

Selectivity Trials with the  
Looe Pair Trawling Team  
of Budding Rose (LH134)  
and Levan-Mor (FY269)

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**Seafish Report No.401**

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January 1992

**SEA FISH INDUSTRY AUTHORITY**  
**Seafish Technology**

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**BUDDING ROSE (LF134) AND LEVAN-MOR (FY269)**

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**SUMMARY**

Sea trials were carried out in November 1991 to investigate the application of a square mesh window in a pair trawl to reduce discards in a multi-species fishery. The vessels selected for the trial were the 11.3m, 194h.p. BUDDING ROSE and the 10.8m, 227h.p. LEVAN-MOR both operating from Looe in the Western Channel fishery, Area VIIe.

The current legal minimum mesh size in Area VII is 80mm. The Looe fleet generally operate with 85mm or 90mm mesh. The trials compared a standard 90mm net without attachments to a standard net with an 80mm square mesh panel approximately 4m in length. The comparisons were made on alternate tows.

The trials showed that in terms of reduced discards and better size selectivity the square mesh trawl gave marginally better results than the standard trawl for hake and whiting. For squid these results were reversed. It was concluded that in this fishery and with pair trawlers at this time of the year these differences do not justify any enforcement of the square mesh.

However, the trials did show up a number of anomalies which need to be taken into account in this statement.

Firstly, most of the Looe pair trawl teams operate with a lifting bag which is twice the mesh size of the codend (e.g. 180mm).

In comparing catches with other pair teams on the same grounds it was clear that the trials team were catching substantially less grade 4 whiting and grades 3 and 4 hake. For squid the differences were more erratic. There are two possible reasons. In the first instance it may be that the lifting bag is cutting down the escape area of the 90mm mesh more than hitherto believed which would affect whiting and hake more than squid.

Another possibility arises from the fact that the vessels have insufficient power to maintain a forward speed at the same time as the winch is engaged. Thus the gear is virtually stopped on the seabed prior to hauling and a very large proportion of the catch may well swim out of the net at this point when the tension is off the meshes and the net mouth is open. The fishermen of Looe may wish to consider this further as it is the Seafish view that there may be inconsistencies in matching the gear to the available power.

It is believed that these two factors are significant unknowns in the towing and hauling sequences and that the results can only be indicative. Nevertheless, the fishery does not appear to produce substantial levels of discards as are to be found elsewhere in U.K. waters but more trials at different times of the year may yield more information.

Seafish were able to use an automatic underwater video camera on these trials to record behaviour in the net at a fixed point. The camera showed large quantities of fish in the net but these were not apparent in the eventual catch. This gives weight to the theory that escapes of all sizes were taking place at the change-over from towing to hauling.

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**1      INTRODUCTION**

The work carried out by Seafish to date into the investigation of ways of improving the selectivity of towed demersal fishing gears has concentrated on species such as cod, haddock and whiting. The work has been aimed at reducing levels of discards of these main commercial species in the North Sea.

Some of the fisheries in other U.K. waters, in particular those based on our channel coasts, rely on other "less common" species as their mainstay.

These fisheries in certain sectors of ICES area VII have a large diversification of species of which many appear seasonally as high-value "by-catches" to the main target species.

Species such as red mullet, grey mullet, bass, squid, black bream, cuttlefish etc., form an important part of these mixed species fisheries.

Little or no work has been carried out to evaluate the effect of recently introduced measures in net design such as increased mesh size or the use of square mesh panels to improve the selectivity of fishing gears used to exploit those stocks.

Following the result of the successful work carried out by Seafish in demonstrating the benefits of the use of square mesh selector panels in the North Sea fishery, Seafish Technology were approached by fishermen's representatives from the main fishing ports covering the ICES fishing areas VIId, e and f to investigate the effects of the introduction of a square mesh selection device in these areas. The main concerns was to establish the benefits such devices would have and the possible cost in terms of the reduction in the catch rates of the marketable "less common" but high value species previously mentioned.

Seafish put together a programme of work to evaluate the use of square mesh selection devices from a number of representative ports throughout the channel area. These were selected to incorporate a number of fishing methods employed in seasonal fisheries for as wide a range of species as was practical (Seafish Internal Report No. 1419).

This report describes the work carried out during the first stage of the programme and covers the Cornish inshore pair trawling fishery based at Looe.

Since Seafish have very little information concerning the pair trawling operation with respect to selectivity, this was seen as a welcome and very valuable opportunity to extend its knowledge and experience.

2      BACKGROUND

Pair trawling has been an established method of fishing in Looe since the early 1980's.

It has proved an effective method of fishing for the relatively small size class of vessel that operate out of this tidal river harbour.

The majority of the fleet capable of undertaking demersal trawling now operate as pair teams for a major part of the year. Most of these pair trawlers are within the size range 10-12m (100-300h.p.)

The decline in local fish stocks has meant that pair trawling has been the only method capable of catching viable quantities of fish at certain times of the year.

During the autumn and early winter the main target species in this fishery are whiting, hake and squid with a good mix of other species making up the rest of the catch.

It was thought that this species mix would allow a reasonable evaluation of the performance of the square mesh panel configuration.

It has been demonstrated that the panel can be used effectively to select out juvenile whiting. What was not known was how effective this device would be at releasing juvenile hake and whether the panel would allow the escape or loss of marketable squid.

The current legal minimum mesh size for ICES area VII sectors under consideration is 80mm. However, the majority of the fleet operating out of Looe use codend diamond mesh sizes of at least 85mm but more commonly 90mm.

Because of this legal requirement the minimum mesh size of square mesh panels used in the trials was 80mm which has been demonstrated as having equivalent selectivity to 90mm diamond mesh.

### 3 TRIALS PROGRAMME

The vessels selected for the work were MFV BUDDING ROSE (LHL34) and MFV LEVAN-MOR (FY269).

The BUDDING ROSE, skippered by Tim Lentell, is a 11.27m, 194h.p. steel vessel shelter-decked and rigged for stern trawling.

The LEVAN-MOR, skippered by Paul Goldthorpe, is a traditionally designed 10.76m netter/trawler, constructed in wood and powered by a 227h.p. engine and again rigged for stern trawling.

The vessels are an established and successful pair team.

The proposal was to carry out 10 fishing days (weather and fishing conditions permitting). The aim was to achieve a minimum of 20 hauls based on the vessels normal commercial operation of two hauls per day. Ten hauls were to be carried out by each vessel, equally split between the standard net and the net fitted with a square mesh panel.

Both vessels carry identical nets and shoot them alternately. By fitting one net with a square mesh panel and leaving the other as standard diamond mesh the two gears were compared using the alternate tow procedure.

To limit any bias towards one vessel or the other, the selection device was swapped between vessels at the half-way stage of the trials.

The fishing operations were carried out on grounds allowing similar towing conditions for each alternate tow.

The initial trials programme proposed the evaluation of an 80mm mesh selection device in combination with 90mm mesh codends/extensions. Assuming satisfactory results and sufficient data were obtained in the initial stages, this procedure was then to be changed to examine the same square mesh panel in combination with 80mm diamond codends/extensions (current legal minimum mesh size).

Unfortunately, due to poor fishing and weather conditions and limited sea time, it was decided to concentrate effort on the first configuration in order to collect sufficient data to try and establish worthwhile results.

Catches of marketable fish from vessels of similar size and type using the same gear were monitored wherever possible to give further comparisons of the trials pair teams performance. This also allowed for a better picture of the size and species mix of fish on the fishing grounds during the course of the trials.

During the course of the exercise, comparative catches could only be obtained on 4 of the 9 fishing days achieved.

### **3.1 Pair Trawl Details**

The nets used in these trials were of a design made by the Fraserburgh net manufacturer Alex Strachan. Strachan Nets have supplied over 40 trawls to the Looe fleet.

The pair trawls used in Looe are lighter versions of the nets which have proved so successful for the North East of Scotland fleets around Fraserburgh. The nets were rigged with 'rockhopper' ground gear and together with cut-away lower wings were designed to work on hard and soft ground. Details of the wire arrangements used with this gear are shown in Figure 6.

### **3.2 Catch Sampling**

Since only relatively small catches were encountered during the trials it was possible to separate the catch by species and measure all individuals of each species under consideration. The species sampled were squid, hake and whiting. Fish lengths were recorded to produce length/frequency distributions for each species.

### **3.3 The Selection Devices**

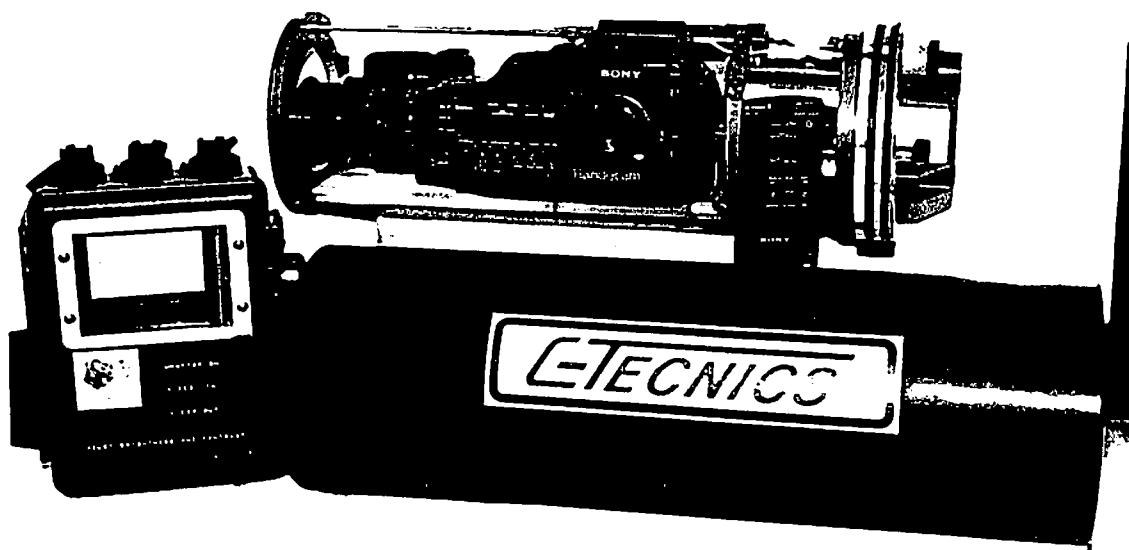
The selection device took the form of a standard square mesh panel or window fitted into the top section of the codend extension in a position just aft of the last tapered section of the net, i.e. incorporated as part of the nets existing parallel extension.

