



Bord Iascaigh Mhara
Irish Sea Fisheries Board

BIM IT Section



Summary report of Gear Trials in Demersal Fisheries VIa

FUNDED UNDER NDP SUPPORTING MEASURES FOR SEA FISHERIES
DEVELOPMENT

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Bord Iascaigh Mhara (BIM)

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1 Introduction

This reports details the results from a baseline selectivity analysis of the 110mm +110mm smp and 120mm +120mm smp regulation mesh sizes introduced into Area VIa in 2009 and also catch comparison trials testing a number of different gear options against the baseline gears. An analysis was also carried out of the economic impact of using the 120mm + 120mm smp gear against the alternative gear options tested in the important Stanton Bank and Barra Head fisheries. This work complements similar experiments being carried out by the Scottish industry.

2 Objectives

The objectives of these trials were as follows:

1. To collect selectivity data for the 120mm codend & 120mm Square Mesh Panels and 110mm codend & 110mm Square Mesh Panels as required under the new regulations in Area VIa.
2. Test alternatives to these gears that will deliver similar reductions in fishing mortality for cod, haddock and whiting as the regulation gears.
3. Determine the economic impact on marketable catches of the 120mm+120mm smp compared to the other gear options tested

3 Trial 1 - Catherine-R

The first trial was completed over the period 28th March to 10th April on board the Greencastle vessel "Catherine-R". The trials were carried out in Area VIa inside the restricted area as defined in Annex III (6.1) of Regulation 43/2009 with standard rockhopper and disc scraper trawls and in areas expected to have haddock, whiting and cod. In total three gear options were tested as follows:

1. 110mm codend with a 110mm square mesh panel placed 9-12m for the codline (14 hauls)
2. 120mm codend and a 120mm square mesh panel placed 9-12m from the codline (14 hauls)
3. 100mm codend with a 120mm square mesh panel placed 6-9m from the codline (9 hauls).

All codends were constructed in double 4mm PE twine with 100 meshes in the codend circumference and 220mm or 240mm cover bags. All square mesh panels were constructed in double 4mm compacted PE and were 3m long. A specialist codend cover was used to retain all fish escaping from the codend and square mesh panel. From the hauls completed selectivity curves for whiting, haddock, hake and megrim were generated. Selectivity data was also obtained for white pollcack and saithe for the 100mm +100mm smp gear option although these results are not reported. Very few cod were retained in any hauls with any of the gear options tested. Table 1 below shows the 50% retention length (L50) and the Selection Factor (SF) for each species and each gear type. The selectivity curves are given in Annex I.

Table 1 Selectivity parameters by species and by gear configuration

	110MM + 110MM SMP		120MM + 120MM SMP		100MM +120MM SMP	
	L50	SR	L50	SR	L50	SR
Haddock	33.13	7.67	38.97	10.07	39.17	10.83
Whiting	38.67	8.9	47.2	12.09	48.72	17.5
Hake	30.6	23.67	50.07	29.68	37.4	21.6
Megrim	No data	No data	41.57	11.8	27.9	6.57

Table 2 below shows the total amount of fish above and below the minimum landing size retained in the codend cover and the codend itself. Annex II shows the length frequency distributions by species and by gear configuration for the codend and cover.

Table 2 The total catches by species for the codend and cover for each gear configuration

		110MM + 110MM SMP		120MM + 120MM SMP		100MM +120MM SMP	
		Cover	Codend	Cover	Codend	Cover	Codend
Whiting	<MLS	147	7	98	2	68	3
Whiting	>MLS	3216	1019	3537	365	759	116
Haddock	<MLS	2073	341	1289	58	548	37
Haddock	>MLS	1164	1916	3184	1575	1059	465
Hake	<MLS	0	0	79	10	266	24
Hake	>MLS	22	57	3015	1688	1973	850
Cod	<MLS	0	0	1	0	0	0
Cod	>MLS	4	12	2	0	0	1
Megrim	<MLS	No Data	No Data	1	0	8	2
Megrim	>MLS	No Data	No Data	409	83	265	387

The results show the following:

1. For all of the codends very few undersize fish of any of the species recorded were retained indicating all three gears are selective for haddock, whiting and hake. For megrim and cod it is less clear as there are too few small fish retained in either the codend or cover to make any assessment.
2. With the 110mm+110mm smp gear configuration, taking the total catch of marketable fish in the codend + cover, 62% of haddock; 24% of whiting; 72% of hake were retained in the codend. There were too few cod and megrim to make any assessment.
3. Similarly with the 120mm+120mm smp gear configuration, 33% of haddock; 9% of whiting; 36% of hake; and 17% of megrim were retained in the codend. There were too few cod caught to make an assessment.
4. With the 100mm+120mm smp gear configuration, 31% of haddock; 13% of whiting; 30% of hake; and 59% of megrim were retained in the codend. Again there were too few cod caught to make an assessment.
5. The 120mm+120mm smp and the 100mm+120mm smp appear to retain similar amounts of haddock, whiting and hake but the 100mm+120mm smp retains significantly more megrim.

4 Trial 2 – Green Isle

The second trial was completed over the period 28th April to – 18th May 2009 on board the Greencastle vessel “Green Isle”. These trials were carried out on the Stanton and Barra Head

grounds with standard disc scraper nets. These grounds are of particular importance to Irish vessels in Area VIa and are essentially mixed fisheries with the catch being made up of hake, megrim, monkfish, *Nephrops* and haddock. In total, three gear options were tested against the baseline 120mm +120mm smp placed 9-12m from the codline as follows:

1. 110mm codend with a 120mm square mesh panel placed 5-7m from the codline (11 hauls)
2. 100mm codend and a 160mm square mesh panel placed 5-7m from the codline (12 hauls)
3. 100mm codend with a 160mm square mesh panel placed 10-12m from the codline (4 hauls).

All codends were constructed in double 4mm PE twine with a 100 meshes in the codend circumference and 200mm, 220mm or 240mm cover bags. All square mesh panels were constructed in double 4mm compacted PE and were 3m long.

