Northern Ireland Gear Trials Project 2017-2022

Summary Report on work completed in

2019 & 2020

afbi AGRI-FOOD & BIOSCIENCES INSTITUTE

ANIFPO

nifpo NORTHERN IRELAND Fish Producers' Organisation

seafish

Department of Agriculture, Environment and Rural Affairs

Contents

1. Executive Summary

During 2019 & 2020 the Northern Ireland Gear Trials Project oversaw seven chartered gear trials of experimental selective devices using under & over 12m nephrops fishing vessels. An additional gear trial was also completed which did not involve the charter of a vessel.

Successive trials of the Inclined net grid (ING) were run with modifications* made each time to correct persistent nephrops loss whilst still maintaining the reductions in whiting catch that this device has shown. When the ING was trialled as a complete single gear the nephrops catch was unaffected and significant reductions of whiting were achieved. The limitations of the ING are manufacturing costs, ease of repair and maintenance and blocking with seaweed.

Research into light technology to improve gear selectivity continued with an extended trial of luminous netting fitted onto the bottom panel of a SELTRA270 box section. This trial informed a subsequent trial where lights replaced the luminous netting. The results suggest that placing lights in the vicinity of an escape point discourage fish from using it. Fish behaviour in a trawl is obviously affected by lights and further work is needed to locate the correct position for them to help reduce <MCRS fish catch.

Two trials assessed the effect on catch of modifying the front end of a nephrops trawl/s. The cover of one trawl in a twin rig configuration was replaced with 400mm diamond mesh. Operationally it was difficult to work two radically different trawls that were joined together and so a further trial assessed a set of coverless trawls against a set of standard trawls using two over 12m vessels of comparable catching ability.

The coverless trawls reduced numbers of whiting overall and was efficient at reducing the smaller individuals in the catch however the catch of larger (still <MCRS) whiting was raised with respect to the control gears. The coverless trawl caught more nephrops than the control gears.

Covid-19 restrictions meant that there were limitations on planning and running gear trials after March 2020 however it was possible to run gear trials in September 2020 due to the good will and additional support from skippers, gear manufacturers, AFBI, Seafish and DAERA. The project has secured additional EMFF funding to continue this work in 2021/22 and further development of the most promising selective gear designs is underway.

* See reference 1 for details on modifications

2. Background

The Northern Ireland Gear Trials Project was originally a 2-year project set up by the NI Fishing Industry in 2017 to develop more selective fishing gears for the purposes of eliminating the capture of juveniles, reducing the catch of unwanted quota species, whilst maintaining the target catch. It was felt that if industry were provided with the support to develop their own ideas, and with collaboration from AFBI, DAEAR and Seafish, this would be the most effective way of addressing some of the challenges associated with the Landing Obligation.

The project has continued to work towards its objectives over 2019/20 with additional EMFF support and has secured more funding for 2021/22.

The design, manufacture and trialling of innovative fishing gear designs has largely been driven by detailed discussions between the project manager and local skippers and gear manufacturers with all ideas and suggestions fed back to the project steering group for consideration. The project works mainly with the NI TR2 nephrops fleet who operate out of Portavogie, Ardglass and Kilkeel harbours and access the NI jurisdictional area of the Irish Sea (Figure 1). All NI nephrops targeting vessels are required to use a highly selective device at present (2) and so this work builds upon several decades of previous effort.

Figure 1 Map showing gear trial area and the three main commercial fishing harbours.

3. Overview of selective devices trialled in 2019 - 2020

3.1 Inclined Net Grid section (fitted to front section of chartered vessels own trawl). Trialled in May/ September 2019 & March 2020 on twin rig vessels.

