HADDOCK | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight groups(kg) | 100-500 | | 500-1500 | | 1500- | | 100-500 | | 500-1500 | | 1500- | |
| No. of hauls | 3 | | 5 | | 8 | | 3 | | 5 | | 8 | |
| Fish length (cm) | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV |
| < 31 | 0. | 9. | 0. | 12. | | | 0. | 136. | 0. | 120. | 0. | 3. |
| 31-32 | 0. | 8. | 0. | 5. | | | 0. | 18. | 0. | 33. | 0. | 4. |
| 33-34 | 0. | 4. | 0. | 6. | 0. | 1. | 0. | 16. | 1. | 13. | 0. | 0. |
| 35-36 | 0. | 5. | 1. | 9. | 0. | 0. | 1. | 16. | 4. | 39. | 0. | 6. |
| 37-38 | 0. | 15. | 1. | 18. | 0. | 1. | 2. | 50. | 6. | 81. | 2. | 18. |
| 39-40 | 0. | 27. | 3. | 30. | 0. | 1. | 1. | 48. | 3. | 131. | 2. | 31. |
| 41-42 | 1. | 59. | 5. | 82. | 0. | 7. | 1. | 93. | 22. | 225. | 5. | 32. |
| 43-44 | 4. | 64. | 5. | 84. | 0. | 4. | 7. | 89. | 24. | 168. | 6. | 26. |
| 45-46 | 5. | 73. | 8. | 132. | 0. | 15. | 12. | 93. | 47. | 207. | 8. | 59. |
| 47-48 | 8. | 156. | 27. | 276. | 1. | 55. | 21. | 183. | 158. | 283. | 91. | 105. |
| 49-50 | 14. | 136. | 31. | 260. | 9. | 100. | 54. | 140. | 133. | 224. | 121. | 82. |
| 51-52 | 44. | 140. | 108. | 383. | 7. | 55. | 68. | 88. | 268. | 214. | 113. | 50. |
| 53-54 | 48. | 104. | 146. | 316. | 17. | 63. | 59. | 79. | 198. | 117. | 116. | 28. |
| 55-56 | 28. | 78. | 134. | 183. | 18. | 49. | 38. | 46. | 116. | 31. | 68. | 7. |
| 57-58 | 49. | 54. | 215. | 128. | 25. | 34. | 24. | 14. | 65. | 12. | 46. | 4. |
| 59-60 | 75. | 43. | 248. | 102. | 47. | 41. | 10. | 4. | 53. | 2. | 25. | 1. |
| 61-62 | 68. | 17. | 347. | 59. | 12. | 12. | 3. | 1. | 12. | 0. | 6. | 0. |
| 63-64 | 86. | 18. | 431. | 64. | 45. | 11. | 1. | 0. | 5. | 2. | 2. | 0. |
| 65-66 | 83. | 11. | 298. | 20. | 38. | 7. | 0. | 0. | 3. | 0. | 0. | 0. |
| 67-68 | 78. | 2. | 371. | 12. | 40. | 2. | 0. | 0. | 2. | 0. | 0. | 0. |
| 69-70 | 50. | 2. | 292. | 4. | 42. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 71-72 | 36. | 2. | 181. | 3. | 15. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| 73-74 | 26. | 0. | 96. | 2. | 13. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |
| > 75 | 72. | 1. | 255. | 2. | 22. | 0. | 0. | 0. | 0. | 0. | 0. | 0. |

Table 7.        Pooled selectivity data from M/Tr "Anny Kræmer", trouser trawl method.
(CD = standard codend, CV = blinded codend)

| Species | | | COD | | | | | | HADDOCK | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Weight groups(kg) | -1000 | | 1000- | | 100-1000 | | -1000 | | 1000- | | 100-1000 | |
| No. of hauls | 3 | | 5 | | 8 | | 3 | | 5 | | 8 | |
| Series | 1 | | 1 | | 2 | | 1 | | 1 | | 2 | |
| Fish length (cm) | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV | CD | CV |
| <31 | 0. | 3. | | | 0. | 8. | 0. | 12. | 0. | 16. | 8. | 852. |
| 31-32 | 0. | 3. | 0. | 1. | 0. | 12. | 0. | 1. | 0. | 1. | 0. | 98. |
| 33-34 | 0. | 2. | 0. | 0. | 2. | 60. | 1. | 2. | 2. | 8. | 1. | 115. |
| 35-36 | 0. | 3. | 0. | 3. | 0. | 33. | 1. | 8. | 7. | 8. | 2. | 177. |
| 37-38 | 0. | 8. | 0. | 12. | 1. | 54. | 0. | 12. | 3. | 26. | 5. | 157. |
| 39-40 | 2. | 10. | 2. | 19. | 3. | 68. | 4. | 31. | 11. | 45. | 4. | 182. |
| 41-42 | 4. | 20. | 8. | 25. | 15. | 106. | 9. | 40. | 62. | 109. | 22. | 253. |
| 43-44 | 5. | 27. | 12. | 30. | 13. | 161. | 20. | 78. | 70. | 145. | 37. | 309. |
| 45-46 | 15. | 32. | 8. | 55. | 26. | 206. | 53. | 112. | 146. | 226. | 106. | 411. |
| 47-48 | 8. | 49. | 38. | 101. | 48. | 320. | 96. | 123. | 286. | 310. | 107. | 540. |
| 49-50 | 21. | 58. | 63. | 127. | 100. | 466. | 114. | 166. | 339. | 398. | 181. | 612. |
| 51-52 | 35. | 78. | 97. | 170. | 120. | 484. | 157. | 152. | 433. | 434. | 231. | 613. |
| 53-54 | 61. | 83. | 126. | 122. | 154. | 510. | 114. | 94. | 343. | 323. | 184. | 399. |
| 55-56 | 63. | 88. | 138. | 164. | 190. | 414. | 71. | 65. | 224. | 217. | 114. | 239. |
| 57-58 | 77. | 90. | 163. | 175. | 229. | 452. | 46. | 24. | 110. | 97. | 62. | 122. |
| 59-60 | 130. | 114. | 178. | 178. | 256. | 424. | 20. | 17. | 44. | 30. | 24. | 79. |
| 61-62 | 124. | 105. | 220. | 194. | 284. | 424. | 1. | 6. | 18. | 18. | 10. | 22. |
| 63-64 | 170. | 102. | 223. | 145. | 307. | 408. | 1. | 1. | 4. | 3. | 3. | 2. |
| 65-66 | 158. | 112. | 248. | 189. | 294. | 392. | 0. | 1. | 1. | 2. | 0. | 6. |
| 67-68 | 138. | 79. | 210. | 147. | 253. | 327. | 0. | 2. | 0. | 0. | 1. | 2. |
| 69-70 | 103. | 74. | 147. | 103. | 207. | 270. | 0. | 0. | 0. | 0. | 0. | 1. |
| 71-72 | 80. | 54. | 132. | 69. | 140. | 178. | 0. | 0. | 0. | 0. | 0. | 0. |
| 73-74 | 55. | 29. | 78. | 45. | 92. | 112. | 0. | 0. | 0. | 0. | 0. | 0. |
| ≥75 | 92. | 93. | 107. | 99. | 195. | 233. | 0. | 0. | 0. | 0. | 0. | 0. |

