

## Annex X

### Request for a de minimis exemption for haddock in the TR1 and TR2 trawl and seine fisheries in ICES division VIIb-k (excluding VIId)

#### Description of the Fisheries

Otter trawlers with codend mesh size over 100mm (TR1) are the predominant fishing gear used in the Celtic Sea, with the highest fishing effort. TR1 gears account for 24% of the total effort (STECF 2017). TR1 fisheries are widespread across the whole area, but most effort is exerted in ICES VII e, f, g and h. The countries that contributed most effort are France, Spain, Ireland and England.

The TR1 fishery is characterized as a mixed fishery, mainly targeting 'gadoid' species, such as haddock (*Melanogrammus aeglefinus*), cod (*Gadus morhua*) and whiting (*Merlangus merlangus*) as well as anglerfish and megrim. There is an important TR1 mixed fishery in ICES VIIj-k, mainly operated by Irish and Spanish vessels and targeting anglerfish (*Lophius* spp), megrim (*Lepidorhombus whiffiagonis*), hake (*Merluccius merluccius*) with a bycatch of haddock and whiting.

The fishing operations occur in depth ranging from 80 to 250 m. They last between 2 and 4 hours. Fishing trips duration depends on the seasons and on the weather forecast, from 4 to 15 days (~13 days in average for French vessels, 4-9 days for Irish vessels).

The French vessels that would be concerned are mainly bottom otter trawlers. In 2016, 132 vessels of more than 18 meters length were having this activity in Celtic Sea and Western channel (Cornou *et al.* 2017).

Otter trawlers using a codend mesh size range between 70-100mm (TR2) have the second highest recorded effort in Celtic Sea, accounting for 22% of the total effort. According to STECF data (2017), TR2 effort is spread amongst Irish, French, Spanish and UK vessels.

The TR2 fishery in the Celtic Sea is widespread and can be characterized by:

- Fisheries for *Nephrops* operated mainly by Irish trawlers in the Smalls, Labadie and Porcupine bank with a bycatch of mainly haddock, whiting and hake;
- A mixed fishery (otter trawl with codend mesh size 70-99mm) targeting megrim and anglerfish, with hake as the main by-catch. Haddock are also caught as a bycatch in this fishery. Effort is distributed on shallow waters of Grand Sole and Porcupine Bank fishing mainly in Division VIIj. This fishery involves vessels from Ireland, France, Spain and the UK; and
- A targeted trawl and seine fishery for whiting with a bycatch of haddock and hake by Irish vessels principally in VIIg.

The French vessels that would be concerned are mainly bottom otter trawlers. In 2016, 152 vessels were having this activity, mainly in the Western channel (Cornou *et al.* 2017).

Fisheries in the Eastern Channel (VIId) are not covered by this de minimis as the fisheries in this area are quite different to the fisheries in the Celtic Sea in terms of catch composition and fleets involved. A range of species including anglerfish, gadoid species and non-quota species such as cuttlefish, red mullet and squid are targeted, with the fisheries taking place in VIId close to the English and French coasts. Many of the demersal fisheries in VIId are an extension of the fisheries in the southern North Sea to all intents and purposes.

### Catch and Discard Data

In 2016 STECF data shows total catches of haddock in VIIbce-k were 17,612 tonnes with landings of 7,562 tonnes and discards of 10,050 tonnes. This gives a discard rate of 57%. In the smaller area of VIIf,g, total catches of haddock were 9,248 tonnes made of 3,104 tonnes of landings and 6,144 tonnes of discards.

Total catches of haddock by the TR1 fleets in 2016 for VIIbce-k were 9,198 tonnes with landings of 4,926 tonnes and discards of 4,272 tonnes. In VIIf,g catches were 6,012 tonnes (2,197 tonnes landings and 3,815 tonnes discards). The average discard rate over the period 2014-2016 was 46% for VIIbce-k and 63% VIIf,g.

For the TR2 fleets in 2016 for VIIb-k, total haddock catches were 4,094 tonnes with landings of 1,731 tonnes and discards of 2,362 tonnes. In the smaller area of VIIf,g catches were 1,559 tonnes made of 466 tonnes of landings and 1,093 tonnes of discards. The average discard rate over the period 2014-2016 was 58%% for VIIb-k and 70% in VIIf,g.

Total Irish catches in 2016 were recorded as 4,976 tonnes (2,249 tonnes landings and 2,727 tonnes discards). Irish discard rates for the TR1 fishery over the same period averaged 50% and for the TR2 fishery over the same period averaged 34%.

Based on this data a summary of the proposed de minimis exemptions is shown in Table 1.

**Table 1 Summary of proposed de minimis exemption for haddock VIIb-k**

Country	Exemption applied for (species, area, gear type)	Species as a bycatch or target	Number of vessels subject to LO	Landings (by LO subject Vessels)	Estimated Discards	Estimated Catch	Discard Rate	Estimated de minimis volumes
IE	Haddock, VIIb-k, TR1	Both	xx	1310.03	1313.72	2624.02	50%	183.68
IE	Haddock, VIIb-k, TR2	Bycatch	xx	557.16	1086.74	1643.9	33.9%	115.01
FR	Haddock,		xx	3532	4353	7885	55%	551

	VIIb-k (7d excepted), TR1							
FR	Haddock, VIIb-k (7d excepted), TR2		xx	1030	1035	2066	50%	145
UK	Haddock, VIIb-k, TR1	Bycatch	xx	371.59	582.85	954.44	61.07	66.81
UK	Haddock, VIIb-k, TR2	Bycatch	xx	124.07	340.06	464.13	73.27	32.49

## Current Regulations

The current mesh regulations in the Celtic Sea are complex with different mesh sizes required in different areas within the wider VIIb-k area. These Regulations are contained in Regulation (EC) 850/98 and also Regulation (EC) 737/2012. They are summarised in table 2 below.

Area – Celtic Sea	Species	Minimum Mesh Sizes
<b>VIIb-k (outside Celtic Sea Protection Zone and Hake Box)</b>	All demersal species except nephrops (max. 30% cod, haddock & saithe & max. 20% hake)	80mm
	Demersal (no restrictions)	100mm
	Nephrops (min. 35% & max. 20% hake)	70mm+80mm smp
	Nephrops (min. 30% & max. 20% hake)	80mm+80mm smp
<b>Inside Hake Box<sup>2</sup></b>	All demersal species (no restrictions)	100mm
<b>Celtic Sea Protection zone<sup>1</sup></b>	All demersal species except whiting & Nephrops (max. 30% cod, haddock & saithe & max. 20% hake)	80mm+120mm smp
	All demersal species (no restrictions)	100mm+120mm smp
	Nephrops (min 30% & max. 20% hake)	70mm+120mm smp
	Nephrops (min 30% & max. 20% hake)	80mm+120mm smp
<b>Celtic Sea Protection zone east of 8 ° west</b>	All demersal species except whiting & nephrops (max. 30% cod, haddock & saithe & max. 20% hake; max. 55% whiting)	80mm+120mm smp
	Demersal species except Nephrops with min. 55% whiting	100mm+100mm smp
	Nephrops (min 30% & max. 20% hake)	70mm+120mm smp
	Nephrops (min 30% & max. 20% hake)	80mm+120mm smp

## Supporting Selectivity Trials



Vessels having a mixed activity catch simultaneously a diversity of species during the same fishing operation. They are depending financially on several species (whiting, haddock, cod, anglerfishes, megrims, cephalopods), which are often spatially and temporally related. Thus, even if preliminary results of selectivity programs are encouraging (CELCELCT, Catchpole et al.), it is very difficult to improve selectivity without causing significant commercial losses.

This difficulty is even truer regarding the differences of those species morphology. Moreover, even with all scientists' efforts on developing mixed species models, it is for now unreal to find the appropriate balance between fishing opportunity taking into account technical and biological interactions. That is why, it is highly necessary to establish suitable solutions.

This specificity of mixed demersal fisheries justifies this exemption request due to this difficulty to improve the selectivity. Several results can attest of commercial catch losses link to selective gear tested until now on mixed gadoids fishery in the Channel (SELECCAB, SELECMER...). For example, the SELECMER program reveals commercial losses between 30% and 36% (pages 49, 54, 59) with the use of different selective devices aiming to reduce cod and small whiting catches (selective grid, eliminator trawl, square mesh...).

In addition to those situations of choke species, landing application enforcement may generate disproportionate cost due to hold overloading and increase the sorting time by the crew. Those arguments justify this de minimis request also for disproportionate costs. Several studies demonstrate those aspects: EODE program (Balazuc et al. 2016), discard study Cobrenord (OP COBRENORD, 2015), discard study OPN (Filippi, 2015), Catchpole (Catchpole et al, 2014). In combining those results on trawlers operating in the Channel and the Celtic Sea, we can emphasize that:

- Choke situation with a total landing obligation situation would cause a diminution of approximately 86% of turnover of bottom trawlers in the Channel and the Celtic Sea, with potential fishery closure in March (OP COBRENORD, 2015).
- The increase of variable costs due to treatment of unwanted catches cause a negative profitability for their exploitation, particularly for small size vessel (<12m) (Catchpole, page 32) ;
- In bottom trawler case in the Channel, total landing obligation enforcement would cause a workable time increase on board of 32% to 68% depending on vessel size (EODE, 2016). Besides, 20% of fishing trip could be concerned by hold overloading issues (EODE, 2016) and cause an increase of travel time of 9% to the detriment of fishing time (OP COBRENORD, 2015).

This de minimis request aims at giving some flexibility needed for fishermen, exercising bottom trawler metier, to implement the landing obligation.

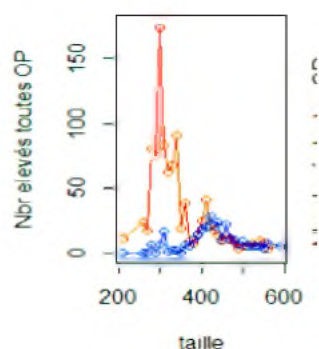
All French bottom trawlers fishing in the Channel are equipped with a square mesh panel 80 mm they keep. It gives consistency to this exemption that is also asked for the North Sea since these vessels work in Southern North Sea and in the Eastern Channel.

In order to improve the selectivity in the fisheries, the French fishing industry has set up two selectivity projects since 2014. Through these two projects, the French industry wants to provide a toolbox to skippers. This idea is justified by the fact that all the selectivity experiments show that the escapement of the same selective device can be highly variable across fleets, gears, seasons, etc. Therefore, there is not a "one fits all" solution and the fisherman might have a choice between several selective devices in order to choose the one that fits his activity.

The first one, CELSELC (project that took place between 2014 and 2017) was carried out on French bottom trawlers operating in the Celtic Sea and Western Channel, with the aim of decreasing their discards. Three basic devices were selected for the trials, according to the main fisheries:

- Extension + codend in meshes turned by 90° ("T90") 100 mm mesh size;

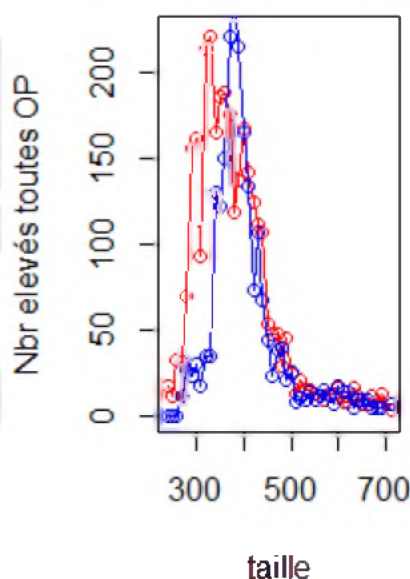
The use of the T90 meshing in the extension and codend offers an answer to the problem of choke species for fishing fleets operating on the West of the Celtic sea, by reducing appreciably the catches of boarfish, mackerel and horse mackerel, which can represent important volumes in punctual and not predictable catches (75-85 % reduction of the discards in weight). The interest of this device is also demonstrated to **reduce the catches of young Gadidea, mainly haddock** and whiting. Losses of these commercial species can exist in some cases, but these volumes do not seem to affect the very positive perception by the skippers of the use of this type of trawl. The implementation of this technique is simple and the global reduction of the volume of catches allows on one hand to limit the sorting on board and on the other hand to improve the quality of the valued part. It is important to note that the results are homogeneous in the various situations of use (boat, fishing zone, season...). The recognized efficiency of trawls equipped with an extension in 100mm T90 meshes led to an extension of their use for the fleet operating in Celtic Sea. However, it is not appropriate for the squid season, due to severe commercial losses.



*Fig. Catch of haddock by length (in orange: the standard trawl / in blue: the selective device)*

- 100 mm square meshes cylinder (SMC) (in addition to the mandatory 100mm and 120 mm square mesh panels (SMP)) with or without scaring floats:

The results obtained for the 100mm square mesh cylinder are less marked, even if the escape of the **small individuals of Gadidea seems improved**. The adjustment of the positioning of the device remains difficult to define and follow-up studies should be led to optimize the technical configurations. In the same way, the interest of the use of a scaring device remains to demonstrate.



*Fig. Catch of haddock by length (in orange: the standard trawl / in blue: the selective device)*

- Monkfish / Skates / Megrim grid (semi-elliptic).