The square mesh window was constructed of 80mm x 4.9mm PE ultra-cross knotless netting. The corresponding lower sheet of the window was constructed of 90mm x 2.5mm PE knotted braid to be compatible with the rest of the extension. The overall length of the panel was 4.0m. Full details of the panel designs are given in Figures 4 and 5.

### 3.4 Underwater Observations

A self-contained underwater video camera unit manufactured by C-Tecnic was used in order to obtain film of the selection device in operation during the exercise. The unit, still in its experimental stages, is designed to be attached to a net in any position depending on the area under examination. It provides 3 hours of video tape which can be examined at the surface as the tape is recorded for analysis.

The intention was to fit the camera in a position to view the square mesh window in order to obtain visual information to back-up the data obtained from the catch sampling and analysis. Despite some technical problems with the unit on one or two occasions, some very valuable film was obtained of the square mesh panel in operation.



4      TRIALS NARRATIVE

A total of 9 days fishing were carried out. The trials were kept as near to the vessel's own commercial operation as was possible.

Poor weather meant that most days operations were spent on the inshore grounds just off Looe. This meant that the fishing grounds were subjected to a lot of fishing effort over a considerable period of time and as a consequence catch rates were low.

Day (1) - 11th November 1991

For the first half of the trial the square mesh panel was fitted in the net onboard BUDDING ROSE.

The first days operations took place on grounds 3-4 miles out of Looe with the vessels shooting westwards along the coast. BUDDING ROSE made the first shot.

Fishing was mostly in 28-30 fathoms of water for which 150 fathoms of warp was shot.

The pair team maintained station at 0.19 miles apart during towing.

To optimise daylight towing time and in order to obtain two tows of identical length, the towing time for the shots on day (1) was 4 hours.

The second shot of the day carried out by LEVAN-MOR with the standard net was made on similar grounds but this time with the vessels towing back eastwards towards Looe.

On day (1) very few whiting or hake were caught, the bulk of the catch being made up of squid with both vessels catching similar quantities.

Vessels fishing on similar tows were the pair teams - CAPRICE/BILANDER, MARET/OUR KATHLEEN, CORINTHIAN/INNISFALLEN.

### Day (2) - 14th November 1991

The second days operation did not get underway until 3 days later due to very poor weather.

Fishing took place in the same general area as for day (1).

First shot was made down to the west by LEVAN-MOR with the standard net. Two other pair teams fished similar tows and provided catch results for comparison. These were the teams - PARAVEL/CAROLINE ANNE, MARIGOLD/ROSS ALITHAN.

The first shot produced better results than the second (as is generally the case). Again towing time was 4 hours using the same warp:depth ratio. The second tow with BUDDING ROSE's net fitted with the panel was made back up the grounds towards Looe. The pair team CORINTHIAN/INNISFALLEN were operating in the same area for comparison.

On the second day, squid again made up the bulk of the catch with some whiting but very few hake.

### Day (3) - 15th November 1991

Very fine weather on day (3) allowed for better conditions for use of the underwater camera unit.

The camera was attached to the net fitted with the square mesh panel onboard BUDDING ROSE.

Situated in a position at the forward end of the square mesh panel the aim was to observe fish reactions to the panel as they passed into the extension of the net.

The pair team returned to the same area as the previous day. BUDDING ROSE shot first again towing westward for 4 hours.

The second tow back eastwards towards Looe produced fewer fish than the first. Fewer squid were caught than on previous days but slightly more round fish were caught on this day.

Other pairs were working the same grounds but unfortunately no catch details were made available for comparison on this day. However, after speaking to skippers over the VHF radio it appeared that catches from the other pairs had shown the same trend of fewer squid with better whiting and hake catches.

#### Day (4) - 16th November 1991

After a fine start to the day the weather freshened, NW 5-6.

The standard net was shot first from LEVAN-MOR on grounds further offshore previous tows but once again to the west. Very poor fishing was encountered, very few squid or round fish were caught.

The second tow of the day using the panel net fitted with the camera was made on grounds inside of the first tow. Towing for 3 hours again to the west produced similar results to the first tow.

The net "came fast" during the second tow after about 1½ hours. The net was cleared without any damage. Very few fish were caught but some good film was obtained with the underwater camera.

The pair team steamed into Polruan and tied-up in the river. The crew returned to Looe by road. By doing this it enabled the following days operations to follow a similar pattern to previous days. It provided a means of avoiding tidal restrictions in Looe.

No other pair teams were working similar grounds to allow catch comparisons to be made.

#### Day (5) - 17th November 1991

The pair team left Polruan in fine conditions which deteriorated rapidly during the day.

Only one tow was made as the vessels returned to Looe due to the very poor weather conditions.

The net was shot from BUDDING ROSE and fitted with the camera. The vessels towed back up the channel towards Looe for two hours. This shorter tow provided underwater film of the full towing operation.

Despite "marking" large concentrations of pilchards on the echo sounder during the tow very few fish were caught. The bulk of the catch was hake.

The vessels returned to Looe where the square mesh panel was swapped over and fitted into the net onboard LEVAN-MOR.

#### Day (6) - 18th November 1991

BUDDING ROSE, this time fishing with the standard unmodified net, shot first. Fishing was again confined to the inshore grounds off Looe due to very poor weather.

As a result of the poor weather forecast very few vessels were at sea. In fact, only one other pair team were on the grounds to compare catches.

Two, 3 hour tows were carried out with very poor results.

The camera was used for the second tow on the LEVAN-MOR's net.

The catch results were compared with those of the PARAVEL/CAROLINE ANNE pair team.

The following days work was postponed due to NE gales.

#### Day (7) - 20th November 1991

Fishing operations commenced on 20th November 1991.

Due to poor results obtained on the inside grounds it was decided to try grounds further offshore near the Eddystone Reef.

Fishing in deeper water, 38-40 fathoms, required 200 fathom of warp. The pair team adjusted the separation distance to 0.17m,

In this area the catch was made up of mixed species including quantities of scad, gurnards and small John Dory as well as squid and hake. Very few whiting were encountered on these grounds.

Two, 3½ hour tows were carried out. No other vessels were in close enough proximity for comparison.

#### Day (8) - 21st November 1991

With improved weather conditions the pair team returned to the Eddystone area but on slightly different tows to the east of the previous days positions.

Most of the Looe fleet were scattered around the general area. The pair teams of CASSADORA/BRIAGHAMARA and CAPRICE/BILANDER were closest to the trials team.

As on the previous day two 3½ hour tows were carried out. BUDDING ROSE shot first with the standard net.

Due to technical problems with the power supply for the camera unit it was not used on this occasion. The second shot using LEVAN-MOR's net with the square mesh panel produced slightly more fish than the first.

Catches were predominantly hake, whiting and squid with quantities of scad, gurnards and John Dory. Large concentrations of feed and small fish were showing on the echo sounders but none of these appeared in the trawls.

#### Day (9) - 22nd November 1991

Day (9) was the last day of the trials. A decision was made to try an area of ground around Rame Head off Plymouth. This area, known to hold quantities of hake and whiting at certain times, is renowned for causing gear damage. The seabed in this area is littered with debris and obstructions which can cause severe gear damage at times.

Due to the risky nature of this ground it was decided not to attach the underwater camera unit for fear of damage.

The panel net was shot first from LEVAN-MOR and towed eastwards for 1½ hours. This haul produced reasonable quantities of fish mainly whiting and hake.

Considerable quantities of "scrap" were also hauled up but fortunately no damage was sustained.

The aim was to carry out four short tows, two with each net.

The second tow with the standard net shot from BUDDING ROSE was again towed eastwards for 1½ hours. This produced less fish but of a similar species mix. Unfortunately, this time the net did not escape undamaged. Considerable belly damage occurred from debris picked-up during the tow.

LEVAN-MOR shot the panel net for the third tow during which time the net damage was repaired. This time the pair towed west for 1½ hours on the inside tracks and produced less fish than the first tow. The catch consisted mainly of large whiting and hake. Once again, a considerable amount of debris was collected.

Once the net onboard BUDDING ROSE had been repaired it was shot for the fourth and final tow. The vessels continued west for a further 1½ hours. Fewer fish were caught than the previous tow.

No further damage was incurred and the vessels returned to Looe.

All gear and equipment was removed from the trials vessels in order that they could return to their normal operations.

## 5      RESULTS

In this fishery it is accepted that fishing in the dark hours is not a viable proposition. Since the vessels work on a daily basis and are bound by tidal conditions in the river harbour, fishing operations are normally restricted to two long tows per day.

For the trials exercise two tows of identical duration and on very similar grounds had to be carried out in order that the results from each could be sensibly compared.

There are noticeable variations in the catch rates on some of the local grounds when comparing the first and second tows of the day. The reasons for this may be numerous but can be linked with fish behaviour and fishing effort.

When such a large fleet of vessels are concentrated in small areas (particularly on the inside grounds) then such fishing activity must effect the fish behaviour, breaking up shoals and scattering the fish from grazing areas.

In order to try and limit the effect of such variations on the catch results, the first shot each day was alternated between the standard gear and the gear fitted with the square mesh panel.

The catches from each tow were sorted into species and each of the three main species under consideration were quantified and measured.

Where relatively small numbers of a particular species were caught all the catch was measured. For larger quantities (such as in the case of squid) only representative samples were measured. The numbers from these samples were then raised by the appropriate multiplier to give an overall estimate.

The information from the catch analysis was then used to produce the data shown in Tables 1-6 and Figures 1-3.

The tables show the total number of fish sampled or measured for the hauls made using the standard or control gear and those made using the square mesh panel.

The raised numbers (total numbers) for each centimetre size class are shown on the left-hand side of the tables along with a frequency figure representing the percentage of the total catch represented by each size class. For example:-

Table 1 representing the whiting catches - the left-hand column for the square mesh panel shows that 35cms whiting made up 10% of the total catch.

The figures from the left-hand columns are used to produce the length/numbers and length/frequency plots shown in Figures 1-3.

The right-hand section of the tables shows the catch broken down into 5cms size groupings. This can be further grouped to represent the EC market gradings (see Tables 4, 5, 6).

In this right-hand section the percentage of the total catch represented by each size group is shown, along with the actual number of fish representing that percentage. The actual number of individuals gives an idea of how valid the percentage figures are. Where very low numbers are concerned then the data is less valid and vice versa.

