

Final report

Programme 9: Pout by-catch mitigation

**An investigation into the potential for reducing
whitefish by-catch in the North Sea Norway
pout fishery by using sieve nets (veil nets)**

Prepared by

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Summary

- Programme 9 of the 2004/05 Fisheries Science Partnership between CEFAS, NFFO and Defra was established to investigate the extent to which a sieve net, incorporated into a commercial Norway pout trawl, could reduce the by-catch of whitefish in the North Sea pout fishery.
- Locations with a sufficient mixture of Norway pout and whitefish for testing the sieve net could not be found during an initial period using a Danish industrial trawl. More useful data were obtained with a modified whitefish trawl fitted with a 20mm cod-end liner, which could be deployed over a greater variety of seabed types. The effect of the sieve net on catches of Norway pout was similar for the two trawls.
- The trials showed that very high release rates of whitefish species could be achieved with the sieve net, at the expense of a substantial reduction in catch of Norway pout. Reductions of 93% or better were recorded for haddock, whiting, cod and saithe. The average reduction in catch of Norway pout when the sieve net was fitted was 73% for the four pairs of hauls using the industrial trawl net and 76% for the eight pairs of hauls using the modified whitefish trawl.
- The design and rigging of the sieve net evaluated in this work is, in its present form, unlikely to be acceptable to commercial fishermen for reducing by-catch in the industrial Norway pout fisheries due to the reduction in catch of Norway Pout. Further development and testing of the sieve net design is required, with a view to reducing the loss of the target species whilst maximizing the release of by-catch species.
- Alternatives to the sieve net could include the use of a rigid excluder grid to reduce by-catches of whitefish. Further work on such measures is warranted.

Introduction

A Fisheries Science Partnership was established between Defra¹, CEFAS² and NFFO³ for the duration of financial year 2003/4 with funding from Defra. A second programme was established in 2004/5. The objectives of the FSP are to enable the fishing industry, in collaboration with CEFAS, to provide independent and verifiable data on fish stocks, fishery catches and gear selectivity in a number of priority fishing areas. Fishing vessels were chartered to carry out the work. Nine primary projects were scheduled for 2004/5. The charter of suitable fishing vessels was arranged by the NFFO, and work plans were developed between NFFO, CEFAS and the vessel skippers. CEFAS deployed sea-going staff to record raw data that were subsequently returned to the laboratory at Lowestoft for input and analysis.

This report summarises the results of Fisheries Science Partnership Programme 9, carried out in December 2004. The Programme was set up to investigate the extent to which a sieve net, incorporated into an industrial fishing trawl, could reduce the by-catch of whitefish whilst retaining sufficient catches of the target species Norway pout (*Trisopterus esmarkii*) in the northern North Sea. Sieve nets (also known as veil nets) are curved cone-shaped funnels of netting traditionally fitted to the inside of beam trawls used for brown shrimps, to reduce the by-catch of unwanted fish (Fig. 1). In the shrimp fisheries, the brown shrimp pass through the meshes of the sieve net and into the cod end, whilst the larger unwanted fish are unable to pass through the meshes of the sieve net and are expelled through the exit hole (Fig. 1).

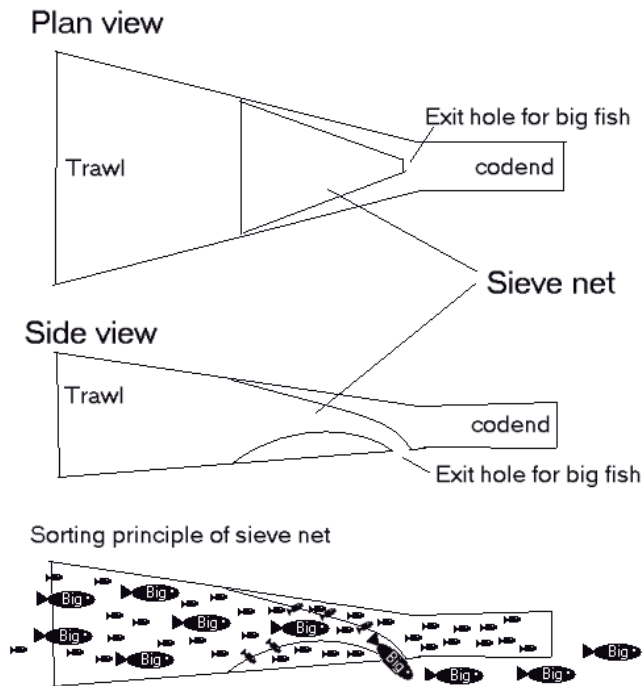
The catch composition of a Norway pout trawl without a sieve net fitted was investigated in Programme 6 of the 2003/04 Fisheries Science Partnership, using FV Swanella. The combined by-catch of haddock, whiting, herring and other minor species was estimated to be on average 75% by weight and 43% by number of the total catch, although figures varied widely from haul to haul (Revill, A. *et al.* 2004. *Report of an investigation into the potential whitefish by-catch in the North Sea Norway pout fishery. Final Report of 2003/04 FSP Programme 6.* www.cefas.co.uk).

The target species, Norway pout is a small fish belonging to the cod family (gadoids). They rarely exceed 25cm in length, and most are below 20cm. Norway pout are caught in a directed fishery using small meshed demersal trawls (16mm codend). The catches are usually processed in industrial plants to produce fishmeal.

The programme used the commercial trawler FV Swanella, which was also chartered for the 2003/04 Norway pout FSP programme, during the period 29 November – 16 December 2004. The work plan involved trawling under dispensation from the quota regulations. The cruise report prepared by the CEFAS observer is reproduced in Appendix 5.

1. Department of Environment, Food and Rural Affairs
2. Centre for Environment, Fisheries and Aquaculture Science
3. National Federation of Fishermen's Organisations

Figure 1. The principal of the sieve net



Objectives

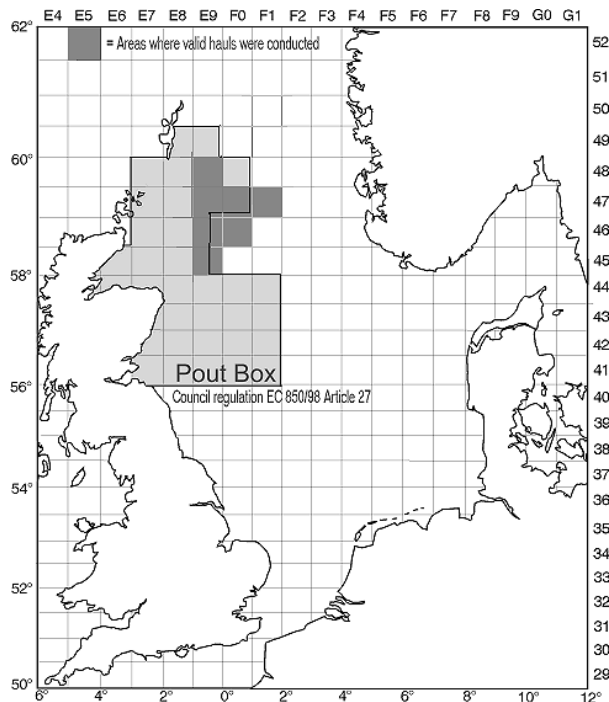
The principal objective of the programme was to determine the potential reduction in by-catch of whitefish when a sieve net is incorporated into a Norway pout trawl. In order to facilitate as close a comparison as possible, pairs of alternate hauls were undertaken with the small meshed demersal trawl, rigged with and subsequently without the sieve net.

Methods

The fishing grounds

The fishing grounds chosen for this project were in the northern North Sea, in and around the 'Pout box', on the known commercial fishing grounds for Norway pout (Fig. 2). The trials were conducted throughout a continuous two-week period in December 2004, traditionally a peak period for landings from this fishery.

Figure 2. Location of areas fished during 2004/05 FSP programme 9



The vessel and fishing gear

The commercial fishing vessel chartered for this project was the 45-metre stern ramp freezer trawler FV Swanella, H 1065 (Appendix 1). Two types of small meshed demersal trawls were used during the trials:

- a) **Industrial trawl.** A commercial design used for industrial fishing, supplied by a Danish trawl maker was initially used during the trials. This trawl was limited to use on soft fishing grounds due to its light construction and ground-gear (Appendix 2).
- b) **Modified whitefish trawl.** A whitefish trawl was fitted with a 20mm cod end liner. This trawl was of a more substantial construction than the industrial trawl, with heavier ground gear, and could therefore be deployed over a wider terrain than the industrial trawl (Appendix 3).

