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Comparative fishing trials with big meshes and rope trawls

by J.C. Brabant, ISTPM Boulogne, Laboratoire Oceanographie
et Pêche, 150. Quai Gambetta,
62 - Boulogne-sur-Mer

N. Prado, ISTPM Nantes

E. DAIM, Federal Research Centre for Fisheries
D-2000 Hamburg, Palmaille 9

Abstract

Big meshes and rope trawl attract the attention of the fishery since some time as suitable means to economize fuel in account of their low towing resistance. Comparative trials between trawls of both construction types having similar drag at equal towing speed have been carried out onboard the FRV "Solea" in 1979 and 1980. The big meshes trawl showed outstanding technical properties with regard to filtered water volume and low towing resistance. The few comparative fishing trials made do not yet allow a statistically significant statement on the fishing performance.

Resume

Les chaluts à très grandes mailles et à cordes retiement l'attention des pêcheurs depuis quelque temps comme moyen d'économiser le carburant, compte tenu de leur faible résistance à l'avancement.

Des essais comparatifs entre les deux types de chalut ont eu lieu en 1979 et 1980 à bord du N.O. "Solea". Le chalut à très grandes mailles a montré des qualités techniques remarquables en ce qui concerne le volume d'eau filtré et la faible résistance à l'avancement. Les essais de pêche comparative en faible nombre ne permettent pas de tirer une conclusion statistiquement significative sur les performances de pêche.

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Comparative fishing trials with big meshes and rope trawls

by J.C. Brabant, ISTPM Boulogne
N. Prado, ISTPM Nantes
E. Dahm, Federal Research Centre for Fisheries
D-2000 Hamburg, Palmaille 9

Introduction

Since some time the rising energy cost decrease the profitability of fishing crafts using trawling as main fishing technique. Means and ways are therefore searched to reduce the energy expenditure. In general there are two ways to do this. One is to attain an especially low drag coefficient in a new built ship by paying special attention to this point during the design phase. But this is only possible if a fishing craft is new built. Existing fishing ships can attain economization of fuel costs only by reduction of speed during their ways to and from the fishing place or by a reduction of the resistance of the towed gear. In recent times two ways to reach this goal have been followed.

Taking into regard research results obtained during the development of the pelagic trawls French, Norwegian, and Faroesse gear technicians and netmakers have elaborated the so called big meshes trawls. During the development phase of conventional pelagic fishing gear it had been discovered that the meshes in the forepart of a pelagic trawl mainly have the function to concentrate the fishes in the middle of the net opening and to lead them into the aft part of the net where they are caught. This task is even fulfilled by meshes whose opening is far larger than the biggest cross-section of the fish to be caught. Because of the difficulty to handle (big meshes tend to hook of parts of auxiliary equipment) and to produce larger meshes by fish netting

machines some fishing nations renounced the use of meshes with an opening bigger than 80 cm. However, in the countries mentioned above larger and larger meshes - up to 16 or even 24 metres opening to date - were used in the forenet. As Fig. 1 shows this applies only to the netting in the wings and at the fore selvedge of the first pint. Towards the codend the mesh size of the giant meshes decreases more and more until approximately in the middle of the whole net an opening is attained which can easily be produced by netting machines. As Fig. 2 shows the "knots" of the giant meshes have to be made by four splices. This is handwork and charges the production costs of these nets to no mean extent. However, the catching efficiency observed in pair trawling in France and in the blue whiting fishery in Norway has assured a good place to this type of trawls despite of increased prices.

In the COMECON countries, in the Federal Republic of Germany, in the Netherlands, and partly also in France another line for the reduction of the towing resistance of trawls has been followed. There the larger meshes in the forenet of pelagic trawls have been replaced by ropes running parallel to each other. Peculiarities in the historic course of this development, technological problems encountered and the present state have been summarized recently by DAIM, LANGE, v. SEYDLITZ (1980). Besides of a considerable reduction of the necessary towing force this type of trawl has at present proved advantage in special fishery situations as e.g. if pelagic fish are detected near to the bottom. The necessary bottom contact of the lower panel to the bottom in this case is born far better by this type of trawl than by an ordinary pelagic trawl. The same applies to a fishery situation where jellyfish or drifting weeds are mixed with fish concentrations. With normal pelagic fishing gear the fishery has to be stopped already after a short time to clean the nets whereas with rope trawls the sorting effect of the ropes helps to prolong the fishing time.