The results are summarized below:

Gear Option 1: 120mm +120mm smp vs 110mm +120mm smp (5-7m)

1. Overall the 120mm +120mm smp reduces total catch by 23% compared with the 110mm +120mm smp but both gears appear selective with very few small fish of any species retained.
2. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > mls were significantly reduced when compared to the 110mm +120mm smp. Catches of marketable fish were reduced by 51% for whiting and 40% for haddock with the 120mm +120mm smp. Catches of hake > 27cm were reduced by 11%. Neither gear retained many haddock, whiting or hake below mls. Table 3 below summarises these results and Annex III shows the length frequency by species for this gear option.

Table 3 Total Cod, Haddock and Whiting catches (by number) with the 120mm +120mm smp vs 110mm +120mm smp (5-7m)

Species	< mls			> mls			Total Catch		% diff
	120/120smp	110/120smp	% diff	120/120smp	110/120smp	% diff	120/120smp	110/120smp	
Cod	1	0	Na	12	12	na	13	12	na
Haddock	8	27	70%	733	1216	40%	741	1243	40%
Whiting	0	1	Na	74	150	51%	74	151	51%
Hake	5	4	Na	967	1083	11%	972	1087	11%

3. Catches of haddock, whiting and megrim by weight were all reduced significantly with the 120mm +120mm smp. These reductions were statistically significant. The catches of monkfish and hake were also reduced, while catches of cod and *Nephrops* were slightly increased but none of these differences were statistically different indicating they were due to variation in catches between hauls. Table 4 below shows the catches of the key commercial species and % differences.

Table 4 Catches of key commercial species and % difference between the two gears
(Figures in Bold are statistically significant at p=0.05)

SPECIES	TOTAL CATCH (KG)	% DIFF
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	120/120smp	110/120smp	
Haddock	308.35	468.6	-34%
Whiting	32.15	47.55	-32%
Cod	37.15	36.15	+3%
Hake	817.77	840.35	-3%
Monkfish	234.3	279.95	-16%
Megrim	191.4	245.45	-22%
<i>Nephrops</i>	136.9	126.65	+8%

4. Combined catches of cod, haddock and whiting are below the 30% specified in the regulation for both the 120mm+120mm smp and 110mm +120 smp. Catches were 18.3% and 20.5% respectively, of which 96% was made up of haddock.

Gear Option 2: 2 120mm +120mm smp vs 100mm +160mm smp (5-7m)

1. Overall the 120mm +120mm smp reduces total catch by 32% compared with the 100mm +160mm smp but both gears appear selective with very few small fish of any species retained.
2. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > mls were significantly reduced compared to the 100mm + 160mm smp. Catches of marketable fish were reduced by 73% for whiting and 36% for haddock with the 120mm +120mm smp although whiting catches were low for all hauls. Catches of hake > mls were reduced by 37%. Neither gear retained many haddock, whiting or hake below mls. Table 5 below summarises these results and Annex III shows the length frequency by species for this gear option.

Table 5 Total Cod, Haddock and Whiting catches with the 120mm +120mm smp vs 100mm +160mm smp

Species	< mls			> mls			Total Catch		
	120/120smp	100/160smp	% diff	120/120smp	100/160smp	% diff	120/120smp	100/160smp	% diff
Cod	2	2	0%	21	25	16%	23	27	16%
Haddock	43	73	41%	891	1388	36%	934	1461	36%
Whiting	1	4	na	49	181	73%	50	185	73%
Hake	19	99	81%	1451	2304	37%	1470	2403	39%

3. Catches of haddock, whiting, megrim, hake and *Nephrops* by weight were all reduced significantly with the 120mm +120mm smp. These reductions were statistically significant. The catches of monkfish and cod were also reduced, while catches of cod and *Nephrops* were slightly increased but none of these differences were statistically different indicating they are due to catch variation. Table 6 below summarises these results.

Table 6 Catches of key commercial species and % difference between the two gears
(Figures in Bold are statistically significant at p=0.05)

SPECIES	TOTAL CATCH (KG)		% DIFF
	120/120smp	100/160smp	
Haddock	341.2	482.1	-29%

Whiting	18.95	53.55	-65%
Cod	25.44	44.7	-43%
Hake	1117	1422.19	-21%
Monkfish	412	507.82	-19%
Megrim	269.45	384.7	-30%
<i>Nephrops</i>	293.1	643.79	-54%

4. Combined catches of cod, haddock and whiting are well below 30% specified in the regulation for both the 120mm+120mm smp and 110mm +160 smp. Catches were 12% for both gears, more than 98% of which was made up of haddock.

Gear Option 3 120mm +120mm smp vs 100mm +160mm smp (10-12m)

1. Overall the 120mm + 120mm smp reduced total catch by 47% by weight compared with the 100mm +160mm smp but both gears appear selective with very few small fish of any species retained.
2. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > mls were significantly reduced when compared to the 100mm + 160mm smp. Catches of marketable fish were reduced by 76% for whiting and 62% for haddock with the 120mm +120mm smp although whiting catches were low for all hauls. Catches of hake > mls were reduced by 51%. Neither gear retained many haddock, whiting or hake below mls. Table 7 below summarises these results and Annex III shows the length frequency by species for this gear option.

Table 7 Total Cod, Haddock and Whiting catches with the 120mm +120mm smp vs 100mm +160mm smp (position 10-12m)

Species	< mls			> mls			Total Catch		% diff
	120/120smp	100/160smp	% diff	120/120smp	100/160smp	% diff	120/120smp	100/160smp	
Cod	1	1	Na	3	9	na	4	10	Na
Haddock	3	23	Na	276	733	62%	279	756	64%
Whiting	0	1	Na	11	77	76%	11	78	76%
Hake	6	44	na	384	781	51%	390	825	53%

3. Catches of haddock, whiting, megrim, hake and *Nephrops* by weight were all reduced significantly with the 120mm + 120mm smp. These reductions are statistically significant. The catches of monkfish and cod were also reduced, while catches of cod and *Nephrops* were slightly increased but none of these differences are not statistically different indicating they are due to catch variation. (Table 8 below).