At the base of this section a figure is given for the percentage reduction in catch attributable to the square mesh panel. A negative figure represents a gain in catch compared to the standard gear. Once again the numbers represented by the percentage figure are shown to give an idea of how valid the figures are.

### 5.1 Results for Whiting Catch

The data for the whiting catch are contained in Tables 1 and 4 and Figure 1.

From the information it can be seen that firstly there are virtually no discards, i.e. no fish retained below the minimum landing size (MLS) of 27cms, apart from 14 individuals which were taken in the standard control gear.

However, the visual evidence from the underwater camera showed considerable quantities of undersize fish passing through the gear on all occasions that film was taken. Large numbers were seen to be passing out through the square mesh panel section.

The fact that virtually none were retained in the standard gear also suggests that they were released at some stage during the fishing exercise. It is possible that most would be released at the point of hauling as the strain comes off the gear and the meshes which are then no longer under tension allow them to open up and the fish to be released.

Poor fishing and weather conditions resulted in low catches of whiting and this must be borne in mind when considering these results. Sample sizes are relatively small and therefore the data are limited.

For both gear types the peak size class was 37cms. Examination of Table 4 also reflects this by the fact that the predominant size grades caught were EC 2 and 3.

When comparing the two gears, i.e. the standard net with the net fitted with the panel, it is seen that the panel net actually caught 24% more whiting than the standard net over the duration of the trials.

Breaking the catch down into approximate EC gradings as in Table 4, the results show very little difference between the gear types, i.e. the percentage of the total catch in each of the four EC grades is similar for both the square mesh and the standard net.

This information is shown in a different format in the length/frequency distributions in Figure 1.

The length/numbers plot shows the difference in actual numbers when the two nets are compared.

From these results it appears that no losses of marketable whiting were attributable to the use of the square mesh panel. In fact, the figures show a 24% improvement compared to the standard net.

## 5.2 Results for Hake Catch

The data for the hake catch are contained in Tables 2 and 5 and Figure 2.

Once again, catch levels were low but hake made up a bigger proportion of the total catch than did whiting.

The hake catch did consist of some discards, i.e. fish below the 30cms MLS. The standard gear caught 21 individuals below 30cms representing 3.6% of the total hake catch for that net. The net fitted with the panel caught 44 individuals representing 6% of its total catch.

In this case the indications are that the square mesh panel net was retaining more juvenile hake. However the numbers are very small and so hardly significant.

The peak size class for the panel net was 41cms and for the standard net 42cms. Both fall within the EC grade 4 for hake.

Once again, there is little difference between the catches from the two nets when comparing the EC grades in Table 5 but the overall difference between the two nets is shown as 27% improvement in favour of the net fitted with the panel.

These figures produce a similar result to that found for the whiting catch in that no losses of hake appear to be attributable to the use of the panel. Once again the results show an increase in catch of a similar order, 27% in favour of the panel.

The low numbers of fish caught mean that these results can only give indications as to the effectiveness of the panel configuration.

There were few observations of hake in the net when the underwater film was examined.

Considering the proportion of the catch that was made up of hake, very few were observed passing through the net in the region of the square mesh panel.

It is known that hake are relatively strong and fast swimmers and it was thought that most of the hake may have remained in the forward sections of the net swimming with the trawl for most of the duration of the tow.

Since filming time was limited to 3 hours and towing time on most occasions was more than 3 hours, it was thought that the hake would not be observed in the net since they would not enter the region covered by the camera until the latter stages of the tow when the camera was not recording.

### 5.3 Results for Squid Catch

The data for the squid catches are given in Tables 3 and 6 and Figure 3.

Since there is no minimum landing size or EC gradings for squid the catch could not be separated as discards and marketable. However, for ease of discussion the squid catch has been split into 4 x 5cm size classes in Table 6.

For both nets the peak size class was the same at 23cms with the bulk of the catches from both nets being in size group B in Table 6.

Comparing the size groups for the two nets it can be seen that there was little difference in the percentage of the catch taken in each group.

The overall difference in catch between the two nets showed a reduction in the squid catch of 24% attributable to the square mesh panel.

Of the three species sampled during the trials, squid made up the biggest proportion of the catch.

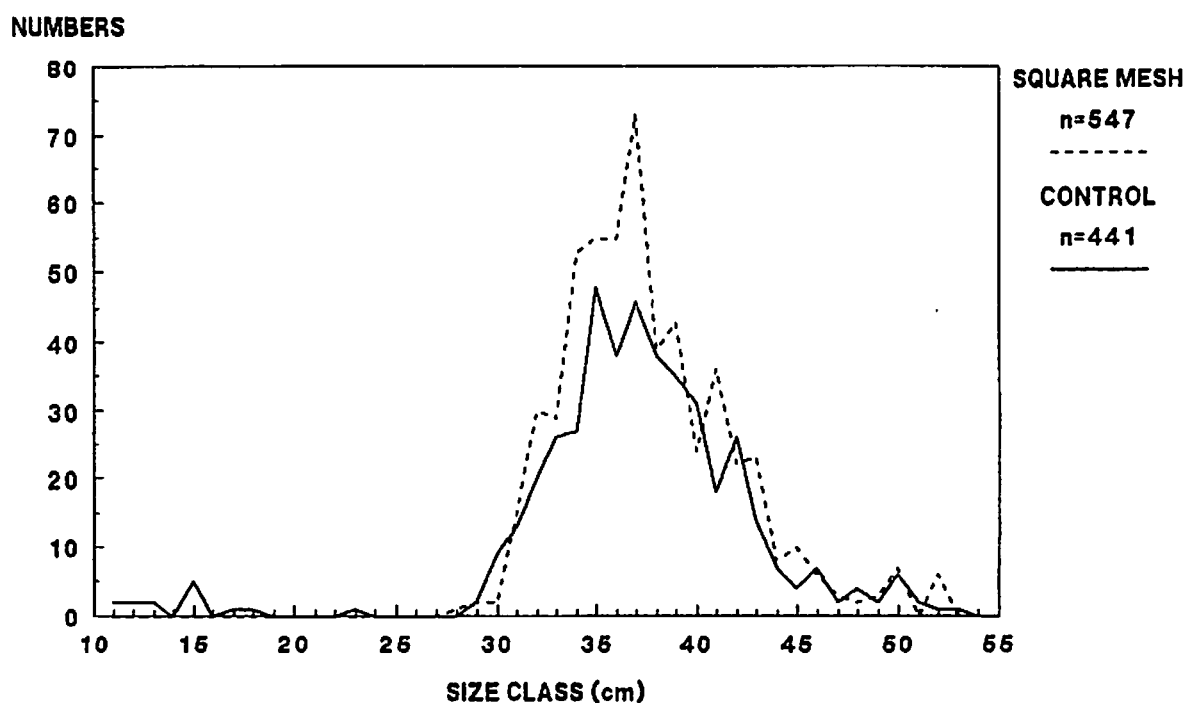
The camera observations failed to show much squid activity near the panel and it is therefore difficult to establish exactly how the squid behave in relation to the panel. Some small squid were observed escaping through the panel but it was difficult to establish if this was the result of a positive "escape attempt" or whether the squid were coming into contact with the more open meshes of the panel as a result of random activity within the extension of the net.

For whatever reason, the results do indicate a reduction in the squid catch when using the square mesh panel net.

Examination of the length/frequency plots indicates a size class shift upwards of 1cm with the use of the panel, i.e. the panel was selecting slightly larger squid than the standard net.

**FIGURE 1**

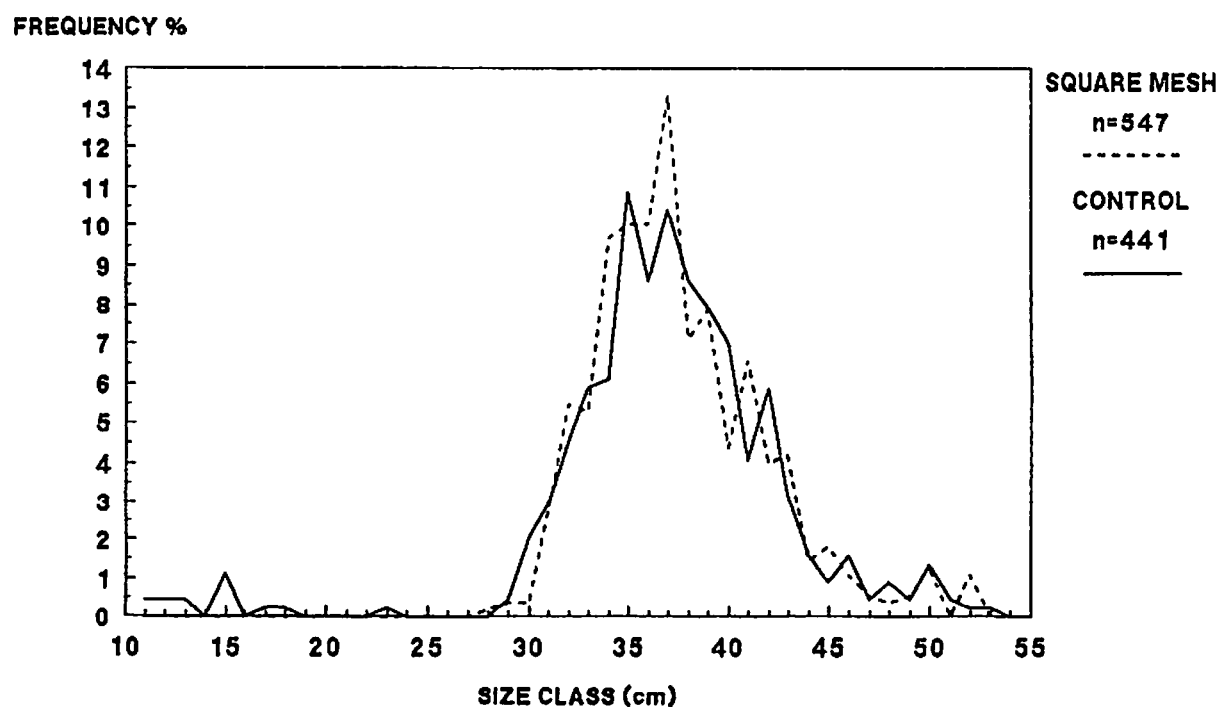
**WHITING: Length-Numbers Plot**  
**Standard 90mm diamond v. 80mm square mesh panel**