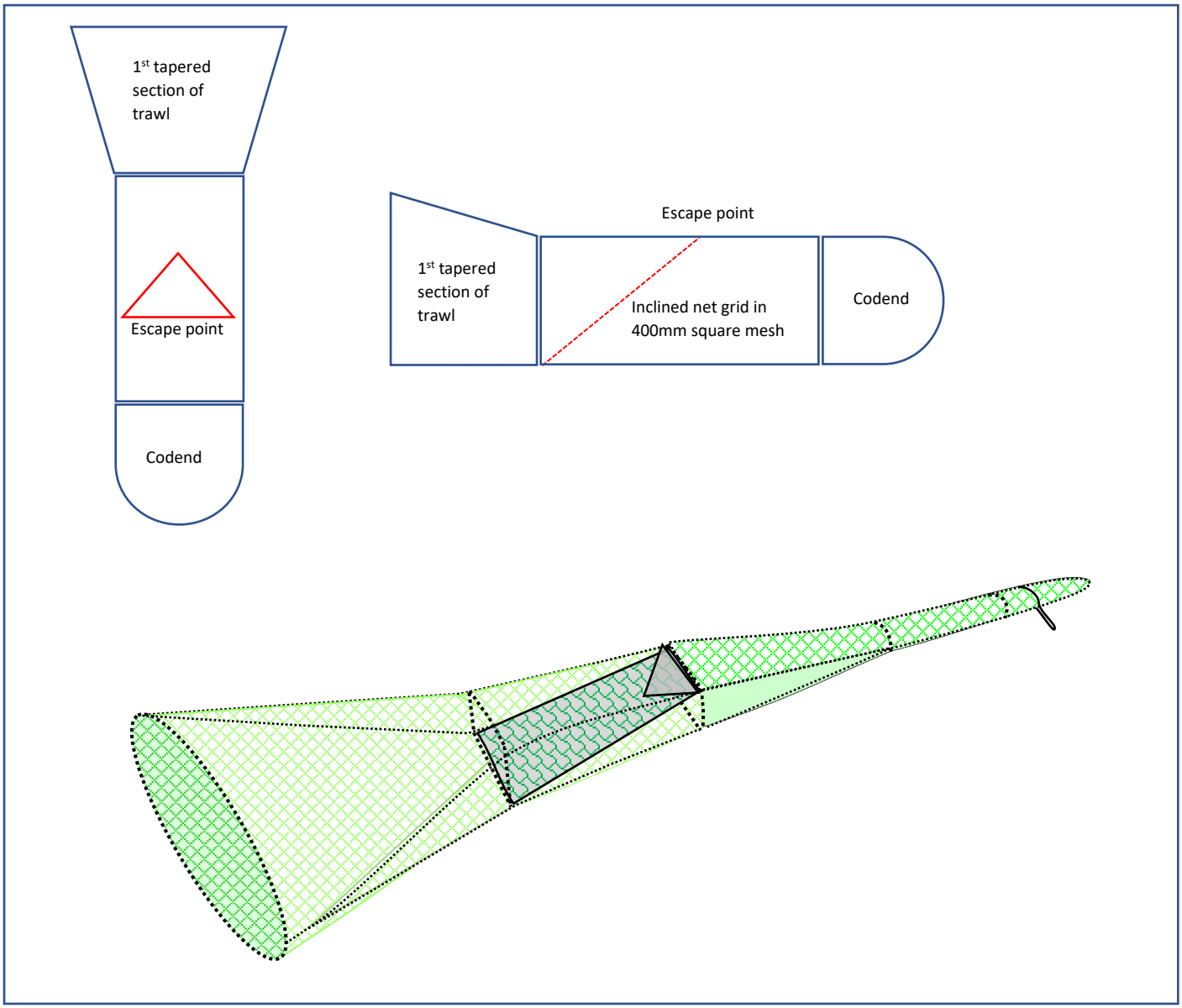


Figure 2 Plan, profile & schematic diagrams of the inclined net grid section.

3.2 Bottom panel of four panel SELTRA box section replaced with luminous netting. Trialled in August 2019 on a twin rig vessel.