Table 8 Catches of key commercial species and % difference between the two gears
(Figures in Bold are statistically significant at p=0.05)

SPECIES	TOTAL CATCH (KG)		% DIFF
	120/120smp	100/160smp	
Haddock	117.9	270.85	-56%
Whiting	3.7	20.4	-82%
Cod	8.45	31.7	-73%
Hake	281.7	473.7	-41%
Monkfish	94.1	119	-21%

Megrim	98.7	131.75	-25%
<i>Nephrops</i>	114.2	268.45	-57%

4. Combined catches of cod, haddock and whiting are well below 30% specified in the regulation for both the 120mm+120mm smp and 110mm +160 smp. Catches were 16% and 20% respectively for the two gears, 94% of which is made up of haddock.

5 Economic Analysis

To provide an estimate of the reduction in earnings likely from using each of the different gear types compared to the 120mm +120mm smp regulation gear, a simple analysis was carried out based on the value of the total catches for the key commercial species using average fish prices in May 2009.

With the 120mm + 120mm smp compared to the 110mm + 120mm smp there was a reduction of 15% in total catch value. The majority of this reduction is from lower catches of haddock and megrim. Catches of whiting and cod were small and had little impact on the results, although whiting catches were reduced by 32% by weight.

With the 120mm+120mm smp compared to the 100mm + 160mm smp at 5-7m there was a reduction of 32% in total catch value. The majority of this reduction was from a combination of lower catches of haddock, hake, megrim and *Nephrops*. Catches of whiting and cod were small and had little impact on the results, although whiting catches were reduced by 73% by weight.

With the 120mm+120mm smp compared to the 100mm +160mm smp positioned at 10-12m there was a reduction of 44% in total catch value although this is based on a small number of hauls. Again the majority of this reduction is from lower catches of haddock, hake, megrim and *Nephrops*. In the case of *Nephrops* catches, though this is based on only two hauls as no *Nephrops* were caught in the other hauls. As before catches of whiting and cod were very low and therefore do not account for much of the reduction in predicted earnings. Table 9 below summarises the catch values for each gear compared to the standard trawl.

Table 9 Summary Economic data for the 110mm +120mm smp, 100mm +160mm (5-7m) & 100mm +160mm (10-12m)

GEAR TYPE	TOTAL VALUE OF COMMERCIAL SPECIES		DIFF IN VALUE	% REDUCTION IN TOTAL VALUE
	Control 120/120	Experimental		
110/120	€4586.51	€5370.25	€783.74	15%
100/160 position 5-7m	€6699.38	€9850.90	€3151.52	32%
100/160 position 10-12m	€2022.17	€3640.80	€1618.63	44%

These figures should be treated with caution as they are based on only the main commercial species. Other species were caught but were not included due to the volumes being small or the catches sporadic

6 Conclusions

General Conclusions

Some general conclusions from these trials are given as follows:

1. These trials have demonstrated that there are significant reductions in marketable catches of megrim, hake and *Nephrops* with the 120mm+120mm smp regulation gear

and these reductions render the important Stanton and Barra Head fishery uneconomic for Irish vessels.

2. The results from trials with the alternative gear options indicate that similar selectivity can be achieved for haddock and whiting by moving the smp closer to the codend than is currently specified in the regulation and/or increasing the mesh size of the panel.
3. A gear option with a smaller codend mesh size, accommodating either of the options in 2 above, would be more acceptable to Irish fishermen as it would allow them to maintain the majority of their megrim, hake and *Nephrops* catches whilst remaining selective for haddock and whiting.
4. Very few cod have been caught during these trials so no assessment can be made as to whether any of the gear options improve the selectivity for cod compared to the regulation gear. It should be noted, though, that cod catches in the Stanton Bank and Barra Head grounds historically are low so the direct impact on cod of reducing the codend mesh size is felt minimal compared to the current regulations.

Specific conclusions relating to the different trials completed are given below:

Catherine-R

1. The 110mm + 110mmsmp and 120mm +120mm smp gears are selective for haddock, whiting, hake with a 50% retention length well in excess of the current mls.
2. The 100mm + 120mm smp placed close to the codend gives similar selectivity as the 120mm+120mm codend for haddock and whiting. It is less selective for hake and megrim but still has an L50 above the mls for these two species.
3. There are too few cod to make any assessment.
4. From the trials with the 110mm+110mm smp gear configuration, based on the total catches retained in the codend cover, losses of marketable fish were calculated as 40% for haddock; 75% for whiting; and 30% for hake. There were too few cod and megrim to make any assessment for this gear.
5. With the 120mm+120mm smp gear configuration, using a similar analysis, losses of marketable fish were estimated at 70% for haddock; 90% for whiting; 65% for hake; and 80% for megrim
6. With the 100mm+120mm smp gear configuration, the losses are estimated at 70% for haddock; 85% for whiting; 70% for hake; and 40% for megrim.
7. Indications from the trials with the 10mm +120mm smp placed 5-7m codend support the results from previous trials in the North Sea that the square mesh panel is most effective when placed close to the codend.