MFVs Levan Mor and Budding Rose, Looe

SEAFISH

**WHITING: Length-Frequency Plot**  
**Standard 90mm diamond v. 80mm square mesh panel**



MFVs Levan Mor and Budding Rose, Looe

SEAFISH

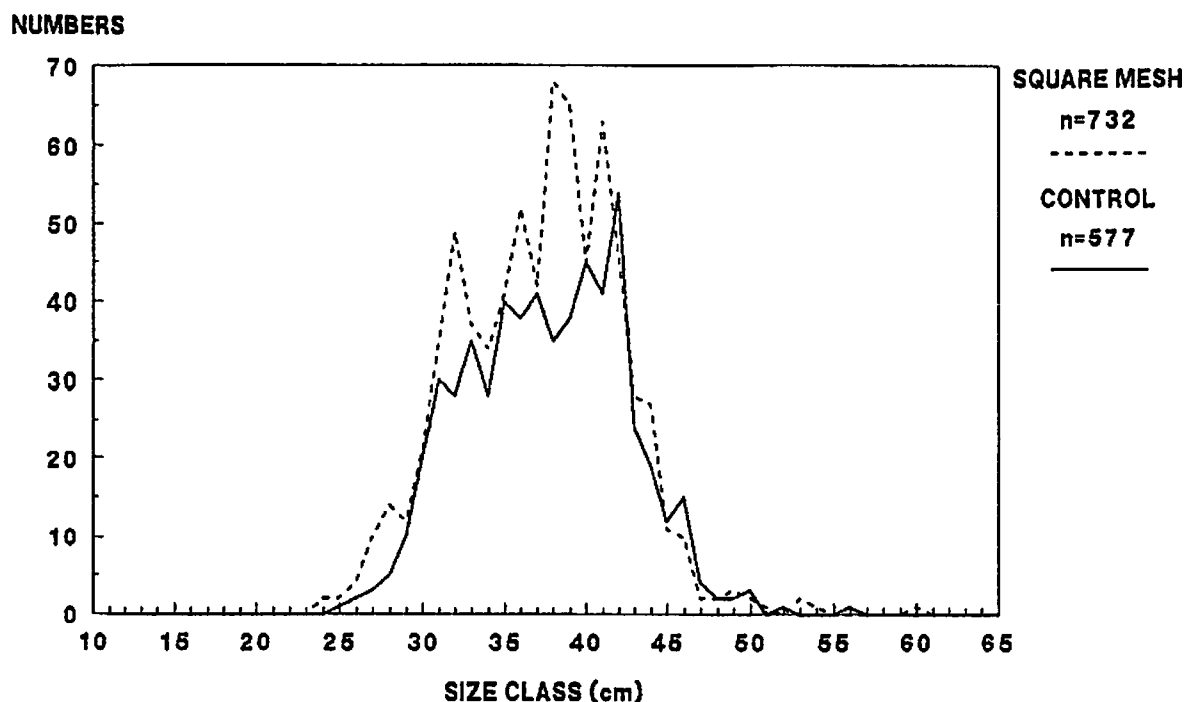
TABLE 1 - WHITING RESULTS

SQUARE MESH			CONTROL			DIFFERENCES BETWEEN GEARS (PERCENT AND NUMBERS)			WHITING	
SAMPLE TOTAL: 547			SAMPLE TOTAL: 441							
RAISED TOTAL: 547			RAISED TOTAL: 441							
MLS (cm) 27			MLS (cm) 27			REDN. DISCARDS: 100 14				
% DISCARDS 0			% DISCARDS 3			GAIN IN MARKETABLE: 28 120				
% RETAINED 100			% RETAINED 97							
CLASS RAISED FREQ.			CLASS RAISED FREQ.			SPECIES: WHITING				
cm	NUMBERS	%	cm	NUMBERS	%	GEAR: std. v 80mm sq.				
11	0	0	11	2	0.45	MFV's LEVAN MOR & BODDING ROSE PAIR TRAWL TRIALS, LOOE ALT. TOW (SQUARE/DIAMOND) NOVEMBER 1991  10 TONS EACH GEAR TYPE				
12	0	0	12	2	0.45					
13	0	0	13	2	0.45					
14	0	0	14	0	0					
15	0	0	15	5	1.13					
16	0	0	16	0	0					
17	0	0	17	1	0.22					
18	0	0	18	1	0.22					
19	0	0	19	0	0					
20	0	0	20	0	0					
21	0	0	21	0	0	Size Groupings:				
22	0	0	22	0	0	SQUARE MESH		CONTROL	DIFFERENCES (CON-SQU)	
23	0	0	23	1	0.22	Group	%	n	%	n
24	0	0	24	0	0	(5cm)				
25	0	0	25	0	0	11-15	0	0	2.5	11
26	0	0	26	0	0	16-25	0	0	0.7	3
27	0	0	27	0	0	26-30	0.9	5	2.5	11
28	1	0.18	28	0	0	31-35	33.3	182	30.4	134
29	2	0.36	29	2	0.45	36-40	42.8	234	42.6	188
30	2	0.36	30	9	2.04	41-45	18.1	99	15.6	69
31	15	2.74	31	13	2.94	46-50	3.8	21	4.8	21
32	30	5.48	32	20	4.53	51-55	1.1	6	0.9	4
33	29	5.30	33	26	5.89	56-60	0	0	0	0
34	53	9.68	34	27	6.12	61-65	0	0	0	0
35	55	10.0	35	48	10.8	66-70	0	0	0	0
36	55	10.0	36	38	8.61	71-75	0	0	0	0
37	73	13.3	37	46	10.4	76-80	0	0	0	0
38	39	7.12	38	38	8.61	81-85	0	0	0	0
39	43	7.86	39	35	7.93	86-90	0	0	0	0
40	24	4.38	40	31	7.02					
41	36	6.58	41	18	4.08					
42	22	4.02	42	26	5.89					
43	23	4.20	43	14	3.17					
44	8	1.46	44	7	1.58	% Gain in catch attributable				
45	10	1.82	45	4	0.90	to the square mesh panels: 24.03 %				
46	6	1.09	46	7	1.58	Number of fish represented by this: 106				
47	3	0.54	47	2	0.45					
48	2	0.36	48	4	0.90					
49	3	0.54	49	2	0.45					
50	7	1.27	50	6	1.36					
51	0	0	51	2	0.45					
52	6	1.09	52	1	0.22					
53	0	0	53	1	0.22					
54	0	0	54	0	0					
55	0	0	55	0	0					
56	0	0	56	0	0					
57	0	0	57	0	0					
58	0	0	58	0	0					
59	0	0	59	0	0					
60	0	0	60	0	0					
61	0	0	61	0	0					
62	0	0	62	0	0					

