Assessment of a 90 mm T90 mesh codend, a new gear option for Celtic Sea whitefish vessels

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Daragh Browne[1], Matthew McHugh[1], Martin Oliver[1], Shane Murphy[2], Cóilín Minto[2] and Ronán Cosgrove[1]

[1] BIM, New Docks, Galway, Ireland

[2] Galway-Mayo Institute of Technology, Dublin Road, Galway, Ireland

Key Findings

1. Excellent gear option for vessels targeting monkfish and megrim given a major increase in monkfish, little difference in flatfish, and substantial reductions in undersize roundfish

2. Vessels targeting whiting may be better served by other gear options under the discard plan

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Introduction

As outlined in BIM's Business of Seafood, *Nephrops* continue to dominate as the highest value species in the Irish demersal fishing sector with landings of 7,200 tonnes worth €56m at first point of sale in 2018. Whitefish species also remain economically important with monkfish, megrim, hake, whiting and haddock, predominantly caught in the Celtic Sea, providing a return of €46m in 2018 (BIM, 2018). These species are primarily caught in mixed demersal trawl fisheries that are subject to the landing obligation which is largely implemented through the discard plan for North-Western Waters. This plan contains survivability and *de minimis* exemptions which permit some continued discarding, and prescribed selective gear options that aim to avoid unwanted catches during fishing. The new gear measures came into force in the Celtic Sea on the 1st July 2019 (EU, 2018).

Vessels targeting *Nephrops* are relatively well prepared to address the discard plan. Gear options such as the 300 mm square mesh panel (SMP) and SELTRA panel that greatly reduce unwanted fish catches have been successfully tested, developed and implemented by BIM and the Irish Industry (BIM, 2014; Tyndall et al., 2017). Emanating from a BIM study, the *Nephrops* survivability exemption in ICES subarea 7 also assists - rather than landing and having them deducted from quotas, large numbers of living juvenile *Nephrops* can be put back to sea, with major biological and economic benefits for the fishery (Oliver et al., 2017). *Nephrops* and whitefish vessels also benefit from 6 to 7% *de minimis* exemptions for cod, haddock and whiting, and survivability exemptions for plaice and skates and rays.

Exemptions aside, a raft of new gear requirements pose challenges for vessels targeting whitefish species in the Celtic Sea. Although yet to be tested, one of the options identified as having major potential to reduce unwanted catches comprises 90 mm T90 mesh in the codend and extension piece. Led by Daragh Browne with assistance from Matthew McHugh, a gear trial was conducted in collaboration with the owners of MFV Foyle Fisher from Greencastle to assess the new gear.

Methods

Fishing operations and gear

The trial was conducted on board the 24.7 m vessel Foyle Fisher (G 497) (Figure 1) in the Celtic Sea protection zone in ICES Divisions 7.j and 7.g (Figure 2) in May 2019. Fishing gear consisted of twin-rigged whitefish hopper trawls configured using triple warps and a centre clump weight (Table 1). The ground gear was constructed with 36 cm (14 inch) discs. The new test gear had a 90 mm (nominal mesh size) T90 codend and extension piece. The traditional gear used as a control had an 80 mm diamond codend and extension piece fitted with a 120 mm SMP located between 9 and 12 m from the codline. Both gears were constructed using 4 mm double twine as is commonly used in the fishery. Codend circumference was the maximum 120 meshes round for the 80 mm diamond and 79 meshes round for the 90 mm T90. Although the maximum circumference for 90 mm codend mesh is also 120 meshes round, previous trials with T90 mesh have shown that a reduced circumference of 80 meshes round yields positive results (Browne et al., 2016; McHugh et al., 2019). Fishing operations approximating normal commercial hauls were carried out.

Sampling and Analysis

Total catches were weighed and sorted to species level. The total weight of main commercial species was recorded in addition to a random representative subsample. Total length (TL) of commercial fish species were measured to the nearest cm below with raising factors applied if subsampling occurred. Length-weight relationships (Silva et al., 2013) for key species were applied to estimate weight in relation to minimum sizes for comparative purposes. A generalised additive model (GAM) was used to statistically assess proportional differences in catch at length of key species, with length frequencies superimposed on the resulting graphs. Between haul variability and sub sampling ratios were incorporated in the model.

