

The Effects of 110 mm and 120 mm Cod-Ends on the Catches of a Seine Net Vessel

Luke Bullough, Ian Napier, Davy Riley & Spencer Stadden

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Summary

A series of trials were carried out in July and September 2001 to assess the potential effects on catches by (single) seine net fishing vessels of introducing 110 mm and 120 mm cod-ends (compared to the normal 100 mm cod-end). The effects of fitting a square-mesh panel in the 110 mm cod-end were also investigated. All three cod-ends tested showed the potential to significantly reduce catches of undersized whitefish, but there were also substantial reductions in catches of marketable whitefish. Overall the reduction in catches was greatest with the 120 mm cod-end and least (although still substantial) with the 110 mm cod-end with no square-mesh panel. The results suggest that the adoption of any of the cod-ends tested would have a significant short-term (and possibly longer-term) impact on whitefish catches by (single) seine net fishing vessels.



The fishing vessel Harmony (LK 63) used in these trials.

Introduction

Under a recent agreement between Norway and the EU the minimum mesh size of demersal trawl and seine nets is to be increased in an effort to reduce the bycatch of undersized (immature) fish, especially cod. The current high bycatch of immature fish, the vast majority of which

are subsequently discarded dead, is arguably one of the most serious issues currently facing commercial fishermen and fisheries managers. This mortality of immature fish results in smaller future stock sizes and reduced earnings for fishermen.

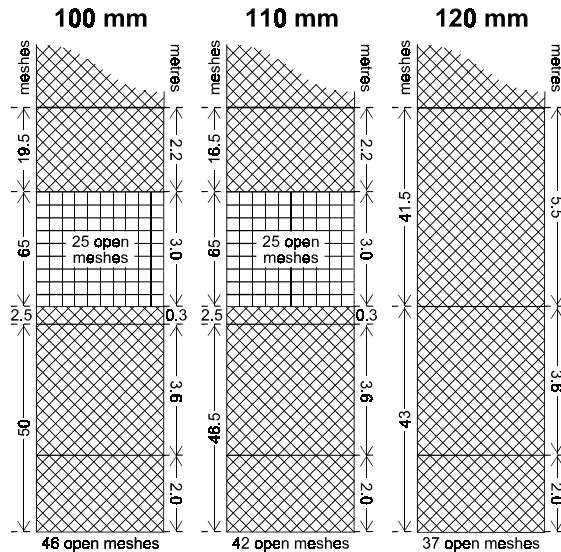
Under the new agreement from 1st January 2002 the minimum mesh size of towed nets for demersal species in the North Sea and Norwegian waters will increase from 100 to 120 mm. A derogation will allow EU vessels targeting cod, haddock, saithe and whiting in EU waters to use 110 mm mesh until 31st December 2002, subject to conditions regarding the composition of catches. This derogation is to be reviewed before the end of 2002 so will not automatically end on 31st December 2002. Existing square-mesh panel rules will apply when using 110 mm mesh, but square-mesh panels will not be a legal requirement when 120 mm mesh is used.

Fishermen using (single vessel) seine nets have expressed particular concern about the potential effects of these new mesh sizes on their catches and earnings. In order to investigate the potential effects of the new regulations on the catches of seine net fishing vessels the North Atlantic Fisheries College undertook a series of trials during July and September 2001 to compare the catches taken by such a vessel with 110 mm and 120 mm cod-ends with those taken with the current standard 100 mm cod-end. (Similar trials were also carried out on demersal trawlers - see *Fisheries Development Notes* No. 10 and 12). At the request of the Shetland Fishermen's Association, the comparison included 110 mm cod-ends both with and without a square-mesh panel.

Methods

The trials were carried out by the *Harmony* (LK 63) a Shetland seine net fishing vessel (23.2 m, 298 kW). Four cod-ends were manufactured for the trials; a normal 100 mm cod-end fitted with a 90 mm square-mesh panel (the control), a 110 mm cod-end without a square-mesh panel, a 110 mm cod-end with a panel, and a 120 mm cod-end, with no square-mesh panel. The square-mesh panels were 3 m in length, constructed of 6 mm black, knotless twine with a mesh size of 90 mm, and were fitted between 6 and 9 m from the cod-line.

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Schematic diagrams of the cod-ends used in these trials. The 110 mm cod-end used in Part 2 of the trials (not shown) was identical to that shown except that it had no square-mesh panel fitted.