After Pope et al. 1975:

First series, adjustment factor $F = \dfrac{\text{Cod above/equal 70 cm in CD (all hauls)}}{\text{Cod above/equal 70 cm in CV (all hauls)}} = \dfrac{1115}{721} = 1.54$

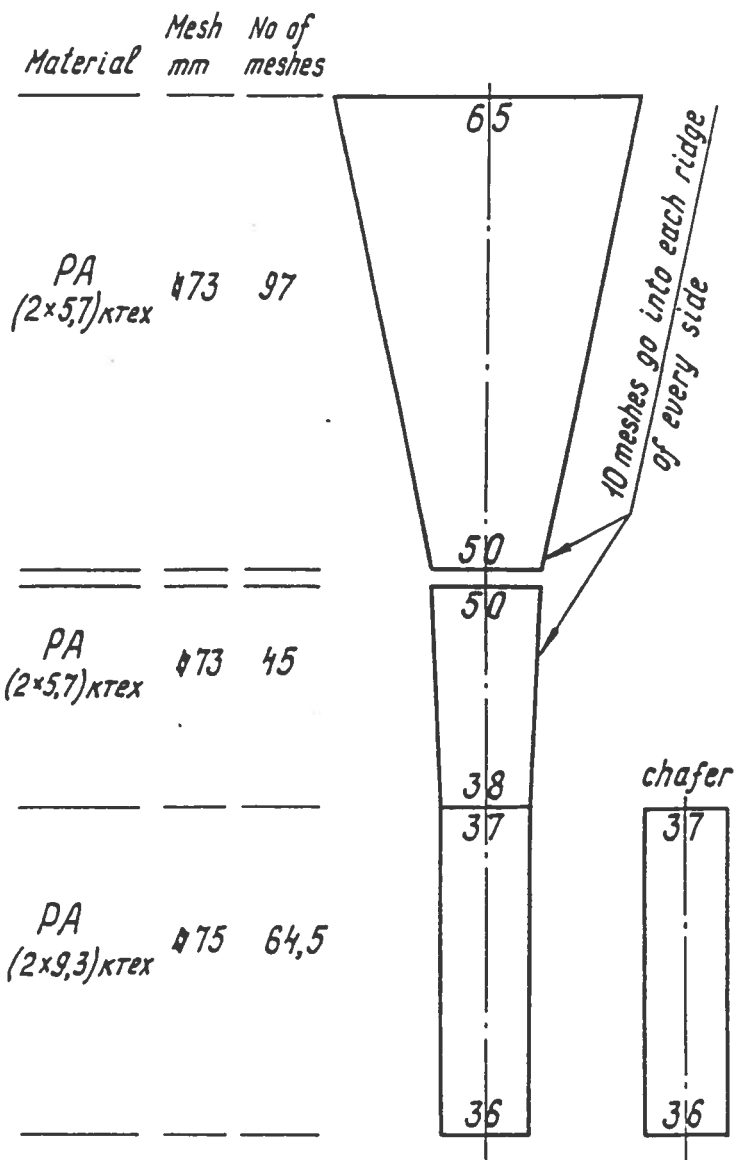Second series, adjustment factor $F = \dfrac{634}{793} = 0.799$

Table 8.  Pooled selectivity data from R/V "Persey III", trouser trawl method.
(CD = standard codend, CV = blinded codend)

| Species | COD | | | | HADDOCK | | | |
|---|---|---|---|---|---|---|---|---|
| Weight groups (kg) | 100-1000 | | 1000 - | | 100-1000 | | 1000 - | |
| No. of hauls | 22 | | 2 | | 22 | | 2 | |
| Series | 1 + 2 | | | | 1 + 2 | | | |
| Fish length (cm) | CD | CV | CD | CV | CD | CV | CD | CV |
| < 31 | 0. | 21. | 0. | 0. | 0. | 998. | 0. | 1. |
| 31-32 | 0. | 18. | 0. | 0. | 0. | 61. | 0. | 2. |
| 33-34 | 0. | 7. | 0. | 0. | 0. | 41. | 0. | 0. |
| 35-36 | 0. | 8. | 0. | 0. | 0. | 62. | 0. | 0. |
| 37-38 | 0. | 23. | 0. | 0. | 0. | 133. | 0. | 3. |
| 39-40 | 0. | 37. | 0. | 2. | 4. | 121. | 0. | 15. |
| 41-42 | 1. | 73. | 0. | 5. | 7. | 234. | 0. | 42. |
| 43-44 | 1. | 56. | 1. | 7. | 6. | 205. | 8. | 24. |
| 45-46 | 4. | 102. | 3. | 10. | 19. | 310. | 17. | 40. |
| 47-48 | 11. | 273. | 3. | 38. | 59. | 608. | 50. | 165. |
| 49-50 | 14. | 244. | 16. | 36. | 96. | 617. | 103. | 181. |
| 51-52 | 36. | 345. | 37. | 151. | 189. | 492. | 146. | 209. |
| 53-54 | 54. | 316. | 33. | 142. | 156. | 395. | 109. | 138. |
| 55-56 | 39. | 241. | 32. | 85. | 106. | 212. | 45. | 80. |
| 57-58 | 90. | 327. | 76. | 131. | 81. | 138. | 37. | 34. |
| 59-60 | 150. | 330. | 89. | 140. | 36. | 44. | 19. | 24. |
| 61-62 | 229. | 290. | 123. | 142. | 19. | 11. | 8. | 3. |
| 63-64 | 257. | 362. | 156. | 215. | 5. | 7. | 1. | 0. |
| 65-66 | 248. | 229. | 132. | 161. | 1. | 0. | | |
| 67-68 | 249. | 276. | 157. | 98. | 0. | 2. | | |
| 69-70 | 198. | 179. | 111. | 78. | 1. | 0. | | |
| 71-72 | 163. | 115. | 75. | 41. | 0. | 0. | | |
| 73-74 | 99. | 83. | 48. | 50. | 0. | 0. | | |
| ≥ 75 | 215. | 224. | 92. | 124. | 0. | 0. | | |

After Pope et al. 1975:

First + second series, adjustment factor $F = \dfrac{CD}{CV} = 1.11$
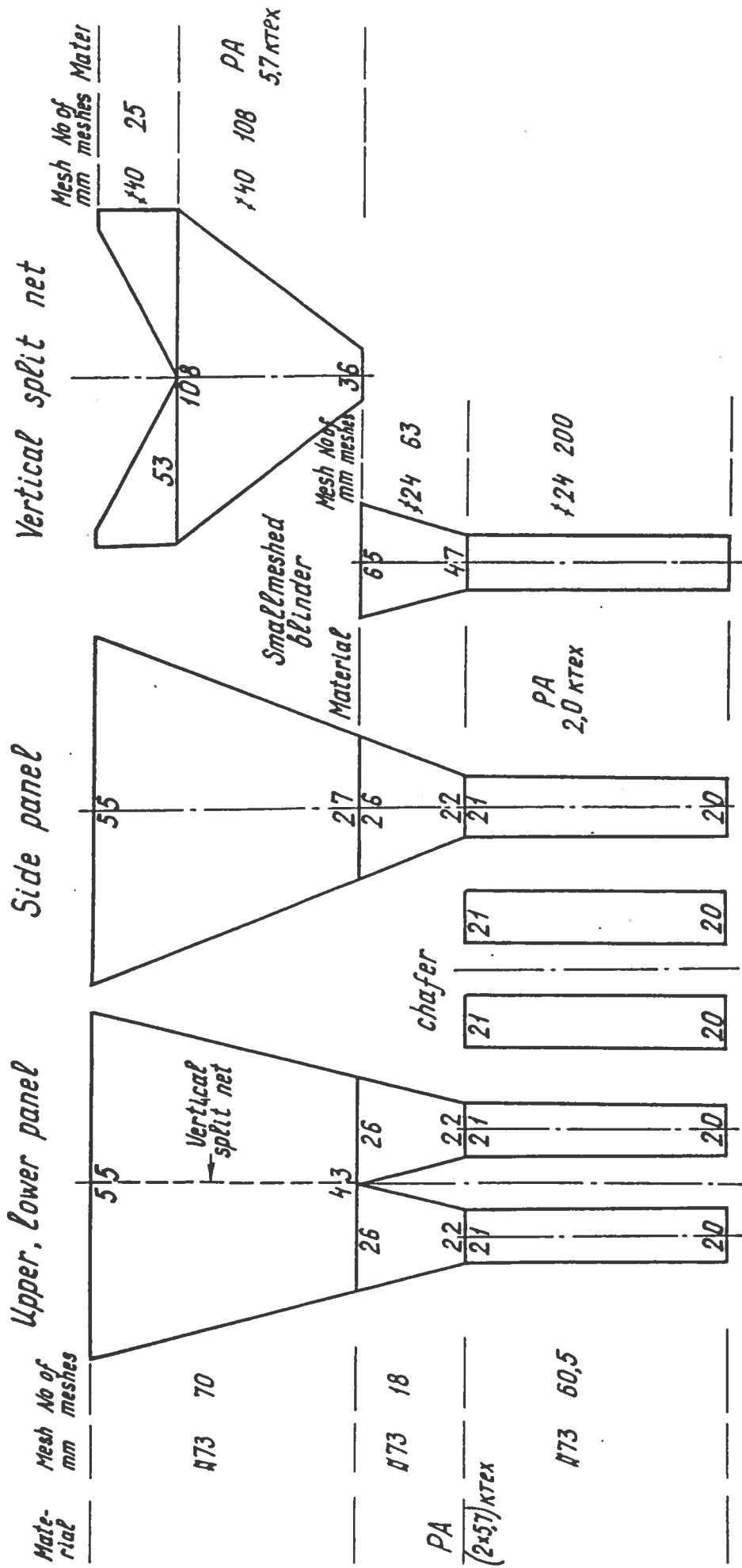
## Codend (4 panel)

| Material | Mesh mm | No of meshes |
|---|---|---|
| PA (2×5,7)ктех | ⌀73 | 97 |
| PA (2×5,7)ктех | ⌀73 | 45 |
| PA (2×9,3)ктех | ⌀75 | 64,5 |

65

10 meshes go into each ridge of every side

50

50

38

37

36

chafer

37

36

## Bag-type cover (4 panel)

| Material | | Mesh mm | No of meshes |
|---|---|---|---|
| PA 5,7 ктех | 3 meshes | ⌀60 | 42 |
| PA 2,7 ктех | 6 meshes | ⌀24 | 177 |
| PA 5,7 ктех | 5 meshes | ⌀34 | 51 |
| | | ⌀34 | 51 |

59

148

into lastridge

148

103

103

102

65
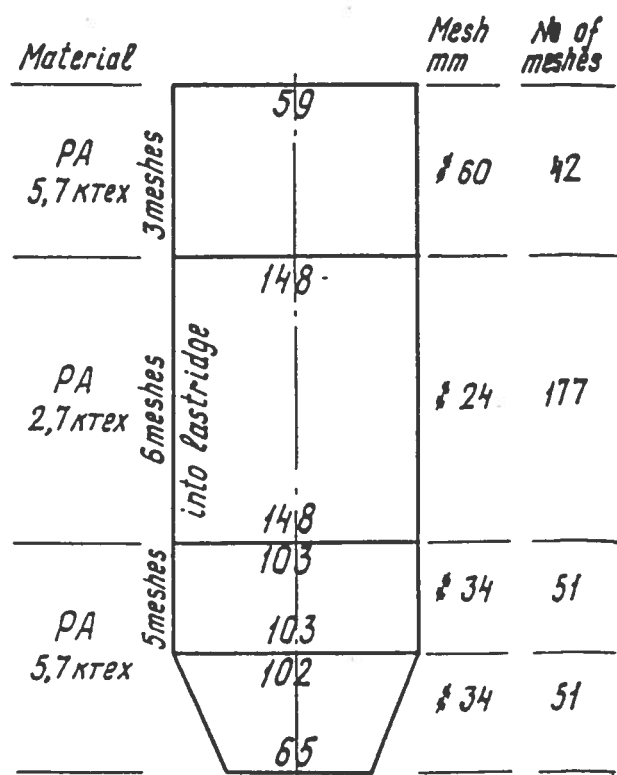
## Codend with bag-type cover (USSR)

Figure l.        Drawings of codend and bag type cover used by R/V "Persey III".

**Vertical split net**

| Mesh mm | No of meshes | Materi |
|---|---|---|
| ↓40 | 25 | |
| ↓40 | 108 | PA 5,7 ктех |

53    108    36

**Small meshed blinder**

| Mesh mm | No of meshes |
|---|---|
| ↓24 | 63 |
| ↓24 | 200 |

65    4:7

PA 2,0 ктех

**Side panel**

55    217    26    22    21    20

Material

**chafer**

21    20
21    20

**Upper, lower panel**

Vertical split net

55    43    26    22    21    20

| Mate- rial | Mesh mm | No of meshes |
|---|---|---|
| | ↓73 | 70 |
| | ↓73 | 18 |
| PA (2×57) ктех | ↓73 | 60,5 |

Codend "Trousers" type (USSR)