The sieve net (Fig. 1; Appendix 4) was constructed from 70mm (full mesh) diamond mesh polyethylene material (1.5mm diameter). Various minor adjustments were made to the sieve net throughout the course of the trials in an attempt to improve its performance. Both the industrial trawl and the whitefish trawl with the 20mm liner were repeatedly tested both with and without the sieve net in paired alternate hauls.

Details of hauls

In total, 37 hauls were made during the course of the trials, six of which were invalid due to fouled or damaged gear. The haul durations varied between 110 - 200 minutes

(average 142 min) in depths ranging from 120 – 240 metres (average 154 m). The average towing speed was 3.9 knots (over the ground) and the choice of haul direction was made regardless of tidal flow. Fishing was conducted across, with and against the tide. Details of the hauls are given in Appendix Table 6.

Paired hauls were used to compare the catches in the trawl with and without a sieve net fitted. In each comparison the two tows with the different net configurations were made one after the other, over the same ground track and for the same duration as far as was practicable.

Details of the successful hauls are given below.

- a) ***Speculative hauls searching for suitable species mix to evaluate the sieve net.*** Eleven trial hauls with the industrial trawl were undertaken to locate areas with suitable species mixes of Norway pout and whitefish. Adequate species mixes were required in order to evaluate the efficacy of the sieve net. Tows were conducted both semi-pelagically (2-10m above seabed) and on the seabed. Catches with a useful mix of whitefish and Norway pout were difficult to locate, and appeared to be less common than was the case during the 2003 /2004 FSP Programme 6.
- b) ***Hauls with the industrial trawl.*** Eight hauls (4 pairs, with and without the sieve net) were successfully completed using this gear. Despite using this trawl for several days, there were no catches with a useful mix of Norway pout and whitefish, and trials with this trawl were discontinued. Subsequent trials were carried out using the modified whitefish trawl, which could be deployed on a wider range of fishing ground in the area.
- c) ***Hauls with the modified whitefish trawl.*** Sixteen hauls (8 pairs, with and without the sieve net) were successfully completed using the modified whitefish trawl.

Catch sampling

Two representative baskets of fish, weighing about 40kg each, were typically sampled from each successful haul. The total body lengths of all fish in the sub-samples were measured and recorded to 1cm below. The ratio of the estimated total number of baskets of fish in the catch to the number of baskets sampled, provided a raising factor by which the total catch of each species could be estimated.

Results

Comparative trials using the industrial trawl (with and without the sieve net fitted)

Four paired sets of hauls were successfully obtained using this gear. However, the species mix was poor, and negligible quantities of whitefish were present in the catches. Herring were present in all of the hauls. Norway pout were caught in the majority of hauls, although completely absent in one paired set and abundant in only

one pair. The limited data from these hauls suggest that the use of a sieve net appeared to reduce the retention rates in the trawl of both herring and Norway pout across all length ranges (Table 1; Figs. 3 & 4). The total number of Norway pout caught in the trawl with the sieve net fitted was about 75% lower than in the net without the sieve net, although this figure is effectively based on only one pair of hauls (10 and 11).

Table 1. Comparison of total catches of Norway pout and herring taken using the industrial trawl without the sieve net, and with the sieve net fitted, and the ratio of the catch using the sieve net to the catch without it.

Paired haul code No's	No caught in trawl without sieve net (x)	No caught in trawl with sieve net (y)	y / x
Norway pout			
6 7	0	0	-
9 8	1,520	1,470	0.97
10 11	46,530	11,322	0.24
13 12	0	268	-
Total	48,050	13,060	

Paired haul code No's	No caught in trawl without sieve net (x)	No caught in trawl with sieve net (y)	y / x
Herring			
6 7	7,650	930	0.12
9 8	4,703	201	0.04
10 11	3,218	2,559	0.80
13 12	936	517	0.55
Total	16,506	4,207	

Figure 3. Range of values obtained for the ratio of the number of fish retained in the industrial trawl with the sieve net fitted to the number retained by the same trawl without the sieve net, in each of the paired comparisons (i.e. the y/x figures from Table 1). The vertical black line is the median of the values shown in Table 1, whilst the horizontal lines show the range of values for the four comparisons.

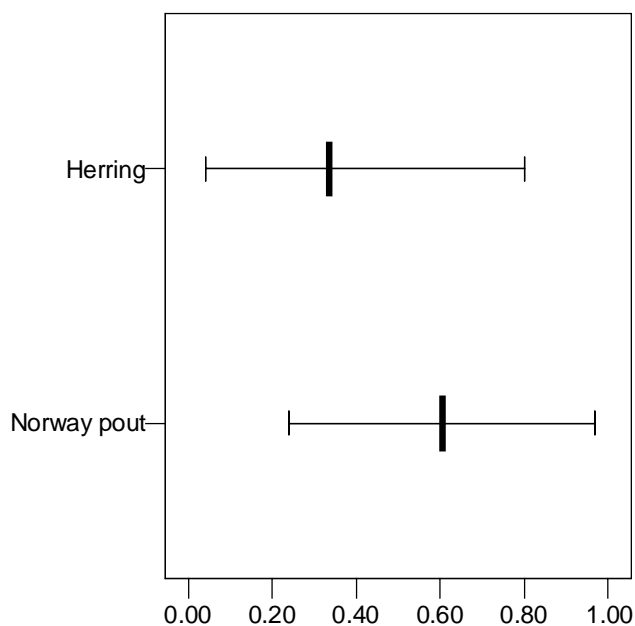
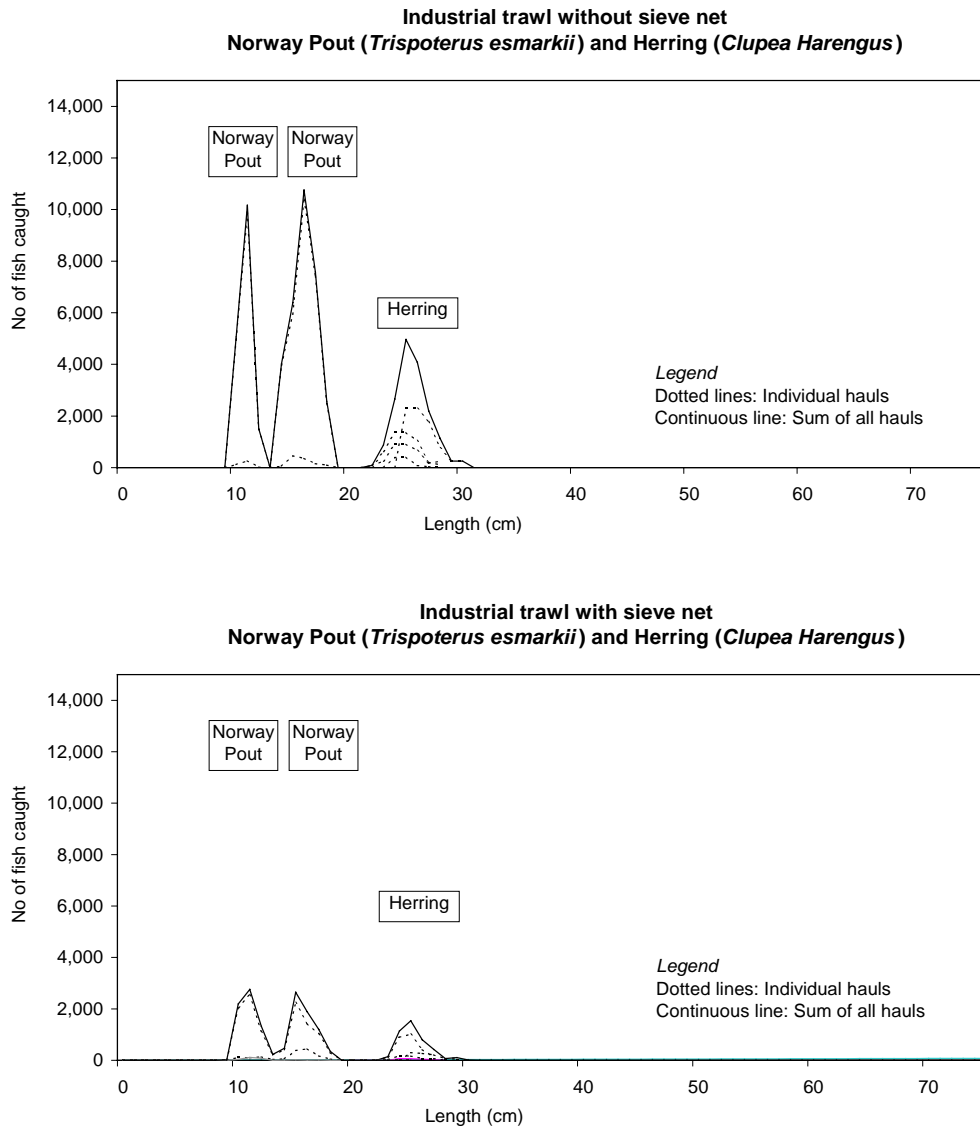


Figure 4. Pooled length frequencies of Norway pout and herring catches from trials with the industrial trawl. Virtually all herring were longer than 20cm, and all Norway pout below 20 cm.