The second project, named REJEMCELEC has been going on for two years and it is ending in 2018. It was set in a complementary way to the CELSELEC project in order to reduce whiting, haddock and pelagic discards for single bottom trawlers fleets targeting whiting, squids, cuttlefish and monkfish within the Western Channel. Here below some devices that has been tested:

- Square mesh panel (80 mm gauge) on the « baitings » and the extension, and 4 faces codend:

This selective device is appropriate to reduce haddock discards (the device reduces the unwanted catch by 35% for undersized haddock and 13% for the fourth commercial grade) but the 80 mm square mesh seems to be too large for the vessels targeting whiting (commercial loss of 39% for 33-36 cm whiting catches). In addition, there are probably some commercial losses on squids and red mullet

- T90 panel (80 mm gauge) on the «baitings» and the extension, and 2 faces codend:The selective device let escape undersized haddocks and has very good results when vessels are targeting whiting above the fourth commercial grade. There is no commercial losses for haddock and whiting.

## TR 1

In the TR1 fisheries improvements in selectivity for haddock can be achieved through simple increases in codend mesh size, large mesh square mesh panels and the use of T90 or square mesh codends.

Since 2010 six studies have been carried out by Ireland testing the selectivity of a range of gear combinations in the mixed demersal fisheries in the Celtic Sea. These selectivity trials have been carried in both the TR2 fishery targeted mixed demersal species and the TR1 fleet targeting haddock and other gadoids. The trials in the TR1 fishery are relevant as they illustrate the extent of losses in marketable fish that would result if selectivity in these fisheries was increased. Table 3 summarises the trials conducted and the gear combinations tested.

**Table 3 Summary of Celtic Sea selectivity trials carried out by Ireland in the period 2010-2015**

Date	Vessel	Vessel Type	LOA	KW	Gear combinations tested	Method Used
July 2010 <sup>1</sup>		OTB Twin-rig	13m	112Kw	100mm 120mm	Paired selectivity
July 2010 <sup>1</sup>		OTB Twin-rig	17m	308Kw	100mm+120mm smp 110mm	Paired selectivity



Sept 2012 <sup>2</sup>		OTB single-rig	25m	600Kw	100mm + 100mm smp	Covered codend
Oct 2013 <sup>3</sup>		OTB single-rig	22m	600Kw	100mm+ 160mm smp 110mm +100mm smp 120mm + 100mm smp	Covered codend
Oct 2014 <sup>4</sup>		OTB single-rig	22m	600Kw	120mm +120mm smp	Covered codend
April 2016 <sup>5</sup>		OTB twin-rig	24m	500kw	80mm T90	Twin trawl

<sup>1</sup> BIM, 2010; <sup>2</sup> BIM 2012; <sup>3</sup> BIM, 2013; <sup>4</sup> BIM 2014, <sup>5</sup> BIM, 2016

### Codend mesh size

Ireland and other Member States have carried out a number of trials that have measured the effects of increasing mesh size in whitefish fisheries. All of these trials show that increasing mesh size reduces unwanted catches of haddock but also of whiting, megrim, sole, hake and plaice that are commonly caught with haddock.

The first two sets of trials carried out on the [REDACTED] and the [REDACTED] (BIM, 2010) were carried out prior to the technical measures being introduced into the Celtic Sea under Regulation (EU) 737/2012 specifically to protect gadoids. They were carried using the twin trawl method was identified as being applicable for this study as described by ICES (1996). For this method a small mesh codend is attached to one trawl to obtain an estimate of the total fish population entering the test codend, fished on the other side of the twin-rig arrangement. Thus the length-frequency distributions of fish from the two codends allow the calculation of the selectivity parameters of the uncovered test codend. During each haul, the starboard net fished the test configuration and the port net fished a 40 mm diamond mesh control codend to sample the total population on the grounds.

At the time of these trials the legal gear was 80mm codend mesh size (with no square mesh panel). These trials considered the effect of increasing mesh size from 80mm to 120mm in the mixed demersal fishery. Several combinations of codends and square mesh panels were also considered and are reported in the following section. For the TR1 fisheries the results from the trials with codend mesh sizes of 100mm, 110mm and 120mm are relevant.

Table 4 shows the 50% retention length (L50) increases for haddock and for other associated species such as whiting and megrim with increasing mesh size. With a codend mesh size of 100mm the L50 for haddock is below the mcrs, indicating relatively poor selectivity for haddock. The L50 for haddock increases with mesh size and with 110mm and 120mm mesh size L50 is in excess of the mcrs.

**Table 4 50% Retention lengths (L50) and selection ranges (SR) for haddock, whiting and megrim for selected codend mesh sizes**



Codend mesh size	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)	
	L50	SR	L50	SR	L50	SR
100mm	28 <sup>1</sup>	11.9 <sup>1</sup>	36 <sup>1</sup>	14 <sup>1</sup>	34.6 <sup>1</sup>	11 <sup>1</sup>
110mm	33 <sup>2</sup>	19.5 <sup>2</sup>	37.4 <sup>2</sup>	18 <sup>2</sup>	38.5 <sup>2</sup>	14.7 <sup>2</sup>
120mm	42.7 <sup>1</sup>	9 <sup>1</sup>	No data		41.2 <sup>1</sup>	9.5 <sup>1</sup>

1 [redacted] 2 [redacted]

Table 5 shows the percentage of fish below and above mcrs retained in the test codend relative to the total number of fish caught in the test codend and small mesh codend combined i.e.:

#### Number of fish retained in the test codend

Total number of fish retained in the test codend and small mesh codend (control)

**Table 5 Total numbers of haddock, whiting and megrim retained in the test codends above and below mcrs relative to the total catch**

Codend mesh size	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)	
	< mcrs	> mcrs	< mcrs	> mcrs	< mcrs	> mcrs
100mm	66% <sup>1</sup>	53% <sup>1</sup>	99% <sup>1</sup>	67% <sup>1</sup>	100% <sup>1</sup>	68% <sup>1</sup>
110mm	61% <sup>2</sup>	55% <sup>2</sup>	85% <sup>2</sup>	45% <sup>2</sup>	73% <sup>2</sup>	84% <sup>2</sup>
120mm	99% <sup>1</sup>	83% <sup>1</sup>	100% <sup>1</sup>	92% <sup>1</sup>	Na <sup>1</sup>	88% <sup>1</sup>

1 [redacted]

2 [redacted]

These results indicate that as mesh size increases the numbers of haddock below and retained decrease significantly. However, there are also losses of marketable haddock above mcrs mainly in the size range from 30-35cm. For whiting and megrim losses of marketable catch are high with almost no marketable fish retained. It should be noted that these trials were carried out on low horsepower vessels and therefore represent an extreme case. There are currently very few Irish vessels of this size range currently using this gear type. The length frequency distribution curves are shown in Annex I.

#### Square Mesh Panels

The 2010 trials on the [redacted] and the [redacted] also tested 120mm square mesh panels used in combination with codends of 80mm, 90mm and 100mm (BIM, 2010). All square mesh panels were placed 9-12m from the codend. Relevant to the TR1 fisheries are the trials with the 100m +120mm smp gear combination

which is the current legal gear in the Celtic Sea Protection Zone within ICES VIIb-k defined in Regulation (EU) 737/2012. Table 6 below shows the L50s for haddock, whiting, megrim and hake for the range of gears tested.

**Table 6 50% Retention lengths (L50) and selection ranges (SR) for haddock, whiting, megrim and hake for selected codend mesh sizes and smp combinations**

Codend/SMPcombination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)		Hake (mcrs = 27cm)	
	L50	SR	L50	SR	L50	SR	L50	SR
100mm/120mm smp <sup>1</sup>	39.2	10.8	No data		38.8	16.2	No data	

The results show that the current legal gear (100mm + 120mm smp) in the Celtic Sea Protection Zone in section 2 is selective for haddock, with an L50 above the mcrs. Table 7 shows the percentage of fish retained in the test gear combinations relative to the total catch observed from the test gear and the control small mesh codend. The results from these trials show the current 100mm+120mm smp used in the fishery is reasonably selective but still retains relatively high numbers of fish < mcrs but lesser numbers of whiting and megrim < mcrs..

Annex II shows the corresponding length frequency curves for whiting, haddock, megrim and hake.

**Table 6 Total numbers of whiting, haddock, megrim and hake retained in the test codends above and below mcrs relative to the total catch**

Codend/SMPcombination	Haddock (mcrs= 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)		Hake (mcrs = 27cm)	
	< mcrs	> mcrs	< mcrs	> mcrs	< mcrs	> mcrs	< mcrs	> mcrs
100mm/120mm smp <sup>1</sup>	38%	46%	12%	22%	7%	31%	35%	40%

Further trials on the Foyle Warrior in 2012 tested a 100mm codend+ 100mm square mesh panel and an 80mm +110m smp gear combination (BIM, 2012). These trials were conducted using the covered codend method as reported by ICES (1996). The catch in the codend and cover combined provide a measurement of the total fish population entering the codend allowing estimation of selectivity.

Table 8 below shows the L50s for haddock, whiting, megrim and hake for 100mm +100mm gear combinations tested in this trial, which is relevant for the TR1 fisheries. The results show that the 100mm+100mm smp gear combination gives reductions in marketable haddock catches in the range of 30-37cms. Catches of

marketable whiting are significantly reduced with these gear combinations in this trial.

Annex III shows the corresponding length frequency curves for haddock, whiting and hake.

**Table 8 50% Retention lengths (L50) and selection ranges (SR) for whiting, haddock and hake for selected codend mesh sizes and smp combinations**

Codend/SMPcombination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Hake (mcrs = 27cm)	
	L50	SR	L50	SR	L50	SR
100mm/100mm smp	33.4	8.2	37.4	6.5	37.9	9.6

Table 9 below shows the percentage of retained fish at the mcrs and also at different marketable sizes for haddock, whiting and hake above which all fish are routinely retained. Fish between this size and the mcrs are quite often discarded due to their low market value.

**Table 9 Total numbers of haddock, whiting, megrim and hake retained in the test codends relative to the total catch at mcrs and at selected market grades**

	Percentage Retained
	100mm + 100mm smp
Haddock at mcrs (30cm)	26%
Grade 3 haddock (37cm)	70%
Whiting at mcrs (27cm)	25%
Grade 3 whiting (32cm)	14%
Hake at mcrs (27cm)	30%
Hake at 1kg (50cm)	93%

Three separate sets of trials were carried out on the Northern Celt in 2013 (BIM 2013) and 2014 (BIM, 2014). The first trials were carried out in area VIIj. and anglerfish and megrim were the main target species. The other sets of trials were carried out in VIIg where haddock and whiting were the main target species. These trials looked at a range of gear combinations with codends of 80mm, 100mm, 110mm and 120mm with square mesh panels of 100mm, 120mm, 140mm and 160mm. As with the previous trials the covered codend method was used.

Table 10 shows the L50s for haddock, whiting, megrim and hake for the gear combinations relevant to TR1 fisheries. The L50 for haddock observed with a 120mm + 100mmsmp and 120mm + 120mm smp are thought to be an underestimate. Earlier trials carried out in Area VIa (BIM, 2009) report an L50 of 47.2cm and 38.97cm for haddock with this gear combination. These trials also showed an L50 of whiting of 38.7cm and 33cm for haddock with a 110mm+110m smp.

The L50s for haddock are all above mcrcs with the 110mm+100mm smp being the least selective gear combination, In these trials increasing the mesh size square mesh panel appeared to be an effective way of improving selectivity but losses of marketable whiting particularly those just above mcrcs were significant.

**Table 10 50% Retention lengths (L50) and selection ranges (SR) for whiting, haddock and megrim for selected codend mesh sizes and smp combinations**

Codend/SMPcombination	Haddock (mcrcs = 30cm)		Whiting (mcrcs = 27cm)		Megrim (mcrcs = 20cm)	
	L50	SR	L50	SR	L50	SR
	Trial 1					
100mm/160mm smp <sup>1</sup>	38.7	15	52	13.5	30.5	20.5
	Trial 2					
110mm/100mm smp <sup>1</sup>	32.8	8.8	35.3	9.4	No data	
120mm/100mm smp <sup>1</sup>	38.7	15	33	10.1	No data	
	Trial 3					
120mm +120mm smp <sup>2</sup>	35.4	17.5	39.3	17	No data	

<sup>1</sup> 2013 trials, <sup>2</sup> 2014 trial

Table 11 below shows the numbers of fish retained above and below mcrcs for each species observed for the different gear combinations.

**Table 11 Total numbers of haddock, whiting and megrim retained in the test codends relative to the total catch at mcrcs**

	Percentage Retained			
	Trial 1	Trial 2		Trial 3
	100mm/160mm smp	110mm/100mm smp	120mm/100mm smp	120mm/120mm smp
Haddock < mcrcs	22%	16%	6%	31%
Haddock > mcrcs	35%	30%	18%	47%



Whiting mcrs	<	8%	18%	9%	7%
Whiting mcrs	>	40%	34%	45%	25%
Megrim mcrs	<	24%	No data	No data	No data
Megrim mcrs	>	37%	No data	No data	No data

The results show that retention of haddock below mcrs is low with all four gear combinations tested. For haddock above mcrs losses of marketable fish increase with increased mesh size noting that the results from the trials with the 120mm+120mm are thought to be an overestimate due the low numbers of haddock encountered during this trial.

Annex IV shows the corresponding length frequency curves for whiting, haddock and megrim.

In conclusion as mesh size increase catches of undersized haddock and whiting are reduced. With a mesh size of 120mm unwanted catches below mcrs are reduced to very low levels.

Results from trials in the Celtic Sea in 2013 showed that with a 120mm codend and 100mm square mesh panel virtually no haddock and whiting less than 20cm were retained but there are losses of marketable catch. For haddock these losses are more moderate (~30-50%) and mostly of lower size grade fish. For whiting these losses are much higher (~60-70%).

