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"Experiments with selective prawn trawls in Norway"

by

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Background, general

Previous work on selective prawn trawls by the Directorate of Fisheries and the Institute of Marine Research (since 1970) which has included a long range of experiments with separating panels in the forward part of the most important types of Norwegian prawn trawls, has, although some encouraging results, revealed a lot of disadvantages with this types of panels. Both the vertical and obliquely mounted installations have caused considerable loss of prawn due to negative influence on trawl opening characteristics. (Rasmussen og Øynes, 1974).

Besides, gilling and clogging of fish in separating panel and frequent damage on panel and trawl webbing due to mud hauls have caused considerable operational and handling problems.

As the major cause of these problems were likely to be the large net area and high water flow at the trawl mouth, ideas occurred to a net installation in the back part of the trawl. A small obliquely mounted net therefore was installed in the after belly panels of a high-opening Campelen Super Prawn Trawl, and different configurations of this net has been tested since experimental work continued last fall and spring.

Experiments, that were performed by the 110 feet long research vessel, M/S "Feiebas", also included testing of vertical side-separating panels in a high opening Super Trawl, and further testing

of a trawl mouth mounted vertical panel in a Kodiak-trawl and an oblique mounted panel in the forward part of a Sputnik-trawl. Besides comparative fishing with a 60 feet commercial trawler with purpose to evaluate possible effects of vessel and gear size, were performed.

### Materials and methods

Construction drawing of the 1400 meshes 3-bridled highopening Super Trawl, which is widely used in the offshore (Barents Sea and Spitsbergen) prawn fishery, is given in Fig. 1. The experiment trawl was rigged on rubber bobbins (40 cm footropes) and with bridle (sweepline) lengths of 40 meters. Measured doorspread averaged 40 meters and opening height about 7.5 meters.

The location of the three by now tested different configurations of the HH-net in the Super Trawl, is given in Fig. 2, with the experiment fish bag in position for the latest, HH3. Profile, net-form and installation specifications for this net, which has proved superior by now, are given in Fig. 3. Total area of net panel is about  $5.7 \text{ m}^2$  compared with  $6.0 \text{ m}^2$  for the mouth obliquely mounted net in the Sputnik Trawl. Lower part of the net is made of 40 m/m (nylon twine), while in upper part, the sorting area of about  $2.5 \text{ m}^2$ , both rectangular 20x40 mm (bars) and square 30x30 mm meshes have been tried. In all parts of the net mesh bars are parallel to the symmetrical (and strain) axis of the net. The vertical side separating panels of 60 and 80 m/m all over bar-mounted Courlene in the Campelen Super Trawl replaced the standard side-panel of this trawl (see Fig.) The separating areas of about  $35 \text{ m}^2$  on each side, were covered by small-meshed panels, with extra shrimp bags.

The Kodiak Trawl is a 1130 meshes (40 m/m) deep-sea prawn trawl of terylene twine with short wings, measuring 26.8 meters along the fishing line. The experimental trawl was rigged on rubber bobbins, with 40 meters sweeplines. The vertical separating panel of 60 mm (stretched) meshsize was attached close to the footrope and headline in the wing panels, while in the center region about 1.5 meters behind the trawl lines. Net height in center was about 5.5 meters.

Upper and lower net mounting lines measured each 26.4 meters, while a net middle line, parallel to the upper and lower lines, only measured 22.3 meters, with the purpose of forming a plow-form of the net. For additional releasing of fish a fish chute was arranged in the center of the upper half of the panel, and the trawl center panels in front of the net were made of very large-meshed webbing.

The 1300 meshes (40 m/m) Sputnik Trawl made of light (Courlene nr. 6-12) twine is widely used by the smaller prawn trawlers in Northern Norway. It is characterized by long wings and large overhang measuring 58 meters along footrope and 46 meters along headline, and is usually rigged on "Sabb" - a 4½" Kokos groundrope. The trawl, that has a relatively high net opening, is known for its good catching efficiency.

The experimental trawl was rigged with 46 meters sweep lines (standard for the smaller trawlers is 28 meters). Measured door-spread averaged 42 meters. The 60 m/m separating panel of light (Courlene nr. 6) twine was attached to the fishing line and mounted obliquely to the upper trawl panel. Total length of the panel is 12 meters, maximum width 7.5 meters and total area about 60 m<sup>2</sup>. In front of the net a fish release opening of about 0.5 m<sup>2</sup> was cut in the upper trawl panel, covered by an experimental fish bag.