The first two trials, to compare the two 110 mm cod-ends (with and without square-mesh panels) with the 100 mm control cod-end, were carried out between 2nd July and 16th July 2001. Due to difficulties in obtaining the netting required to manufacture the 120 mm cod-end the third trial, to compare the 120 mm and 100 mm cod-ends, had to be delayed until 10th to 14th September.

The cod-ends were compared in a series of alternate shots, one with the test cod-end and one with the control. Both shots in each pair were made in the same area so that the catches could be directly compared. Due to the mode of operation of the seine net it was not possible to exactly match the duration of the shots in each pair or the area fished, but it was assumed that any variations would average out over the course of the trials. Apart from alternating the cod-end on the net between shots the skipper's normal fishing practices were followed as closely as possible (e.g. fishing pattern, choice of grounds, etc.).

After each shot the catch was sorted by species and the total weight of each determined using a motion-compensated electronic balance. The haddock, whiting, cod, monkfish, ling and saithe were measured. Haddock were sub-sampled in a few cases where large catches were taken but normally all fish were measured.

Results

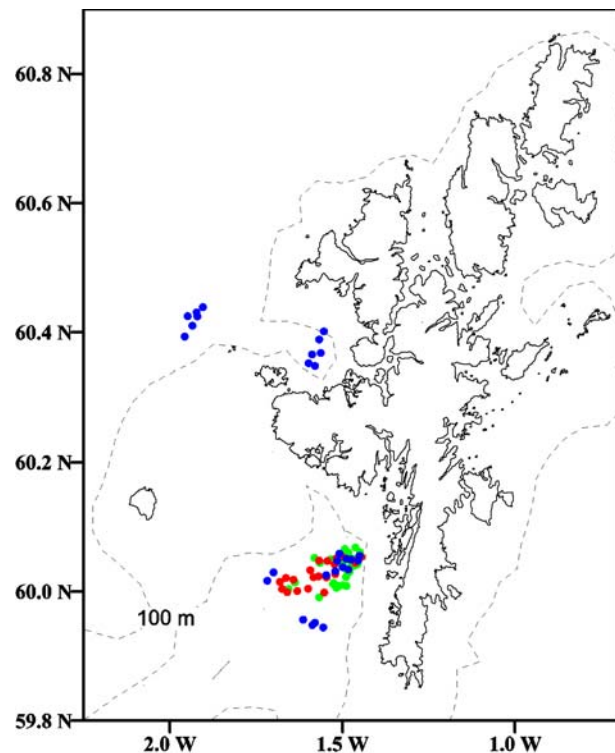
A total of 47 pairs of shots (i.e. 94 shots in total) were made on seine-net fishing grounds to the West of Shetland, as shown on the map below. Two shots were discarded as foul, in one case because the wing of the

net was twisted, in the other because of an unusually large catch (> 1,000 kg) of cod and ling. This left 45 valid pairs of shots; 11 with the 110 mm cod-end (no square-mesh panel), 20 with the 110 mm cod-end (with panel), and 14 with the 120 mm cod-end.

The *Harmony* shot 12 coils of rope either side of the net (1 coil = 120 fathoms = 220 metres). From the positions where the dhan buoy and net were shot, of the turning points while the warps were being shot, and where the net was hauled the average area of sea-bed swept by the gear was estimated as 3.26 square kilometres (just under 1 square nautical mile). From shooting the dhan to the net reaching the surface each shot took an average of 1 hour 46 minutes.

The *Harmony's* total catch during the trials was 36,325 kg, of which 18,630 kg (51.3%) was classed as marketable and retained. The remaining 48.7% of the catch was either unmarketable species or fish below minimum landings sizes and was discarded. The marketable component of the catch was dominated by cod (33% by weight), haddock (31%) and whiting (18%) which together accounted for 82% by weight. Other marketable species which were caught in significant quantities included plaice (6%), monkfish (3%), saithe (2%), and skate (2%).

The discards were dominated by undersized haddock (79% by weight), but contained very little undersized whiting or cod (0.8% and 0.4% by weight, respectively). The balance of the discards included species such as gurnards, dabs, spotted dogfish, horse mackerel, mackerel and herring.



Location of shots made by the Harmony during these trials (● Part 1, ● Part 2, ● Part 3).

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The catches of cod, haddock and whiting are summarised in more detail in the table at right. The graphs overleaf show the numbers of these species of each length caught with each cod-end in the smaller marketable size grades, along with the percentage reductions in weight of catch for these grades.