Comparative trials using the modified whitefish trawl (with and without the sieve net fitted)

The results of eight paired-sets of hauls indicated that the sieve net significantly reduced the retention rates of all of the major whitefish species (cod, whiting, haddock and saithe) in the trawl (Table 2 and Figs. 5 – 11). Catches of saithe and cod were reduced almost to zero when the sieve net was fitted. A 99% reduction in whiting catch was observed using the sieve net, based on total catches over the eight hauls. A slightly lower figure of 94% is given by the median of the individual haul values (the median is a value that divides the hauls into two equal sized groups, and is a useful measure of the “typical” value when there are large individual variations or unusual

extreme values). For haddock, the reductions were slightly less (93% based on total catches and 87% based on median of individual hauls).

While these reductions in whitefish retention rates may appear impressive, they come with a penalty of an associated loss of target species (Norway pout) of around 75% (total catches and median). The rigging and design of the sieve used in these trials is therefore unlikely to be commercially acceptable in its present form.

As with the trials using the industrial trawl, there appeared to be reduction in fish catches across all length ranges when the sieve net was fitted. However, there were some indications that the larger fish were more readily excluded from the trawl than the smaller fish. Hence, it is concluded that the sieve net reduces the catch of all species substantially, but has less effect on small fish such as Norway pout.

Table 2. Comparison of total catches of Norway pout and four by-catch species in eight paired hauls using the modified whitefish trawl. Figures are total numbers taken using the industrial trawl without the sieve net, and with the sieve net fitted, and the ratio of the catch using the sieve net to the catch without it.

Paired haul code No's	No caught in trawl without sieve net (x)	No caught in trawl with sieve net (y)	y / x	Paired haul code No's	No caught in trawl without sieve net (x)	No caught in trawl with sieve net (y)	y / x
Norway pout				Haddock			
14 15	198	53	0.27	14 15	451	26	0.06
17 16	2,478	280	0.11	17 16	97	36	0.37
18 19	7,372	2,079	0.28	18 19	321	4	0.01
21 20	11,418	1,034	0.09	21 20	186	11	0.06
23 22	6,468	2,897	0.45	23 22	32	7	0.22
25 24	3,268	752	0.23	25 24	1,312	27	0.02
26 27	18,612	7,245	0.39	26 27	76	51	0.67
28 29	10,736	1,331	0.12	28 29	128	25	0.20
Total	60,550	15,670		Total	2,603	186	
Whiting				Cod			
14 15	540	72	0.13	14 15	22	2	0.07
17 16	23	58	2.56	17 16	28	0	0.00
18 19	213	0	0.00	18 19	24	0	0.00
21 20	120	5	0.04	21 20	6	0	0.00
23 22	556	43	0.08	23 22	46	0	0.00
25 24	924	14	0.02	25 24	8	0	0.00
26 27	578	120	0.21	26 27	2	0	0.00
28 29	388	18	0.05	28 29	0	0	-
Total	3,341	330		Total	136	2	
Saithe							
14 15	0	0	-				
17 16	278	0	0.00				
18 19	150	6	0.04				
21 20	21	0	0.00				
23 22	1,584	0	0.00				
25 24	0	0	-				
26 27	0	0	-				
28 29	0	0	-				
Total	2,033	6					

Figure 5. Range of values obtained for the ratio of the number of fish retained in the modified whitefish trawl with the sieve net fitted to the number retained by the same trawl without the sieve net, in each of the eight paired comparisons (see Fig. 3 for explanation).

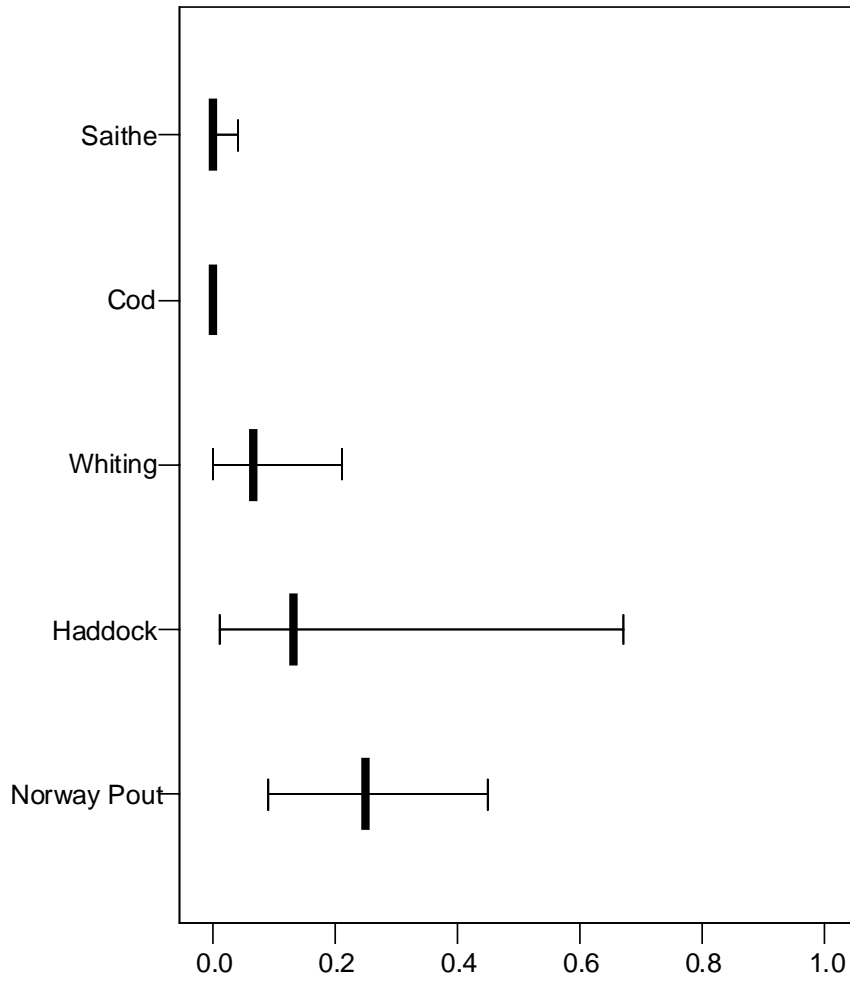


Figure 6. Pooled length frequencies of Norway pout from trials with the modified whitefish trawl. Top two panels show catch rates on same y-axis (catch) scale; third panel uses an expanded catch scale to show the results for the sieve net more clearly.