Trials with large square mesh panels in the Celtic Sea and West of Scotland have shown that increasing the mesh size of the panel over 120mm leads to improvements in selectivity for whiting and haddock. A 2013 Celtic Sea trial of a 100 mm codend with a 160mm SMP yielded reductions in undersize haddock and whiting of 78% and 97% respectively. As with an increase in codend mesh size to 120 mm there were corresponding losses of marketable haddock and whiting.

It is also interesting to note the results from Irish trials in 2015 with T90 codends of 80mm mesh size showed catches of undersized whiting could be reduced by 60% (BIM, 2015). However, in these trials catches of undersize haddock did not decrease. Research conducted by Ifremer in the Celtic Sea has demonstrated that a larger 100 mm T90 mesh substantially reduces catches of undersize haddock but also results in 20 to 30 % losses in market sized whiting.

The results from these trials while not directly comparable given the differences in vessels, gears, the methodologies used to measure selectivity, catch composition and the prevailing environmental conditions which all have a bearing on selectivity do support the justification for this de minimis exemption. The trials show increasing selectivity by whatever means generally results in reductions in undersize haddock and whiting but also leads to losses of marketable haddock and whiting and other species caught in the fishery.







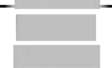
## TR 2

In the TR2 fisheries the main focus of Irish selectivity work has been in improving selectivity in the directed *Nephrops* fisheries. The trials have considered increasing codend mesh size, square mesh and other types of escape panels as well as the use of rigid sorting grids.

The vessels operating in this fishery in the Celtic Sea have been subject to the Landing Obligation since 2015 for *Nephrops* and whiting. Haddock has not been subject to the Landing Obligation as yet. ICES report that discarding of haddock in the *Nephrops* fisheries in the Celtic Sea can be high despite the introduction of improved selectivity measures. However, discard rates differ between FUs with the highest discard rates reported in the Smalls (FU 22) and Aran grounds (FU 17). Discards of haddock are much lower in the Porcupine (FU 16) and Labadie (FU 20-21) fisheries.

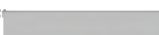
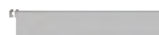
Since 2009, eleven studies have been carried out by Ireland testing the selectivity of a range of gear combinations in directed *Nephrops* fisheries. Much of this work has been carried out in the *Nephrops* fisheries in the Irish Sea but is considered representative of the *Nephrops* fisheries in the Celtic Sea given the gears used and the catch compositions are similar. Table 12 summarises the trials conducted and the gear combinations tested

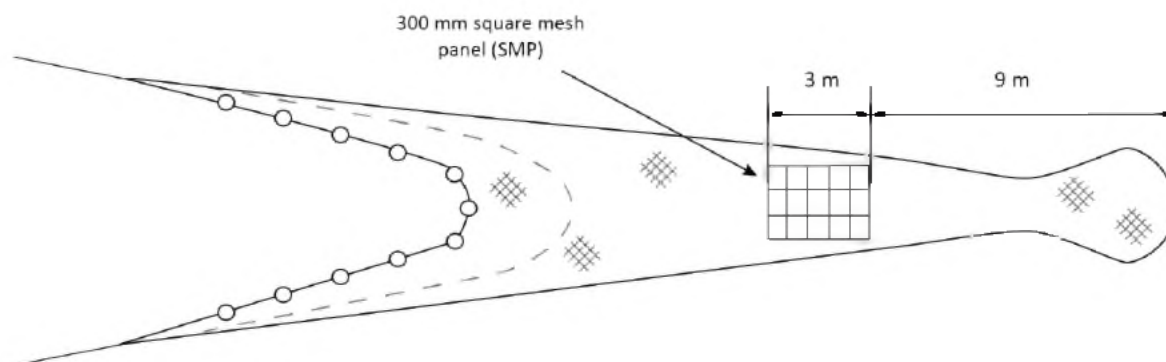
Date	Vessel	Vessel Type	LOA	KW	Gear combinations tested	Method Used
March/April 2009		OTB Twin-rig	24.7	421	Swedish sorting grid Inclined separator panel 100mm codend + 160mm SMP	Twin-trawl
June 2009		OTB twin-rig	22.4	440	100mm + 200mm SMP Coverless Trawl	Twin-trawl
April/May 2012		OTB twin-rig	24.9	370	SELTRA Sorting Box (200mm smp)	Twin-trawl
August 2014		OTB quad-rig	23.5	441	70mm codend + 300mm smp	Quad-rig

July 2015		OTB quad-rig	24.9	370	80mm codned 90mm codend 100mm codend	Quad-rig
September 2015		OTB quad-rig	23.5	441	SELTRA sorting Box (300mm smp)	Quad-rig
September 2015		OTB quad-rig	22	484	Swedish grid Nephrops Sorting grid + 70mm codend Nephrops Sorting grid + 75mm codend	Quad-rig
February 2016		OTB quad-rig	23.5	441	45mm square mesh codend 55mm square mesh codend 65mm square mesh codend	Quad-rig
September 2016		OTB Twin-rig	18	224	SELTRA Sorting Box (300m smp)	Twin-rig
December 2016		OTB Twin-rig	18	224	SELTRA Sorting Box (300m smp) with adapter section	Twin-rig
April 2017		OTB Twin-rig	18	224	SELTRA Sorting Box (300m smp) with adapter section and inclined panel	Twin-rig

The most relevant trials to consider in the context of this de minimis exemption are those with 300mm square mesh panels, the SELTRA box codend and the Swedish sorting grid. All three of these gears are recognised as highly selective gears and currently Irish vessels targeting *Nephrops* in the Irish Sea must use one of these three gears. A summary of the results observed with these gears is provided in the following sections.

### 300mm Square Mesh Panels

Assessment of a 300 mm square-mesh panel (as shown in Figure xx) in the Irish Sea *Nephrops* fishery was carried out in 2014 and again in 2016 (compared to a SELTRA sorting box) on board the mfvs "" and "". These trials were carried out as catch comparison experiments testing against the current legal gear of 80mm codend with 80mm smp required in the Irish Sea.



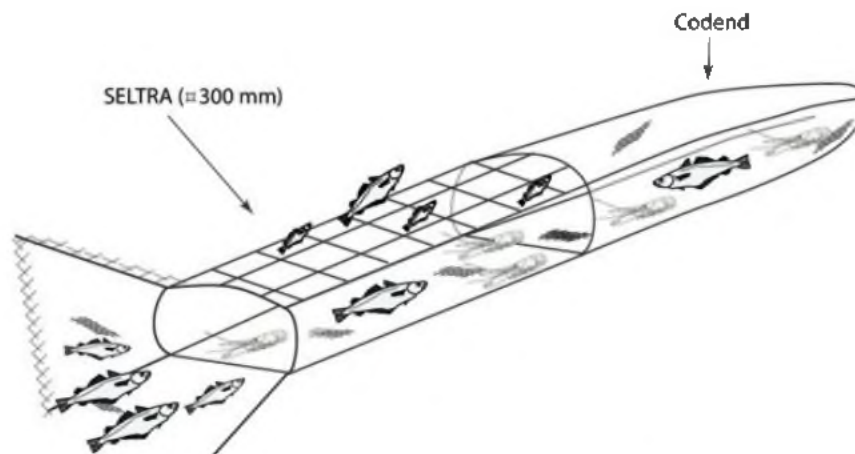
During the first set of trials reductions of total catches of haddock and whiting of 52% and 70% respectively were observed. Over 80% of the haddock and whiting caught were below the mcrs so these reductions apply primarily to fish below mcrs. Marginal increases in *Nephrops* and reductions in flatfish catches compared with the standard trawl were observed. Reductions in catches were consistent across size classes for haddock and whiting. The length frequency curves for haddock and whiting are shown in Annex xx.

The 300mm smp was further tested against a SELTRA sorting box codend in 2016 on board the mfv [REDACTED]. The results of these trials showed the SELTRA performed better than a standard 300 mm SMP achieving further reductions in catches of haddock and whiting below mcrs of 98% and 53%. However, the trawl with the 300mm smp retained relatively few fish below mcrs for both species and the losses of marketable haddock and whiting above mcrs was significantly reduced using the 300mm smp.

### SELTRA Sorting Box Trawl

A number of assessments of the SELTRA sorting box (as shown in Figure xx) in the Irish Sea and Celtic Sea have been carried out in 2012, 2015, 2016 and 2017 on the mfvs [REDACTED], [REDACTED] and [REDACTED]. These trials have also been conducted as catch comparison trials comparing the SELTRA sorting box codend of 200mm and 300mm smp and 70mm codends with standard Regulation gear and in one case (as reported earlier) against a trawl fitted with a 70mm codend and 300mm smp.

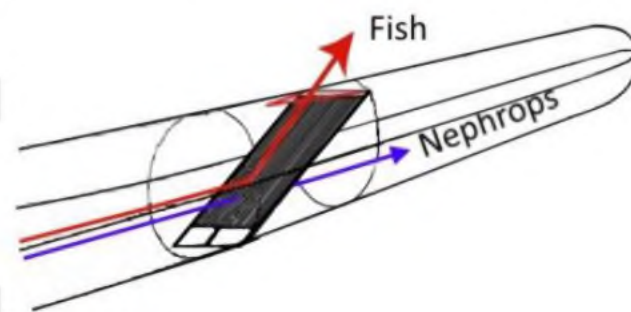




In all trials substantial reductions in fish catches in the SELTRA compared with a standard trawl or 300mm smp were observed. Reductions were 91% of haddock and 57% for whiting respectively. *Nephrops* catches improved by 9% in the SELTRA compared with a standard trawl (BIM, 2012, 2015, 2016 and 2017).

### Sorting Grids

Testing of sorting grids (as shown in Figure xx) began in 2009 in the Celtic Sea on board the mfv "██████████", in 2010 in the Irish Sea on the mfv "██████████". More recent work completed 2015 in the Irish Sea was completed on board the mfv "██████████". A standard Swedish fish sorting grid and a modified *Nephrops* sorting grid were tested during these trials on the basis of catch comparison experiments.



In all trials with the sorting grid, the results have shown that it reduces haddock and whiting catches by 60% and 70% respectively of haddock and whiting above ~ 23cm while reducing cod catches by almost 100%. As demonstrated in a number of studies, mixed results have been obtained with very small gadoids of less than ~20cm which can pass through the space between the bars of the grid. This is a particular issue in the Irish Sea but less of a problem in the Celtic Sea where such small haddock and whiting are not as predominant.

While it is possible to combine the grid with a more selective codend constructed in a bigger mesh size or constructed in square mesh, BIM trials of such measures have shown that they will reduce the catches of *Nephrops* significantly and potentially

make the fishery uneconomic. Losses of larger *Nephrops* have been reported when using the Swedish grid. In the most recent trials a reduction of 11% in *Nephrops* > 31 mm compared with the control net was observed. Other trials have shown no reductions in *Nephrops* catches.

In conclusion the trials conducted have shown all three of the three gears to be selective for haddock, whiting and a lesser extent cod. The sorting grid and SELTRA have been shown to be most effective at reducing unwanted catches. However, they also have been shown to give significant reductions in marketable catches. The 300mm smp is less effective at reducing unwanted catches but has corresponding lower losses of marketable catch. None of these devices seem to significantly reduce the catch of *Nephrops*. It is therefore considered that these three gear options are a reasonable compromise between increased selectivity and maintaining economically viable fisheries. Fishermen may choose to use these gears depending on whether they have quota for bycatch species such as haddock, whiting and cod. In situations where they have little or no quota then the grid and SELTRA are more appropriate devices to continue fishing.

### Targeted whiting and mixed demersal fisheries

In the other TR2 fisheries – the targeted whiting and mixed demersal fisheries - the results from some of the trials indicated above for the TR1 fisheries are directly relevant. As with the TR1 fisheries the focus has been on increases in codend mesh size, large mesh square mesh panels and the use of T90 or square mesh codends that have been shown to reduce unwanted catches of haddock. Trials have been carried out with both trawl and seine net gears. The relevant trials are outlined in Table 13 below.

Date	Vessel	Vessel Type	LOA	KW	Relevant gear combinations tested	Method Used
July 2010 <sup>1</sup>		OTB Twin-rig	13m	112Kw	80mm 90mm 90mm + 120mm smp 100mm	Paired selectivity
July 2010 <sup>1</sup>		OTB Twin-rig	17m	308Kw	80mm 80mm+120mm smp 100mm+120mm smp	Paired selectivity
July 2011		SSC	18m	260Kw	100mm+110mm SMP	Alternate hauls
June 2012		SSC	18m	260Kw	100mm+100mm SMP	Alternate hauls

Sept 2012 <sup>2</sup>		OTB single-rig	25m	600Kw	80mm+110mm smp 100mm + 100mm smp	Covered codend
Oct 2013 <sup>3</sup>		OTB single-rig	22m	600Kw	80mm +140mm smp 100mm+ 160mm smp	Covered codend
April 2016 <sup>5</sup>		OTB twin-rig	24m	500kw	80mm T90	Twin trawl

The first two sets of trials carried out on the [redacted] and the [redacted] (BIM, 2010), as reported under the TR1 fisheries, considered a range of increases in codend mesh sizes and also square mesh panels.

At the time of these trials the legal gear was 80mm codend mesh size (with no square mesh panel). These trials considered the effect of increasing mesh size from 80mm to 120mm primarily in the mixed demersal fishery. Table 14 shows the 50% retention length (L50) increases for haddock and for other associated species such as whiting and megrim with increasing mesh size. These results indicate that as mesh size increases the L50 for haddock increases slightly but even with a 100mm codend, the L50 remains below mcrs. For whiting and megrim L50 is above mcrs when codend mesh size increases to 90mm.