The 110 feet research vessel M/S "Feiebas", with 565 HP main engine, is equipped for both side and stern (net drum) trawling. Throughout the experiments 4.5 m<sup>2</sup>, 650 kg's V-doors and 2" trawl warps were used to a scope ratio of 2.0 to 2.5. Towing speed averaged 2.0 knots.

### Fishing experiments

In the experiments in September 1975, the vertical side-separating panels in the Super Trawl and the first configuration of the HH-nets were tested on two different prawn grounds in the Varangerfjord of Northern Norway. On both grounds average shrimp catch was about 50 kgs per 2 hours (average prawn weight was 5 grams). On the 230 meters deep ground large quantities of cod and haddock (all sizes), redfish and small flounder, while on the deeper ground (425 meters depth) mostly mature cod and lots of juvenile

redfish, were caught.

In the subsequent experiments in the Karmøy area of Western Norway in October last year, further testing of the HH-nets and the vertical net in the Kodiak Trawl were performed. Trawling depths varied from 230 to 270 meters. Average shrimp catch per 2 hours was 20 kg and dominating fish species were Norway Pout and Blue Whiting.

Latest experiments in March-April this year included testing of the HH3-net and the obliquely mounted net in the Sputnik Trawl. In addition comparative fishing experiments with a chartered commercial 60' prawner with a 1300 meshes Sputnik Trawl were performed. These experiments took place at different commercial prawn grounds in the fjords of Northern Norway, with depth ranges from 185 to 465 meters. Shrimp catches varied from 20 to 90, averaging 60 kgs per 2 hours towing, and cod, haddock and redfish (all sizes) were dominating fish species.

## Results and discussion

### Vertical side-separating panels

The experiments gave rather disappointing results as only 4 and 14 percent, respectively, were sorted out through the 60 m/m and 80 m/m side panels. Obviously, the flow pattern of this high-opening trawl is not favourable for side separation, so no further experiments on this sorting concept were performed or planned.

### Vertical 60 m/m separating panel in the mouth of the Kodiak Trawl

Previous findings of reduced catches with this type of net was confirmed as in two hauls in Varanger only 40% of the average prawn catch of the Super Trawl and the Kodiak Control Trawl was caught. After some modification of the net, prawn catch reduction in three comparative hauls in Karmøy area was 39%, while fish catch reduction (total number) was only 44%. Besides, clogging of larger fish and gilling of Blue Whiting in net panel caused laborious handling of the experimental trawl.

### Oblique 60 m/m separating panel in Sputnik Trawl

Previous reported operational problems with this type of net were not confirmed, as in 13 hauls only 1 mud haul was experienced with

minor damage on net. This improvement might be due to some rigging modification and reduced towing speed. Neither prawn catch reduction was confirmed, as in 5 comparative fishing hauls with the commercial prawner, on average only 5% less prawns were caught.

Prawn separation was good as only 3.4% was sorted out (lost). However, sorting of smallsize and juvenile fish was not acceptable as only 6% of the cod of length less than 17 cm (1-group) and 13% of 1-group haddock were sorted out. Of all sizegroups 62% of cod and 50% of all fish species were sorted out.

These results indicates too large meshes in the separating panel, and might be improved by installation of f.inst. 50 m/m panels. However, this will in case truly lead to further reduction of prawn catch and the previous experienced operational problems might occur, as the hydrodynamical forces on the denser net will be increased.

#### The oblique HH-net in back part of the Super Trawl

Experimental results for the different configurations of the HH-net are given in Table 1. With respect to HH1, the difference in shrimp retention for the two Varanger grounds - as average shrimp size was the same - obviously was the huge quantities of small flounder on the 230 meters ground that had a clogging effect on the net. Despite of this, the net gave an acceptable retention percentage of shrimp. However, the large retention percentage of small redfish on the Varanger Grounds and of Norway Pout on Karmsund Ground was not acceptable.

The reason for the inverted profile configuration of HH2 was that larger fish - especially flatfish - had a tendency to clog the upper half of HH1, and desirability to establish effects of different slopes in the two parts of the net. With respect to the fishing trials with HH2, no clogging was observed and the net slope effects are demonstrated by the fact that on the same ground this 50 m/m net retained the same percentage of shrimp and far more Norway Pout than the 60 m/m HH1.

A what might be an important effect was discovered by the fact that radical improvement in Norway Pout sorting was attained by

covering the lower part of HH2, with only minor influence on shrimp retention (Exp.5). Exp.7 and 8 at the Skudesnes Ground with very large skrimp (the reason for low shrimp retention in Exp.7) clearly shows the same effect, and how a combination of small-meshed (covered) lower net area and large-meshed upper part give improved shrimp retention and fish (Norway Pout) escapement. The third configuration of HH-nets are constructed along these principles. Unfortunately the experiment (9) with rectangular meshes in upper part of this net failed (with respect to shrimp retention), but the reason for this was obviously that the stiff cut bars that were not removed, had a densing effect on the net. Another reason might be that a net area with rectangular meshes easier distorts than one with normal meshes. However, changing to 60 mm meshsize webbing in the upper part (Exp.10) radically improved (to acceptable level) shrimp retention while fish sorting only was minor influenced.