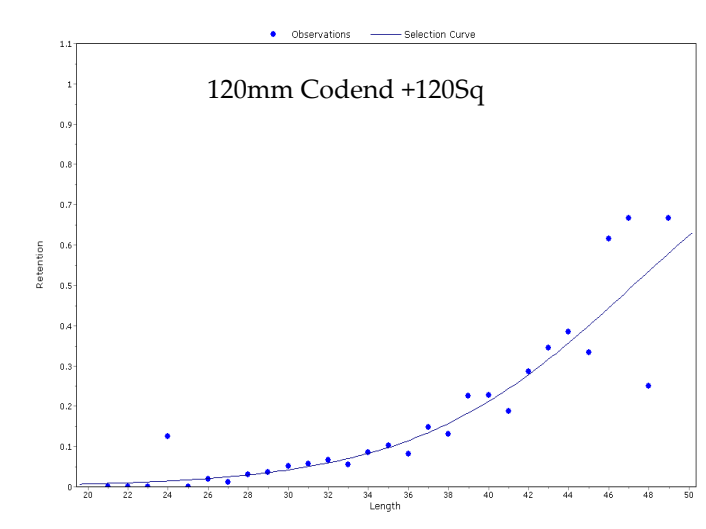
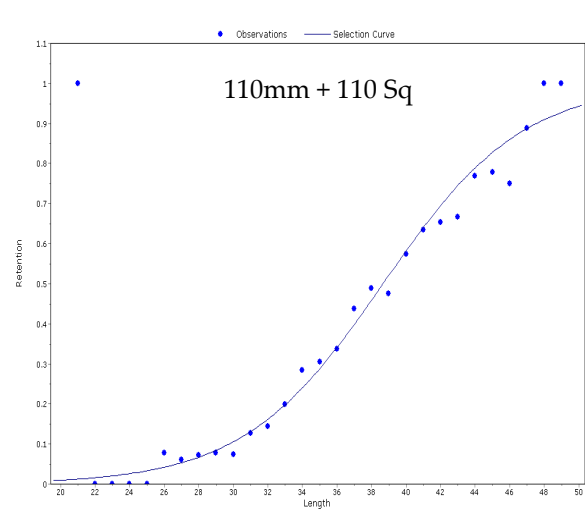
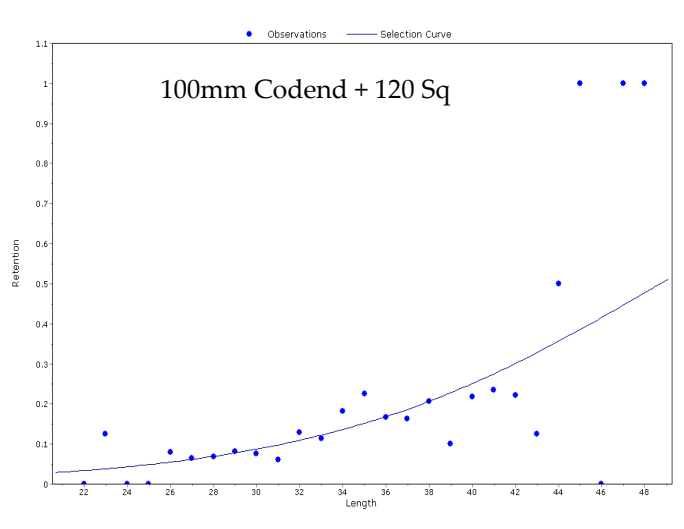
Green Isle

1. Overall the 120mm+120mm smp reduced total catch by 23% compared with the 110mm +120mm smp but both gears appeared selective with very few small fish of any species retained.
2. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > mls were significantly reduced when compared to the 110mm +120mm smp.
3. Catches of haddock, whiting, megrim, hake and *Nephrops* by weight were all reduced significantly with the 120mm+120mm smp.
5. Overall the 120mm+120mm smp reduced total catch by 32% compared with the 100mm +160mm smp (close to the codend) but both gears appeared selective with very few small fish of any species retained.

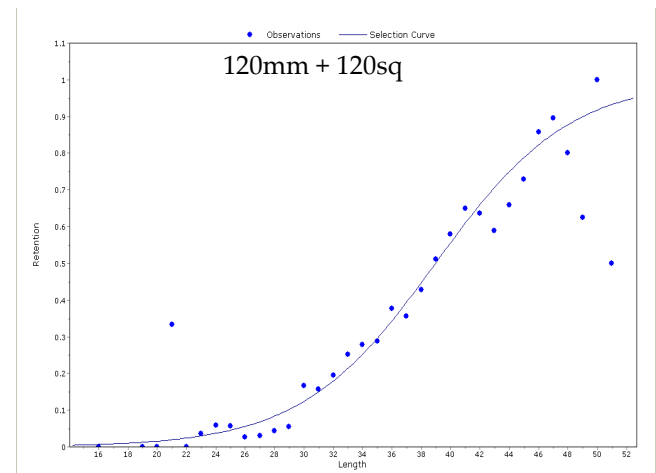
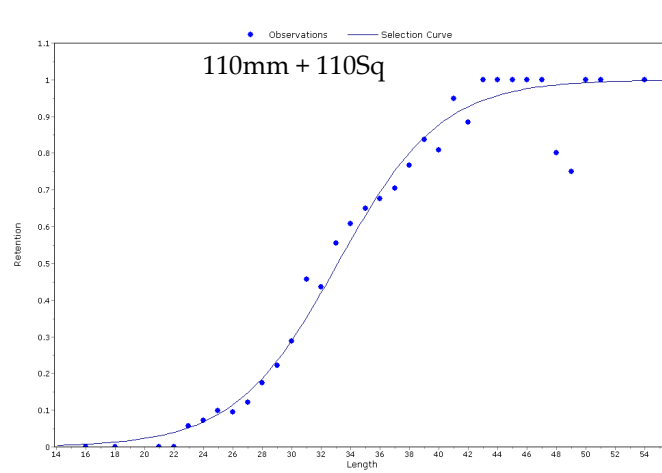
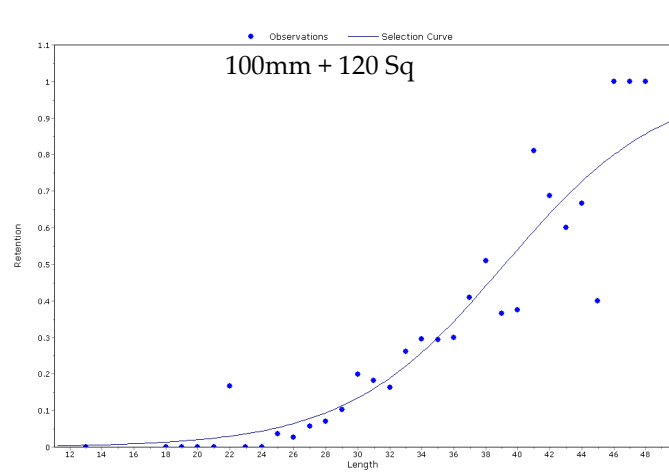
4. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > 30cm were significantly reduced when compared to the 100mm +160mm smp.
5. Catches of haddock, whiting, megrim, hake and *Nephrops* were all reduced significantly with the 120mm +120mm smp.
5. Overall the 120mm +120mm smp reduced total catch by 47% by weight compared with the 100mm +160mm smp (further up the trawl) but both gears appeared selective with very few small fish of any species retained.
6. The number of haddock and whiting retained with the 120mm +120mm smp across all size ranges > 30cm were significantly reduced when compared to the 100mm +160mm smp in this position.
7. With the 120mm+120mm smp compared to the 110mm +120mm smp there was a reduction of 15% in total catch value. The majority of this reduction was from lower catches of haddock and megrim.
8. With the 120mm + 120mm smp compared to the 100mm + 160mm smp close to the codend there was a reduction of 32% in total catch value. The majority of this reduction was from a combination of lower catches of haddock, hake, megrim and *Nephrops*.
9. With the 120mm+120mm smp compared to the 100mm +160mm smp positioned 10-12m from the codend there was a reduction of 44% in total catch value although this is based on a small number of hauls.
10. As with trial 1, the indications from these trials are that the square mesh panel should be placed as close to the codend as possible to improve selectivity although the short trials with the 160mm smp placed at 10-12m still gave encouraging results.