**Table 14 50% Retention lengths (L50) and selection ranges (SR) for haddock, whiting and megrim for selected codend mesh sizes**

Codend mesh size	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)	
	L50	SR	L50	SR	L50	SR
80mm	24.2 <sup>1</sup>	11.2 <sup>1</sup>	26.4 <sup>1</sup>	12 <sup>1</sup>	27.6 <sup>2</sup>	12.7 <sup>2</sup>
90mm	27.1 <sup>1</sup>	13.1 <sup>1</sup>	31.1 <sup>1</sup>	9.6 <sup>1</sup>	33.8 <sup>1</sup>	17.4 <sup>1</sup>
100mm	28 <sup>1</sup>	11.9 <sup>1</sup>	36 <sup>1</sup>	14 <sup>1</sup>	34.6 <sup>1</sup>	11 <sup>1</sup>

Further experiments were carried out on these two vessels with a range of codend and smp combinations as shown in Table 15. The results show that for haddock L50 was above mcrs with a combination of 90mm and 120mm smp and is well in excess of the L50 with a 100mm+120mm smp combination. All there gear combinations result in L50s in excess of the respective mcrs for whiting and megrim. For hake only data is available for the 90mm+120mm smp combination.

**Table 15 50% Retention lengths (L50) and selection ranges (SR) for haddock, whiting, megrim and hake for selected codend mesh sizes and smp combinations**

Codend/SMPcombination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)		Hake (mcrs = 27cm)	
	L50	SR	L50	SR	L50	SR	L50	SR
80mm/120mm smp <sup>1</sup>	28.2	14.8	32.8	13.5	29.1	15.6	No data	
90mm/120mm smp <sup>2</sup>	34.5	18.3	37.2	9	33.2	14.6	32.3	17.8
100mm/120mm smp <sup>1</sup>	39.2	10.8	No data		38.8	16.2	No data	

The trials on the [REDACTED] in 2012 were carried out in ICES VIIg in the directed whiting fishery and tested an 80mm codend and 110mm square mesh panels as well as a 100mm codend with a 100mm square mesh panel (BIM, 2012). Table 16 below shows the L50s for haddock, whiting and hake for the two gear combinations tested in this trial.

**Table 16 50% Retention lengths (L50) and selection ranges (SR) for haddock, whiting and hake for selected codend mesh sizes and smp combinations**

Codend/SMPcombination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Hake (mcrs = 27cm)	
	L50	SR	L50	SR	L50	SR
80mm/110mm smp	33	14	32.1	6.61	31	12.8
100mm/100mm smp	33.4	8.2	37.4	6.5	37.9	9.6

The results indicate that both combinations tested during this trial are selective for haddock with an L50 in excess of the mcrs. There was very little difference between the two gear combinations tested. Similarly for whiting and hake, the L50s observed are in excess of the mcrs for these species with the 80mm+110mm smp combination and well in excess of the mcrs with the 100mm+100mm smp combination.

Table 17 below shows the percentage of retained fish at the mcrs and also at different marketable sizes for whiting, haddock and hake above which all fish are routinely retained. Fish between this size and the mcrs are quite often discarded due to their low market value.

**Table 17 Total numbers of, haddock, whiting megrim and hake retained in the test codends relative to the total catch at mcrs and at selected market grades**

	Percentage Retained	
	80mm +110 smp	100mm + 100mm smp
Haddock at mcrs (30cm)	37%	26%
Grade 3 haddock (37cm)	65%	70%
Whiting at mcrs (27cm)	14%	25%
Grade 3 whiting (32cm)	50%	14%
Hake at mcrs (27cm)	65%	30%
Hake at 1kg (50cm)	98%	93%

The results show that the losses of marketable whiting and hake are more pronounced with the 100mm+100mm smp gear combination. Catches of marketable haddock are similar with both gears.

Of the trials carried out on the Northern Celt in 2013 (BIM 2013) and 2014 (BIM, 2014), only the tests with an 80mm+140 smp are relevant to the TR2 fisheries. This trial was carried out in the mixed demersal fishery where haddock is a bycatch. Table 18 shows the L50s observed for haddock, whiting and megrim.



**Table 18 50% Retention lengths (L50) and selection ranges (SR) for whiting, haddock and megrim for selected codend mesh sizes and smp combinations**

Codend/SMP combination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Megrim (mcrs = 20cm)	
	L50	SR	L50	SR	L50	SR
80mm/140mm smp <sup>1</sup>	25	15	47	16	21.5	9.9

The results indicate that in this trial, this gear combination did not appear to be selective for haddock or for megrim but was highly selective for whiting. It was observed that 65% of haddock < mcrs were still retained with this gear combination. However, during this trial the number of haddock greater than 25cm observed was very low and the result may be an underestimate.

There have been two trials on the seine net vessel MFV "██████" in the targeted whiting fishery. These trials were carried out in July 2011 and June 2012 and tested a 100mm codend+110mm square mesh panel and a 100mm codend+100mm smp against a standard 100mm codend. These trials were conducted as a catch comparison experiment using the alternate haul method. Seine nets are regarded as being more selective than trawl gears although a review by ICES in 2011 did not find any appreciable difference based on the results of a number of separate selectivity experiments with this type of gear. The results from the Ashrona trials are summarised in Table 19.

**Table 19 Total numbers of haddock, whiting and megrim retained in the test codends relative to the total catch at mcrs**

Codend/SMP combination	Haddock (mcrs = 30cm)		Whiting (mcrs = 27cm)		Hake (mcrs = 27cm)	
	<mcrs	>mcrs	<mcrs	>mcrs	<mcrs	>mcrs
100mm/110mm smp <sup>1</sup>	41%	40%	No data	19%	No data	51%
100mm/100mm smp <sup>2</sup>	42%	98%	No data	64%	No data	102%

<sup>1</sup> ████████ – July 2011; <sup>2</sup> ████████ June 2012

The results from this trial show that a 100mm codend without a smp fitted catches large quantities of haddock < mcrs. The addition of the 100mm or 110mm smp improves selectivity quite significantly and reduces the haddock retained below mcrs. Both gear combinations lead to losses of marketable fish. These losses are highest with the 110mm smp.

The results from Irish trials in 2015 with T90 codends of 80mm mesh size are relevant to the TR2 fisheries. In these trials catches of undersized whiting were reduced by 60% (BIM, 2015). However, catches of undersize haddock did not decrease. Research conducted by the French institute, IFREMER in the Celtic Sea has demonstrated that a larger 100 mm T90 mesh substantially reduces catches of undersize haddock but also results in 20 to 30% losses in market sized whiting.

Further testing of this type of codend is required to identify the best compromise mesh size for T90 codends.

In conclusion, based on the limited number of trials carried out it seems reasonable that continued use of a smaller codend mesh size than in the TR1 fisheries is appropriate, given the catch composition and reliance on whiting and at certain times of the year, hake. Further increases in selectivity may make this fishery uneconomic given the likely losses of marketable catch. In the mixed demersal fisheries which operate largely outside the Celtic Sea Protection Zone, given catches of haddock are much lower than in other fisheries and the target species in these fisheries are primarily anglerfish and megrim there seems little merit in requiring a smp to be fitted.

## **Conclusions**

The main conclusions are as follows:

- The discard rates of haddock in both TR1 and TR2 fisheries in the Celtic Sea are high (~50%). Therefore in line with the Council Declaration on selectivity and also as haddock has been identified as a high risk choke stock it is important to improve selectivity in fisheries catching haddock in the Celtic Sea.
- In order to allow the vessels involved adapt to using more selective gears this de minimis exemption is important to allow limited discarding of residual unwanted catches that are likely to remain.
- Improving selectivity in fisheries targeting haddock should result in increased catches of larger fish with a higher economic value which will help to offset any short-term losses in marketable catch associated with using these more selective gears.
- In the TR1 mixed gadoid fisheries the current regulation gear inside the Celtic Sea Protection Zone of 100mm+120mm smp where the majority of landings are taken in this fishery is selective for whiting but less so for haddock. Based on the results of the trials increasing codend mesh size and maintain the existing 120mm smp would seem appropriate. The alternatives would be look at T90 mesh in the codend and extension which has also been shown to improve selectivity for gadoids. Any increases in selectivity will undoubtedly reduce the marketable catch of whiting, hake and flatfish species.
- In the other TR1 fisheries, haddock catches are much lower and there is less of necessity to increase selectivity overly in the short term. The combination of losses of haddock and other associated species such as megrim, whiting and hake resulting from increasing selectivity would make these fisheries uneconomic.
- In the TR2 *Nephrops* fisheries moving from 80mm+120mm smp to using an 80mm codend with a 300mm smp, SELTRA box codend or sorting grid will increase the selectivity for haddock significantly without reducing catches of

*Nephrops unduly*. Based on the results of the trials the use of any of these devices will reduce haddock catches by between 50-90%.

- Based on the results from the trials and model predictions the use of a 100mm+100mm smp gear combination in the TR2 directed whiting fishery will give an estimated L50 of between 31-33cm for haddock and an L50 for whiting of 35-37cm.
- In the other TR2 mixed demersal fisheries, where catches of haddock are much lower an increase in codend mesh from 80mm to 100mm would have limited impact for haddock but would give a general improvement in these fisheries where discarding of other species such as hake can be significant.