Throughout the experiments with HH-nets no handling and operational problems (except for som clogging in HH1) due to net installation have occurred, and no negative influence on trawl catching performances is found.

### Conclusion

Primarily due to the HH-nets' better catching, handling and operational qualities compared with the trawl mouth mounted nets, further work will be concentrated on these types of nets.

The promising results with small-meshed webbing in lower (leading) net area and large-meshed webbing in upper (separating) area will be followed up, and this fall 70 mm meshes will be tried in upper part of HH3. Besides, HH-nets will be installed and tested in other trawl types.

### References

- KARLSEN, L. 1976. Forsøk med sorteringstrål etter reker i tiden 10.09 - 02.10 og 22.10 - 13.11 1975. Institute of Fishery Technology Research, Bergen, Norway. 1976, 1-21, 5 fig.[Mimeo.]

- KARLSEN, L. 1976. Forsøk med sorteringstrål etter reker i tidsrommet 15.03 - 10.04 1976. Institute of Fishery Technology Research, Bergen, Norway. 1976, 1-11, 6 tab. 6 fig. [Mimeo.]
- RASMUSSEN, B. 1973. Fishing Experiments with Selective Shrimp Trawl in Norway, 1970 to 1973. FAO Fish.Rep. 1973(139)50-56.
- RASMUSSEN, B. & ØYNES, P. 1974. Forsøk med reketral som sorterer bort fisk og fiskeyngel. Fiskerinæringens Forsøksfond 1974 (4) 3-15.

Table 1. Results from fishing experiments with HH-separating nets in Campelen Super Trawl.

Exp. No.	Separating net			Percent retention of shrimp (by weight) and fish (number)										Locality Depth (meters)		
	Designation	Mesh size (and form)		No. of Hauls	Shrimp		Cod		Haddock		Redfish		Flounder		Norway Pout	Blue Whiting
		Upper part	Lower part		All sizes	0-and 1-gr.	All sizes	0-and 1-gr.	All sizes	All sizes	Small					
1	HH1	60 mm	60 mm	5	96.4	7.3	17.4	54.8	27.2							Varanger - 465
2	"	"	"	5	77.8	18.3	9.1	22.1	46.8							" 230
3	"	"	"	5	90.2								63.4	13.6		Karmsund - 250
4	HH2	50 mm		4	87.3								81.8	0.1		" "
5	"	"	covered	2	79.3								51.4	0.4		" "
6	"	25x50 mm bars in 15% of area	covered	2	83.2								57.5	19.3		" "
7	"	50 mm	50 mm	2	58.7								64.0	1.8		Skudesnes - 260
8	"	25x50 mm bars in 60% of area	covered	3	84.1								47.3	24.8		" "
9	HH3	20x40 mm bars in 80% of area	40 mm	6	42.0	16.5	7.4	9.5					Capelin	Herring		Northern fjords - 185-465
10	"	60 mm	40 mm	6	75.7	12.1	0	16.6					70.1	29.1		" "