The apparent advantage of both types of trawls suggested the idea of a comparison. There as well the technological parameters as height and spread of the net opening and the drag in the towing warps as the catching efficiency under equal conditions had to be considered. A prerequisite to such a comparison nevertheless was

the comparableness of the trawls in question. From a technical point of view the most plausible would have been to replace the forenet of a given trawl at the one hand by giant mesh panels or on the other hand by ropes. Commercial fishermen, nevertheless, show no great interest in this "academic" type of investigation. What they want to know is how much more this new type of trawl catches if it is towed with equal energy expenditure and a similar speed as a common pelagic trawl. Only after this prove the fishermen can be convinced to reduce the fuel consumption per unit of catch by taking advantage of this new type of trawl construction. The trial trawls were therefore designed to the demand that the researchcutter "Solea" should be in the position to tow the nets in question at full engine performance with a speed of 4 to 4.5 knots. This resulted in the fact that the trawls under investigation (see Fig 1,3, and 4) showed different dimensions.

The authors of this paper are well aware of the impossibility to prove the better catching efficiency of one or the other type of trawl statistically significant in two short research cruises. The variability of the catch with one type of trawl alone is due to the patchy distribution of fish schools already so big that e.g. only after a longer series of hauls reliable estimates of the stock density in a certain area can be given. (BARNES and BAGENAL 1951). The scouting if all trawls in question show a comparable fishing efficiency or if some reveal outstanding properties in this context nevertheless has been tried as well as if the findings apply to different fish species.

Gear technological measurements

Measurement values for the nets Fig. 3 and 4 at a standard adjustment of auxiliary equipment had been made beforehand to the start of the cruises of FRV "Solea" (85. cruise from 3.9.79 to 16.9.79 and 100. cruise from 17.6.80 to 27.6.80). Initial trials with the big meshes trawl showed that with the same standard adjustment also sufficient measurement values could be reached even if they differed a bit from common practice in the French fishery. A synoptic compilation of important technological parameters at different towing speed steps of all nets is given in table 1.

The opening area F is calculated as a rectangle H x B in the four seam trawls (Fig. 1 and 3) and as an ellipse $\pi \times \frac{H \times B}{4}$ in the two seam rope trawl (Fig. 4).

The standard adjustment applied to all trawls was:

Towing warp	length	200	m
Bridle	length	50	m
Front weight	per side	200	kg
Otterboards		3,14	m ² round cambered

Especially the comparison of the drag of all trawls at equal speed shows the outstanding low towing force requirement of the big meshes trawl even if its net opening area is twice so large as with the rope trawls.

Catches

Due to the short time left for comparative fishing and the time consuming necessity to find suitable fish stocks few catches were made up to date. Some indications to a good fishing performance of the big meshes trawl were gathered in 1979 when fishing for mackerel off Cornwall. It was intended to complete the information gathered by fishing for pelagic aggregations of herring and/or cod in the Baltic in 1980. Unfortunately and unexpectedly no pelagic stocks of both could be found during the 100. cruise in 1980. Instead both species were detected very close to the bottom in the time mentioned. In this fishery with the lower panel on or very close to the bottom, a special rope trawl where only the lower panel was replaced by ropes showed considerably better catching performance than the two-seam-rope trawl tested. Comparative hauls with the big meshes trawl did not show similarly striking differences in favour of the first. Small catches in spite of good traces in the netsonde and meshed fish in the whole body of the big meshes trawl suggest a lower catching efficiency of the big meshes trawl in the herring fishery than when hunting mackerels. Nevertheless, this has to be tested more thoroughly in the future.

Discussion

The measurement trials at the big meshes trawl showed an impressive technical superiority of the big meshes trawl to rope trawls with a similar drag. In spite of a manyfold size of the filtered water column the drag in the towing warps is even lower at equal speed. The prove of an increased fishing efficiency of the big meshes trawl either because of filtering a bigger water volume or because of increased towing speed could not yet be given in the trials performed up to date. Therefore they should be continued.

Remark

This investigation was carried out as a joint French-German study in the frame of the Fish Capture Committee of ICES. France supplied the big meshes trawl and delegated two scientists, whereas the Federal Republic provided the FRV "Solea" during the 85. und 100. cruise as well as other scientific personnel and the other fishing gear. The cooperation was carried out in a good atmosphere favoured by the engaged support of captain and crew of the research vessel.