Annex I Selectivity Curves from the trials on the “Catherine-R”

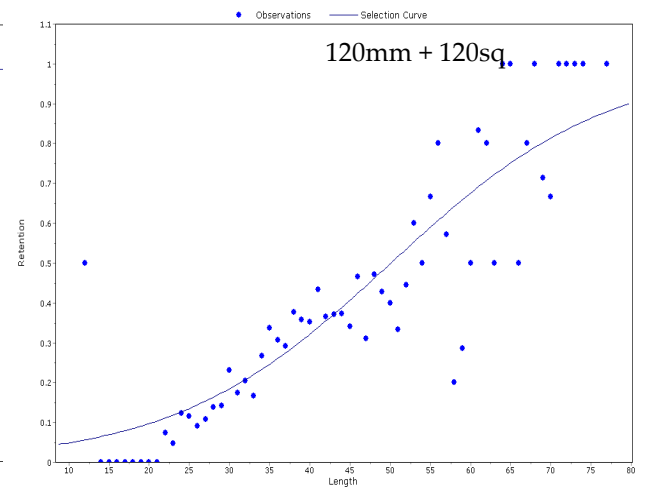
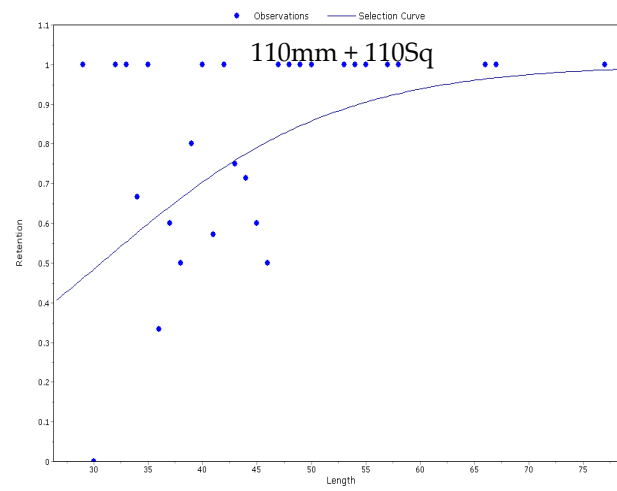
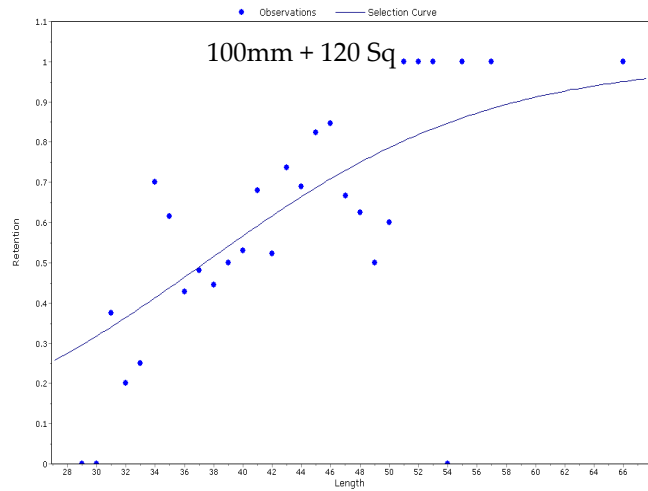
Whiting Selectivity



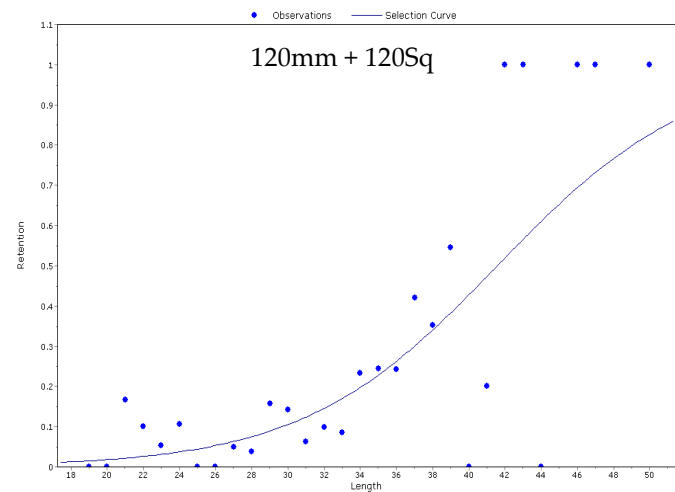
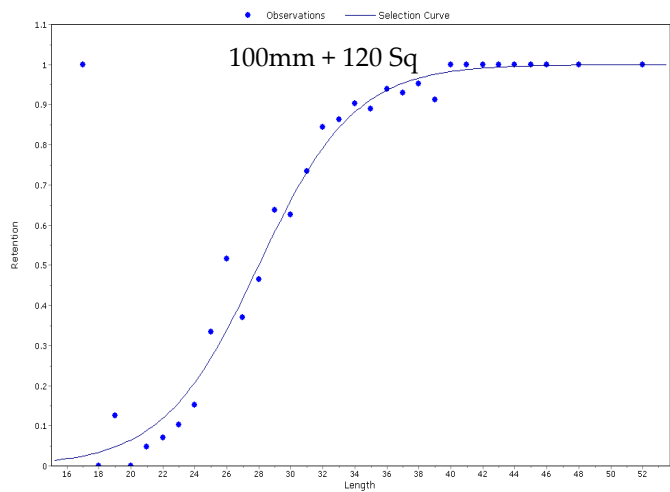
Haddock Selectivity