**FIGURE 2**

**HAKE: Length-Numbers Plot**

**Standard 90mm diamond v. 80mm square mesh panel**

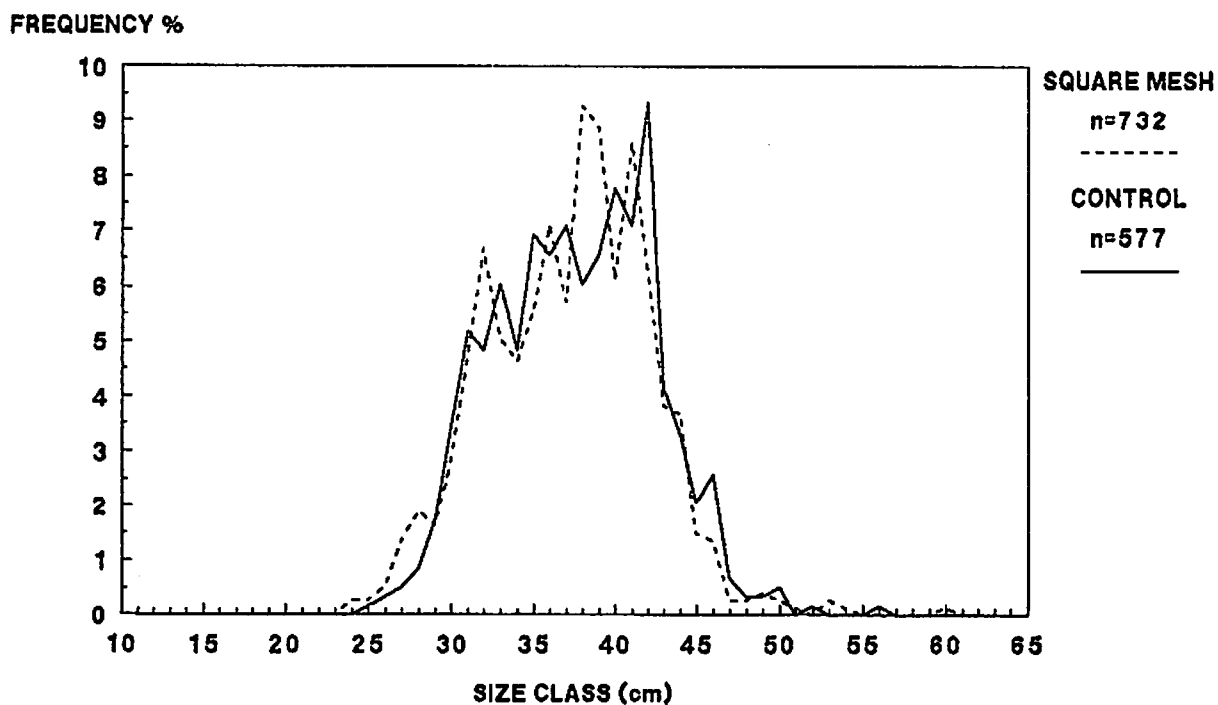


MFVs Levan Mor and Budding Rose, Looe

SEAFISH

**HAKE: Length-Frequency Plot**

**Standard 90mm diamond v. 80mm square mesh panel**



MFVs Levan Mor and Budding Rose, Looe

SEAFISH

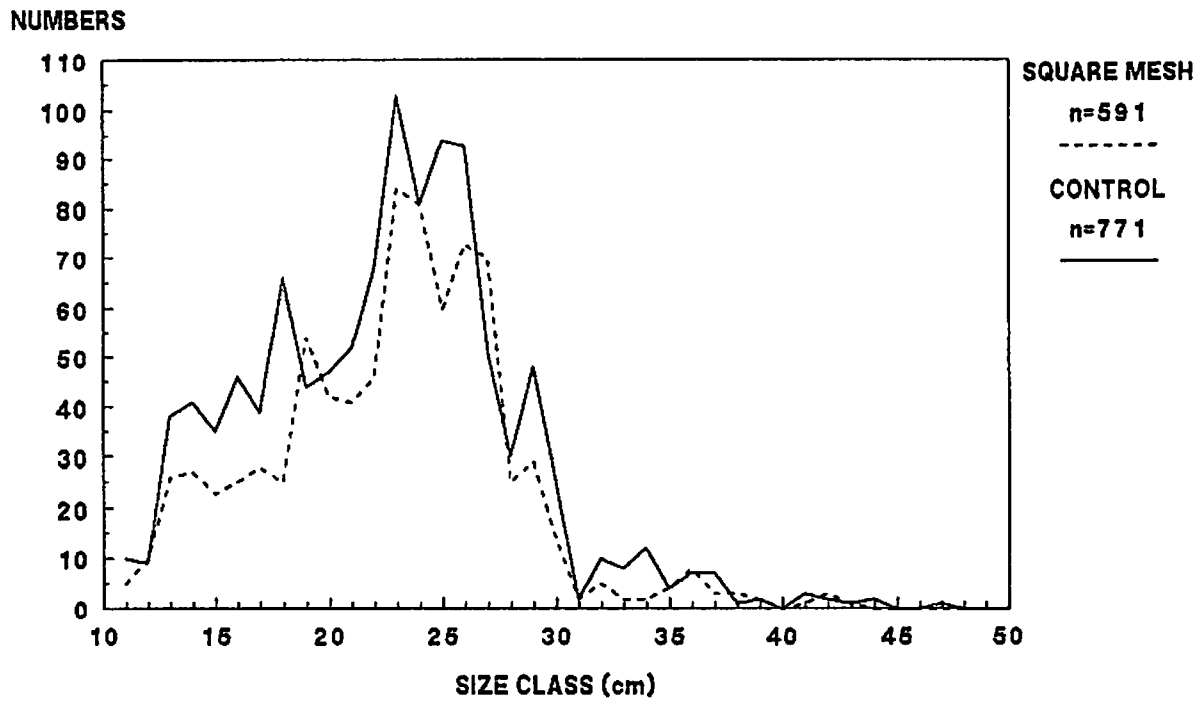
TABLE 2 - HAKE RESULTS

SQUARE MESH			CONTROL			DIFFERENCES BETWEEN GEARS (PERCENT AND NUMBERS)				HAKE		
SAMPLE TOTAL:	732		SAMPLE TOTAL:	577				%	n			
RAISED TOTAL:	732		RAISED TOTAL:	577								
MLS (cm)	30		MLS (cm)	30								
% DISCARDS	6		% DISCARDS	4								
% RETAINED	94		% RETAINED	96								
CLASS RAISED FREQ.			CLASS RAISED FREQ.			SPECIES: HAKE						
cm	NUMBERS	%	cm	NUMBERS	%	GEAR: std. v 80mm sq.						
11	0	0	11	0	0	MFV's LEVAN MOR & BUDDING ROSE PAIR TRAWL TRIALS, LOOE ALT. TOW (SQUARE/DIAMOND) NOVEMBER 1991  10 TOWS EACH GEAR TYPE						
12	0	0	12	0	0							
13	0	0	13	0	0							
14	0	0	14	0	0							
15	0	0	15	0	0							
16	0	0	16	0	0							
17	0	0	17	0	0							
18	0	0	18	0	0							
19	0	0	19	0	0							
20	0	0	20	0	0							
21	0	0	21	0	0	Size Groupings:						
22	0	0	22	0	0							
23	0	0	23	0	0	SQUARE MESH		CONTROL		DIFFERENCES (CON-SQU)		
24	2	0.27	24	0	0	Group	%	n	%	n	%	n
25	2	0.27	25	1	0.17	(5cm)						
26	4	0.54	26	2	0.34							
27	10	1.36	27	3	0.51	11-15	0	0	0	0	0	0
28	14	1.91	28	5	0.86	16-25	0.5	4	0.2	1	-0.3	-3
29	12	1.63	29	10	1.73	26-30	8.3	61	6.9	40	-1.4	-21
30	21	2.86	30	20	3.46	31-35	26.8	196	27.9	161	1.1	-35
31	35	4.78	31	30	5.19	36-40	37.2	272	34.1	197	-3.1	-75
32	49	6.69	32	28	4.85	41-45	23.9	175	26	150	2.1	-25
33	37	5.05	33	35	6.06	46-50	2.6	19	4.5	26	1.9	7
34	34	4.64	34	28	4.85	51-55	0.5	4	0.2	1	-0.3	-3
35	41	5.60	35	40	6.93	56-60	0.1	1	0.2	1	0.1	0
36	52	7.10	36	38	6.58	61-65	0	0	0	0	0	0
37	42	5.73	37	41	7.10	66-70	0	0	0	0	0	0
38	68	9.28	38	35	6.06	71-75	0	0	0	0	0	0
39	65	8.87	39	38	6.58	76-80	0	0	0	0	0	0
40	45	6.14	40	45	7.79	81-85	0	0	0	0	0	0
41	63	8.60	41	41	7.10	86-90	0	0	0	0	0	0
42	46	6.28	42	54	9.35							
43	28	3.82	43	24	4.15							
44	27	3.68	44	19	3.29	% Gain in catch attributable						
45	11	1.50	45	12	2.07	to the square mesh panels: 26.86 %						
46	10	1.36	46	15	2.59	Number of fish represented by this: 155						
47	2	0.27	47	4	0.69							
48	2	0.27	48	2	0.34							
49	3	0.40	49	2	0.34							
50	2	0.27	50	3	0.51							
51	1	0.13	51	0	0							
52	0	0	52	1	0.17							
53	2	0.27	53	0	0							
54	1	0.13	54	0	0							
55	0	0	55	0	0							
56	0	0	56	1	0.17							
57	0	0	57	0	0							
58	0	0	58	0	0							
59	0	0	59	0	0							
60	1	0.13	60	0	0							
61	0	0	61	0	0							
62	0	0	62	0	0							