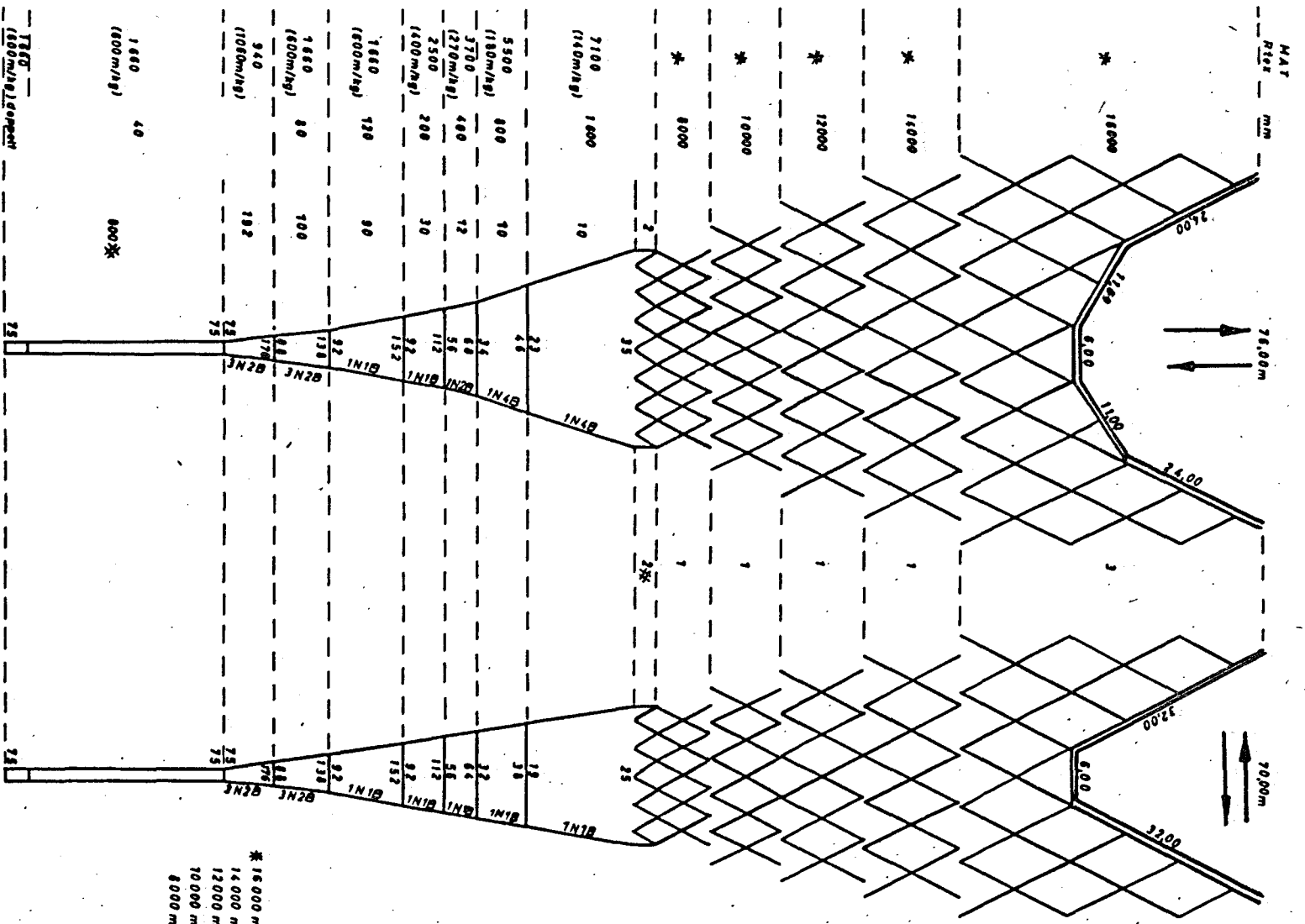
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*

Due to a slightly increased angle of attack at the otter-board the measurement values of the two seam trawl show minor positive differences in spread, F, and towing force and are therefore only to be considered as being in the right order of magnitude.

(Mark to table 1)



5 meshes for the lash are to be added to the mesh number on each side.