Hake Selectivity

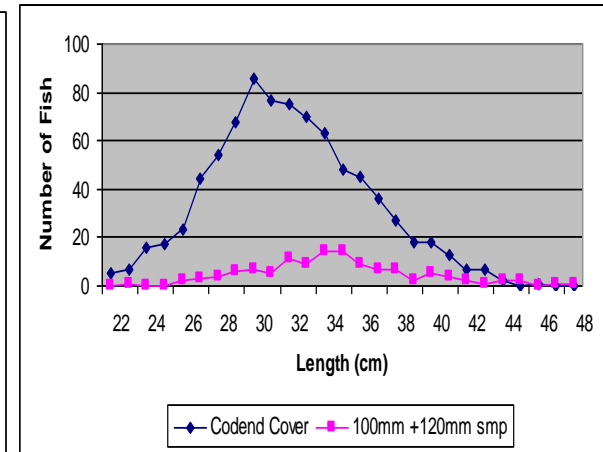
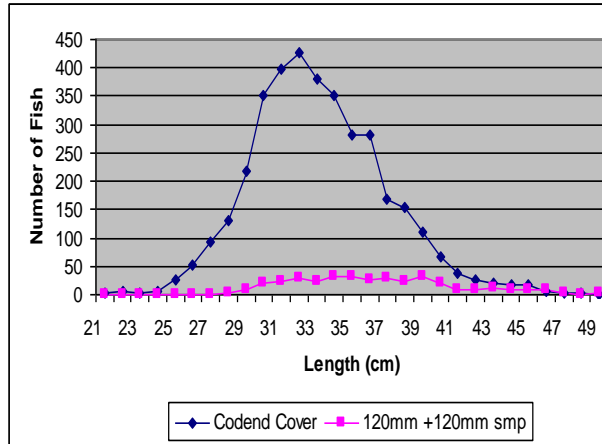
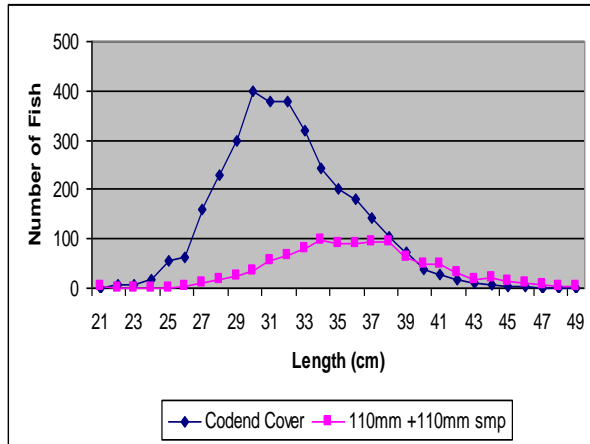


Megrim Selectivity

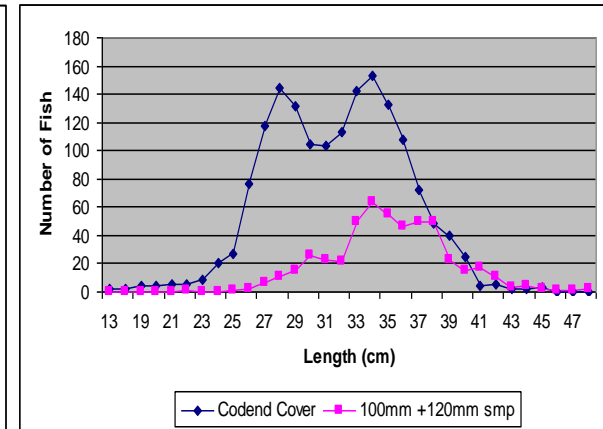
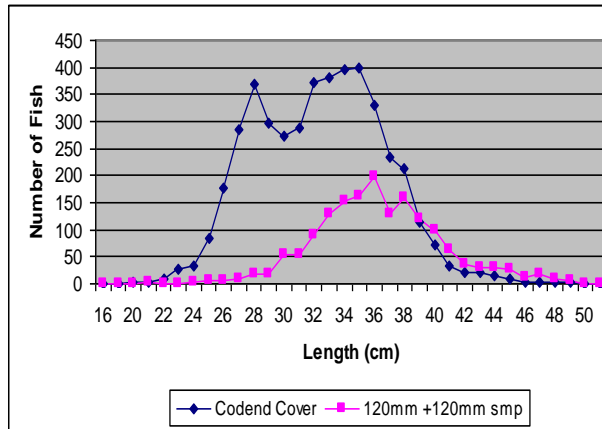
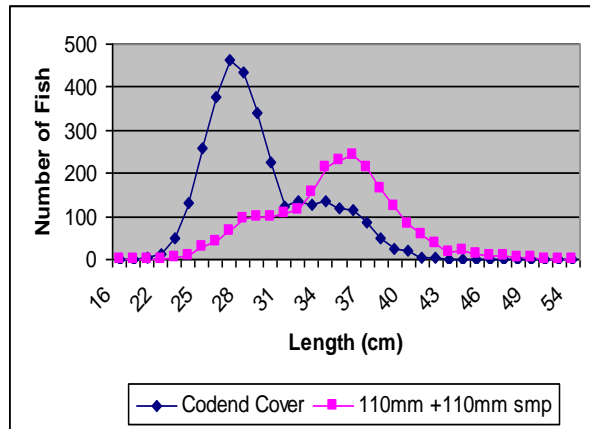


Annex II Length frequency by species and by gear configuration for the codend and cover from the trials on the “Catherine-R”