Figure 2.    Drawing of the trouser trawl system used by R/V "Persey III".
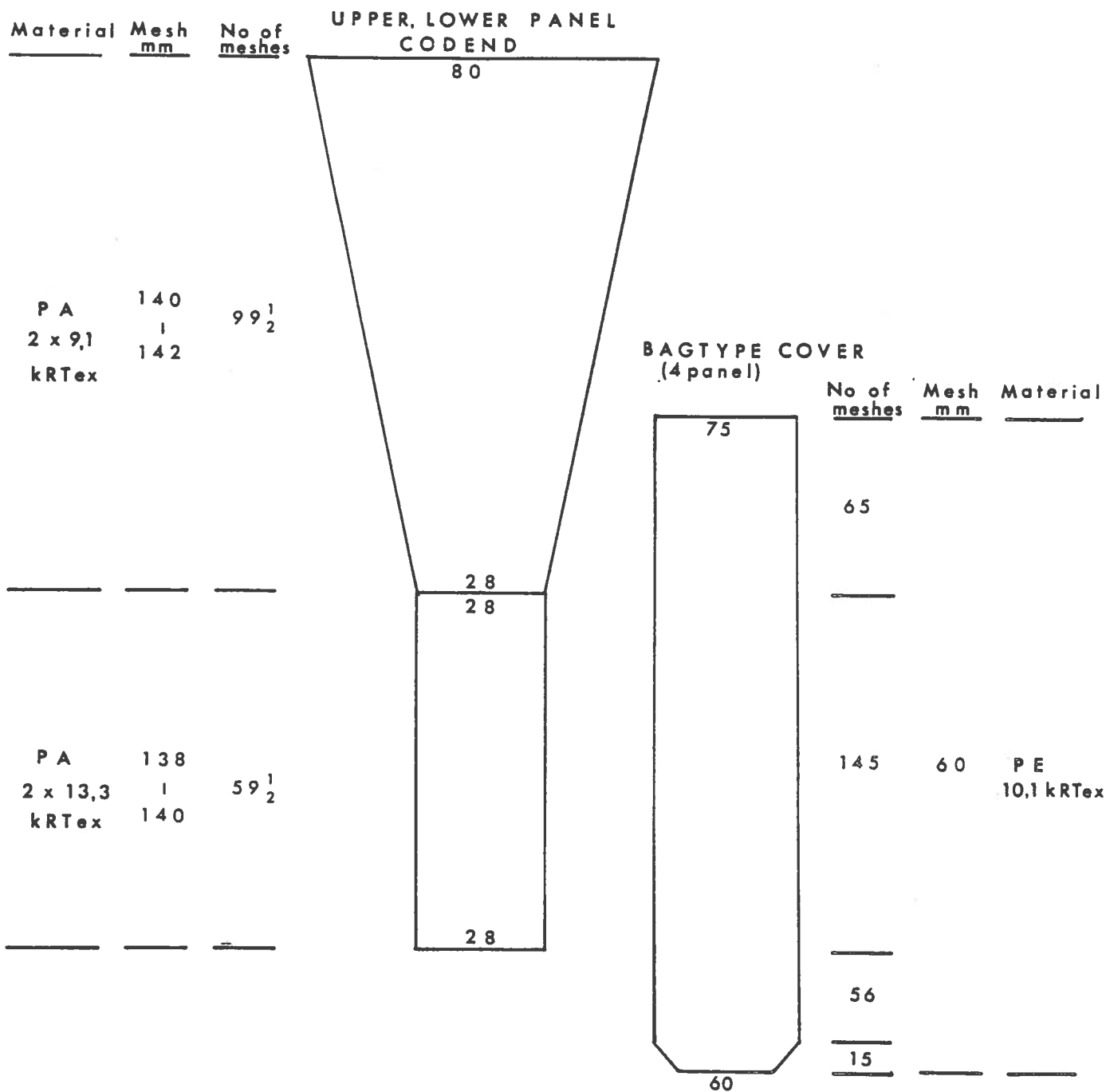
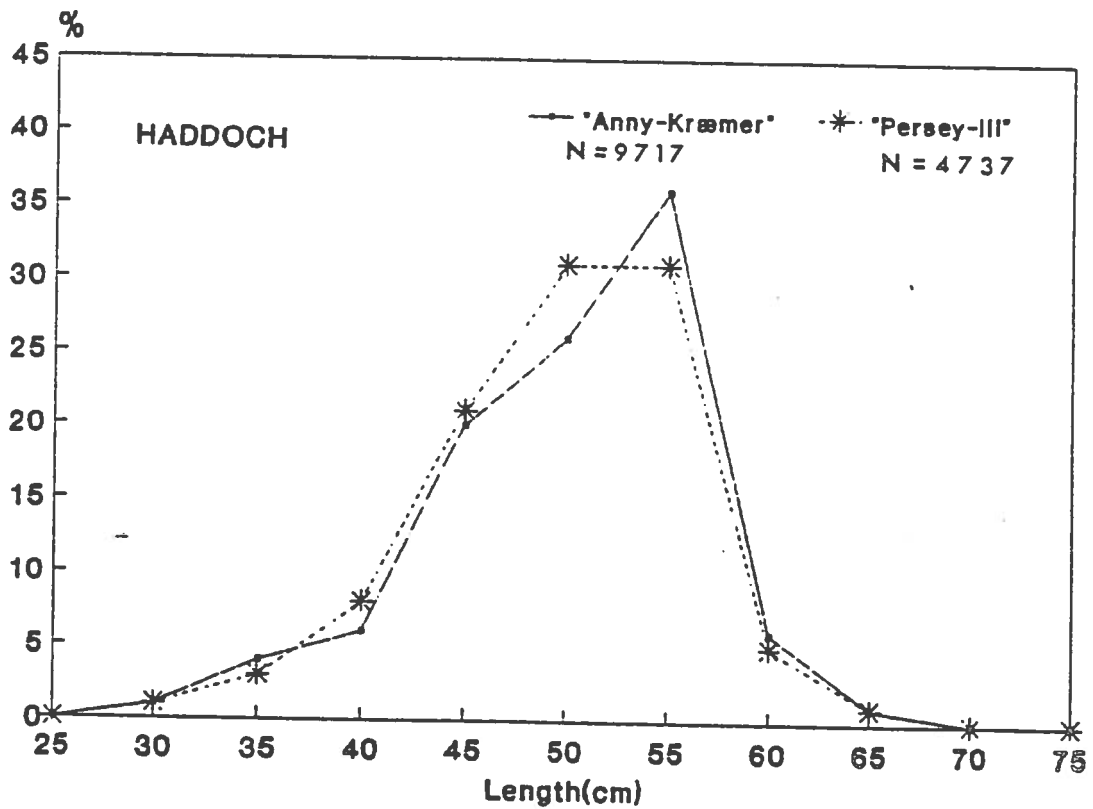