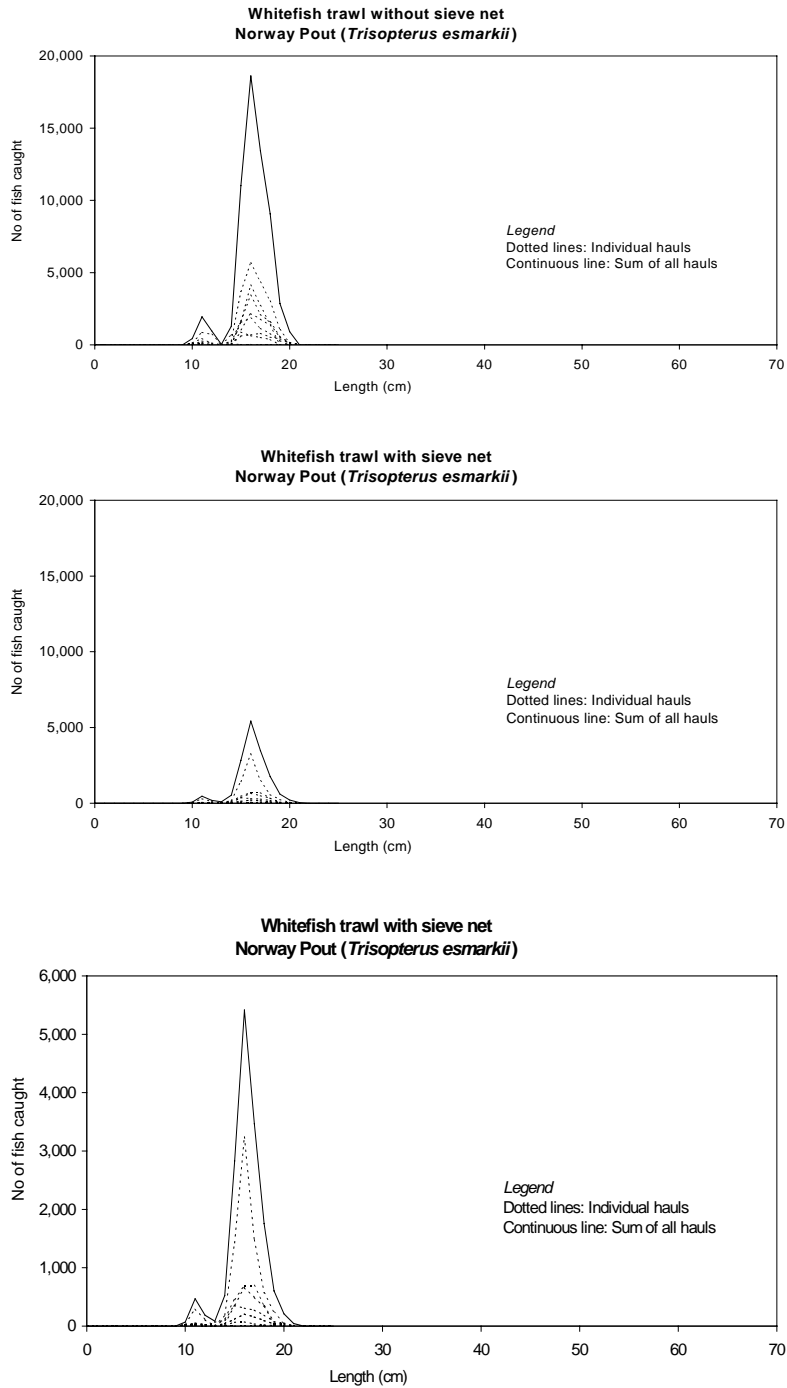


Figure 7. Pooled length frequencies of haddock from trials with the modified whitefish trawl. Top two panels show catch rates on same y-axis scale; third panel uses an expanded scale to show the results for the sieve net more clearly.

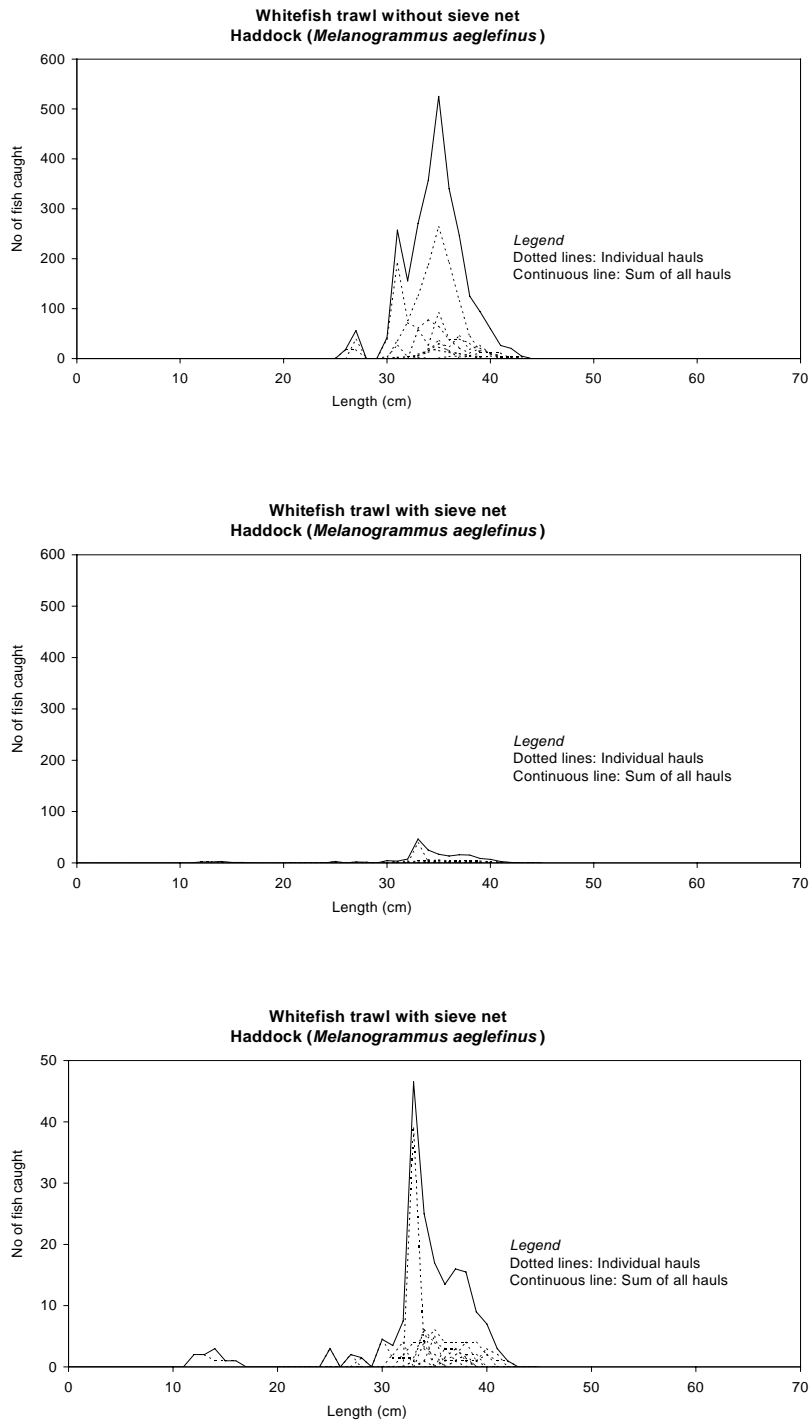


Figure 8. Pooled length frequencies of whiting from trials with the modified whitefish trawl. Top two panels show catch rates on same y-axis scale; third panel uses an expanded scale to show the results for the sieve net more clearly.