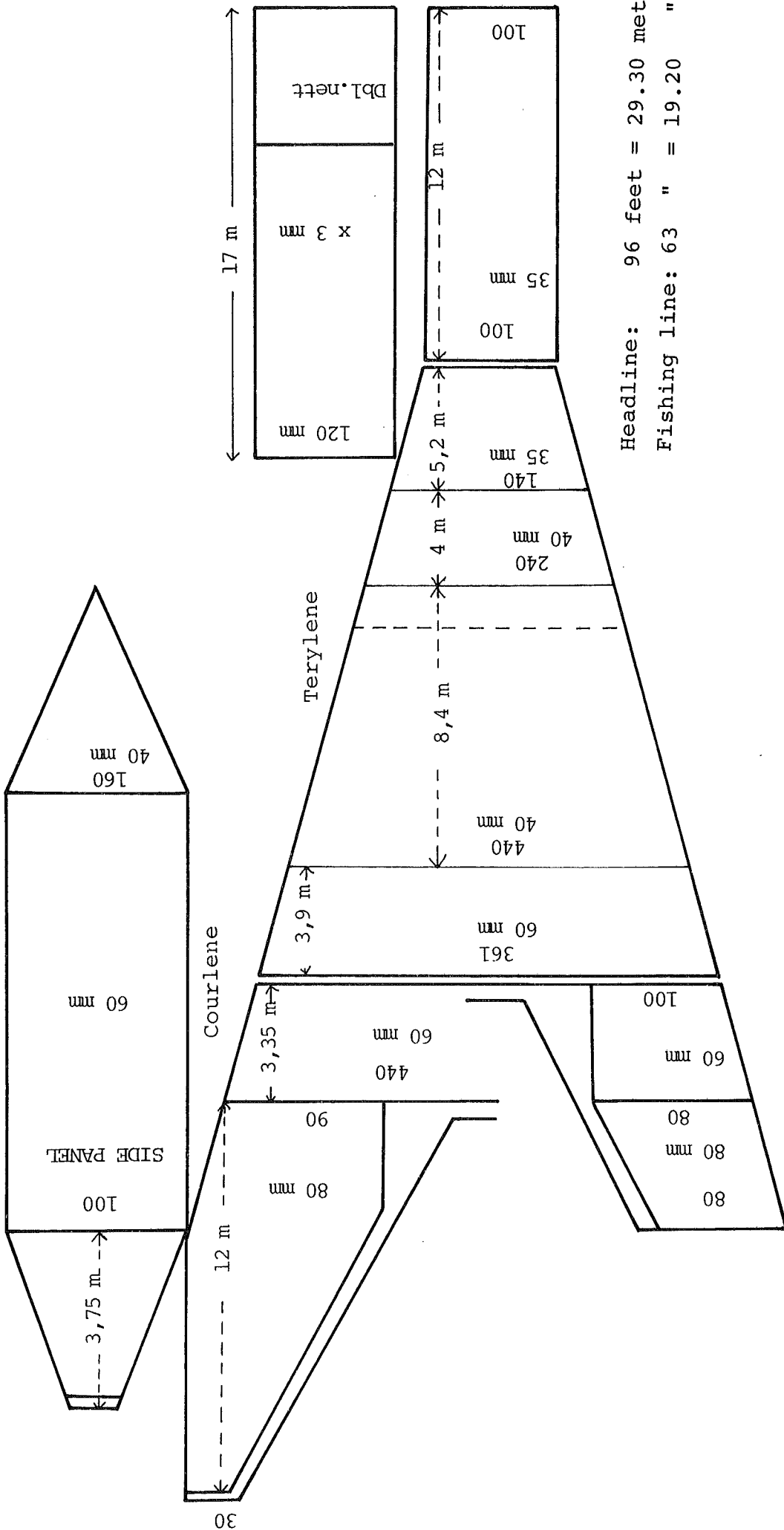


Fig. 1. 1400 meshes (40 m/m) Experimental Super Prawn Trawl

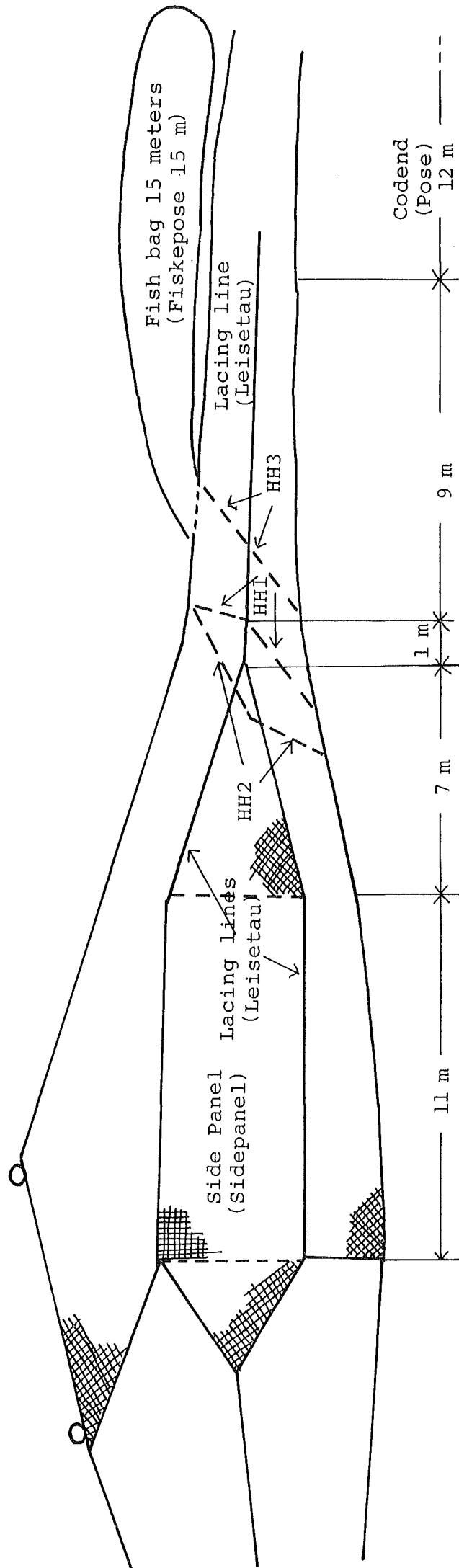


Fig. 2. Location and profile of HH - separating nets in Experimental Prawn Trawl.