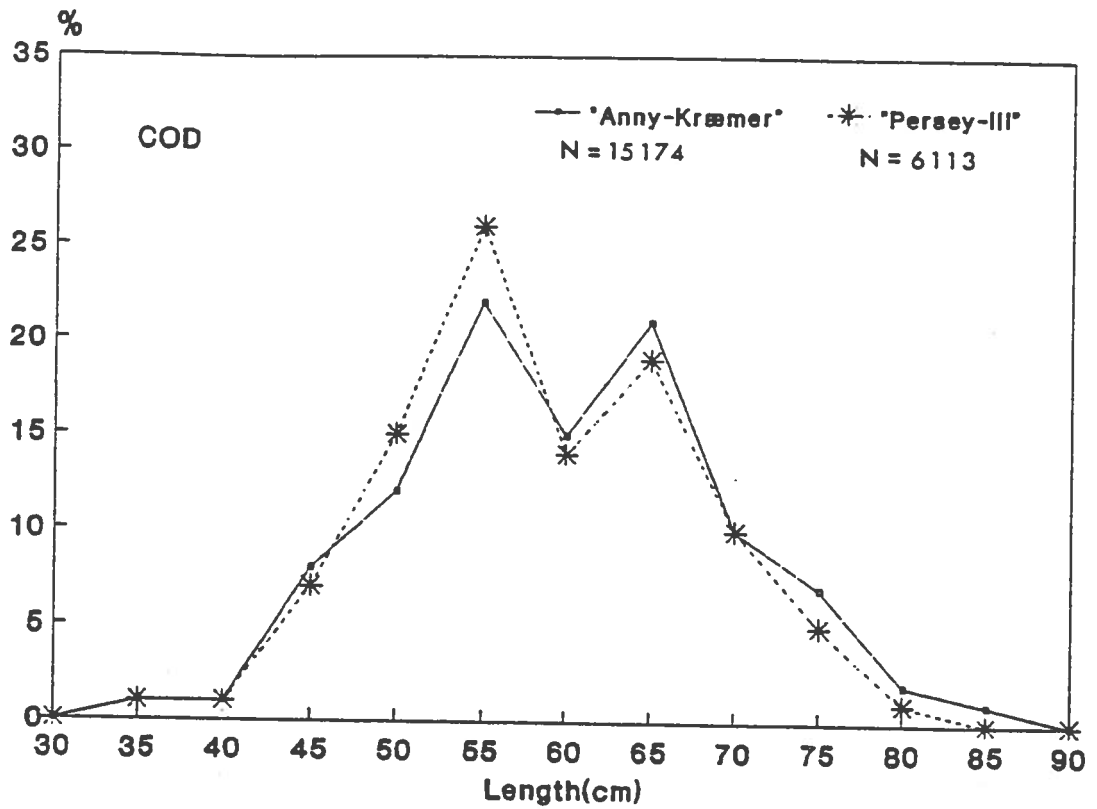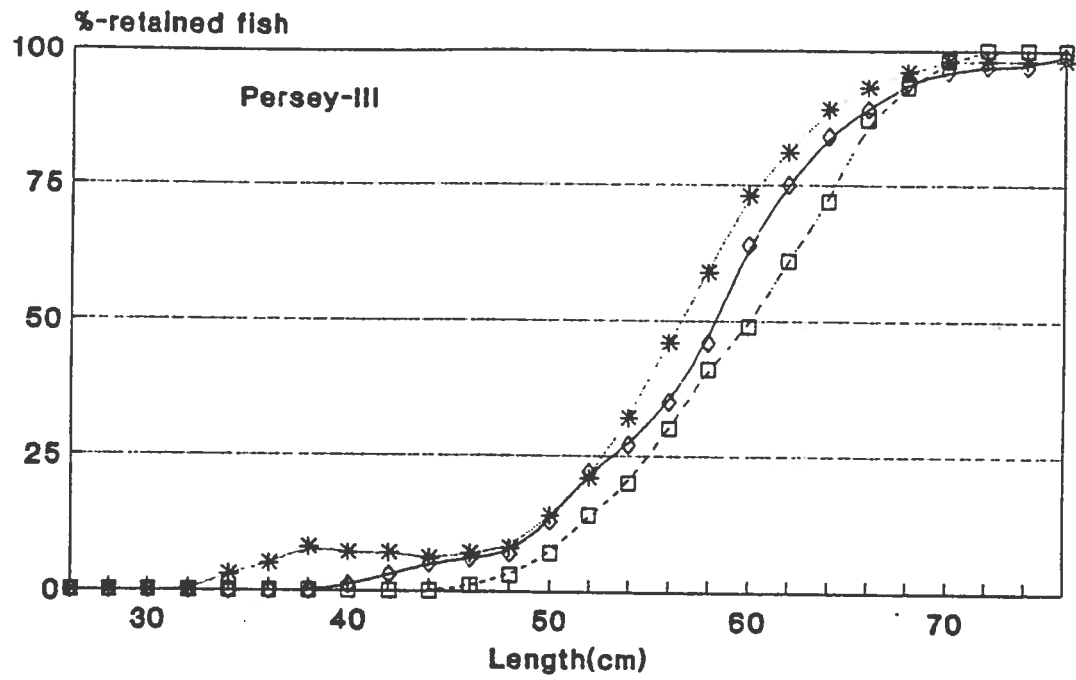Figure 3.   Drawings of the codend and bag type cover used by M/Tr "Anny Kræmer".