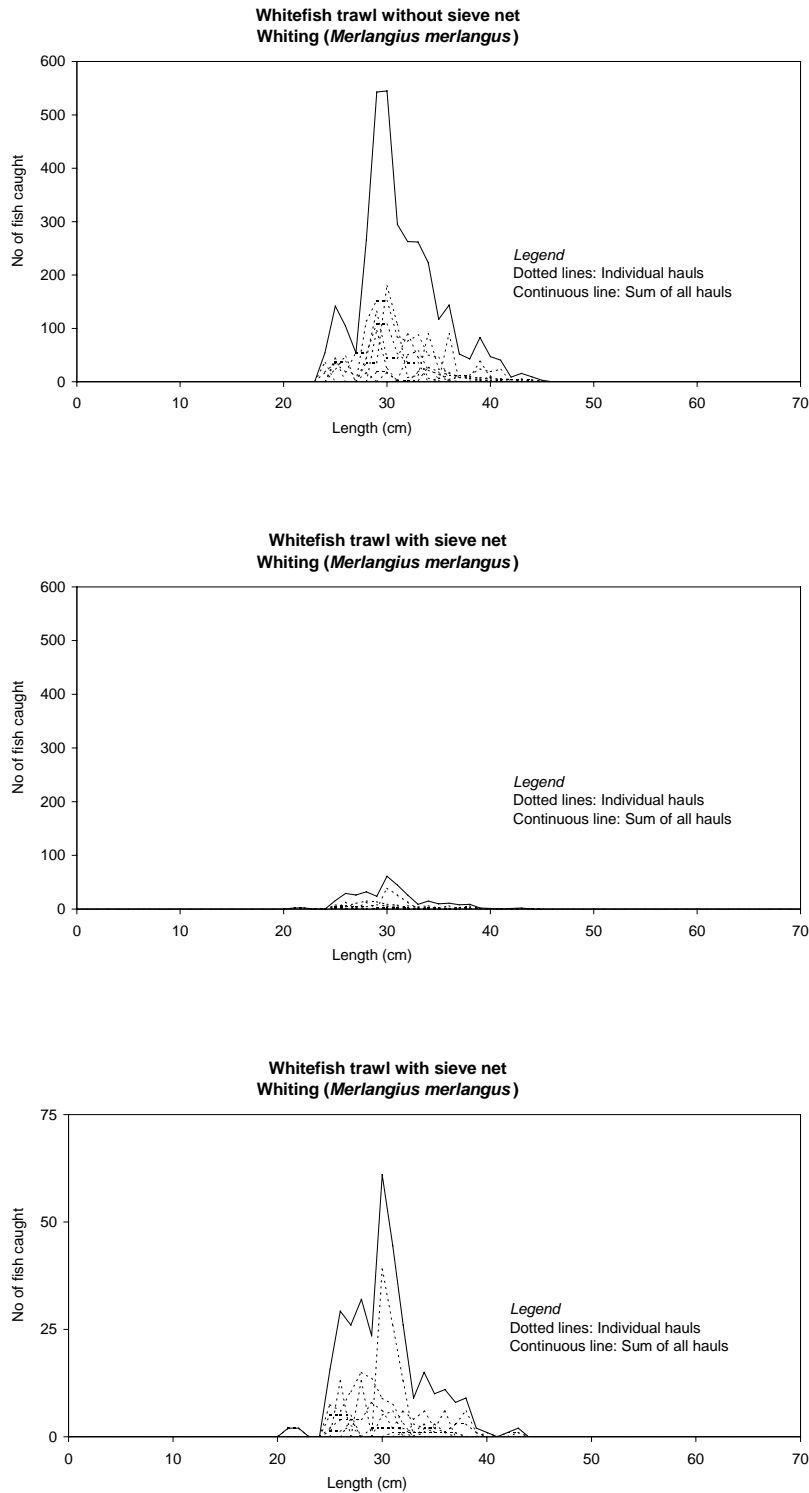


Figure 9. Pooled length frequencies of cod from trials with the modified whitefish trawl (both plots on same catch scale).

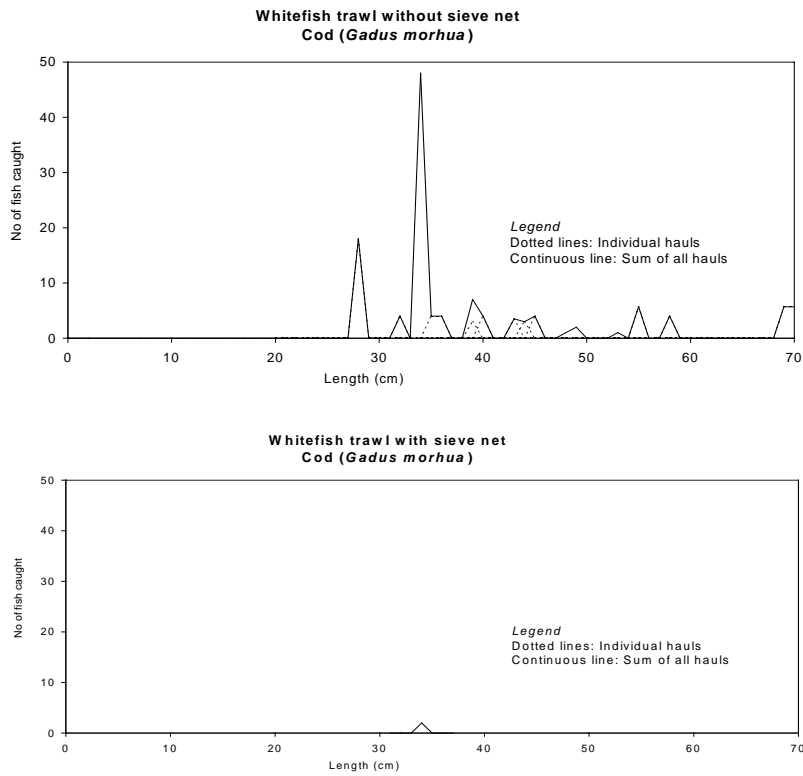


Figure 10. Pooled length frequencies of saithe from trials with the modified whitefish trawl (both plots on same catch scale).

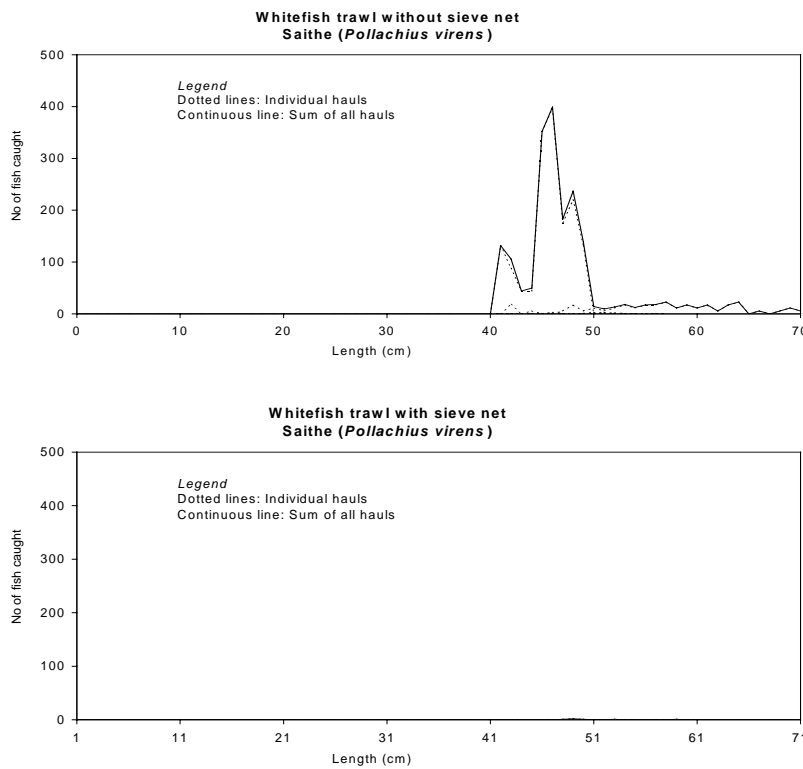


Figure 11. Pooled length frequencies of all species in trials with the modified whitefish trawl. Top two panels show catch rates on same scale; bottom two panels (overleaf) use an expanded scale for both plots to show the results for species other than Norway pout more clearly (note: Norway pout catches are off –scale in bottom two plots)