Figure 1. The Foyle Fisher (G 497)

Figure 2. The trial location (hatched area)

Table 1. Gear characteristics

Gear	80 mm diamond	90 mm T90
Trawl type	Twin-rig whitefish	
Headline length (m)	28	
Footrope length (m)	21	
Fishing-circle (meshes × mm)	600 x 120	
Sweep length (m)	55 + 51	
Warp diameter (mm)	20	
Door manufacturer & model	Bison 11	
Door weight (kg)	900	
Clump weight (kg)	900 (roller)	
Average headline height (m)	5.4	
Average door spread (m)	139	
Nominal mesh size (mm)	80	90
Measured mesh size (mm)	85.6	92.2
Cod end circumference (mesh no.)	120	79
120 mm SMP location from codline (m)	9–12	Not present

Results

A total of 10 valid hauls were completed over four days (Figure 1). Mean haul duration, towing speed and depth fished were 03:59 hr, 2.8 kt and 92 m. Major reductions in total catches of whiting and dogfish, and a substantial increase in monkfish occurred in the T90 gear. Little difference occurred in flatfish species (Table 3). Major differences occurred in the size of retained roundfish species - undersize catches were reduced by around 90% in the case of whiting and haddock, and 60% for cod in the T90 gear. Due to the increased size and orientation of the T90 mesh, market sized whiting (≥ 32 cm) were reduced by 60%. Market sized haddock and hake catches increased by 41% and 29% respectively (Table 4).

Modelling of proportional catch at length in the two gears confirmed significantly lower catches of whiting ~ < 40 cm, haddock < 30 cm (MCRS), cod ~ 35 cm (MCRS) and hake ~ < 40 cm in the T90 gear. Significant increases were observed in some larger size classes of whiting, haddock and hake, and in monkfish from ~ 25 cm to ~ 60 cm (Figures 3a, 3b).

Table 3. Species catch weights

Species	80 mm diamond (kg)	90 mm T90 (kg)	Difference (%)
Haddock	1,030	1,099	7
Lesser spotted dogfish	367	147	-60
Non-commercial species#	348	251	-28
Whiting	260	47	-82
Monkfish	244	380	56
Other species$	241	219	-9
Plaice	236	243	3
Cod	233	210	-10
Hake	214	268	25
Ray and Skate	213	185	-13
Lemon Sole	196	230	18
Megrim	164	193	18
Mixed flatfish*	41	50	24
Bulk	3,785	3,522	-7

#Gurnards, Dab and Crustaceans; $John Dory, Bream, Black Pollock, White Pollock, Ling; *Brill, Turbot, Witch, Black sole;

Table 4. Estimated catches (kg) in relation to minimum conservation reference or *market size

Species	Size category (cm)	80 mm diamond (kg)	90 mm T90 (kg)	Difference (%)
Whiting	< 27	25	1	-97
	≥ 27	307	60	-80
	≥ 32*	143	56	-61
Haddock	< 30	312	35	-89
	≥ 30	876	1,236	41
Cod	< 35	64	26	-59
	≥ 35	192	192	0
Hake	≥ 27	229	295	29
Megrim	≥ 20	188	222	18
Monkfish		244	380	56
Plaice	< 27	47	52	11
	≥ 27	216	216	1
Lemon sole	< 25*	46	60	30
	≥ 25*	177	207	16