**FIGURE 3**

**SQUID: Length-Numbers Plot**

**Standard 90mm diamond v. 80mm square mesh panel**

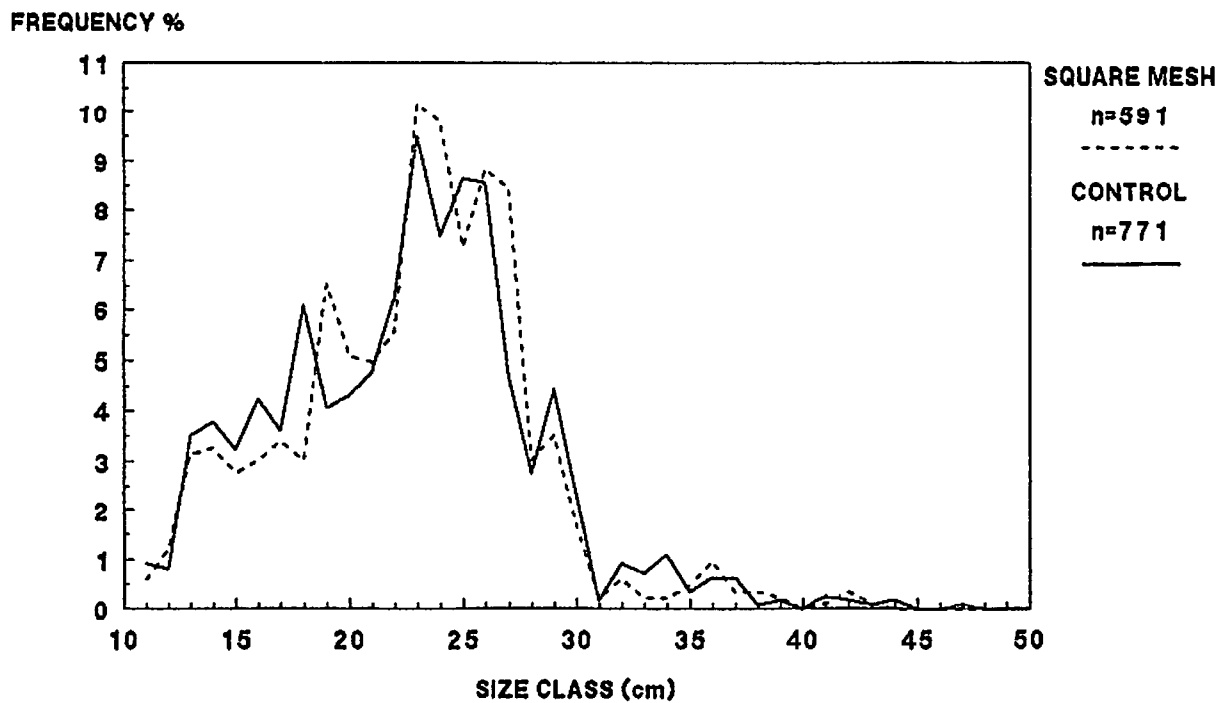


MFVs Levan Mor and Budding Rose, Looe

SEAFISH

**SQUID: Length-Frequency Plot**

**Standard 90mm diamond v. 80mm square mesh panel**



MFVs Levan Mor and Budding Rose, Looe

SEAFISH

TABLE 3

SQUARE MESH			CONTROL			DIFFERENCES BETWEEN GEARS (PERCENT AND NUMBERS)					
SAMPLE TOTAL: 591			SAMPLE TOTAL: 771								
RAISED TOTAL: 824			RAISED TOTAL: 1082								
MLS (ca) 0			MLS (ca) 0								
% DISCARDS N/A			% DISCARDS N/A								
% RETAINED N/A			% RETAINED N/A								
CLASS RAISED FREQ.			CLASS RAISED FREQ.			SPECIES: SQUID					
ca	NUMBERS	%	ca	NUMBERS	%	GEAR: std. v 80mm sq.					
11	5	0.60	11	10	0.92	MFVs LEVAN MOR & BUDDING ROSE PAIR TRAWL TRIALS, LOOZ ALT. TOW (SQUARE/DIAMOND) NOVEMBER 1991  10 TONS EACH GEAR TYPE					
12	10	1.21	12	9	0.83						
13	26	3.15	13	38	3.51						
14	27	3.27	14	41	3.78						
15	23	2.79	15	35	3.23						
16	25	3.03	16	46	4.25						
17	28	3.39	17	39	3.60						
18	25	3.03	18	66	6.09						
19	54	6.55	19	44	4.06						
20	42	5.03	20	47	4.34						
21	41	4.97	21	52	4.80	Size Groupings:					
22	46	5.58	22	68	6.28						
23	84	10.1	23	103	9.51	SQUARE MESH		CONTROL		DIFFERENCES (CON-SQU)	
24	81	9.83	24	81	7.48	Group	%	n	%	n	%
25	60	7.28	25	94	8.68	(5ca)					
26	73	8.85	26	93	8.59	11-15	11	91	12.3	133	1.3
27	70	8.49	27	51	4.71	16-25	59	486	59.1	640	0.1
28	25	3.03	28	30	2.77	26-30	25.6	211	22.8	247	-2.8
29	29	3.51	29	48	4.43	31-35	1.6	15	3.3	36	1.5
30	14	1.69	30	25	2.31	36-40	1.9	16	1.6	17	-0.3
31	2	0.24	31	2	0.18	41-45	0.6	5	0.7	8	0.1
32	5	0.60	32	10	0.92	46-50	0	0	0.1	1	0.1
33	2	0.24	33	8	0.73	51-55	0	0	0	0	0
34	2	0.24	34	12	1.10	56-60	0	0	0	0	0
35	4	0.43	35	4	0.36	61-65	0	0	0	0	0
36	8	0.97	36	7	0.64	66-70	0	0	0	0	0
37	3	0.36	37	7	0.64	71-75	0	0	0	0	0
38	3	0.36	38	1	0.09	76-80	0	0	0	0	0
39	2	0.24	39	2	0.18	81-85	0	0	0	0	0
40	0	0	40	0	0	86-90	0	0	0	0	0
41	1	0.12	41	3	0.27	% Reduction in catch attributable to the square mesh panels: 23.84 % Number of fish represented by this: 253					
42	3	0.36	42	2	0.18						
43	1	0.12	43	1	0.09						
44	0	0	44	2	0.13						
45	0	0	45	0	0						
46	0	0	46	0	0						
47	0	0	47	1	0.09						
48	0	0	48	0	0						
49	0	0	49	0	0						
50	0	0	50	0	0						
51	0	0	51	0	0						
52	0	0	52	0	0						
53	0	0	53	0	0						
54	0	0	54	0	0						
55	0	0	55	0	0						
56	0	0	56	0	0						
57	0	0	57	0	0						
58	0	0	58	0	0						
59	0	0	59	0	0						
60	0	0	60	0	0						
61	0	0	61	0	0						
62	0	0	62	0	0						

**FREQUENCY DISTRIBUTION OF GRADE BANDS BETWEEN THE CATCHES FROM  
THE SQUARE MESH PANEL AND STANDARD DIAMOND MESH NETS**

**TABLE 4 - WHITTING**

		FREQUENCY %		
Approx EC Grade	Size cm	Square Mesh Panel	Diamond Mesh Standard	Difference In %
E4	26-30	0.9	2.5	1.6
E3	31-35	33.3	30.4	2.9
E2	36-40	42.8	42.6	0.2
E1	41-45	18.1	15.6	2.5
	46-50	3.8	4.8	1.0

**TABLE 5 - HAKE**

		FREQUENCY %		
Approx EC Grade	Size cm	Square Mesh Panel	Diamond Mesh Standard	Difference In %
E5	31-35	26.8	27.9	1.1
E4	(36-40	37.2)	34.1)	1.0
	(41-45	61.1 23.9)	60.1 26.0)	
E3	(46-50	2.6)	4.5)	1.7
	(51-55	0.5)-	0.2)-	
	(56-60	3.2 0.1)	4.9 0.2	

**TABLE 6 - SQUID**

		FREQUENCY %		
No EC Grading	Size cm	Square Mesh Panel	Diamond Mesh Standard	Difference In %
A	11-15	11.0	12.3	1.3
B	16-25	59.0	59.1	0.1
C	26-30	25.6	22.8	2.8
D	31-35	1.8	3.3	1.5

## 6 CATCHES FROM OTHER VESSELS

Over the duration of the trials period, whenever possible, the catches of the trials pair team were compared with other vessels of a similar class working on similar grounds.

Although this could never provide an accurate comparison it did provide a further indication of the effectiveness of the test gear compared with the conventional gear.

All the vessels used for comparison to the trials pair team were using the same net design and mesh size etc. The only significant difference in the gear specifications was that the other vessels were using lifting bags\* (and some were also using chafers). The lifting bags were of a standard design with a mesh size of two times that of the codend mesh size.

Over the course of the trials it was only possible to obtain comparative catch results for four days. There was no data on discards from the other vessels. However, these results provided some interesting indications.

- \* The use of lifting bags on the trials vessels was avoided in order that their possible influence on selectivity of the codend/extension could be eliminated. With hindsight it would have been preferable to use lifting bags in order to make the exercise more representative of the fishery.

On day 1 (11/11/91) of the trials, catch reports from two other pair teams were obtained - CAPRICE/BILANDER and MARET/OUR KATHLEEN. The differences can be seen from the following tables.

SQUID				
	<b>Trials Pair</b>	<b>Caprice/ Bilander</b>	<b>Maret/ Our Kathleen</b>	<b>Corinthian/ Innisfallen</b>
	23½st	16½st	23st	26½st

These results show that the trials pair compared well with the other vessels with similar quantities being taken by each pair.

WHITING				
<b>Grade</b>	<b>Trials Pair</b>	<b>Caprice/ Bilander</b>	<b>Maret/ Our Kathleen</b>	
4	None	2½st	5st	
3	1st	4½st	14½st	
2	1½st	3½st	9st	
1	1½st	1½st	4½st	

Here the results show inconsistency, of the 3 pair teams none caught similar quantities but the trials vessels were outfished by the other two pairs. It is interesting to note that no grade 4 whiting were taken by the trials pair.

HAKE				
<b>Grade</b>	<b>Trials Pair</b>	<b>Caprice/ Bilander</b>	<b>Maret/ Our Kathleen</b>	
3	None	None	5½lb	
4	1½st	1st	4½st	
5	½st	1½st	5½st	

Here again different quantities were taken by all three pairs and quantities are low but it appears once more that the trials pair have a reduced catch of the smaller grades when compared to the other vessels.

Day 2 (14/11/91) provided four pair teams for comparison - PARAVEL/CAROLINE ANNE, CORINTHIAN/INNISFALLEN, MARET/OUR KATHLEEN, ROS ALITHER/MARIGOLD.

SQUID					
	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>	<b>Corinthian/ Innisfallen</b>	<b>Maret/ Our Kathleen</b>	<b>Ros Alither/ Marigold</b>
	4½st	5½st	4½st	18½st	35½st

These results show better size catches of squid and the trials pair faired better than two of the four pairs under comparison.

WHITING					
<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>	<b>Corinthian/ Innisfallen</b>	<b>Maret/ Our Kathleen</b>	<b>Ros Alither/ Marigold</b>
1	5st	11½st	3½st	2½st	7½st

Catch rates varying between 2½ and 11½ stones. It is fair to say that trials pair compared reasonably considering the variation.

<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>	<b>Corinthian/ Innisfallen</b>	<b>Maret/ Our Kathleen</b>	<b>Ros Alither/ Marigold</b>
2	3½st	9st	7½st	4st	8½st

Less variation in catch rates but trials pair appears to be loosing fish as the grades decrease.

<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>	<b>Corinthian/ Innisfallen</b>	<b>Maret/ Our Kathleen</b>	<b>Ros Alither/ Marigold</b>
3	1½st	12st	17½st	10st	13½st

Similar catch rates from the four comparative pairs but trials pair completely outfished.

<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>	<b>Corinthian/ Innisfallen</b>	<b>Maret/ Our Kathleen</b>	<b>Ros Alither/ Marigold</b>
4	None	6½st	6½st	4st	7½st

Here again, similar catch rates for the other pairs but no grade 4 whiting for the trials vessels.

HAKE					
Grade	Trials Pair	Paravel/ Caroline Anne	Corinthian/ Innisfallen	Maret/ Our Kathleen	Ros Alither/ Marigold
3	121b	51b	51b	None	None

Very few grade 3 hake caught. Out of the three pairs catching any, the trials pair faired the best. However these quantities are hardly significant.

Grade	Trials Pair	Paravel/ Caroline Anne	Corinthian/ Innisfallen	Maret/ Our Kathleen	Ros Alither/ Marigold
4	3st	1½st	6½st	4½st	1½st

Catch rates less consistant and trials pair performed comparatively well. Two pairs catching more and two catching less than the trials team.

Grade	Trials Pair	Paravel/ Caroline Anne	Corinthian/ Innisfallen	Maret/ Our Kathleen	Ros Alither/ Marigold
5	1st	1½st	None	4st	4½st

Again less consistant catches, the trials pair comparing favourably with two out of the four pairs.

These figures for the hake catches are less significant due to the low numbers of fish concerned.

Day 6 (18/11/91) was the next day were catches could be compared with other vessels. On this occasion only one pair team was available for comparison - PARAVEL/CAROLINE ANNE.

SQUID		
	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>
	8½st	8½st

Here the squid catches were very similar.

WHITING		
<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>
1	2½st	4½st
2	1st	4½st
3	4lb	8½st
4	None	3½st

In all grades, the only vessel for comparison outfished the trials pair. The most significant result can be seen in grades 3 and 4 where in 4, catches were non-existent for the trials pair.

HAKE		
<b>Grade</b>	<b>Trials Pair</b>	<b>Paravel/ Caroline Anne</b>
3	½st	½st
4	2st	6st
5	1½st	2½st

Trials pair compared well with Paravel/Caroline Anne for grade 3 but were outfished on the smaller grades 4 and 5.

On day 8 (21/11/91) the catches from the trials pair team were compared with those of the pairs - CASSADORA/BRIAGHAMARA and CAPRICE/BILANDER.

SQUID			
	<b>Trials Pair</b>	<b>Cassadora/ Briaghamara</b>	<b>Caprice/ Bilander</b>
	12st	43½st	10½st

Similar catches were taken when compared with one of the pairs but the trials teams were outfished by the other by over 3½ times. Such a large difference seems to suggest that the Cassadora/Briaghamara pair hit on a good mark of squid on this occasion.