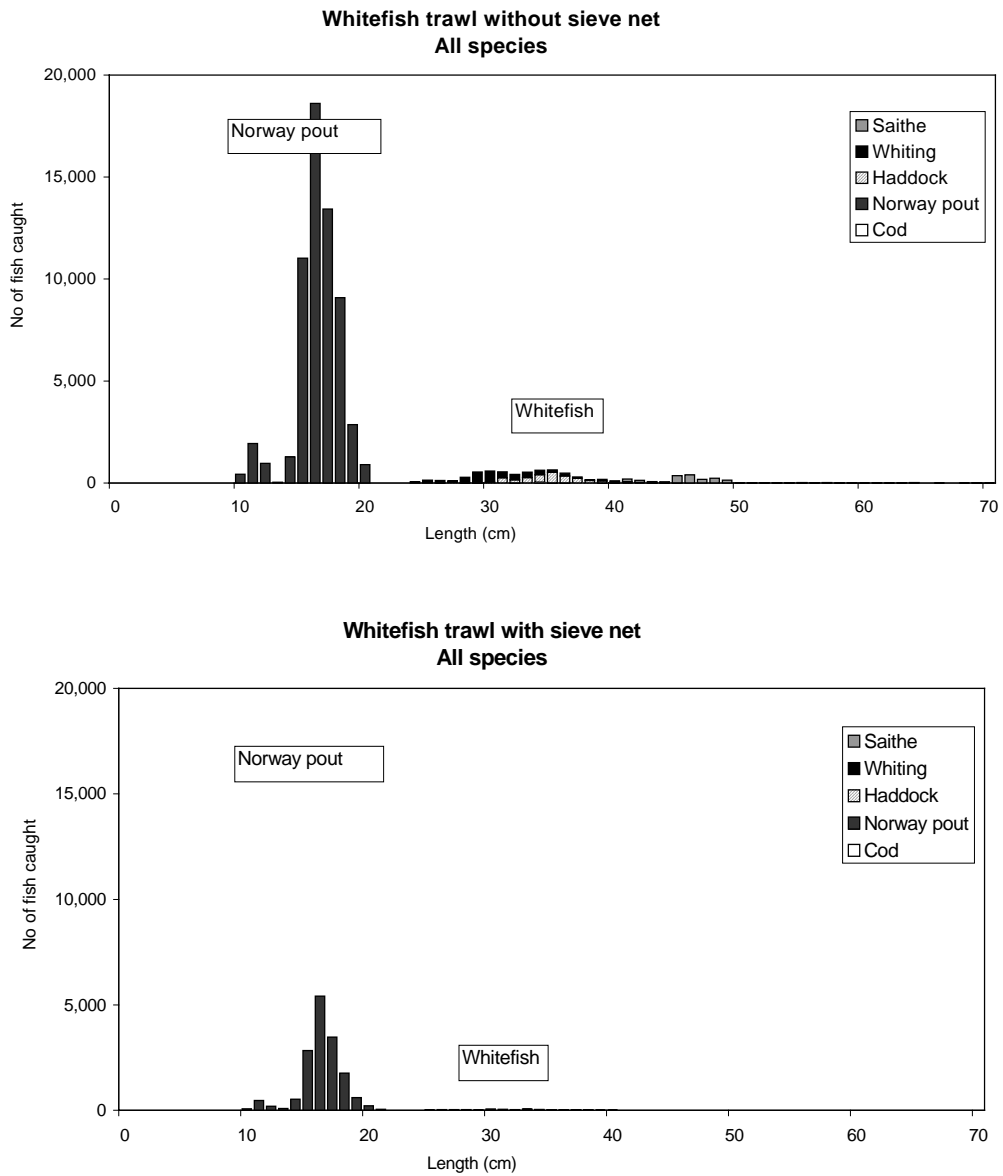
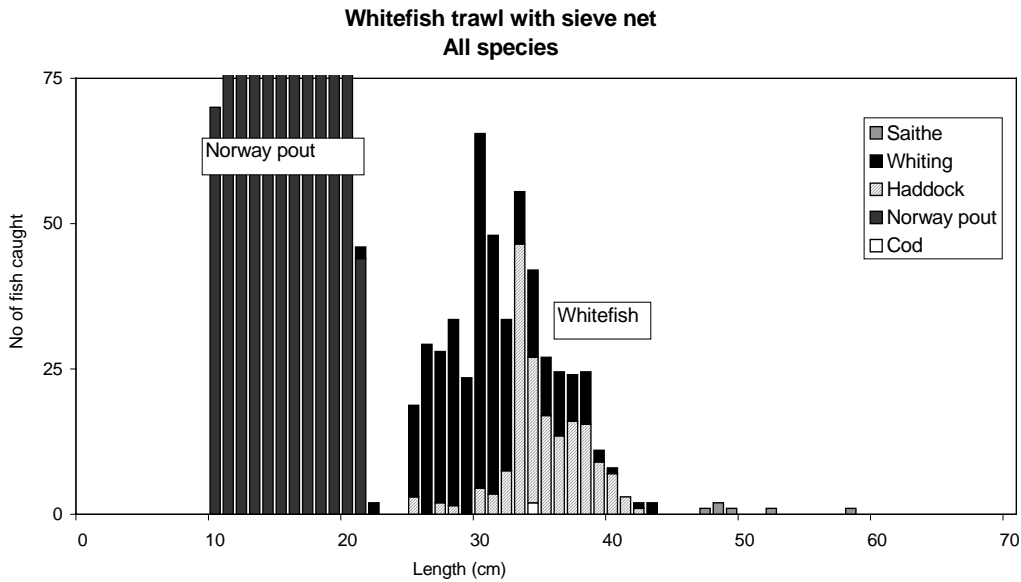
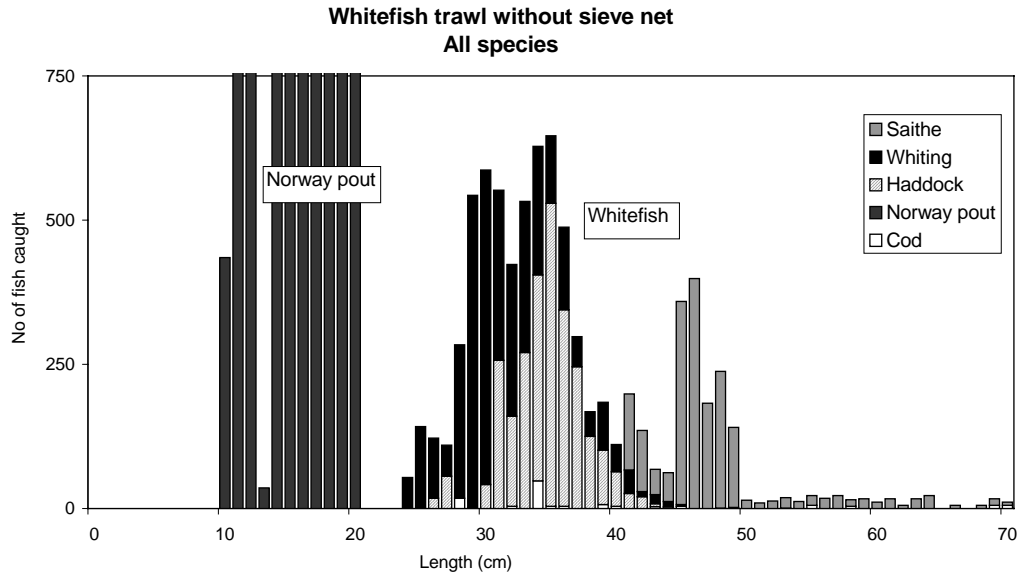


Figure 11 continued



Discussion and Recommendations

The results of trials of this nature depend upon locating areas with sufficient abundance of potential by-catch species of concern, to enable the benefits of the sieve net to be fully evaluated. Mixed catches of Norway pout and whitefish were less common than was the case during the 2003/04 Fisheries Sciences Partnership trials, particularly when the industrial trawl was used at the beginning of the programme. The most useful data to evaluate the sieve net was obtained with the whitefish trawl, which had been fitted with a 20mm cod-end liner and could be fished over a greater variety of seabed types.

The trials showed that very high release rates of whitefish species could be achieved with the sieve net, at the expense of substantial reductions in the catch of the target species as well. Reductions of 93% or better were recorded for haddock, whiting, cod and saithe. These high release rates were however, associated with substantial losses of the target species (Norway pout). The average reduction in catch of Norway pout when the sieve net was fitted was 73% for the four pairs of hauls using the industrial trawl net and 76% for the eight pairs of hauls using the modified whitefish trawl. Although the number of trials is small, these figures are similar enough to suggest that the results observed using the sieve net in the modified whitefish trawl may be mirrored in the industrial trawls used by the commercial fishery.

The sieve net in the form evaluated in this work is, however, unlikely to be acceptable to commercial fishermen for reducing by-catch in the industrial Norway pout fisheries due to the large reduction in pout catch. Further development and testing would be required to advance the sieve net design further, with a view to reducing the loss of the target species whilst maximizing the release of by-catch species. Such tests could investigate, for example, the size and positioning of the sieve net, the mesh size of the sieve net and the rigging of the escape hole. The use of underwater video to examine the reaction of fish within the trawl and sieve net would provide valuable information for modifying the design.

Alternatives to the sieve net could include the use of a rigid excluder grid to reduce by-catches of whitefish. Further work on such measures is warranted.

Acknowledgements

The active support of Mally Trott (Skipper of the Swanella), the officers and crew of the Swanella, John Howard (Managing director of Boris Nets, Fleetwood), John Smith (F.A.L.), N.F.F.O., Defra are all acknowledged for their invaluable contributions towards this project. Defra are also thanked for making this FSP programme possible.