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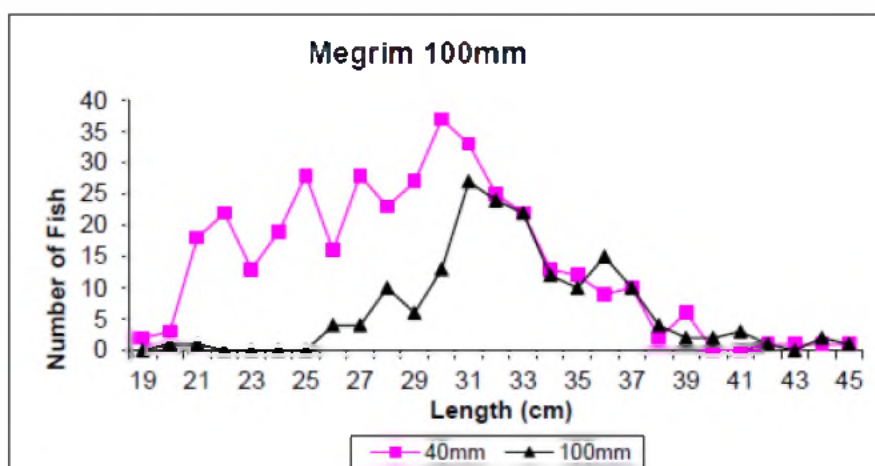
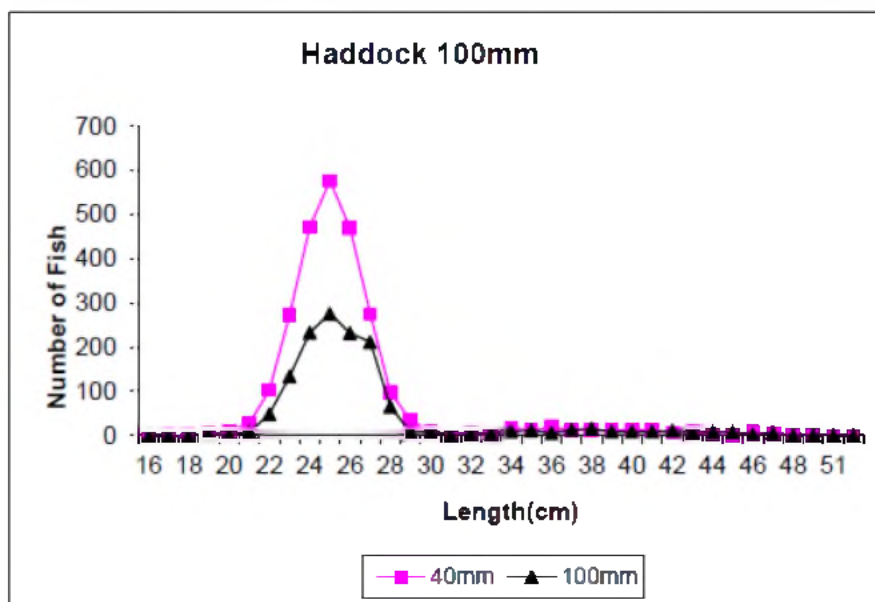
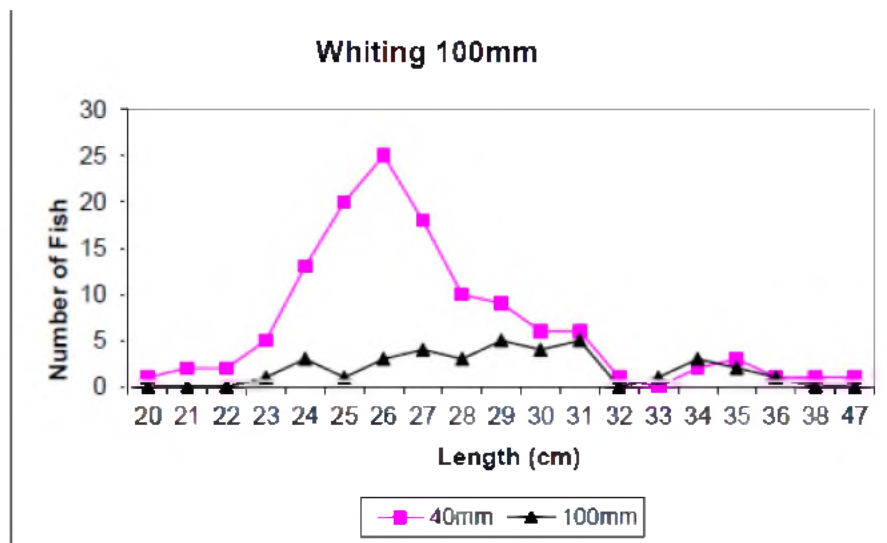
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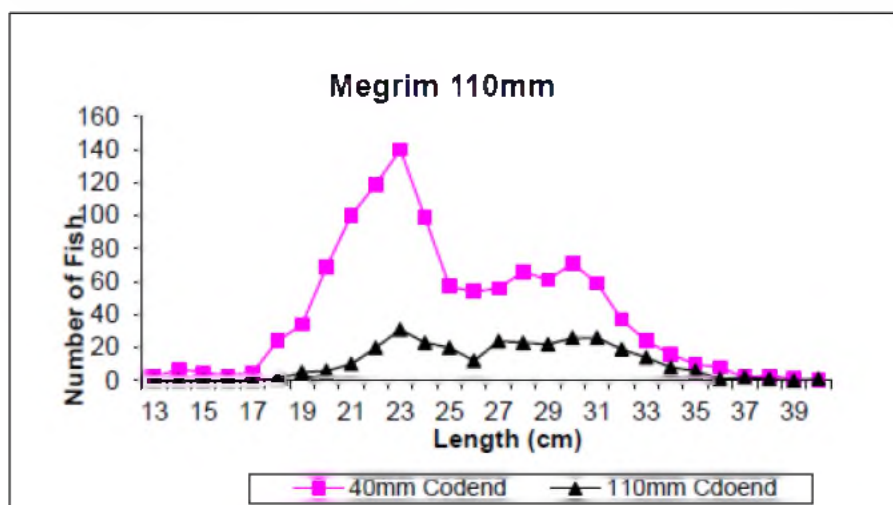
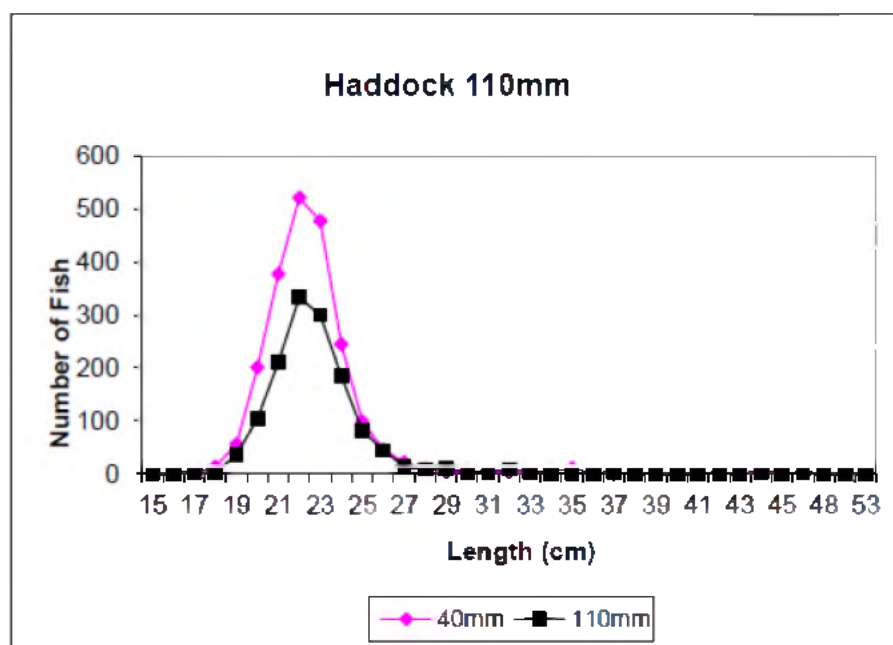
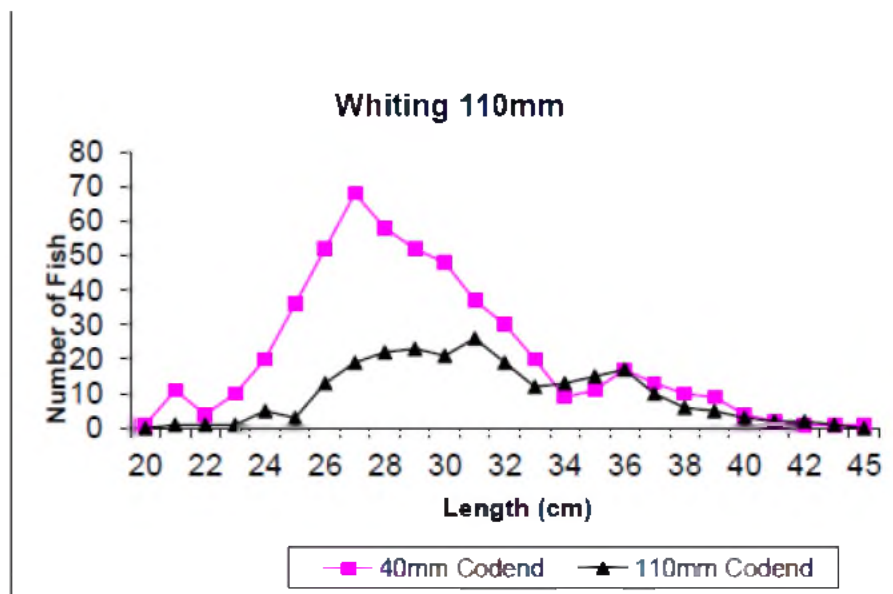
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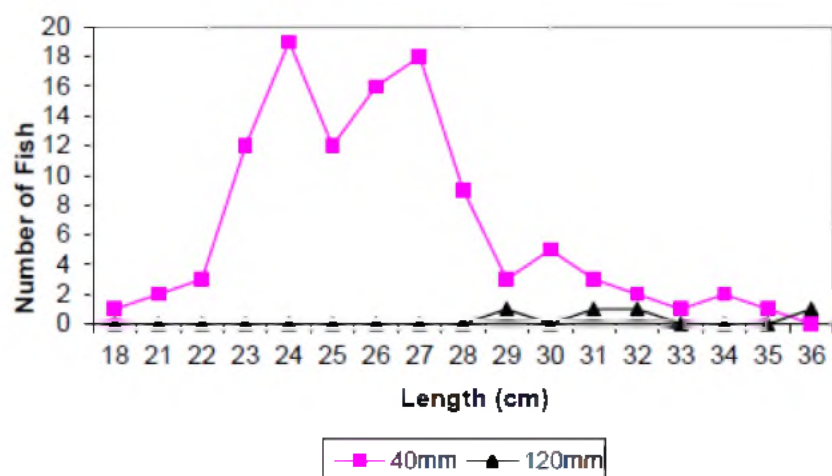
## Annexes