VERTICAL SPLIT NET

| Material | Mesh mm | No of meshes | Material |
|---|---|---|---|
| | | 40 | PE 10.1 kRTe |
| | | 120 | |
| | 60 | 8 | |
| | | 155 | PE 7.6 kRTex |

Values on net drawing: 40, 40, 80, 10

UPPER, LOWER PANEL

Vertical split net

Smallmeshed blinder

| Material | Mesh mm | No of meshes |
|---|---|---|
| PA (2 x 9,1) kRTex | 140 – 142 | 99 $\frac{1}{2}$ |
| PA (2 x 13,3) kRTex | 138 – 140 | 59 $\frac{1}{2}$ |

Values on panel drawing: 80, 5, 6, 28, 28, 28, 28

Values on blinder: 72, 72
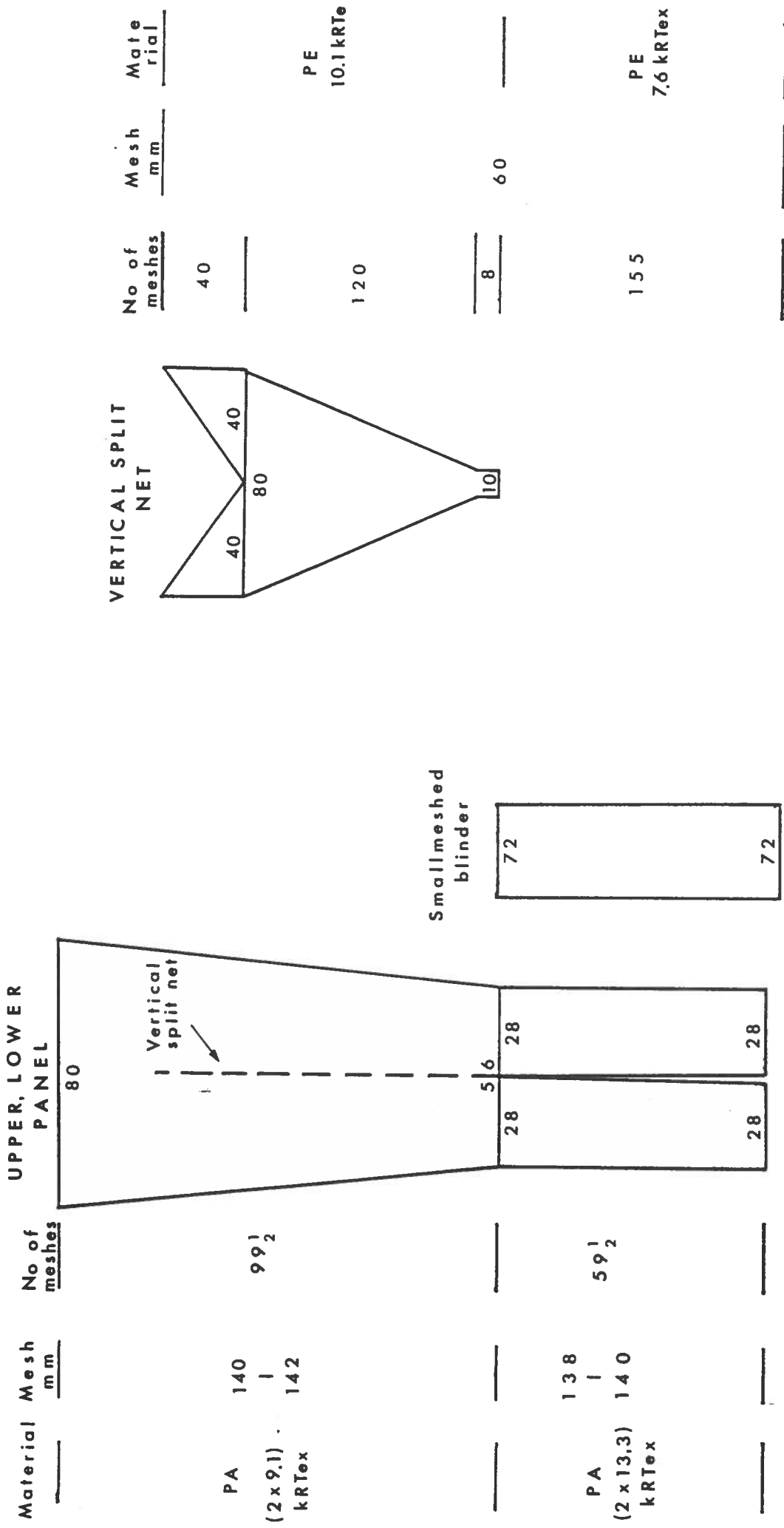
Figure 4.  Drawings of the trouser trawl system used by M/Tr "Anny Kræmer".

**Figure 5.** Length distribution of cod and haddock caugth by R/V "Persey III" and M/Tr "Anny Kræmer" during the joint selectivity experiment in August/September 1989 (first series with bag type cover).

**% -retained fish**

Persey-III

| l$_{50}$ (cm) | Catch 100-500kg | Catch 500-1500kg | Catch 1500- kg |
|---|---|---|---|
| l$_{50}$ (cm) | 58.5 | 56.6 | 59.8 |
| s.r. (cm) | 8.4 | 7.8 | 9.2 |
| S.F. | 4.1 | 4.0 | 4.2 |

**% -retained fish**
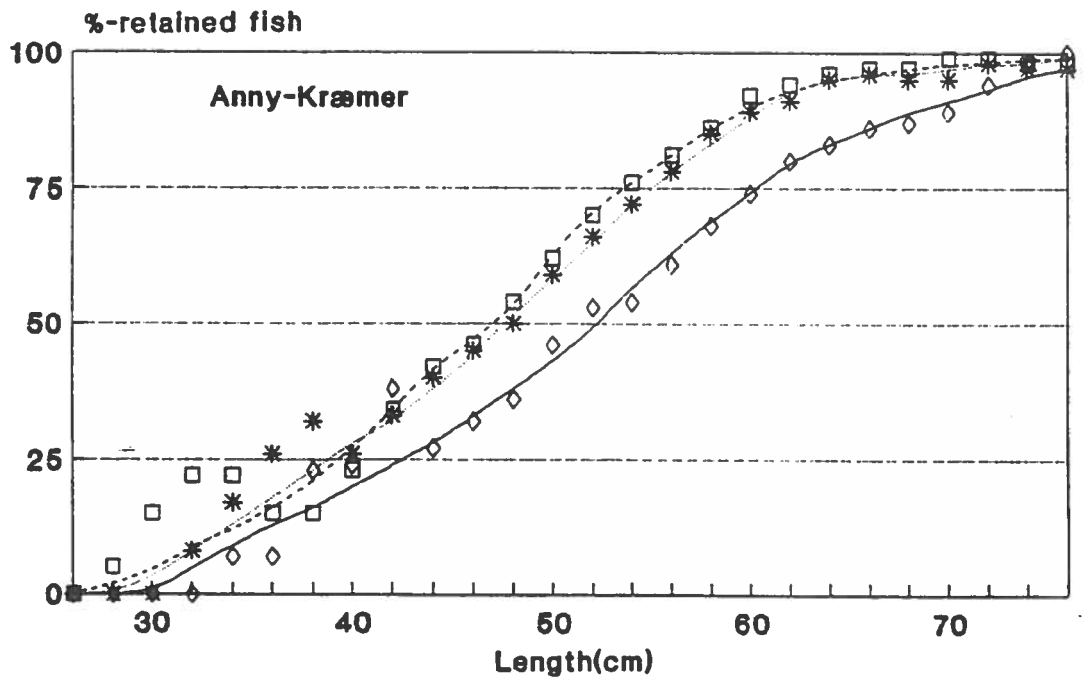
Anny-Kræmer

| | Catch 100-500kg | Catch 500-1500kg | Catch 1500- kg |
|---|---|---|---|
| l$_{50}$ (cm) | 52.2 | 47.6 | 47.0 |
| s.r. (cm) | 17.7 | 16.4 | 16.0 |
| S.F. | 3.8 | 3.5 | 3.4 |

Figure 6.    Selection oogives for cod, bag type cover.

(R/V "Persey III": 141 mm, M/Tr "Anny Kræmer": 137 mm)