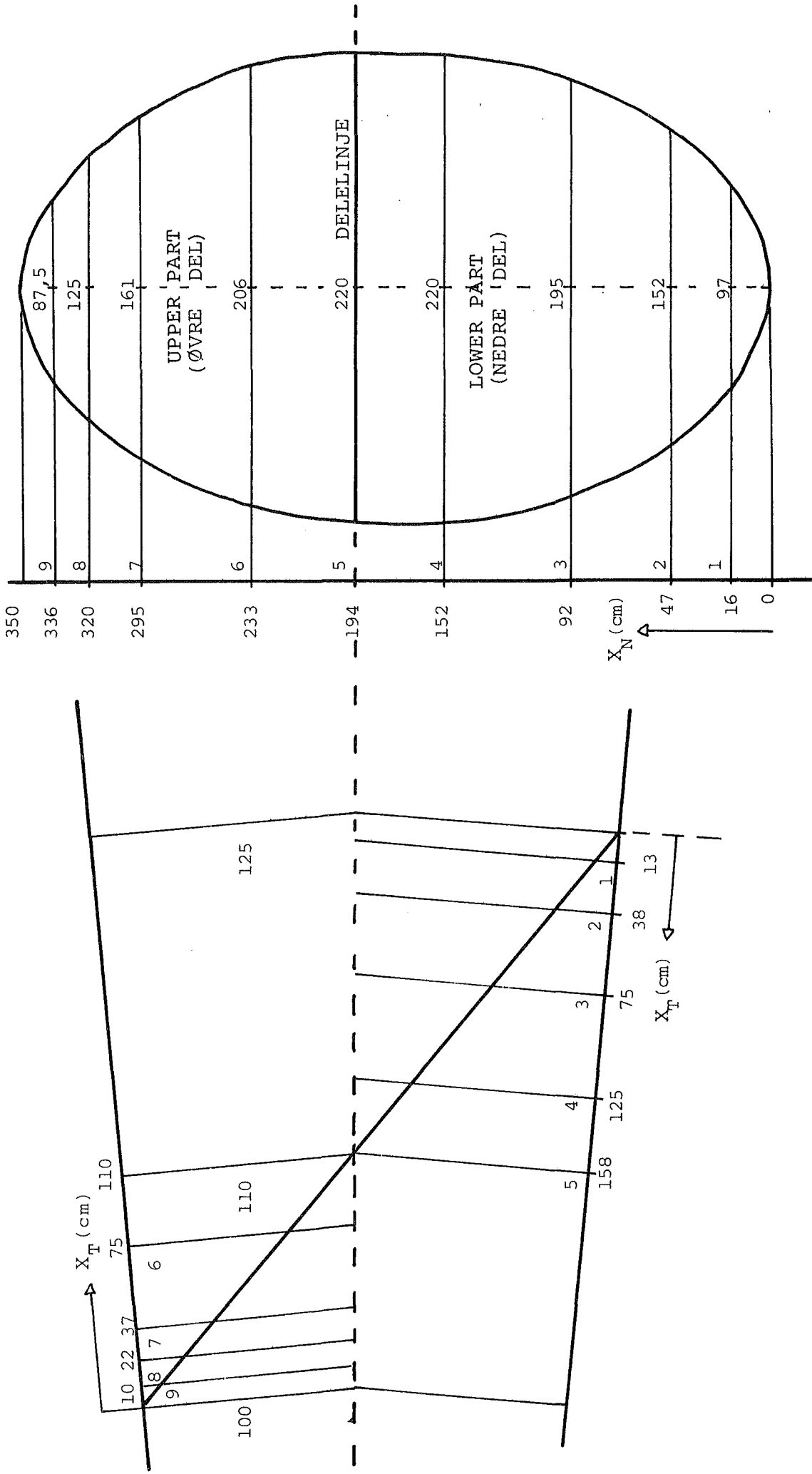


Fig. 3. Netform and installation specification of HH3 Separating Net in Experimental Prawn Trawl.

Scale: 1:25  
All measures in cm.