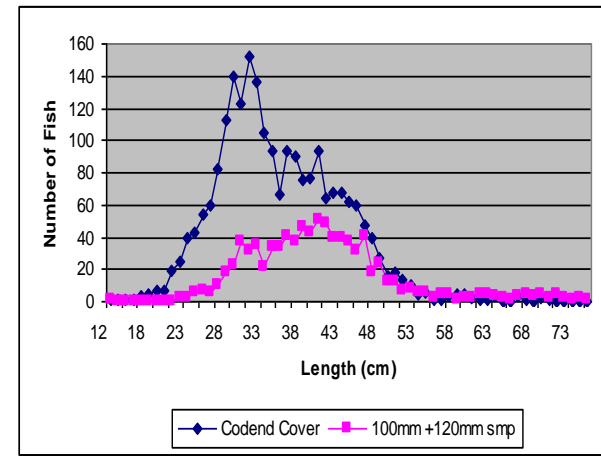
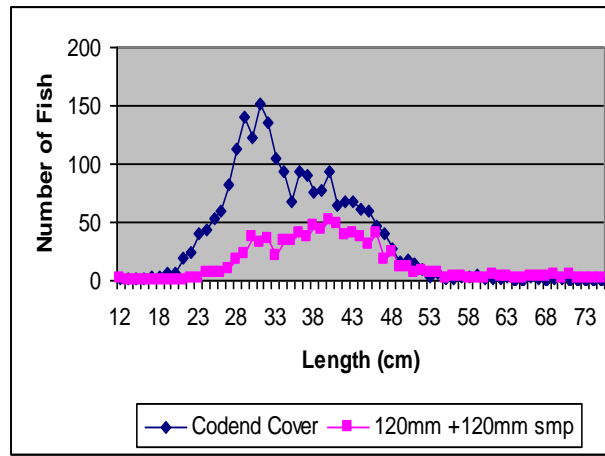
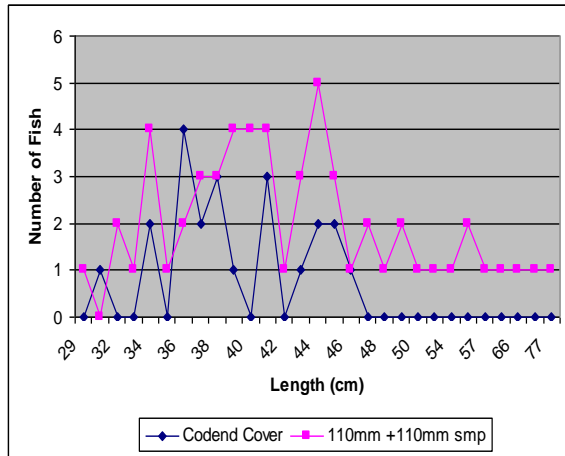
Whiting Length Frequencies



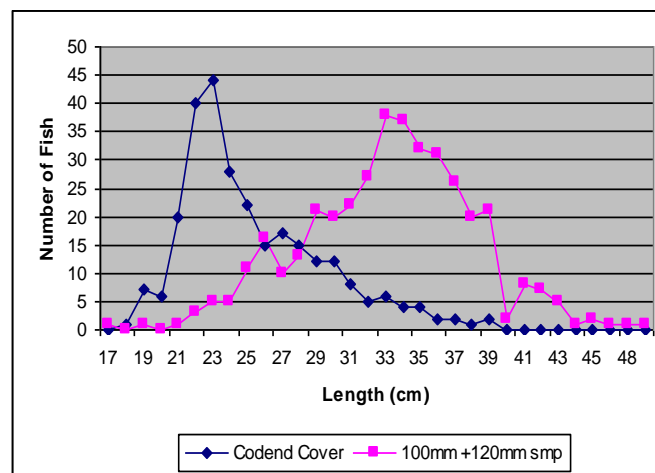
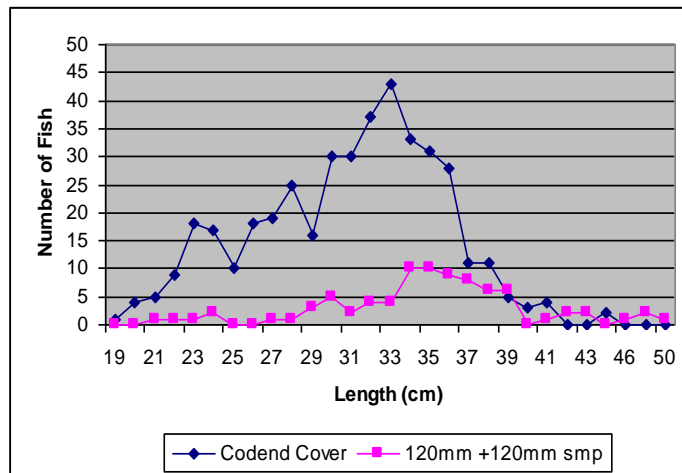
Haddock Length Frequencies



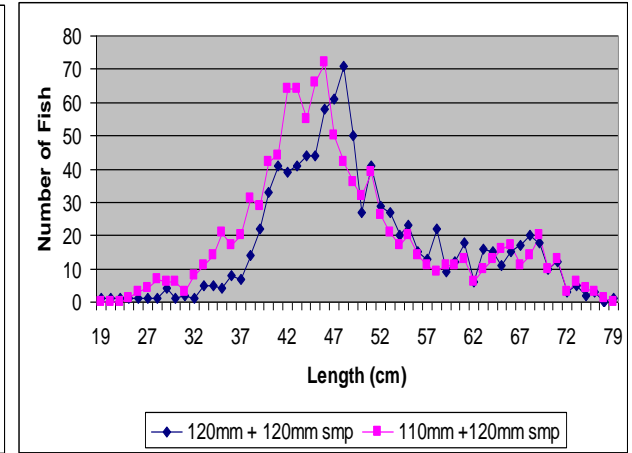
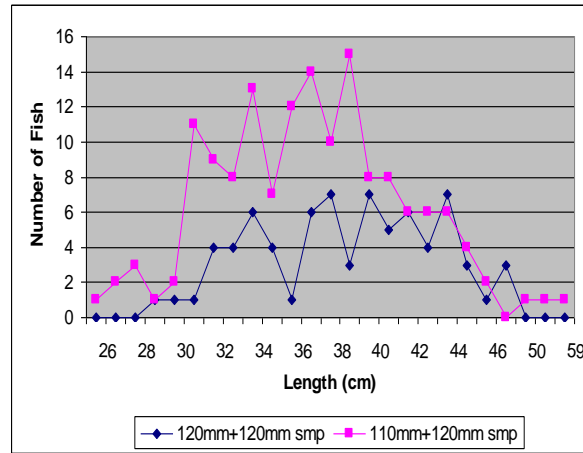
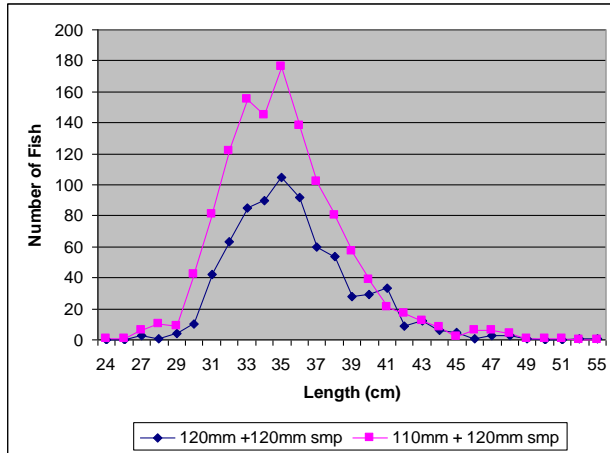
Hake Length Frequencies