- * 16000 mm Ø10mm
- 14000 mm Ø 8 -
- 12000 mm Ø 8 -
- 10000 mm Ø 8 -
- 8000 mm Ø 6 -

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Maßstab 1:600

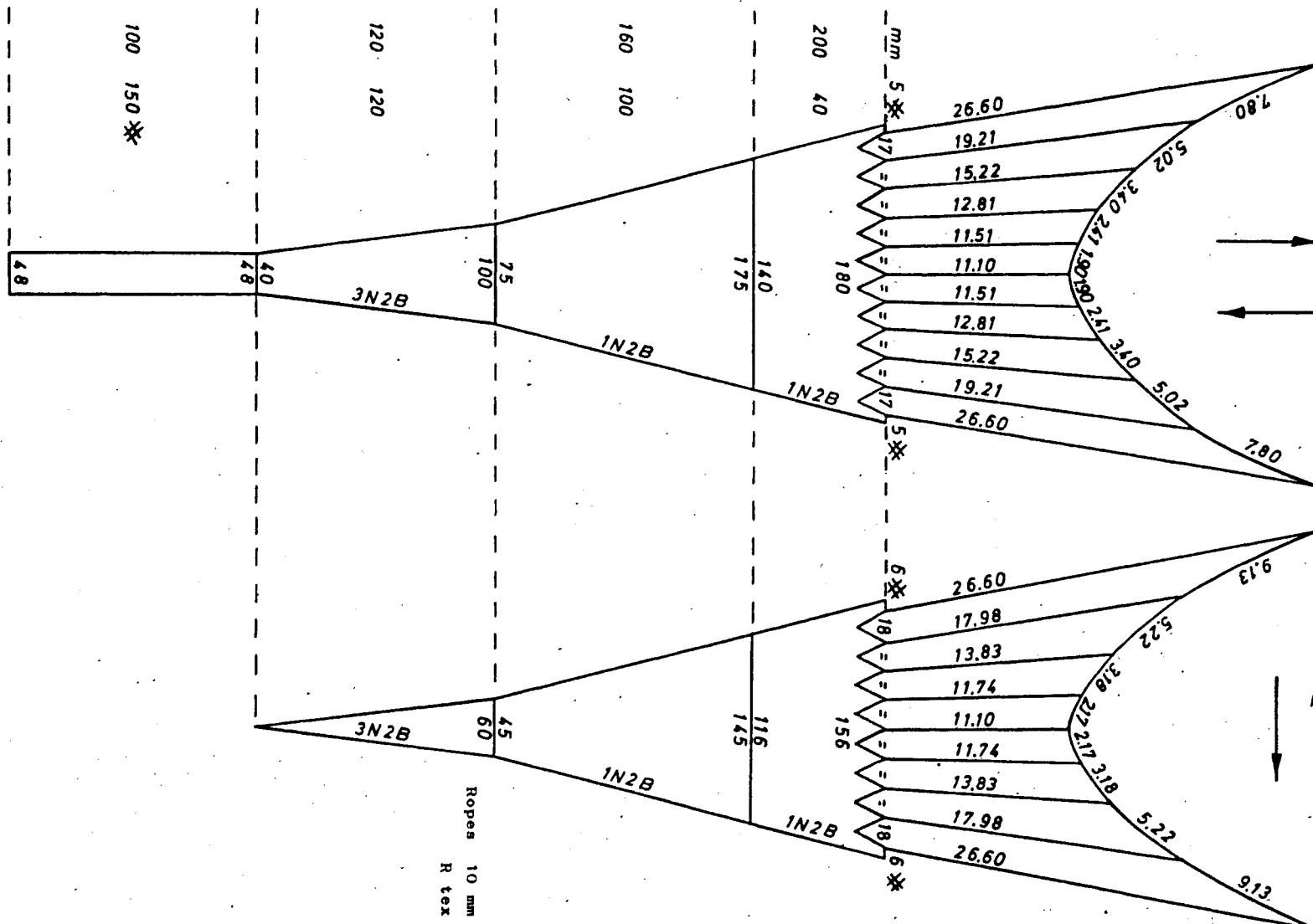
Fig. 1

27.9.79 John
27.9.79 Dahm

Big meshes trawl for
fishing crafts of 600
to 800 hp.



Fig. 2: Connection of four bars in
in a big meshes trawl.