Haddock was the only species for which significant quantities of undersized fish were caught and the amount was substantially reduced with all three of the cod-ends tested, as shown in the Table below. There were also substantial reductions in the catch rates of undersized cod and whiting although only relatively small quantities of these species were caught. With the 110 mm cod-end the reduction in discards was markedly greater when a square-mesh panel was fitted, and the reduction was even greater with the 120 mm cod-end.

Percentage reduction in discards (weight) of cod, haddock and whiting with the experimental cod-ends compared the control (100 mm) cod-end.

	Cod	Haddock	Whiting
Part 1 (110 mm, no panel)	27%	46%	75%
Part 2 (110 mm, panel)	39%	66%	96%
Part 3 (120 mm, no panel)	87%	88%	80%

There were also substantial reductions in the catches of marketable cod, haddock and whiting with the experimental cod-ends, as shown on the graphs overleaf. The catch of Grade IV haddock, for example, was reduced by 40% with the 110 mm cod-end (with panel) and by 76% with the 120 mm cod-end. The effect on whiting was even greater with 80% and 91% reductions in catch with these cod-ends, respectively.

Discussion

The results of these trials clearly demonstrate the potential of 110 and 120 mm cod-ends to substantially reduce catches of undersized whitefish with (single vessel) seine nets. Comparison of the 110 mm cod-ends with and without square-mesh panels also clearly demonstrates the effectiveness of the panel at reducing discards with this type of fishing gear.

However, all of the cod-end designs tested also substantially reduced catches of marketable whitefish, especially of whiting. This indicates that the adoption of such cod-ends is likely to result in substantial economic losses by the (single vessel) seine net fleet, at least in the short term. In the longer term these losses may be at least partly offset by increased catches of larger fish. Given the magnitude of the losses of marketable fish, however, it seems unlikely that increased future catches of larger fish could fully compensate for the immediate losses of smaller marketable fish.

Overall, as might have been expected, the 120 mm cod-end had a greater effect on catches than the 110 mm cod-end. Comparison of the 110 mm cod-ends also demonstrated that the square-mesh panel did reduce

discarding, although it also increased losses of marketable fish.

The magnitude of the effects of the 110 and 120 mm cod-ends on catches in these trials was much greater than was observed in trials of similar cod-ends on a large demersal trawler (*Fisheries Development Note 10*), but were of broadly similar scale to those observed on a smaller, inshore trawler (*Fisheries Development Note 12*). In addition, the general discarding rate (even