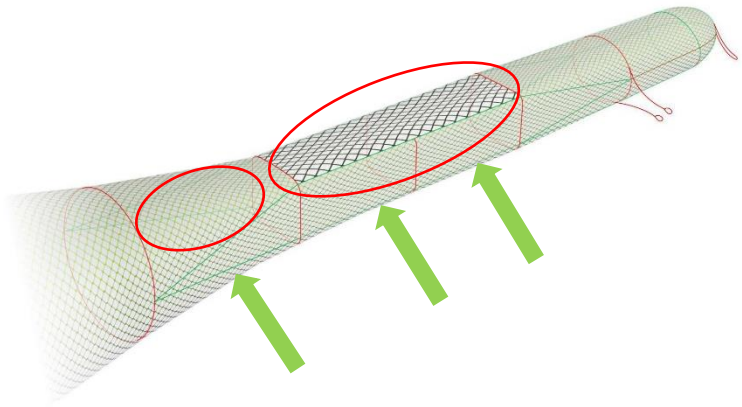
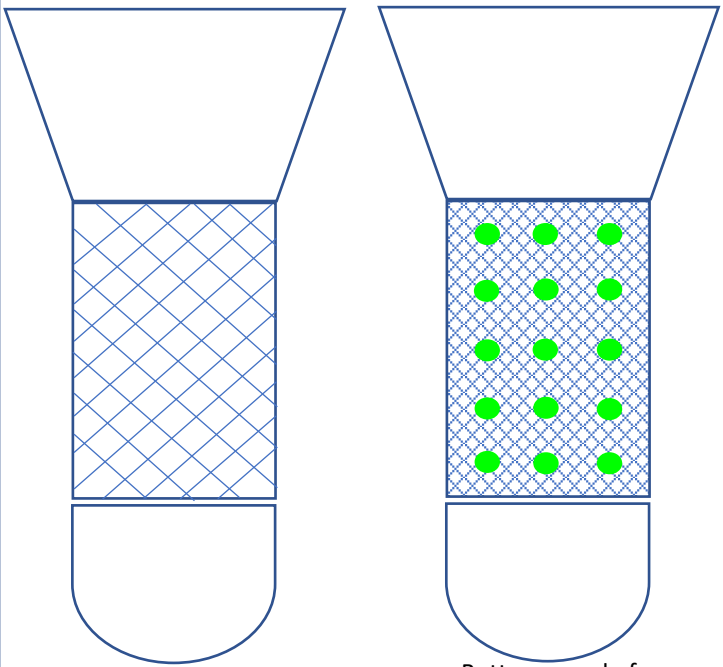


Figure 3 SELTRA270 section. Escape points are circled red and position of luminous netting is indicated by arrows. The additional SMP on this trawl would be located at the position of the smaller circle.

Figure 4 Image of a sheet of luminous netting fitted on the bottom panel of the SELTRA270 section. The trawl has been turned inside out in the photograph to allow fitting of the new netting.

3.3 Bottom panel of four panel SELTRA box section with 3 rows of 5 green lights attached. Trialled in February 2020 on a twin rig vessel.



Top panel of SELTRA box section with 270mm diamond mesh escape point.

Bottom panel of SELTRA box section showing configuration of lights attached to the 80mm diamond mesh bottom sheet.

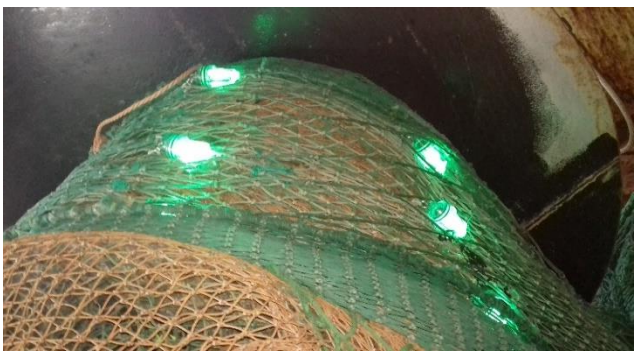
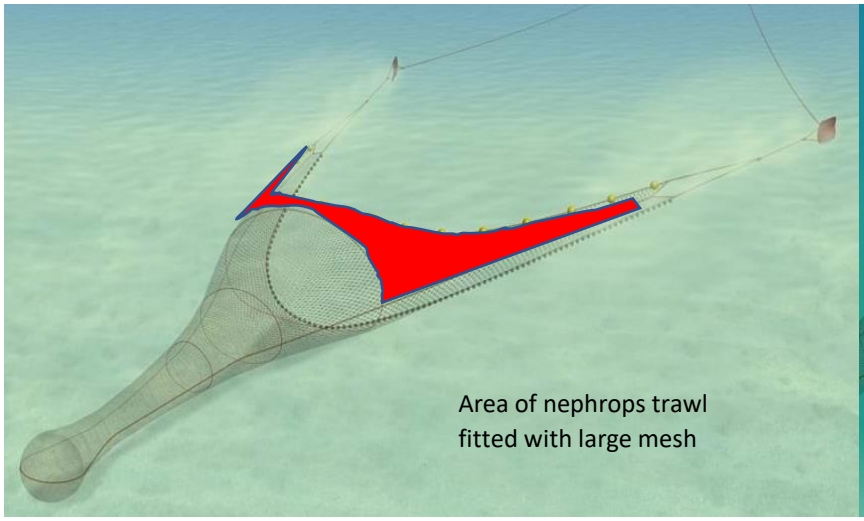
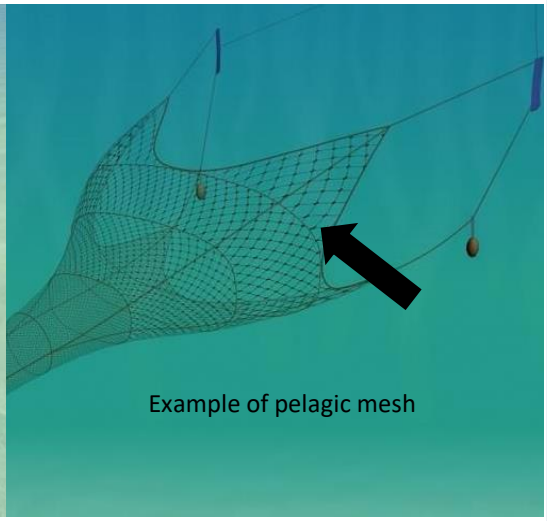