**%-retained fish**

Persey-III

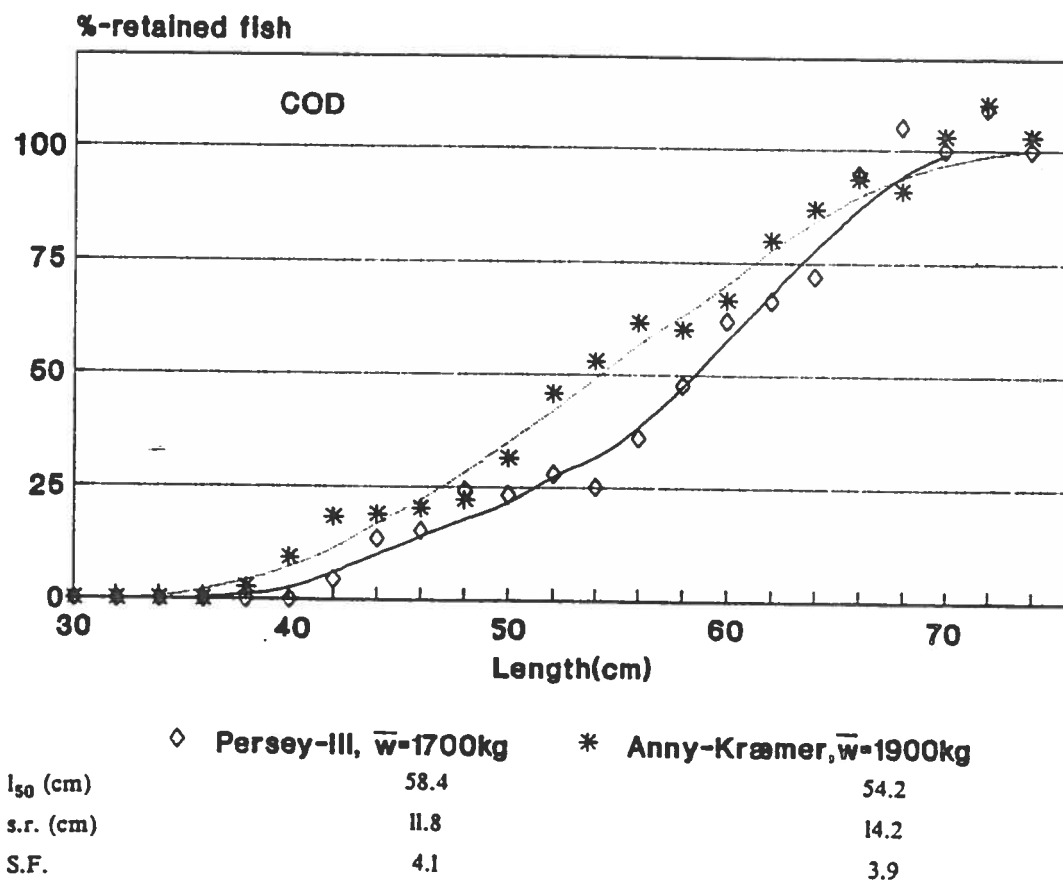| l50 (cm) | Catch 100-500kg | Catch 500-1500kg | Catch 1500- kg |
|---|---|---|---|
| $l_{50}$ (cm) | 55.4 | 51.4 | 49.2 |
| s.r. (cm) | 10.8 | 9.2 | 7.2 |
| S.F. | 3.9 | 3.6 | 3.5 |

**%-retained fish**

Anny-kræmer

| | Catch 100-500kg | Catch 500-1000kg | Catch 1500- kg |
|---|---|---|---|
| $l_{50}$ (cm) | 46.8 | 43.0 | 43.0 |
| s.r. (cm) | - | 16.1 | 16.1 |
| S.F. | 3.4 | 3.1 | 3.1 |

Figure 7.     Selection oogives for haddock, bag type cover.

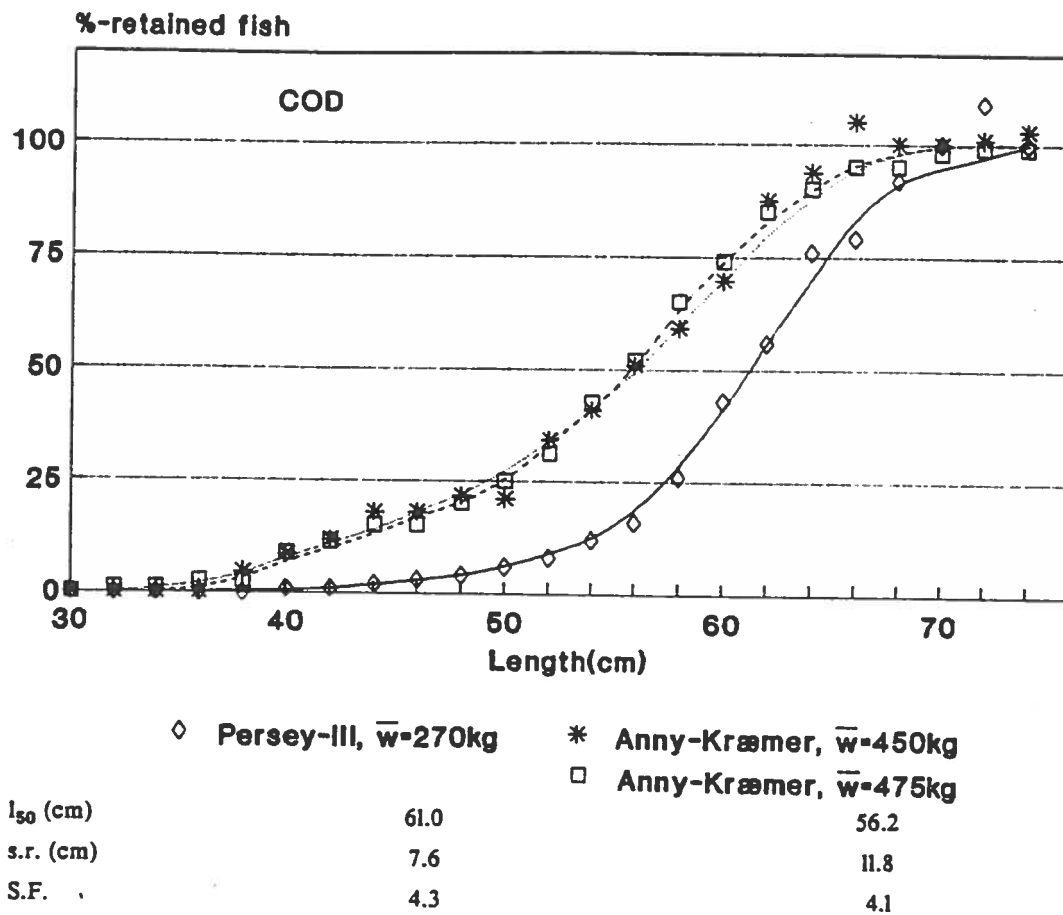**%-retained fish**

COD

| | Persey-III, $\overline{w}$=270kg | Anny-Kræmer, $\overline{w}$=450kg |
| | | Anny-Kræmer, $\overline{w}$=475kg |

| | | |
|---|---|---|
| $l_{50}$ (cm) | 61.0 | 56.2 |
| s.r. (cm) | 7.6 | 11.8 |
| S.F. | 4.3 | 4.1 |