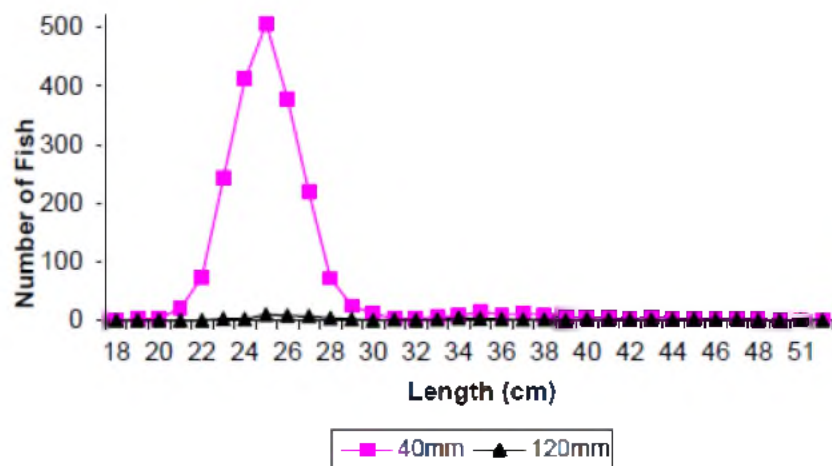




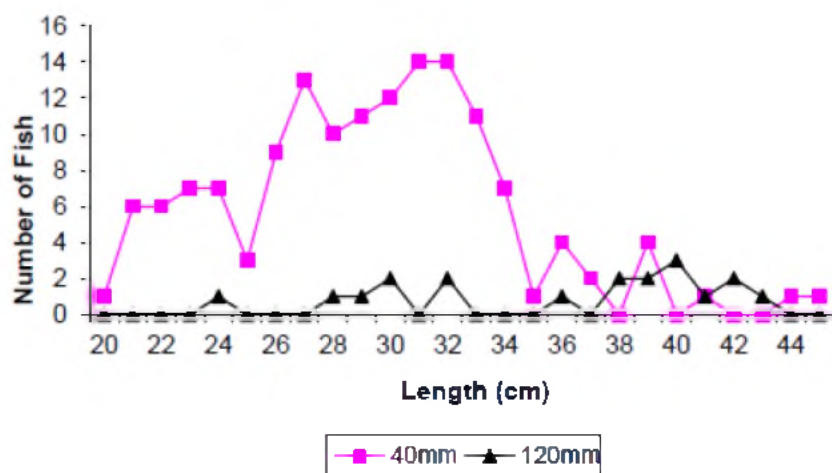
### Whiting 120mm

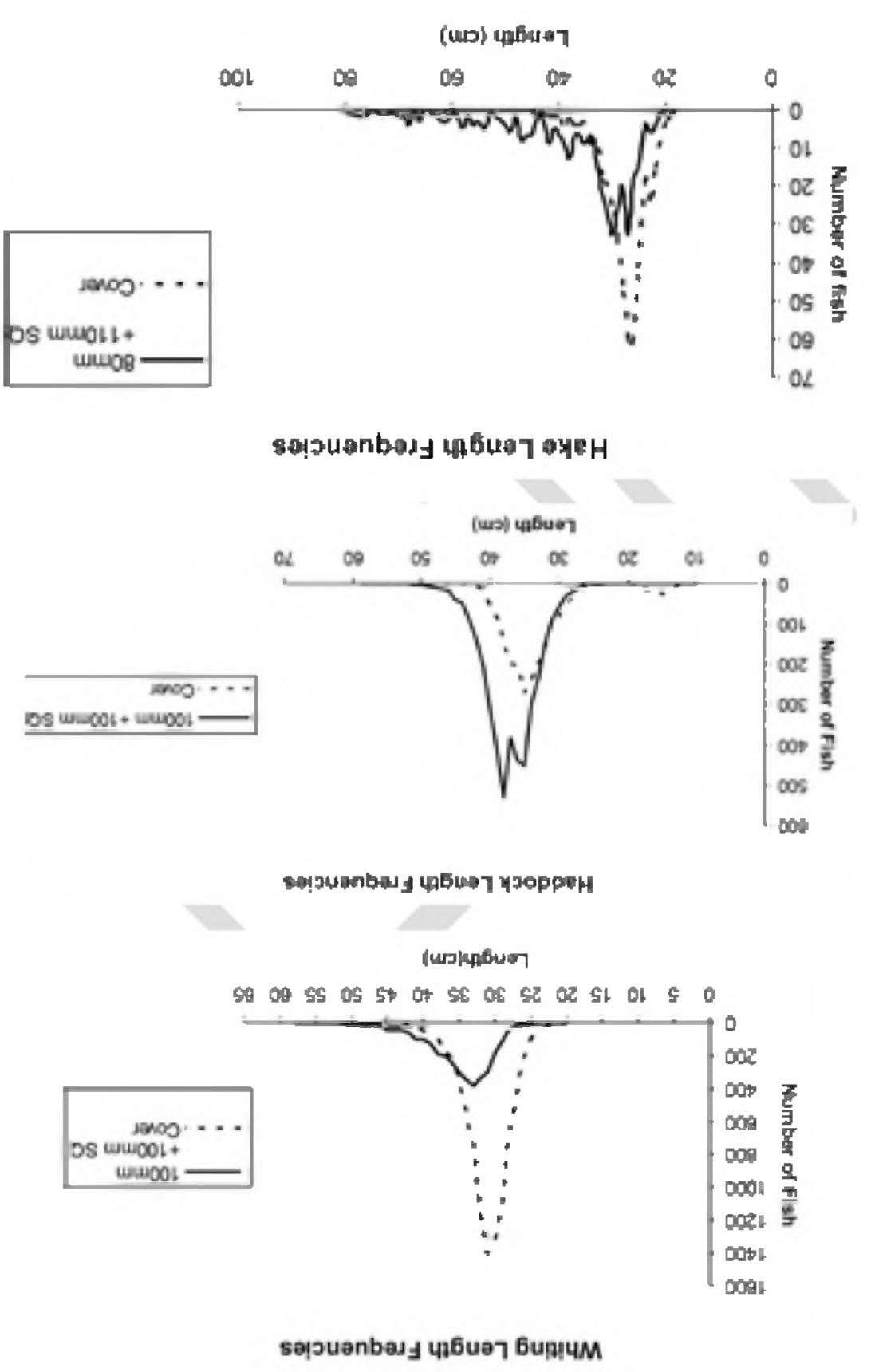


### Haddock 120mm

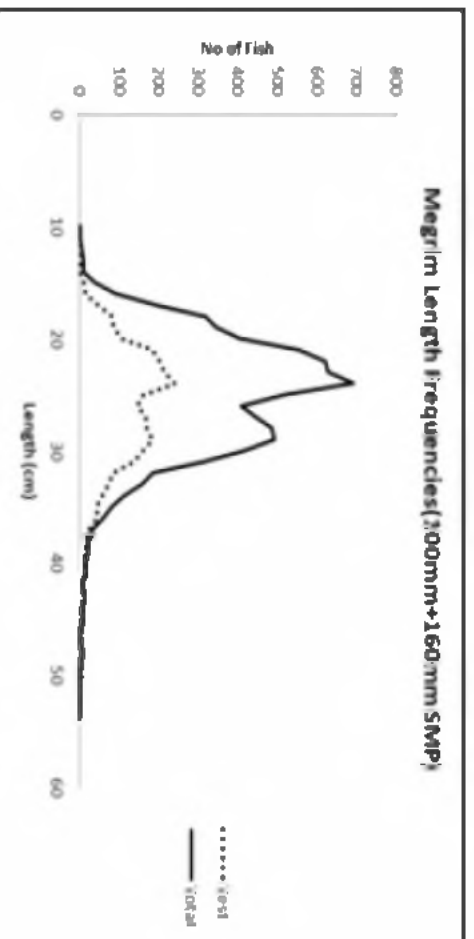
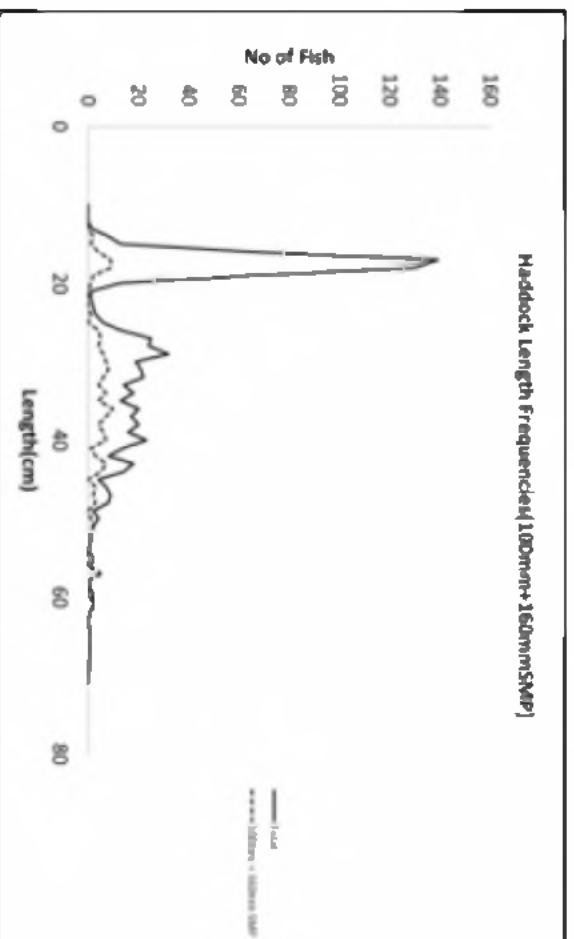
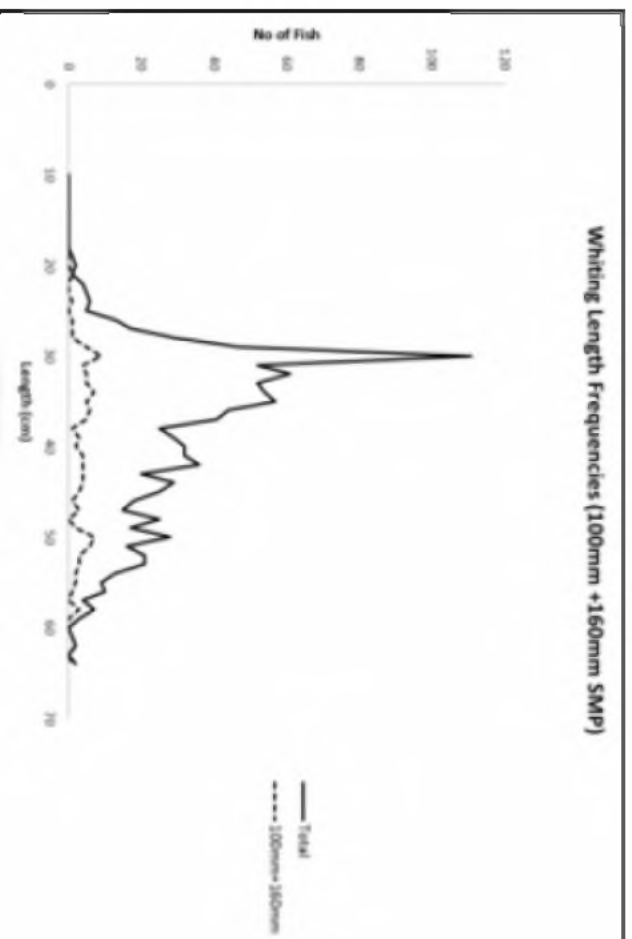


### Megrim 120mm





## 100mm+160mm smp

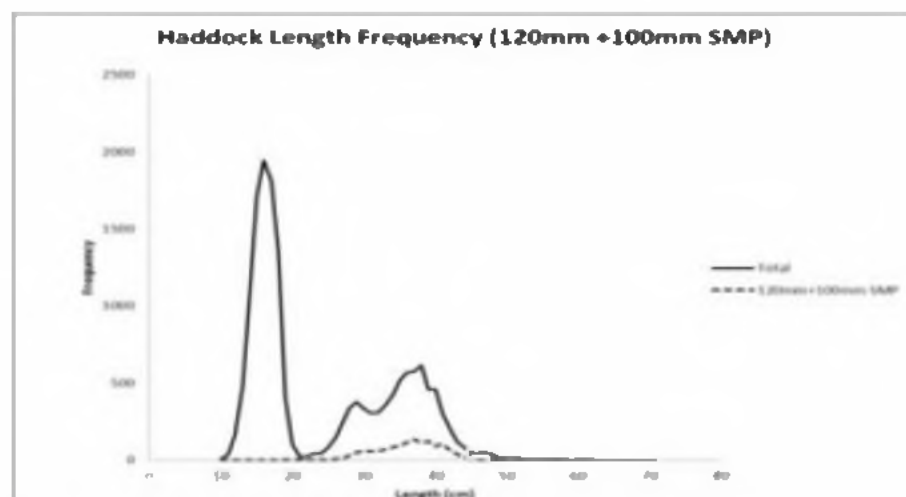
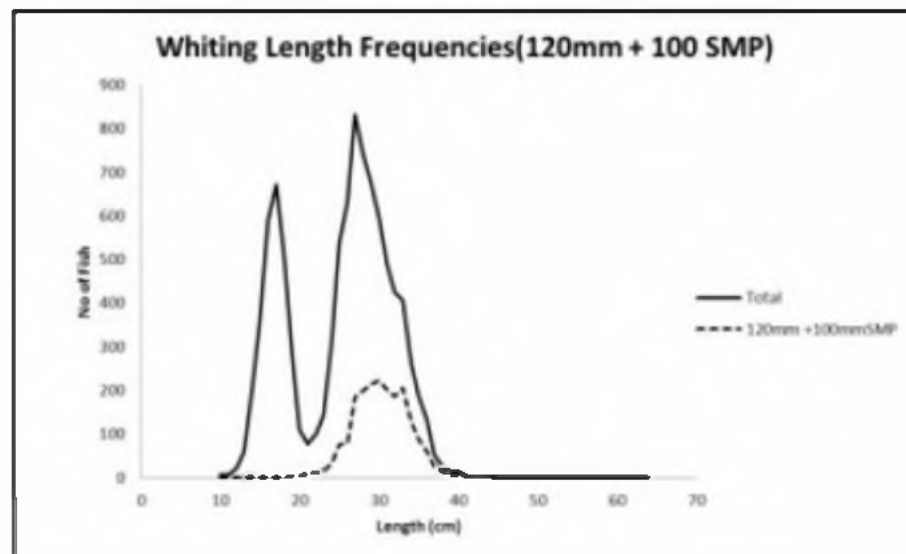


110mm + 100 smp



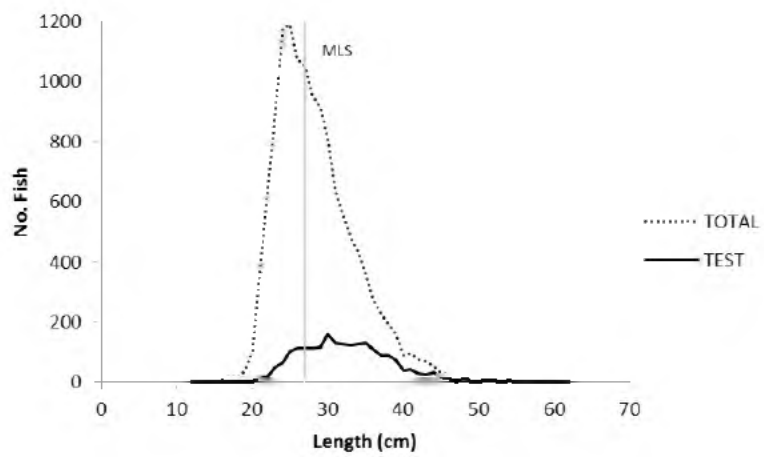


**120mm +100 smp**

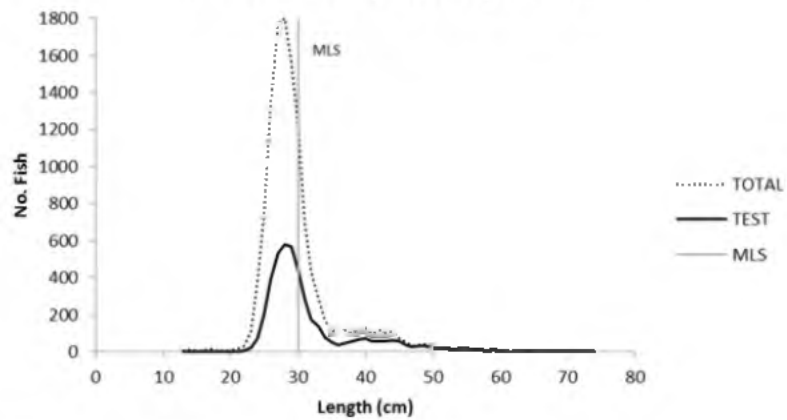


**120mm + 120mm SMP**

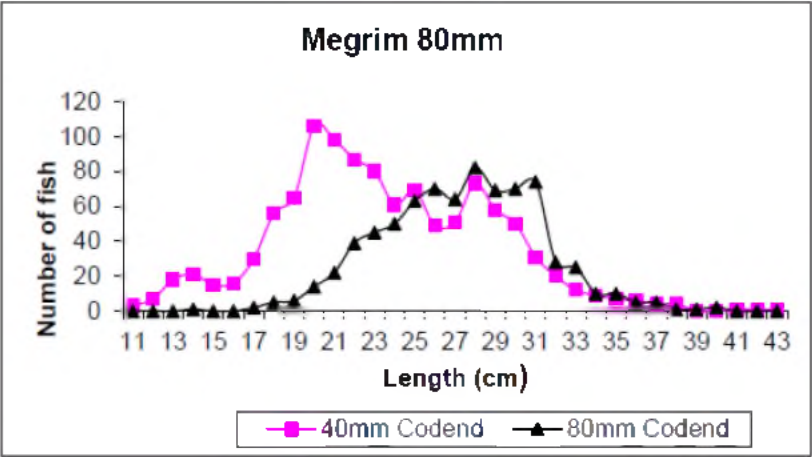
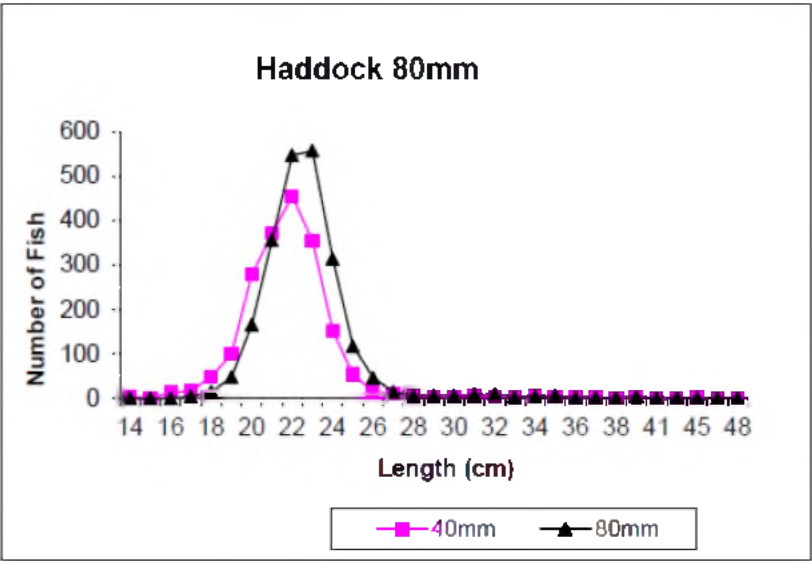
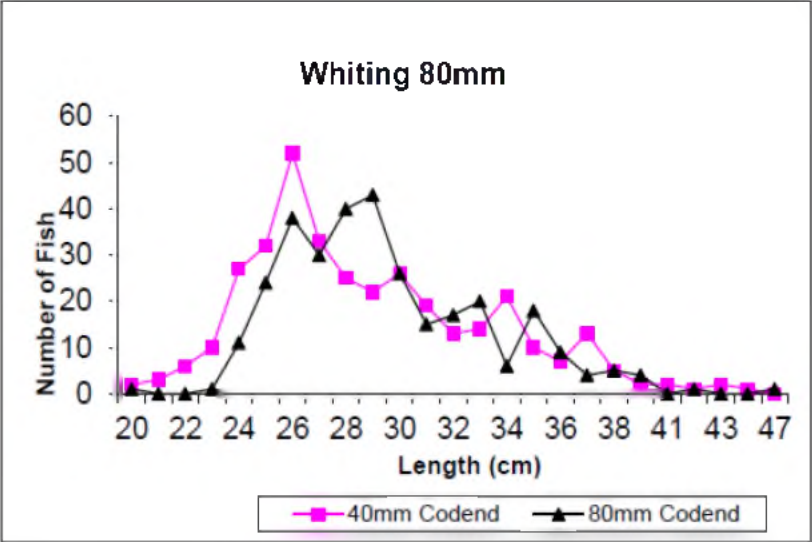
### Whiting Length Frequencies