Figure 5 Plan views of top and bottom panels of SELTRA showing position of lights & images of illuminated trawl on the net drum.

3.4 Cover and upper wings of trawl fitted with 400mm diamond mesh, similar to pelagic netting. Trialled in March 2020 on a twin rig vessel.



Area of nephrops trawl fitted with large mesh



Example of pelagic mesh

400mm diamond mesh in upper wing - foreground, and in cover - background

* Top two images courtesy of Seafish gear database

Figure 6 Schematic diagram showing area of trawl replaced with large mesh, example of pelagic trawl & image of experimental trawl.

3.5 Coverless trawls trialled as a pair against a pair of control trawls. Trialled in September 2020 on two twin rig vessels.

A coverless trawl has the top and furthest forward panel of the net cut back so that the headline and footrope are of similar length. This helps to allow the release of fish rising in front of the footrope (3).

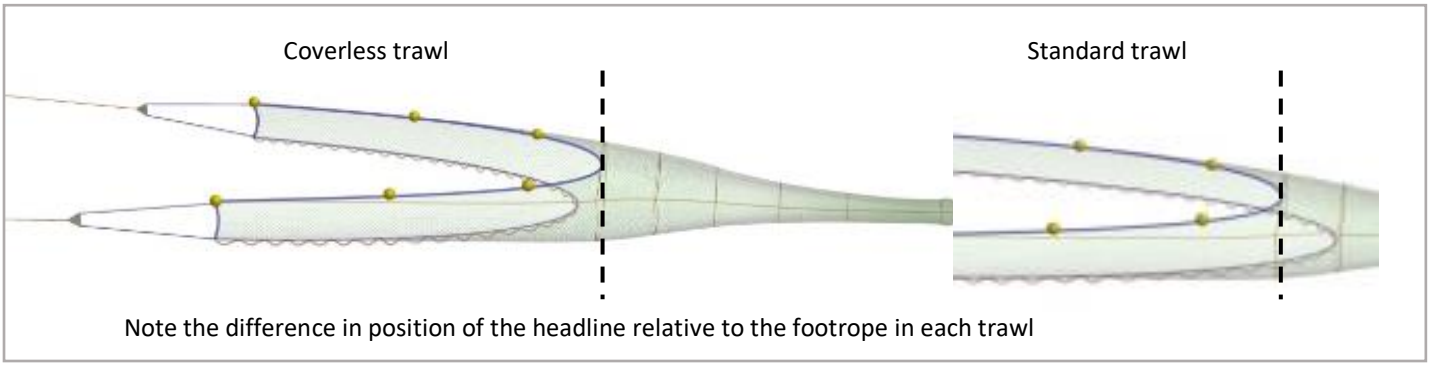
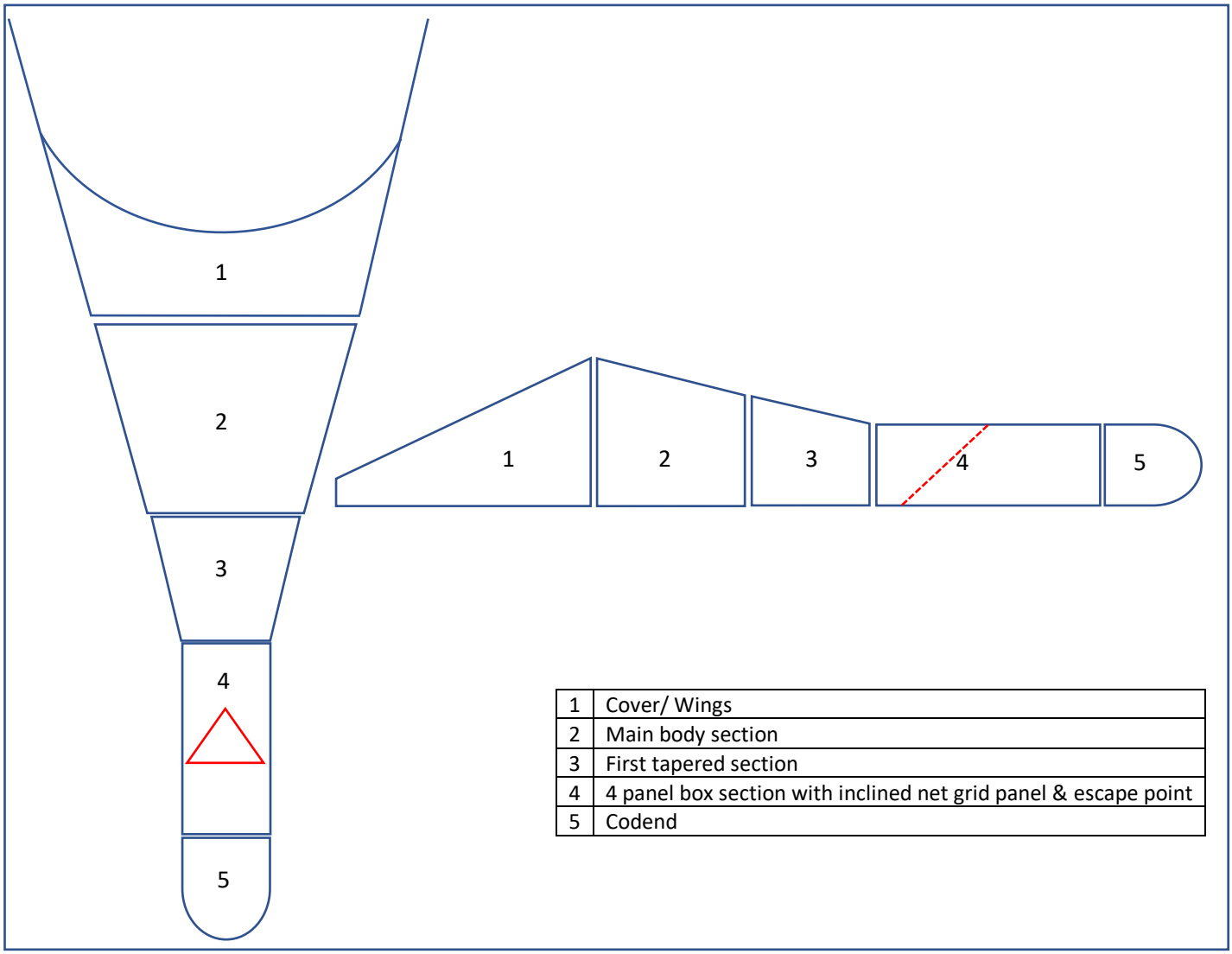


Figure 7 Schematic diagram of a coverless trawl & standard trawl for comparison.

3.6 Inclined Net Grid complete trawl trialled as a single gear. Trialled in September 2020 on two single rig vessels.



1	Cover/ Wings
2	Main body section
3	First tapered section
4	4 panel box section with inclined net grid panel & escape point
5	Codend

Figure 8 Plan & profile diagrams showing sections of a trawl and location of inclined net grid and escape point.

4. Results

4.1 Note on presentation of data

In this section the results from each gear trial are presented in two ways. The catch per unit effort tables (CPUE) provide catch results for experimental and control gears in kg/hr. The charts below each CPUE table show the corresponding counts of individual whiting and haddock from the same gear trial. When catch data from gear trials is analysed it is important to consider both the differences in weight between experimental and control gears and numbers of individuals as there is not always a positive correlation between the two.

4.2 Inclined Net Grid (ING400) section fitted into vessels own trawl

May 2019

Both CPUE and raised count results indicate that during this gear trial the inclined net grid trawl did not produce a significant effect on the catch of whiting or haddock. The small differences in catch between the experimental and control gears are within the range of natural variability.

The minimum conservation reference size (MCRS) for whiting and haddock is 27cm and 30 cm respectively (4). As the results show, most of the catch of each of these two common fish species is below the MCRS.