**%-retained fish**

COD

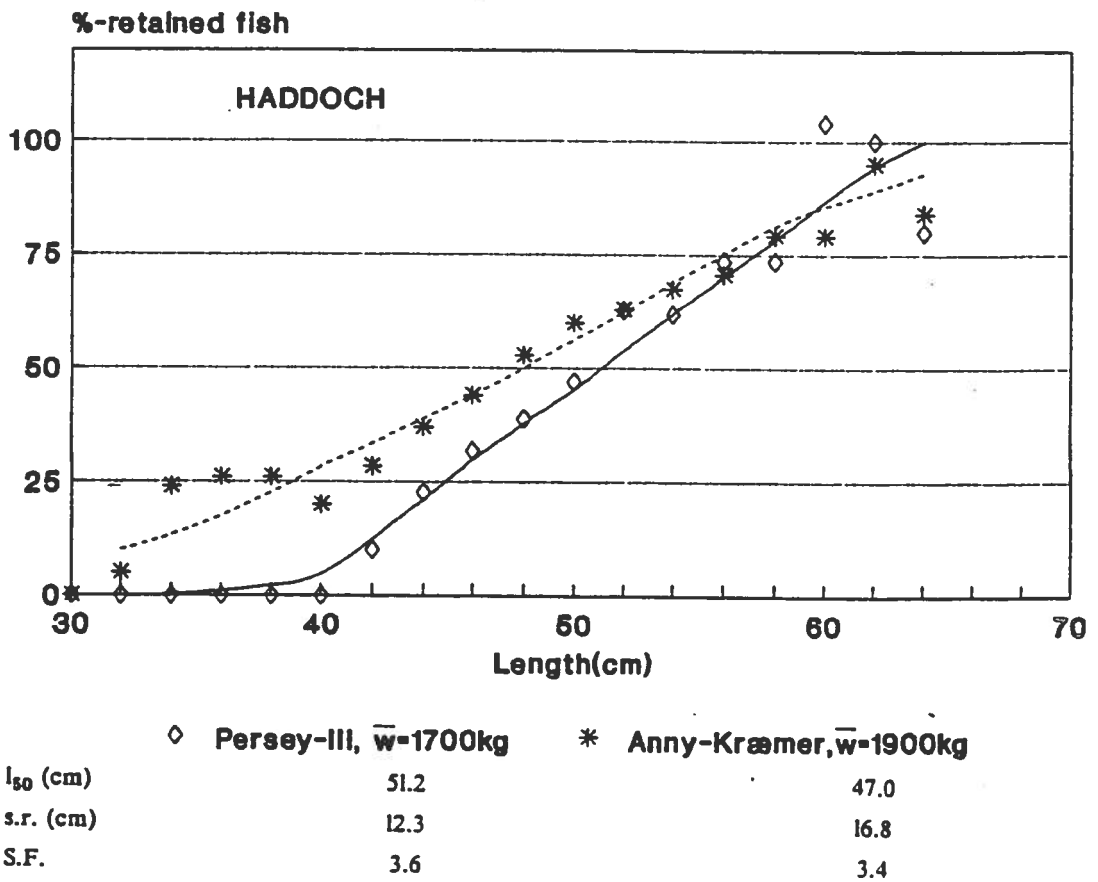| | Persey-III, $\overline{w}$=1700kg | Anny-Kræmer, $\overline{w}$=1900kg |
|---|---|---|
| $l_{50}$ (cm) | 58.4 | 54.2 |
| s.r. (cm) | 11.8 | 14.2 |
| S.F. | 4.1 | 3.9 |

Figure 8.  Selection oogives for cod, trouser trawl.

(R/V "Persey III": 143 mm, M/Tr "Anny Kræmer": 138 mm)

%-retained fish

HADDOCH

| | Persey-III, $\overline{w}$=270kg | Anny-Kræmer, $\overline{w}$=450kg |
| | | Anny-Kræmer, $\overline{w}$=475kg |
|---|---|---|
| $l_{50}$ (cm) | 56.0 | 51.5 |
| s.r. (cm) | 8.6 | 11.1 |
| S.F. | 3.9 | 3.7 |

%-retained fish

HADDOCH

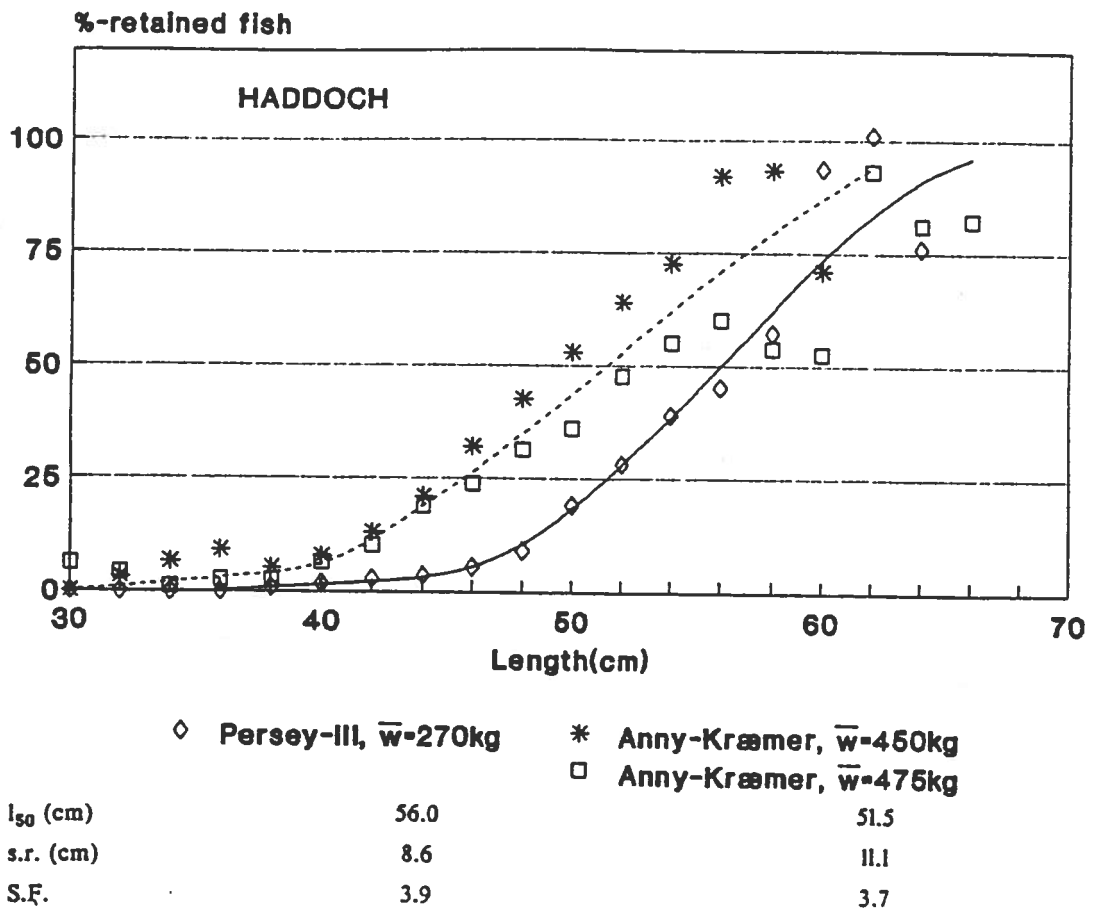| | Persey-III, $\overline{w}$=1700kg | Anny-Kræmer, $\overline{w}$=1900kg |
|---|---|---|
| $l_{50}$ (cm) | 51.2 | 47.0 |
| s.r. (cm) | 12.3 | 16.8 |
| S.F. | 3.6 | 3.4 |

Figure 9.        Selection oogives for haddock, trouser trawl.