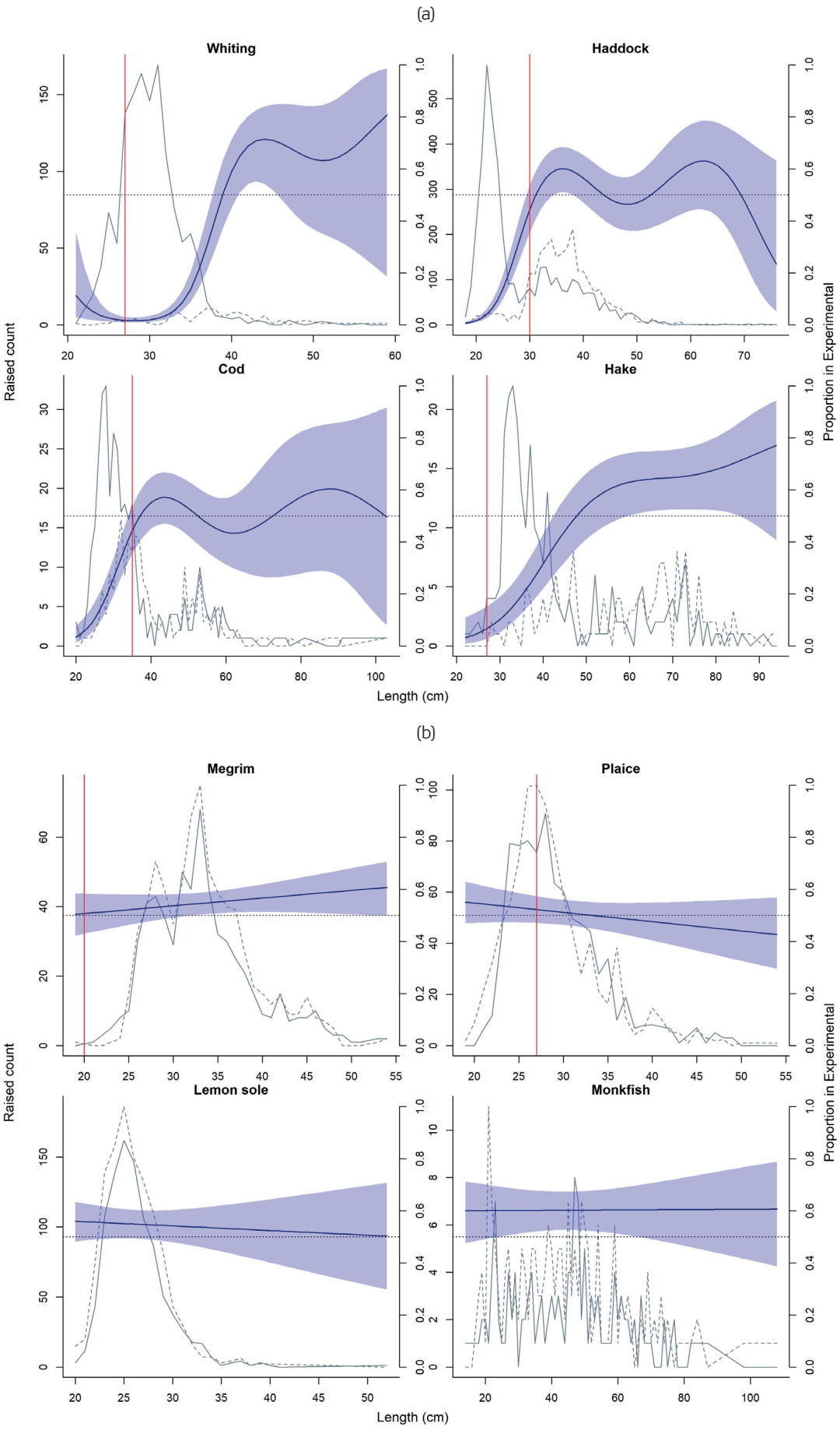

Figure 3. Proportional catch at length for (a) key roundfish and (b) flatfish species in the 90 mm T90 gear. Fitted average (solid) and 95% confidence intervals (shaded areas) come from the GAM model. Length frequencies are represented by grey dashed (T90) and solid grey (80 mm diamond) lines. MCRS is represented by vertical red lines.

Discussion

The T90 codend and extension worked well for most roundfish species. The 56% increase in monkfish is difficult to explain but may be linked to increased water flow through T90 meshes and resulting effects on trawl geometry and spread. Whatever the reason, results are extremely positive for vessels targeting monk and megrim given such increases in a key target species, and major reductions in unwanted catches of undersize roundfish species.

Substantial losses of market sized fish, suggest that the traditional directed fishery for whiting may be better served by one of the other gear options in the discard plan. These include a 100 mm codend. Previous research (BIM, 2012) suggests that more market size whiting but also more undersize whiting will be retained in the latter gear compared with the 90 mm T90 codend. An additional option comprising an 80 mm codend with a 160 mm SMP, could incorporate T90 mesh in the codend and warrants further investigation in the directed whiting fishery.

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References

BIM, 2012. Celtic Sea Selectivity Trials 2012, September 2012. BIM Gear Technology Report. 9pp.

BIM. 2014. Assessment of a 300 mm square-mesh panel in the Irish Sea *Nephrops* fishery. Irish Sea Fisheries Board (BIM), Fisheries Conservation Report. 5 pp.

BIM. 2018. The business of seafood. A snapshot Ireland's seafood sector. 48 pp.

Browne, D., Cosgrove, R., and Tyndall, P. 2016. Assessment of T90 mesh in a fishery targeting whiting in the Celtic Sea, Irish Sea Fisheries Board (BIM), Fisheries Conservation Report, June 2016. 8 pp.

EU 2018. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018R2034&from=EN.

McHugh, M., Oliver,M., Browne, D., Minto, C. and Cosgrove, R. 2019. Benefits of 120 mm diamond and 100 mm T90 codends in the Celtic and Irish Seas, Irish Sea Fisheries Board (BIM), Fisheries Conservation Report, February 2019. 6 pp

Oliver, M., McHugh, M., Browne, D., Murphy, S., and Cosgrove, R. 2017. *Nephrops* survivability in the Irish demersal trawl fishery. Irish Sea Fisheries Board (BIM), Fisheries Conservation Report, September 2017. 14 pp.

Silva, J.F., Ellis, J.R., and Ayers, R.A. 2013. Length-weight relationships of marine fish collected from around the British Isles. Science Series Technical Report, Cefas Lowestoft, 150. 109 pp.

Tyndall, P., Oliver, M., Browne, D., McHugh, M., Minto, C., and Cosgrove, R. 2017. The SELTRA sorting box: A highly selective gear for fish in the Irish *Nephrops* fishery. Irish Sea Fisheries Board (BIM), Fisheries Conservation Report, February 2017. 12 pp.

Bord Iascaigh Mhara
An Cheannoifig,
Bóthar Crofton,
Dún Laoghaire,
Co. Bhaile Átha Cliath.
A96 E5A2

Irish Sea Fisheries Board
Head Office,
Crofton Road,
Dún Laoghaire,
Co. Dublin.
A96 E5A2

T +353 (0)1 214 4100
F +353 (0)1 284 1123
www.bim.ie