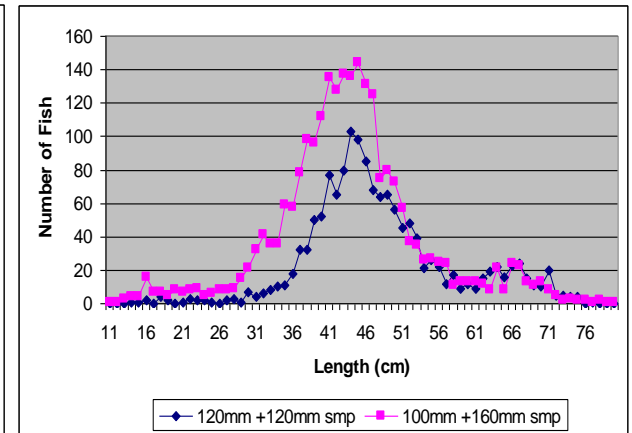
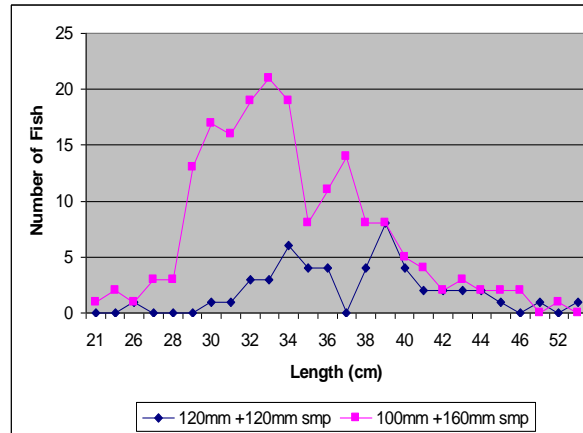
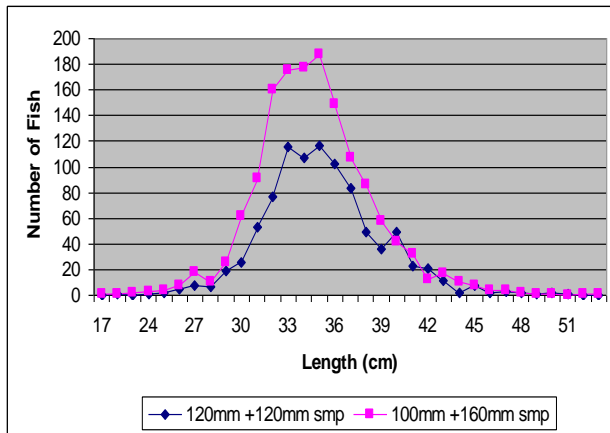
Megrim Length Frequencies



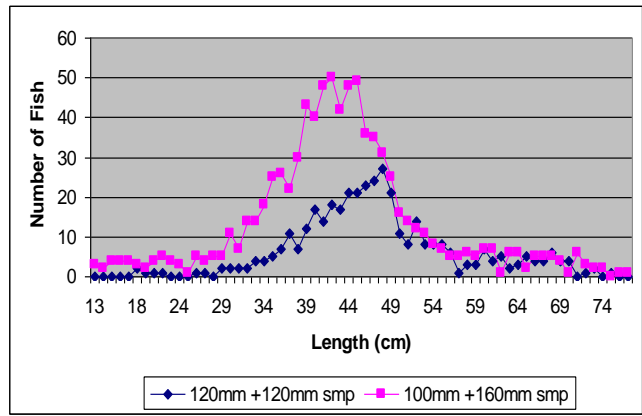
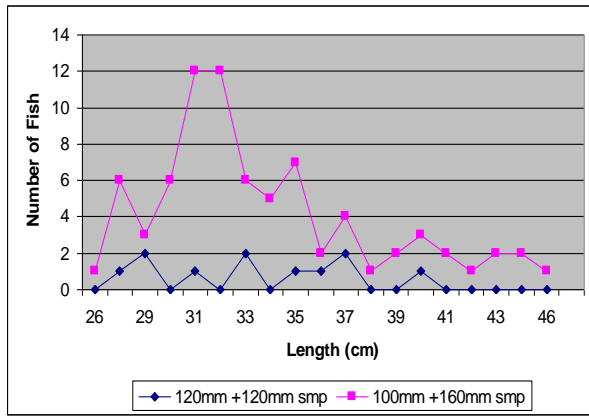
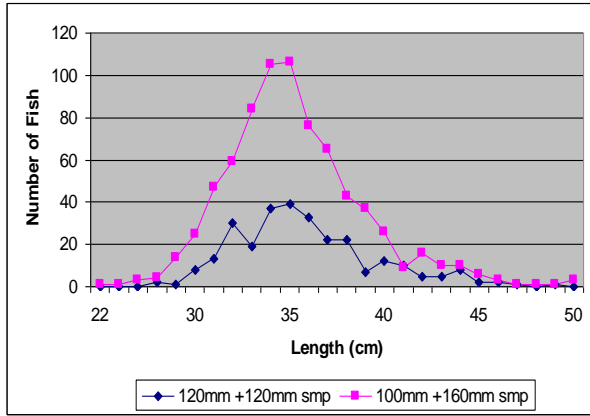
Annex III Length Frequencies by Species and Gear Option for the Trials on the “Green Isle”



Length Frequency for haddock, whiting and hake with the 110mm+120mm smp



Length Frequency for haddock, whiting and hake with the 100mm+160mm smp



Length Frequency curves for haddock, whiting and hake with the 100mm+160mm smp placed further forward in the trawl