Appendix 1. Fishing vessel details

Item	Detail
RSS No / Port registration No	B 14074 / H 1065
Vessel name & registration port	Swanella: Hull, England
Year of build	1989
Owner	J. Marr Limited, St Andrews Dock, Hull
Hull dimensions	R. length 45.45 m, L.O.A. 53.10 m, breadth 12.02 m, depth 6.5 m
Gross tonnage / Net tonnage	1,195 tonnes / 358 tonnes
Type of vessel	Stern ramp freezer / fresh trawler
Main engine power	1980 kW
Main engine power take offs	Shaft generator
Auxiliary engines	2 x 400 HP Mitsubishi engines
Propeller details	4 blade, 3.3m diameter propeller housed in Kort nozzle
Bow thruster	1 x bow thruster
Gear box reduction ratio	4.5: 1
Factory	Plate freezing fish factory
Crew No and nationality	Skipper, 1st Mate, 2 nd Mate, Chief Engineer, 2 nd Engineer, 5 crew, 1 cook, 1 trainee (All British)
Usual fishing grounds	Northern North sea / Icelandic / Greenland / Norwegian waters
Usual fishing patterns	5 – 10 weeks at sea / 1 day in port for each week at sea
Usual target species	Cod, Saithe, Redfish
Bridge equipment	2 radars, 2 plotters, depth sounder / fish finder, Fish safe oil industry pipeline and rig plotter, Scanmar gear sensors, VHF / MF communications, autopilot, automatic winch control, V.M.S.
Fuel storage / consumption	300 m ³ / 6.5 m ³ per day when fishing
Fresh water storage	46 m ³

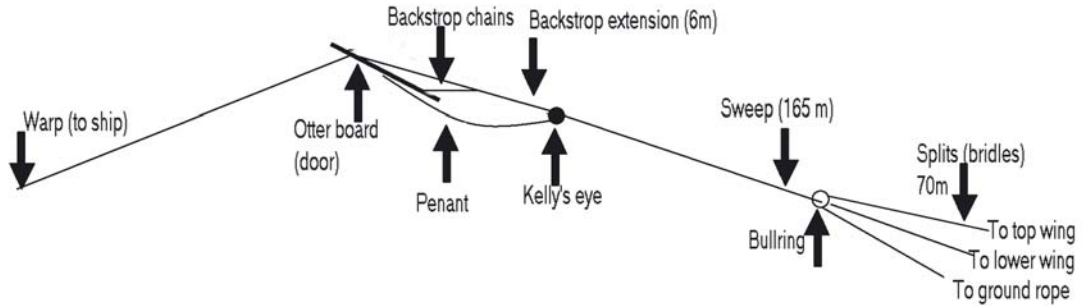
The FV Swanella (H1065)



Appendix 2. Fishing gear details: Danish industrial trawl

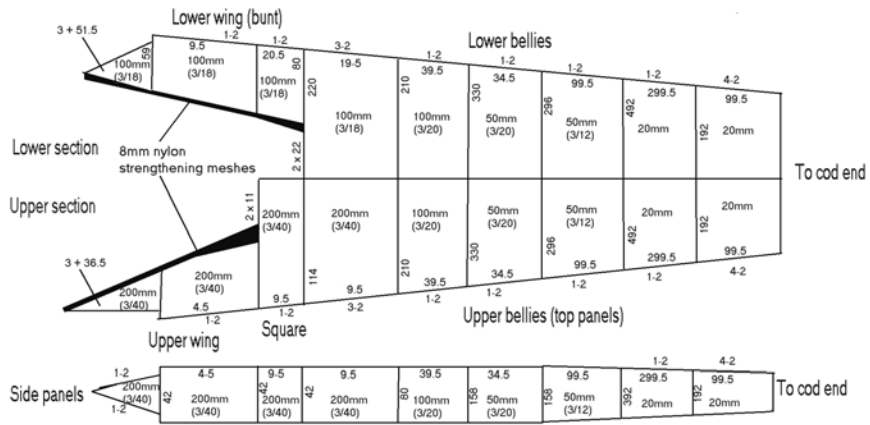
Item	Detail
Type of trawl	Danish industrial demersal pout trawl
Sweeps	2 x 165 metres combination rope 24mm diameter
Bridles	6 x 70 metre bridles combination rope 28mm diameter
Head line	22mm combination stainless 6 groups of 8 floats (11 litres each)
Foot rope	22mm combination stainless
Ground rope	11mm wire stainless Length 21.5 metres
Rubber discs on ground rope	130mm diameter rubber discs separated by rubber spacers of 40mm diameter
Doors	2 x Perfect Multipatent 140 inch doors Manufactured by Perfect Trawlskovle, Esbjerg, Denmark Weight of single door (1,700 Kg)
Trawl sections (Full mesh size)	Front sections 200mm Mid sections 100 mm Mid sections 50 mm Mid sections 20mm Cod end 20mm
Chaffer bag	100mm 6mm single at front end / 100mm 6mm double at back end

Warp, door, sweep and bridle arrangement used with the Danish industrial trawl



Swanella Norway pout trawl net plan

Cutting rates
 1 - 2 (1 bar & two side knots)
 3 - 2 (3 bars & two side knots)
 4 - 2 (4 bars and two side knots) etc



Cod end & chaffer bag	Front end	Length of cod end = approximately 50 metres	Back end
	20mm Nylon	4 panels Top 350 meshes deep Sides 150 meshes deep Bottom 350 meshes deep	16mm Nylon
Front end	Chaffer bag (Length approximately 70 metres)		Back end
100mm single 6mm			100mm double 6mm

Appendix 3. Fishing gear details: Whitefish trawl with a 20mm liner

Details available from J. Marr Ltd. St Andrews dock, Hull, U.K.

Appendix 4. The sieve net

Construction material	70mm (full mesh) diamond mesh polyethylene material (1.5mm \emptyset).
Cutting rate along taper	All bars
Hanging ratio of for'd circle of sieve net	75 %
Width of exit hole	Approx 1 metre
Position of exit hole	Belly
Setting length as a % of stretched length	Set to 85 % of stretched length

Appendix 5. CEFAS cruise report for Programme 9.

DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS

CEFAS, LOWESTOFT LABORATORY, SUFFOLK, NR33 0HT, ENGLAND

FISHERIES SCIENCE PARTNERSHIP 2004/2005

PROGRAMME 9 North Sea pout

REPORT: MFV Swanela

SKIPPER: Malcolm Trott

CEFAS STAFF: a) Andrew Revill (29th Nov - 16th Dec 2004)
b) John Smith (external) covered for Andrew Revill for short time mid-trials, (8th – 12th Dec).

DURATION: Departed Hull 29th November 2004 returning to Hull 16th December 2004.

LOCALITY: Northern North Sea (near the pout box)

GEAR:

- a) Industrial pout trawl tested both with and without a veil net fitted
- b) A modified whitefish trawl (fitted with 20mm liner) tested both with and without a veil net fitted

AIMS:

To determine the potential efficacy of a veil net to reduce the bycatch of non-target round fish species when fitted inside a small mesh demersal trawl. The small mesh demersal trawl was being used to target Norway Pout for industrial fishmeal processing.

NARRATIVE: (All times are BST)

- a) Sailed from Hull early am 29th November 2004
- b) Returned to Hull around 0800 16th December 2004
- c) Some days (circa 2-3) were spent initially trying to locate useful mixes of Norway pout and whitefish to test the veil net.
- d) Initial trials were conducted with the industrial small meshed trawl both with and also without the veil net fitted (several days)
- e) Useful mixes of Norway pout and roundfish were not generally found using the industrial trawl, and it was difficult to demonstrate the efficacy of the veil net.
- f) Testing was switched to using a modified whitefish trawl (lined with a 20mm liner) as this could be deployed on a wider range of fishing

grounds (more rougher) and could be used to find more useful mixes of Norway Pout and whitefish more readily.

- g) The rest of the trials were occupied with testing the modified whitefish trawl both with and without the veil net fitted.
- h) Several alterations during the trials were made with an aim to improve the efficacy of the veil net.

RESULTS:

1. Nearly 40 hauls were undertaken in total during the trials
2. Recorded hauls when searching for useful species mixes
3. Recorded hauls with industrial trawl (both with and without veil net fitted)
4. Recorded hauls with the modified whitefish trawl (both with and without the veil net fitted)
5. Overall, the veil net was shown to reduce whitefish by-catch but also lost significant and unacceptably large amounts of Norway Pout. Further trials and flume tank testing of prototypes are required before any further progress can be made with this technology.