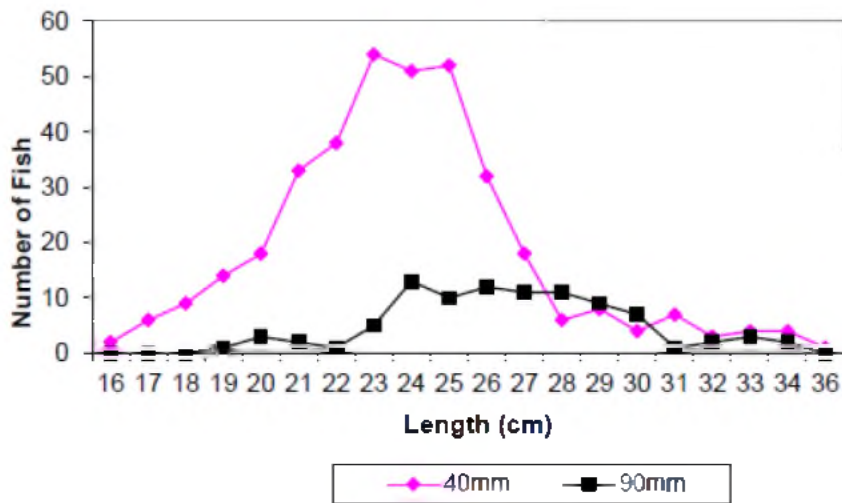
### Haddock Length Frequencies



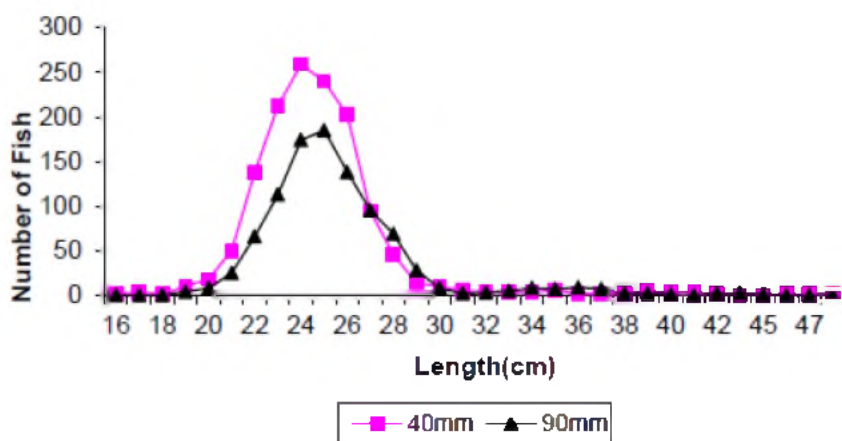
Annex I Length Frequency Distribution Curves for whiting, haddock and megrim with 80mm; 90mm; 100mm, 110mm; and 120mm codends



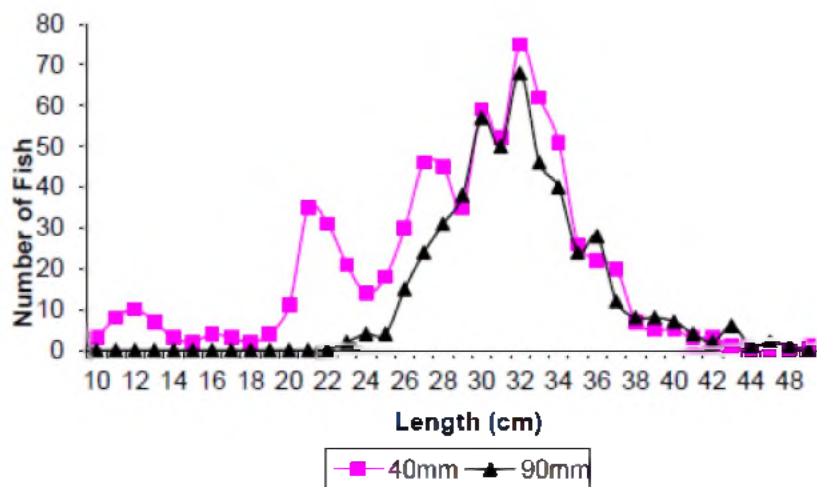
Whiting 90mm



Haddock 90mm

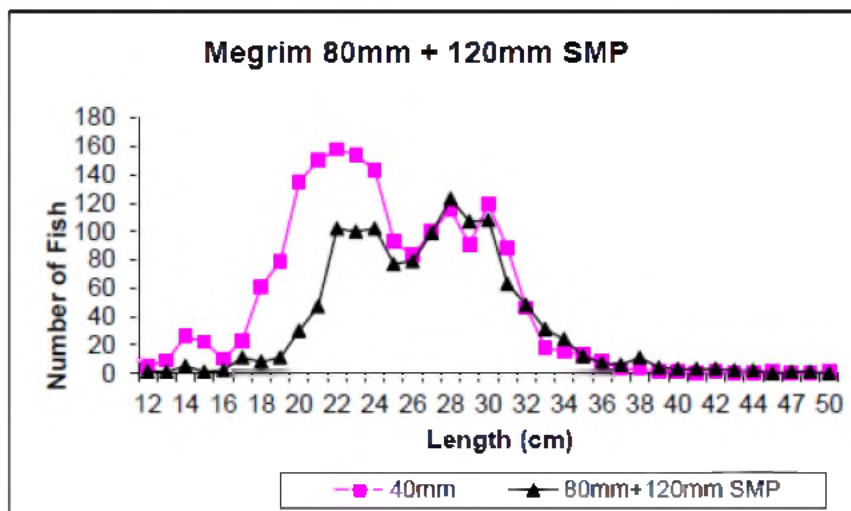
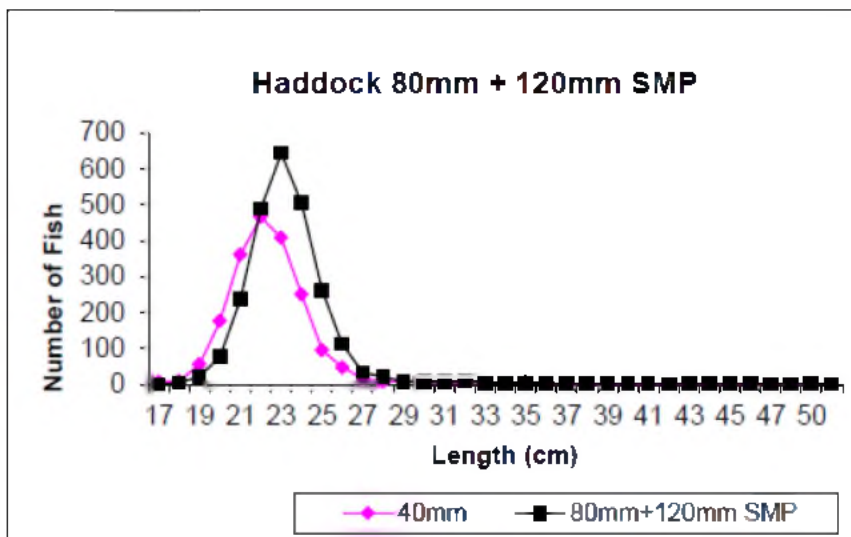
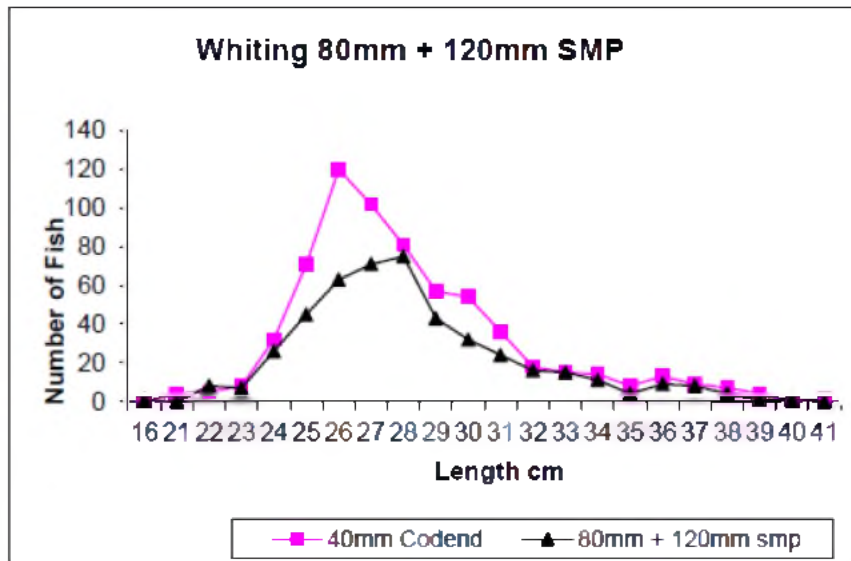


Megrim 90 mm

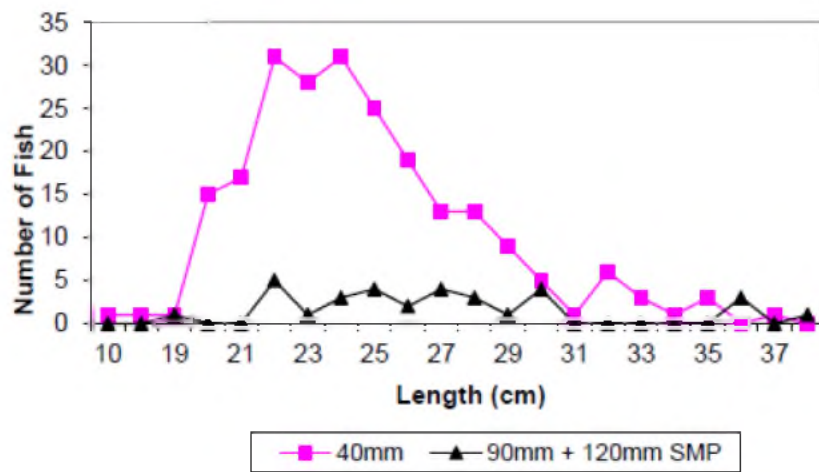




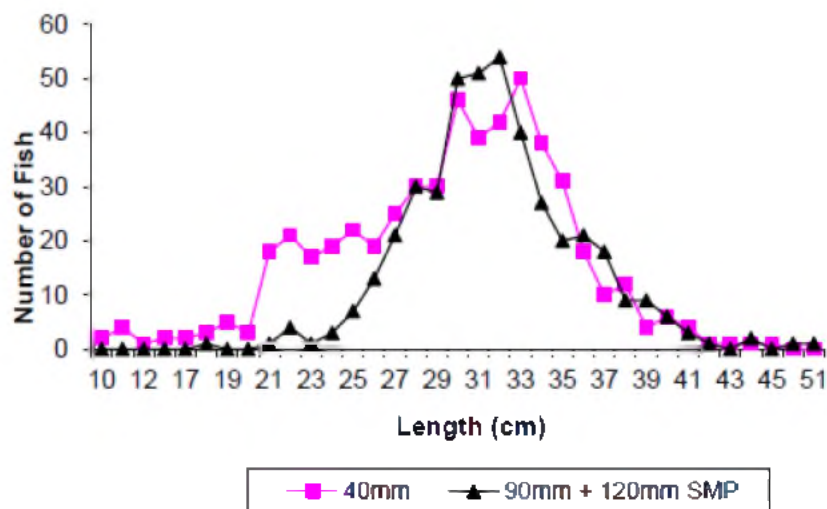
Annex II Length Frequency Distribution Curves for whiting, haddock and megrim with 80mm+120mm smp; 90mm+120mm smp; and 100mm+ 120mm smp