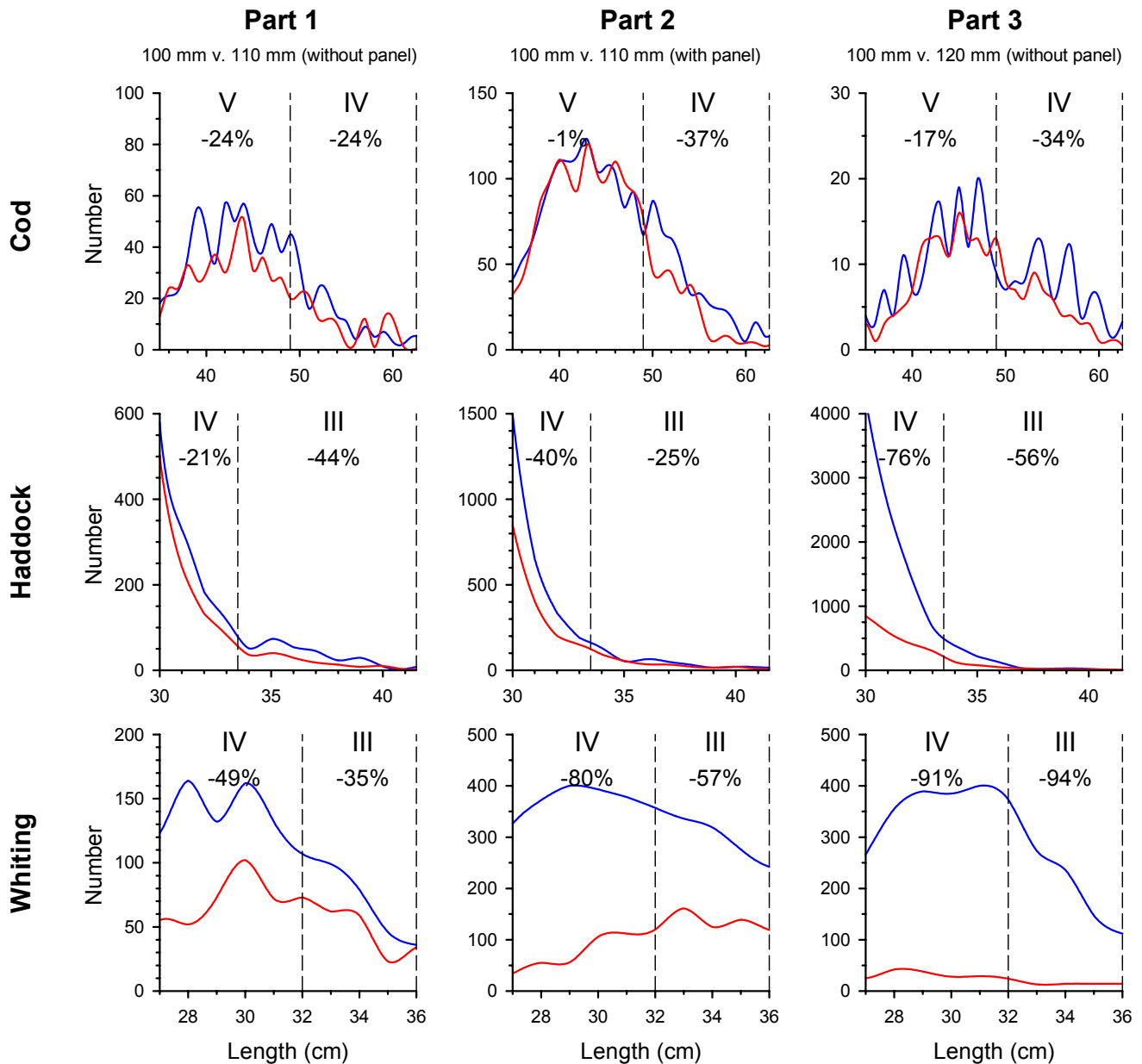
Summary of the total weights (kg) of cod, haddock and whiting caught with the control (100 mm; shaded) and experimental cod-ends, by size grade and marketable (retained) and undersized (discarded) components.

Part 1		100 mm v. 110 mm (without panel)					
		Cod		Haddock		Whiting	
		100	110	100	110	100	120
Grade	I	0	0	10	4	17	41
	II	18	7	12	9	39	46
	III	59	31	127	71	88	58
	IV	282	214	278	220	129	65
	V	442	335				
Marketable		801	587	426	304	274	209
Undersized		12	9	2,391	1,299	29	7
Total		812	596	2,817	1,604	302	216

Part 2		100 mm v. 110 mm (with panel)					
		Cod		Haddock		Whiting	
		100	110	100	110	100	120
Grade	I	0	0	24	17	160	207
	II	20	12	33	18	293	182
	III	153	106	168	126	350	150
	IV	763	482	614	366	338	69
	V	995	982				
Marketable		1,931	1,582	840	528	1,141	608
Undersized		29	18	4,434	1,502	65	2
Total		1,960	1,600	5,274	2,030	1,206	610

Part 3		100 mm v. 120 mm (without panel)					
		Cod		Haddock		Whiting	
		100	110	100	110	100	120
Grade	I	0	0	1	5	47	15
	II	0	0	13	21	114	13
	III	43	46	389	172	273	17
	IV	163	108	2,086	493	328	29
	V	126	105				
Marketable		332	259	2,489	690	763	75
Undersized		5	1	5,179	626	42	8
Total		337	259	7,669	1,316	805	83

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The numbers of cod, haddock and whiting of each length in the smaller marketable size grades caught by the *Harmony* with the control (100 mm; -----) and experimental (110 or 120 mm; - - - - -) cod-ends. The divisions between the size grades are indicated by dashed vertical lines, and the percentage reductions in weight caught with the experimental cod-end, compared to the control cod-end, are shown for each grade. Note that axes scales vary in these graphs.

with the 100 mm cod-end) was higher in these trials than was observed on the larger demersal trawler, although again more in line with that seen on the inshore trawler.

The fact that the inshore trawler and seine net vessel experienced greater effects on their catches (and had higher discarding rates) may reflect the composition of fish stocks in the inshore waters where these trials were carried out (and where these vessels normally fish). Alternatively it may reflect differences in the design of the

fishing gear, or its mode of operation (speed, power of towing, etc.), compared to the larger demersal trawler.

Acknowledgements

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