Andrew Revill

17 December 2004

Appendix 6. Haul details (*Trials with the industrial trawl*)

Haul No	6		7		8		9		10	
Fishing Gear used	X		X		X		X		X	
Industrial demersal pout trawl (no veil)	X		X		X		X		X	
Industrial demersal pout trawl with veil net	X		X		X		X		X	
	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED
Date:	02/12/2004	02/12/2004	02/12/2004	02/12/2004	02/12/2004	03/12/2004	03/12/2004	03/12/2004	03/12/2004	03/12/2004
Time:	13:15	15:30	16:35	18:45	23:35	2:00	4:15	6:40	7:40	10:40
Depth (Metres)	120		120		150		150		154	
Speed over the ground (Knots)	4		4		3.8		3.8		3.7	
Lat (Degrees):	59	59	59	59	59	59	59	59	59	58
Lat (Minutes):	13.0	20.0	20.0	12.0	5.0	0.0	0.0	6.0	7.0	59.5
North / South	N	N	N	N	N	N	N	N	N	N
Long (Degrees)	1	1	1	1	0	0	0	0	0	0
Long (Minutes)	1.0	1.0	2.0	2.0	28.0	19.7	19.7	29.0	23.0	10.7
East / West	E	E	E	E	W	W	W	W	W	W
Warp length (Metres)	400		460		440		460		472	
Haul duration (Minutes)	135		130		145		145		180	
Tow direction	N		S		SE		NW		SE	
ICES statistical rectangle	47 F1		47 F1		47 E9		47 E9		47 E9	
Tide direction	SE		SSW		NE		N		NNW	
Tidal speed (Knots)	0.2		0.5		0.2		0.4		0.3	
Wind force	4		3		5		6		6	
Wind direction	NNW		NNW		SW		SW		S	
Sea state	3		2		4		4		5	
COMMENTS:	Haul 6 paired with haul 7. Gear on bottom. Catch sensor went off after two hours. Herring only in catch.		Haul 7 paired with haul 6. Gear on bottom. Repeat of haul 6 but in opposite direction with the veil fitted. Herring only in catch.		Gear on bottom. SW side of trench. Lot of bottom marks on sounder. Haul 8 paired with haul 9. Mostly Norway Pout. Very few whitefish.		Gear on bottom. SW side of trench. Lot of bottom marks on sounder. Haul 9 paired with haul 8. Norway Pout and Herring mix. Very few whitefish.		Gear on bottom. North side of trench. Haul 10 paired with haul 11. Norway Pout and Herring mix. Very few whitefish.	

Appendix 6 contd.

Haul No	11		12		13	
Fishing Gear used						
Industrial demersal pout trawl (no veil)					X	
Industrial demersal pout trawl with veil net	X		X			
	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED
Date:	03/12/2004	03/12/2004	03/12/2004	03/12/2004	04/12/2004	04/12/2004
Time:	11:45	14:45	20:45	23:45	0:55	3:55
Depth (Metres)	128		128		120	
Speed over the ground (Knots)	3.7		3.7		3.7	
Lat (Degrees):	59	59	59	59	59	59
Lat (Minutes):	0.0	8.0	7.0	18.0	18.0	6.0
North / South	N	N	N	N	N	N
Long (Degrees)	0	0	0	1	1	1
Long (Minutes)	11.7	24.0	59.0	5.0	6.0	1.0
East / West	W	W	E	E	E	E
Warp length (Metres)	474		460		360	
Haul duration (Minutes)	180		180		180	
Tow direction	NW		N		S	
ICES statistical rectangle	47 E9		47 F0		47 F0	
Tide direction	NE		N		NE	
Tidal speed (Knots)	0.2		0.4		0.2	
Wind force	3		5		5	
Wind direction	W		W		W	
Sea state	4		4		4	
COMMENTS:	Gear on bottom. North side of trench. Haul 11 paired with haul 10. Norway Pout and Herring mix. Hit herring mark on hauling. Very few whitefish.		Gear on bottom. Haul 12 paired with haul 13. Pout and Herring mix. Very few whitefish.		Gear on bottom. Haul 13 paired with haul 12. Herring only. No whitefish.	

Appendix 6. Haul details (*Trials with the modified whitefish trawl*)

Haul No	14		15		16		17		18	
Fishing Gear used	X		X		X		X		X	
<u>20mm lined whitefish demersal trawl without veil net</u>	X		X		X		X		X	
<u>20mm lined whitefish demersal trawl with veil net</u>	X		X		X		X		X	
	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED
Date:	04/12/2004	04/12/2004	05/12/2004	05/12/2004	05/12/2004	05/12/2004	05/12/2004	05/12/2004	09/12/2004	09/12/2004
Time:	20:00	23:30	0:45	3:05	10:40	12:30	13:20	15:15	8:40	10:40
Depth (Metres)	140		140		240		240		240	
Speed over the ground (Knots)	3.8		3.8		3.8		3.8		3.9	
Lat (Degrees):	58	58	58	58	58	59	59	59	59	59
Lat (Minutes):	48.0	48.0	48.0	43.3	56.0	1.0	2.0	56.0	0.0	6.0
North / South	N	N	N	N	N	N	N	N	N	N
Long (Degrees)	0	0	0	0	0	0	0	0	0	0
Long (Minutes)	55.0	58.0	56.0	42.6	9.0	19.0	19.0	9.0	19.0	27.0
East / West	E	E	E	E	W	W	W	W	W	W
Warp length (Metres)	480		450		600		600		720	
Haul duration (Minutes)	150		145		110		115		120	
Tow direction	SW		SSW		WNW		NNE		NW	
ICES statistical rectangle	46 F0		46 F0		46 E9		46 E9		47 E9	
Tide direction	NW		NE		N		NNE		S	
Tidal speed (Knots)	0.3		0.3		0.5		0.3		0.2	
Wind force	7		9		8		7		6	
Wind direction	SW		SW		WNW		WNW		SW	
Sea state	6		8		7		6		6	
COMMENTS:	Paired with haul 15		Paired with haul 14		Paired with haul 17. Towing along bottom of trench on sea bed		Whitefish +++. Towing along bottom of trench on sea bed. Paired with haul 16.		Longer veil net made up and fited by skipper / mate	

Appendix 6 contd.

Haul No	24		25		26		27		28	
Fishing Gear used			X		X				X	
<u>20mm lined whitefish demersal trawl without veil net</u>			X		X				X	
<u>20mm lined whitefish demersal trawl with veil net</u>	X						X			
	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED	SHOT	HAULED
Date:	10/12/2004	10/12/2004	10/12/2004	10/12/2004	10/12/2004	11/12/2004	11/12/2004	11/12/2004	11/12/2004	11/12/2004
Time:	9:05	11:05	12:00	14:00	22:30	0:30	1:10	3:10	16:00	18:00
Depth (Metres)	150		150		150		150		150	
Speed over the ground (Knots)	4		4		4		4		3.9	
Lat (Degrees):	58	58	58	58	59	59	59	59	59	59
Lat (Minutes):	56.0	49.0	49.0	54.0	10.0	3.0	3.0	11.0	4.0	4.0
North / South	N	N	N	N	N	N	N	N	N	N
Long (Degrees)	0	0	0	0	0	0	0	0	0	0
Long (Minutes)	15.0	20.0	19.0	16.0	33.0	33.0	33.0	33.0	26.0	38.0
East / West	W	W	W	W	W	W	W	W	W	W
Warp length (Metres)	500		500		500		500		500	
Haul duration (Minutes)	120		120		120		120		120	
Tow direction	S		N		S		N		N	
ICES statistical rectangle	47 E9		47 E9		47 E9		47 E9		47 E9	
Tide direction	SSE		WSW		S		SW		N	
Tidal speed (Knots)	0.3		0.2		0.5		0.2		0.3	
Wind force	7		6		5		5		3	
Wind direction	SSW		SSW		SSW		SSW		SW	
Sea state	6		5		4		4		2	

COMMENTS:

Veil exit split into three thirds with two sittings (lashings)

Paired with haul 24

Bottom sheet of veil net shortened by two meshes to reduce slack

Some small holes in aft end of veil net. Paired with haul 26

Paired with haul 29

Haul No	29	
Fishing Gear used		
<u>20mm lined whitefish demersal trawl without veil net</u>		
<u>20mm lined whitefish demersal trawl with veil net</u>	X	
	SHOT	HAULED
Date:	11/12/2004	11/12/2004
Time:	18:45	20:45
Depth (Metres)	10	
Speed over the ground (Knots)	3.9	
Lat (Degrees):	59	59
Lat (Minutes):	10.0	9.0
North / South	N	N
Long (Degrees)	0	0
Long (Minutes)	40.0	28.0
East / West	W	W
Warp length (Metres)	500	
Haul duration (Minutes)	120	
Tow direction	S	
ICES statistical rectangle	47 E9	
Tide direction	NE	
Tidal speed (Knots)	0.3	
Wind force	4	
Wind direction	SW	
Sea state	3	

COMMENTS:

Paired with haul 28