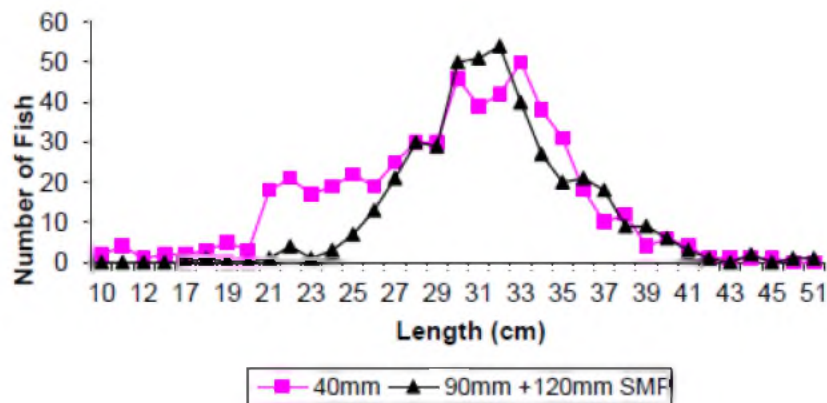
**Whiting 90mm + 120mm SMP**

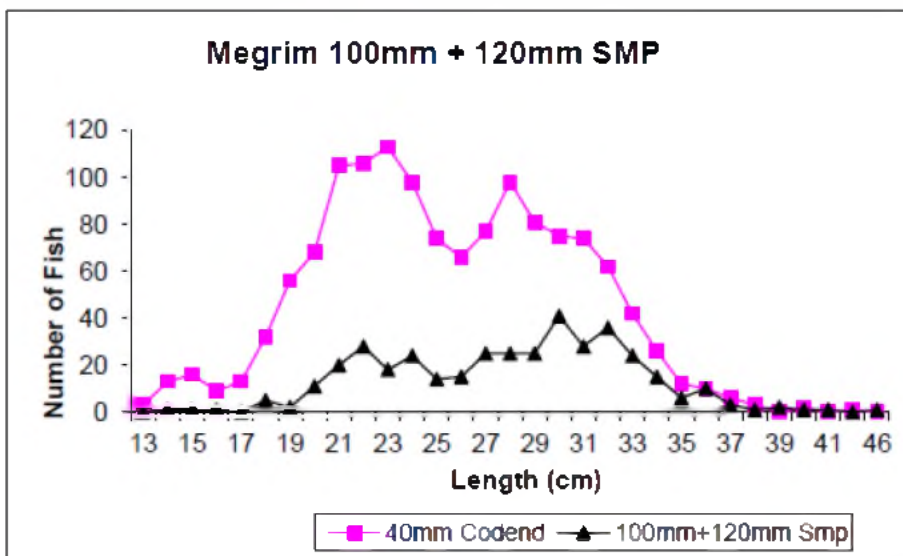
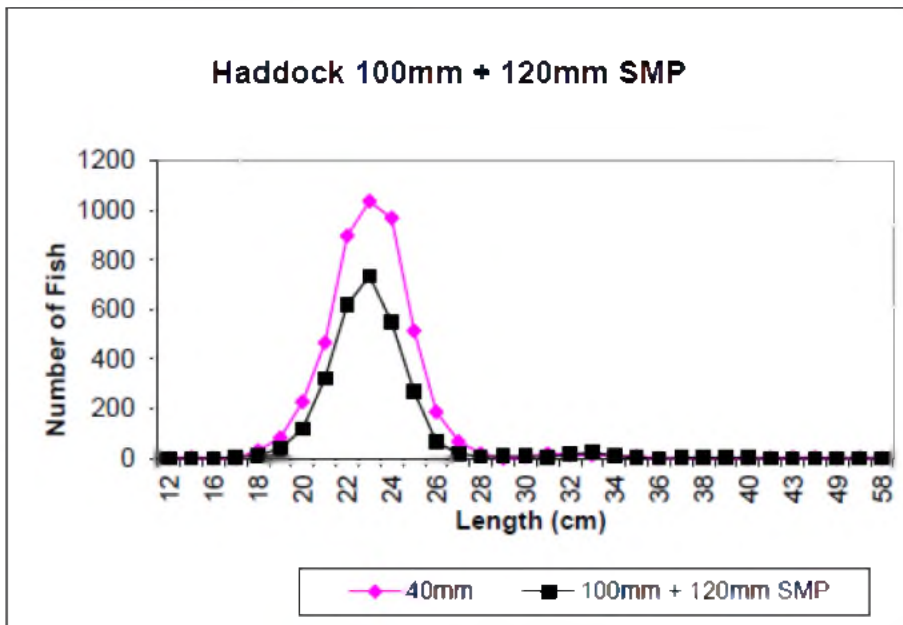
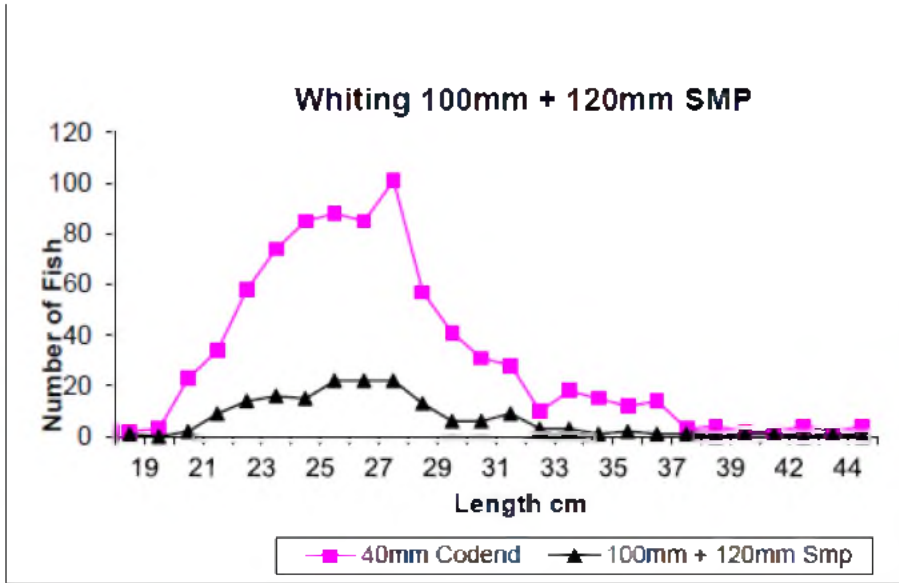


**Haddock 90mm + 120mm SMP**



**Megrim 90mm + 120mm SMP**

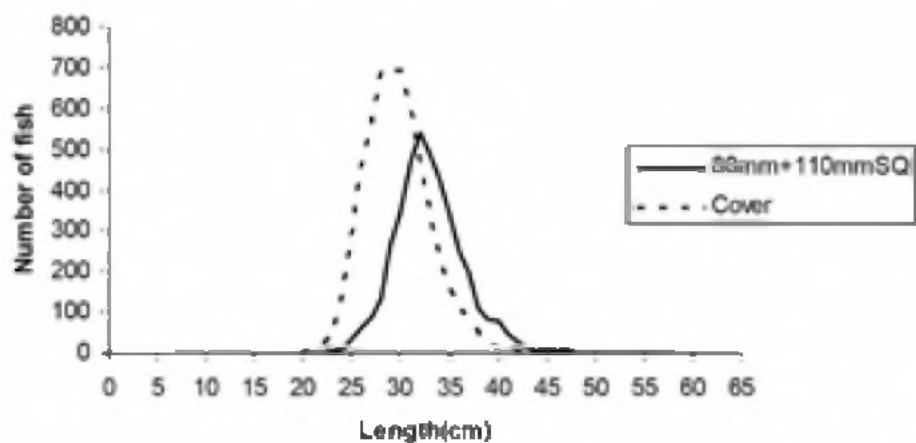




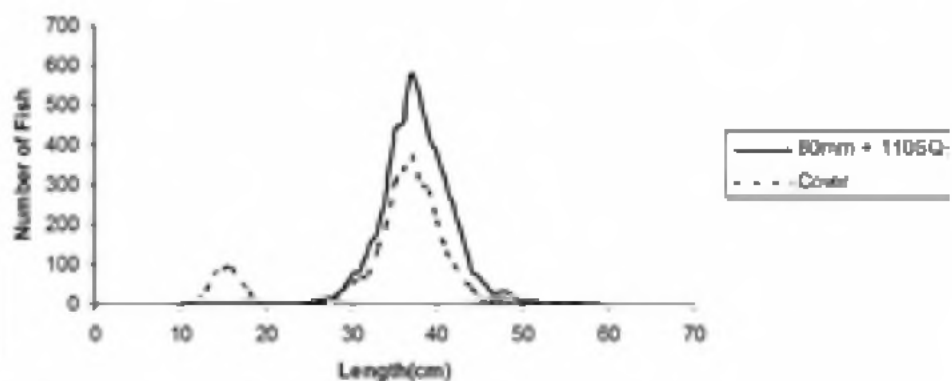
Annex III – Length frequency Distribution Curves for whiting, haddock and hake for  
80mm+110 smp and 100mm+100 smp

**80mm+110mm smp**

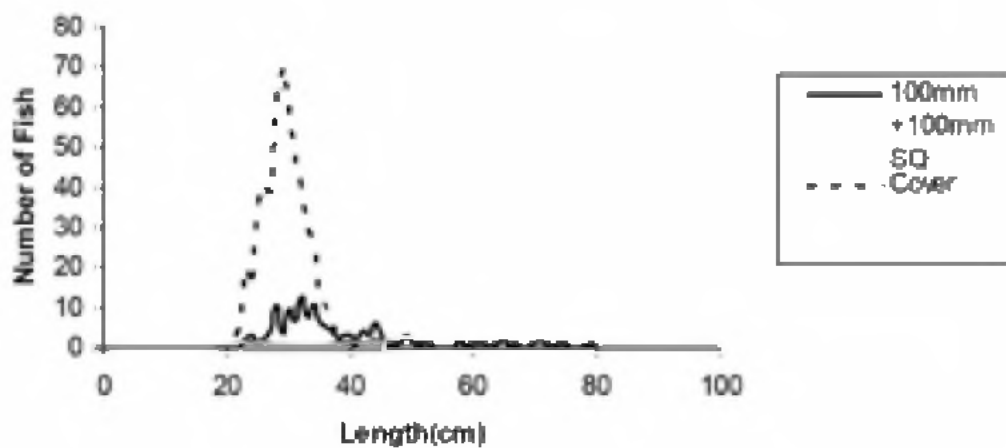
**Whiting Length Frequencies**



**Haddock Length Frequencies**



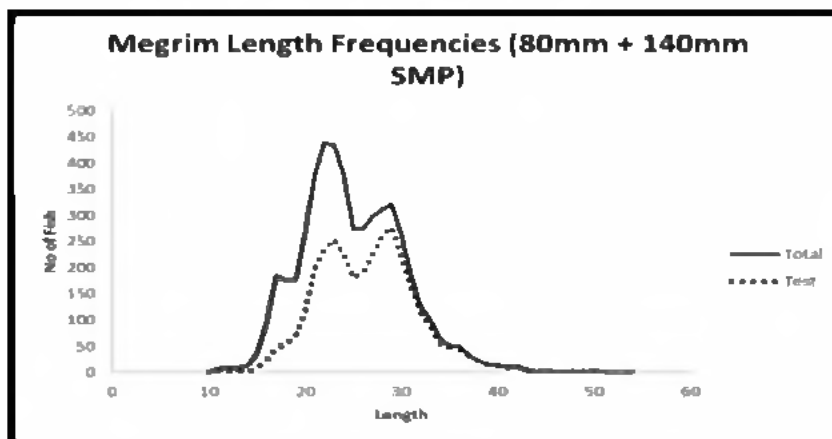
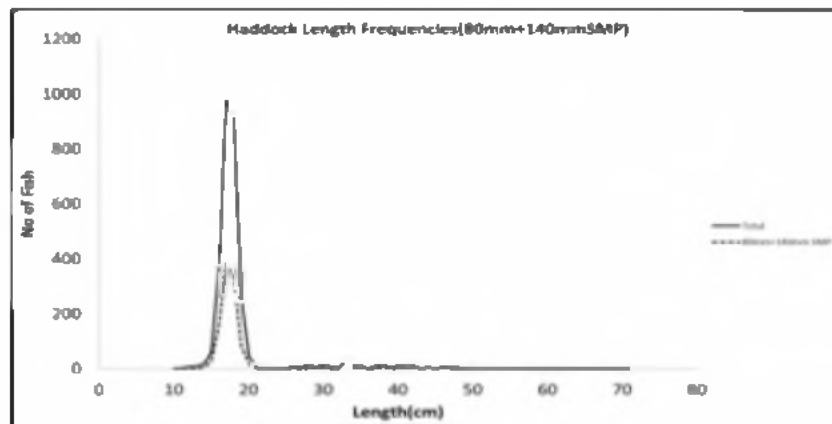
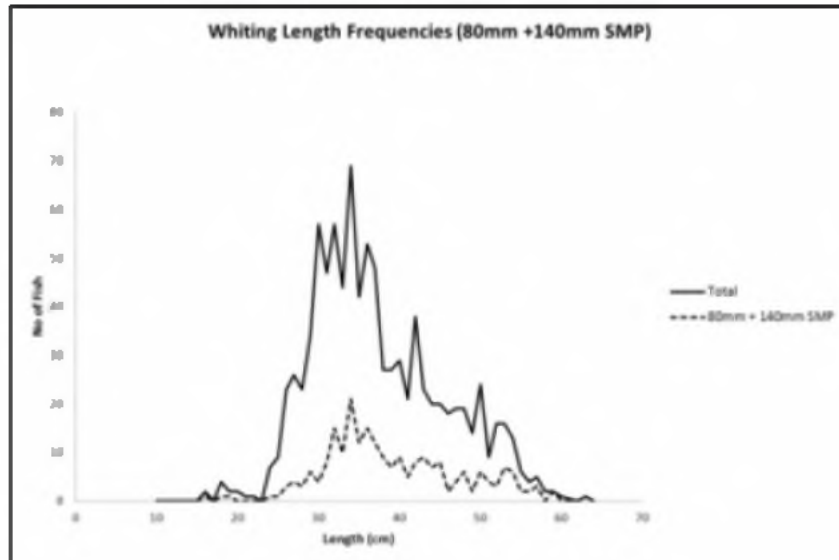
**Hake Length Frequencies**





Annex IV Length frequency Curves for Whiting, Haddock and Megrin for 80mm+140mm smp; 100mm+160mm smp; 110+100mm smp; 120mm+100 smp; 120mm+120mm smp

**80mm+140mm smp**



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