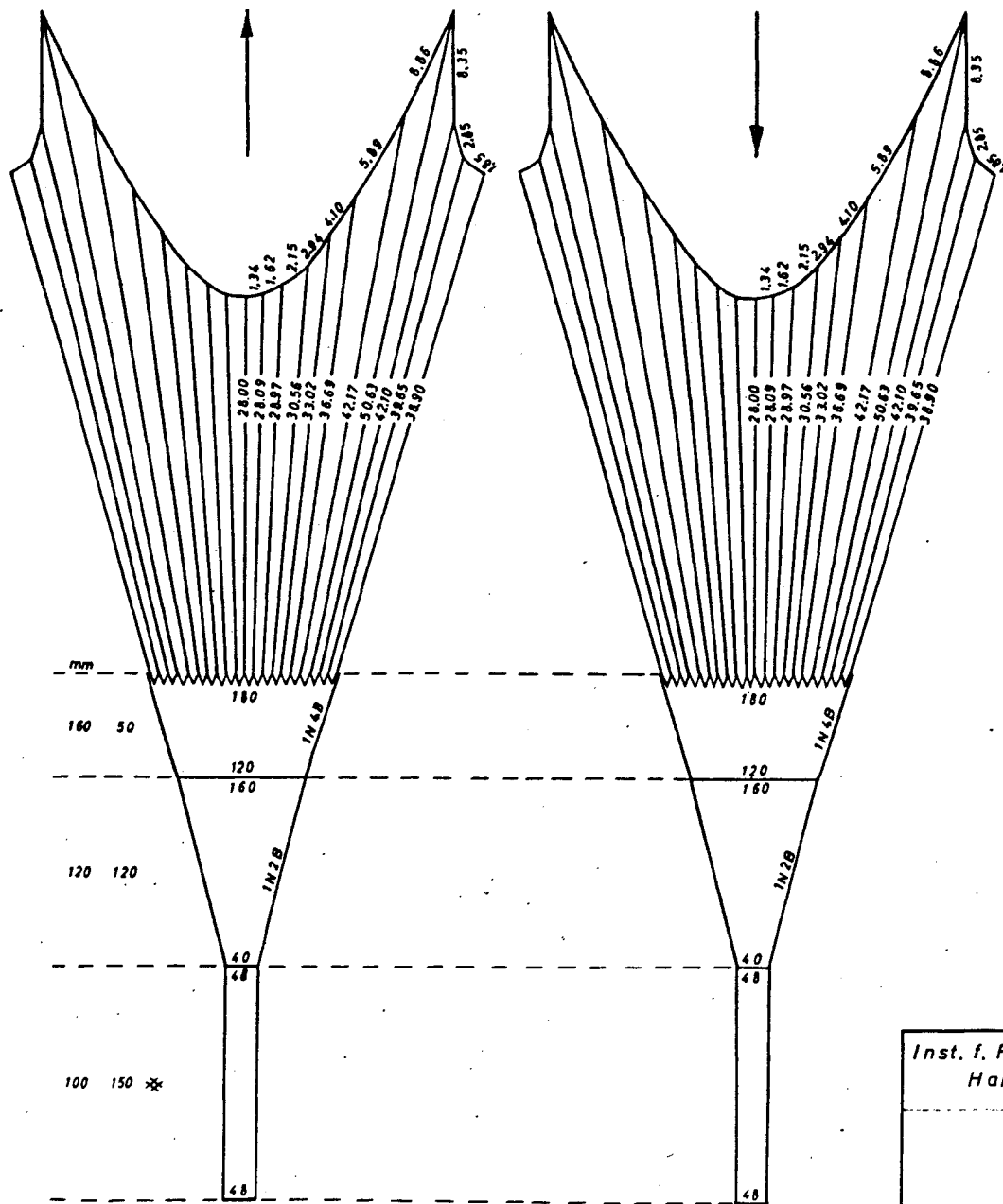
Ropes 10 mm Perlon-braided II
 R tex = 52 265

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 Hamburg

1 : 250
 Fig. 3

John Aug. 80
 La/Da. Aug. 80

Four - panel rope trawl.



Inst. f. Fangtechnik Hamburg	1 : 350 Fig. 4
3.7.80 John 4.7.80 Dahm	Two - seam rope trawl "longrope trawl"