WHITING			
<b>Grade</b>	<b>Trials Pair</b>	<b>Cassadora/ Briaghamara</b>	<b>Caprice/ Bilander</b>
1	1st	2½st	1½st
2	2st	4st	1½st
3	1½st	7st	3½st
4	None	2st	2st

Very little whiting showed for this days work. The trials pair were outfished on all but grade 2 fish where they performed very slightly better than one pair. Again quantities are very small but the trend continues to suggest that the trials team were not performing as well as the other teams particularly on the lower grades. Here again, no grade 4 whiting were caught.

HAKE			
<b>Grade</b>	<b>Trials Pair</b>	<b>Cassadora/ Briaghamara</b>	<b>Caprice/ Bilander</b>
3	101b	1st	-
4	11st	1½st	9st
5	2½st	1st	7½st

These results suggest that one of the pairs under comparison failed to find any hake in quantity on this day. The trials pair compared well with grade 4 hake, outfishing the others but appears to have lost out again on the smaller grade 5.

## 7 DISCUSSION

### 7.1 Catch Comparisons with Other Vessels

The results have shown that on the days when the catches from the trials pair were compared with other vessels the squid catches showed no marked differences between all the pair teams.

However, examining the round fish catches of whiting and hake, it can be seen that the results suggest that when compared to the other pair teams, the trials pair were catching less round fish generally but specifically much less grade 4 whiting and the smaller grades of hake.

When considering the differences between the gear used by the trials pair and the other pairs to which they were compared, there are two significant variations in the gear configurations. These are:-

- 1) The use of the square mesh selector panel by one of the vessels of the trial pair team.
- 2) The use of lifting bags by the other pair teams and not by the trial pair.

The results from the comparison of the catches between the two vessels of the trial pair team, i.e. the vessel using standard gear compared to the gear fitted with the square mesh panel, showed that the trawl fitted with the 80mm square mesh window caught 24% more whiting, 27% more hake and 24% less squid than the standard rigged trawl with the 90mm diamond mesh.

Even allowing for the low numbers of fish caught, these figures seem to suggest that the differences in catches compared to the other pair teams can not solely be attributable to the square mesh panel.

It would appear that the use of the panel did have the effect of reducing the numbers of squid caught. The length/frequency distributions (Fig 3) also show that the square mesh panel produced a slight shift in the size class of squid being caught. This shift was an increase in the size of squid caught by approximately 1cm. This may not be a major shift but it is noticeable.

The use of the square mesh panel did not show losses when compared with the standard gear when used within the same pair team. However, the trials pair team did not appear to compete well with other similar vessels for whiting and hake. Since the only other significant factor was the use of lifting bags by the other pair teams, then it is reasonable to assume that the use of the lifting bags was influencing the selectivity of the gear.

The use of a lifting bag totally enclosing the codend could have a number of effects on the meshes of the codend within. Some of these effects could be detrimental to the selectivity of the codend. For instance, the meshes of the "lifter", although of twice the codend mesh size, may be obstructing some of the codend meshes preventing the release of some fish. The "lifter" as a whole could produce more strain on the codend in the direction of tow thus causing the codend meshes to close-up.

If any of these situations were to be the case then it is reasonable to assume that the release of some fish from the codend would be restricted.

## **7.2 Looe Pair Trawling Technique**

A closer look at the pair trawling operation as undertaken by the Looe vessels in question suggests some possible explanations for catch variations.

The normal procedure during the hauling operation was for the pair team to come together just prior to stopping the vessels in order to engage the trawl winches to commence hauling. The vessels have insufficient power to keep forward way on the ship and use power for the winch.

As soon as the vessels stop in the water to start hauling, the net begins to slow and within a very short time it stops and settles on the seabed in an almost collapsed state.

Since there is no way on the net, any fish that have been herded into the mouth and fore part of the net have the opportunity of swimming back out of the gear. To a certain extent this also applies to fish within the extension and also codend if they are not prevented from doing so by the "flapper" or by the fact that they are too tired to swim back.

Although not within the remit of these trials, Seafish would suggest that there may be some inconsistencies in matching the gear to the available power and winch power.

Since these fishing operations were carried out in less than 30 fathoms of water and considering that typically there would be approximately 350 fathoms of wire between the vessel and the net, it can be appreciated that it is some time before the net begins to move again as it is lifted from the seabed. At this time any fish within the main body of the net would be pushed towards the codend.

This situation applies to all vessels operating under these conditions. But if a net with a codend fitted with a "lifting bag" (and/or chafers) is compared with a "clean" codend in this situation it can show where there might be the possibility of differences in the codends ability to retain fish.

When the net comes to a stop on the seabed and the tension comes off the netting, the meshes of the codend may be allowed to open thus increasing the potential release area for fish still able to swim freely within the codend. If the codend is enclosed within a lifting bag then, as the netting collapses due to lack of forward movement, it is possible that the "lifter" may collapse onto the codend and thus "masking" the codend meshes. This would result in a reduction in the potential release area within the codend.

This may be a possible explanation for the differences in catches of the smaller grades of fish. The use of the "lifter" may be preventing the release of the smaller fish by effectively reducing the mesh opening when compared to a "clean" codend.

It must be emphasised that this is only speculation. However, observations made with the self-contained underwater camera unit did provide some evidence to back up the suggestions.

Although no film was actually taken within the codend, on a number of occasions fish were observed swimming strongly and unrestricted within the extension of the net in all directions as the net was stopped in the water. Fish were seen to swim forward of the camera towards the mouth of the net as the net settled on the seabed and started to collapse.

### 7.3 Observations from Underwater Camera

Prior to commencing the trials, discussions with fishermen operating pair trawls in the Looe fishery revealed that their catches contained very few, if any, discards. This was borne out on the trials.

The trials conducted by Seafish produced results that supported this claim. However, the observations made using the underwater camera unit clearly showed considerable quantities of juvenile fish of a number of species passing through the net.

The fact that these undersized fish are rarely being retained in the net and brought onboard suggests that they are being released from the gear at some point.

If this is the case then there appears to be no argument for the case of using selection devices such as the square mesh panel in this fishery. However, the underwater film did show juvenile fish escaping from the net via the square mesh panel very readily through the much more open meshes.

Assuming that under normal circumstances these juveniles are being released from the standard gear from the area of the codend, it is reasonable to assume that prior to their release they could be subjected to a prolonged period of time (in some instances the duration of the tow) of being churned around in the codend and subjected to all sorts of stress, including physical damage.

Considering the nature of this pair trawling operation and the observations made using the underwater camera, it would appear that the time at which the net is starting to be hauled would be the time at which most releases would occur. This is the time when the strain comes off the gear releasing tension in the meshes. If this is the case, then there is an argument in favour of using square mesh panels of sensible mesh size and correctly positioned within the gear to allow the juvenile fish to escape at the earliest opportunity allowing them a good chance of survival once they are released.

Unfortunately, the effect of the panel arrangement on some of the valuable by-catch species like red mullet could not be assessed. Only the odd few individuals were caught during the trials preventing valid comparisons.

8      SUMMARY OF FINDINGS

1.      The trials results indicate that at this time of the year that as far as pair trawling is concerned there is no measurable reduction of discards when using a square mesh panel in the trawl. There were few discards in either the square mesh trawl or the standard trawl.
2.      In terms of marketable round fish the results showed that the square mesh trawl with 80mm mesh caught 24% more whiting and 27% more hake than the standard trawl. At the same time 24% less squid were caught by the square mesh trawl.
3.      Due to the low numbers of fish caught and the size classes on the grounds, these results cannot be considered conclusive and more work needs to be done although only at a time when there are significant amounts of discards in the fishery if in fact this occurs.
4.      The trials vessel did not use trawls fitted with a lifting bag. Other pair teams in the area used a lifting bag as is common practice at Looe. It appeared that the other vessels had higher catches of the smaller legal sizes of whiting and hake. This could be due to the masking effect of the lifting bag restricting the codend meshes and cutting down the escape area. No information is available on the discard levels of these other otter trawls.
5.      The pair trawl teams in Looe are between 100 and 300h.p. but any team is obviously matched to the lower power level. The size of gear necessitated all power to be transferred from propulsion to the winch for hauling. At this time the net lay stopped on the seabed for several minutes. There is evidence from the video camera observations that at this point there are escapes from the net both through the meshes and the net mouth. This is almost certainly a factor in the low levels of discards, but it also makes it difficult to interpret the results of the comparisons in a meaningful way.

The Looe fishermen may consider the implications of this information in the context of matching the gear to the available power and winch power. It is the Seafish view that there are inconsistencies in the matching which should be investigated.

6. The exercise produced some interesting and valuable film from the underwater camera unit. The observations when used in conjunction with the numerical data collected during the trials give a better insight into the operation of the gear. Valuable observations on fish behaviour and reactions to the square mesh panel were made. This information is not only useful in analysing the results from this exercise but can be used for future reference also.

9      ACKNOWLEDGEMENTS

Seafish gratefully acknowledge the assistance and cooperation of the following - Dave Pessel, Chairman of Plymouth Trawler Owners Association in setting-up the work programme for the South West region; Tony Berry, Vice Chairman of NFFO South West Committee for all his help in organising and running the Looe trials; the skippers and crews of the two trials vessels MFV BUDDING ROSE and MFV LEVAN-MOR for their patience and cooperation during the trials.

K Arkley

January 1992

FIGURE 4

STANDARD RIG.

SELECTOR PANEL.

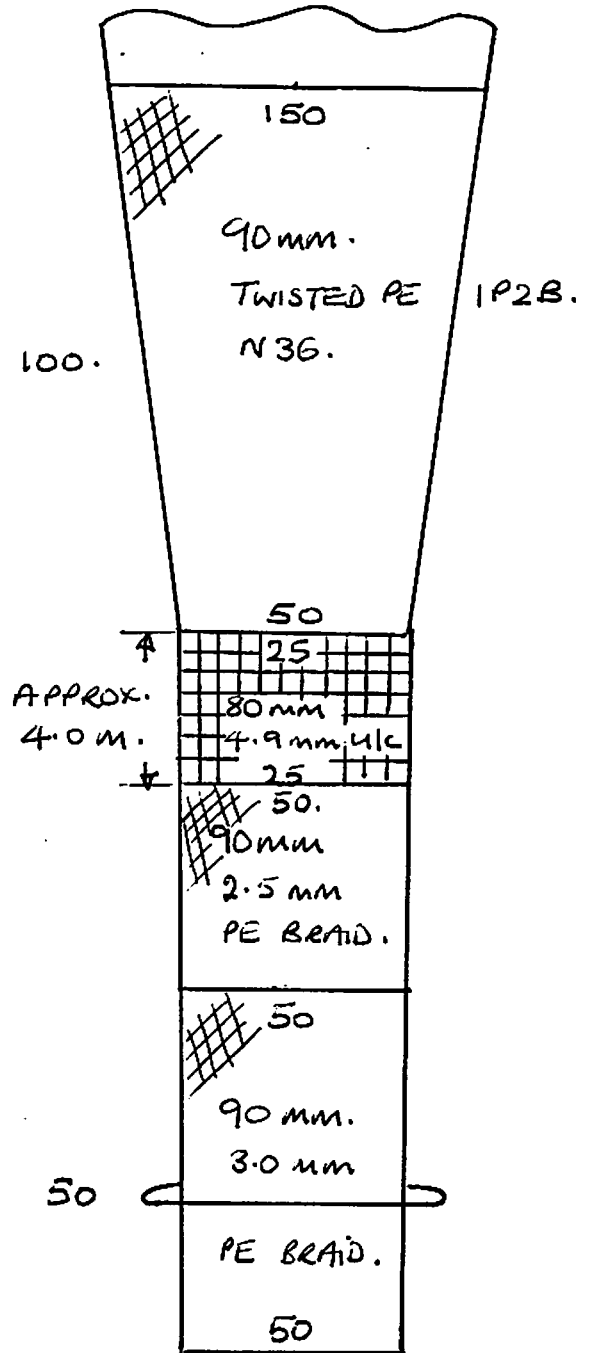
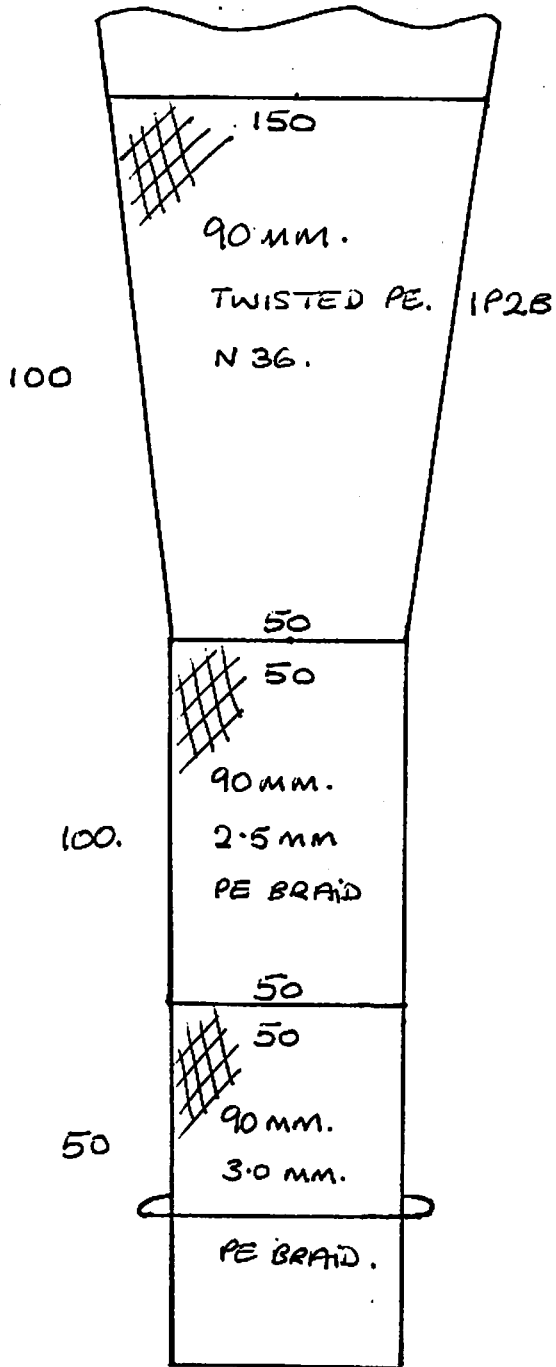


FIGURE 5

SQUARE-MESH PANEL DETAILS. 90◇/80□

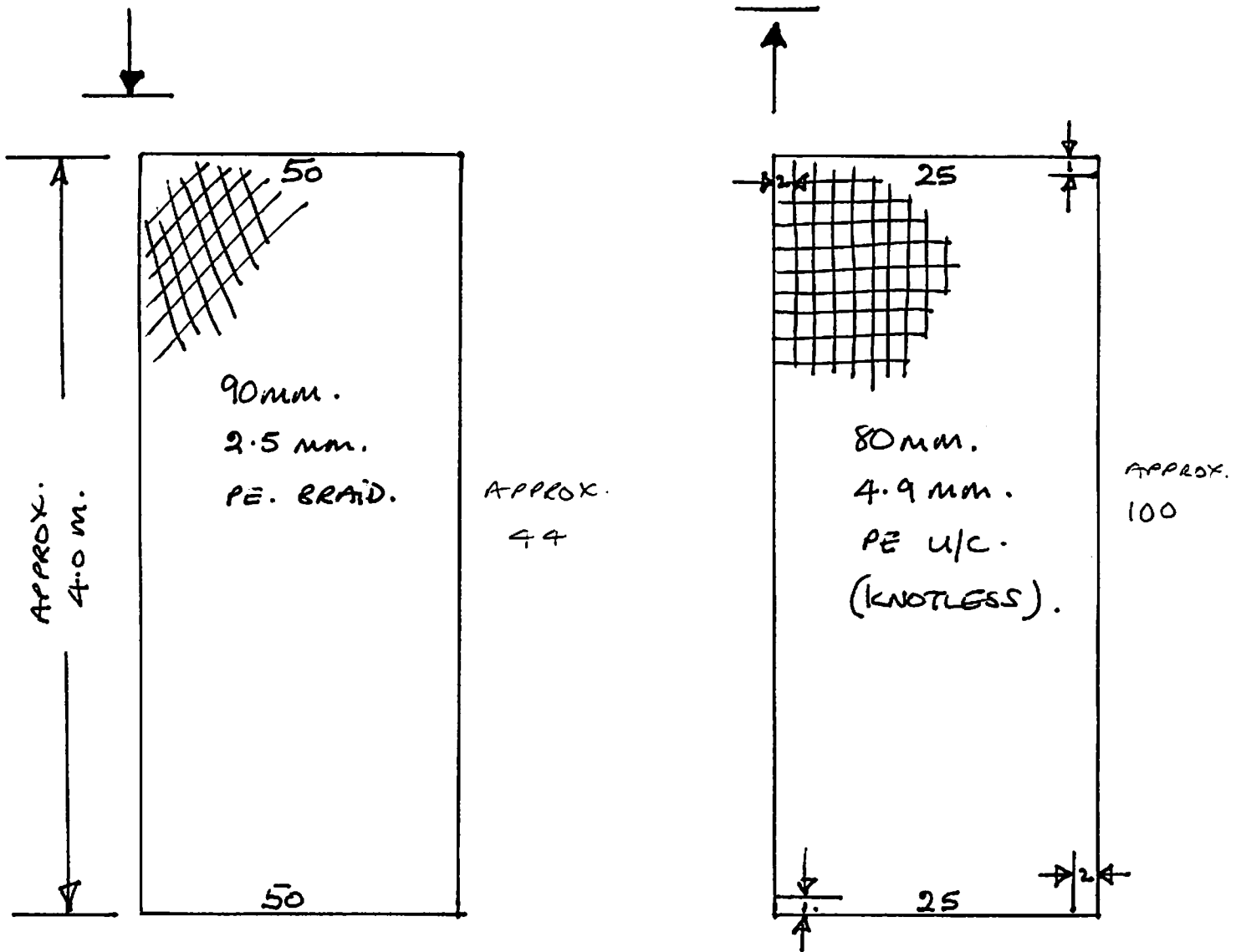
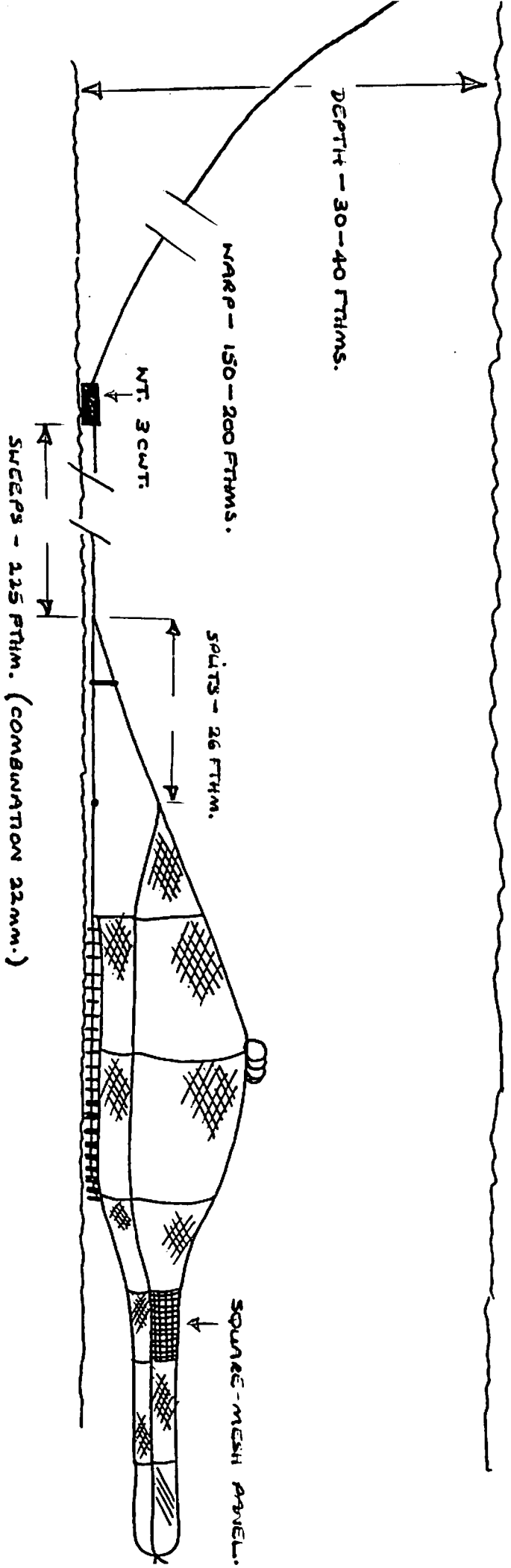


FIG. (6).



NOT TO SCALE.