The experimental gear caught nephrops at a reduced rate than the control gear over the duration of the gear trial (Table 1, Figures 9&10).

Table 1 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control 300 SMP	Mean CPUE experimental
Cod	0.31	0.33
Haddock	2.15	2.69
Whiting	1.53	1.68
Nephrops	29.5	19.0

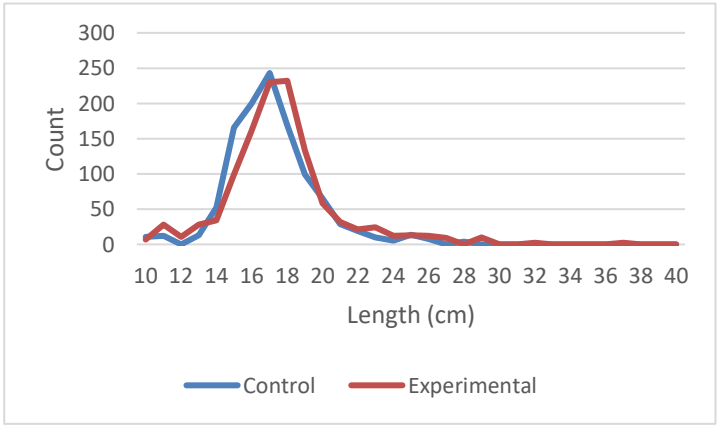


Figure 9 Length/Frequency plot derived from raised counts of whiting catch for the ING and control gear. May 2019 gear trial.

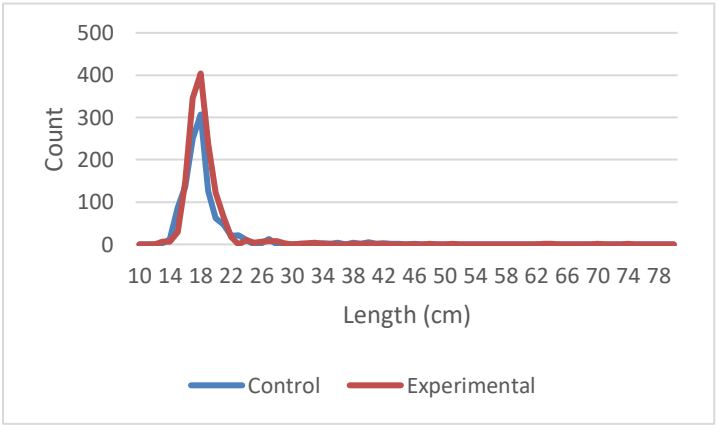


Figure 10 Length/Frequency plot derived from raised counts of haddock catch for the ING and control gear. May 2019 gear trial.

September 2019

The CPUE and raised counts from catch data collected during this repeat of the inclined net grid section trial indicated that the experimental trawl reduced the catch of whiting and haddock. Whiting catch was reduced in the experimental trawl across the range of observed lengths, all of which are below the MCRS for this species. The experimental trawl reduced catches of haddock measuring between 9-15cm and did not affect the catch of larger individual fish.

The catch of nephrops was significantly reduced in the experimental trawl when compared to the control gear (Table 2, Figures 11&12).

Table 2 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control 300 SMP	Mean CPUE experimental
Whiting	4.28	1.40
Haddock	2.66	1.39
Nephrops	68.85	39.81

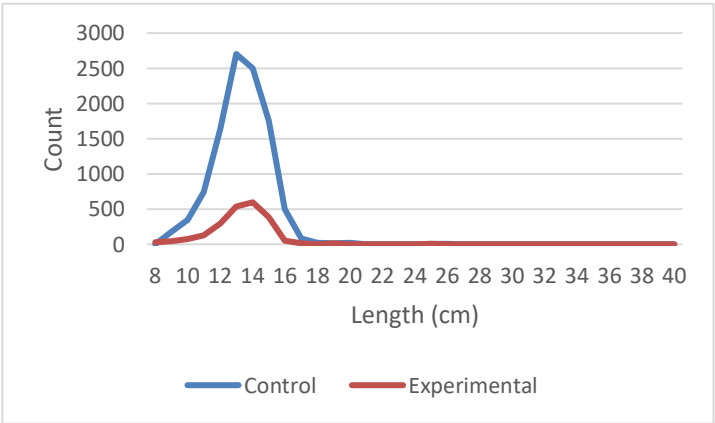


Figure 11 Length/Frequency plot derived from raised counts of whiting catch for the ING and control gear. September 2019 gear trial.

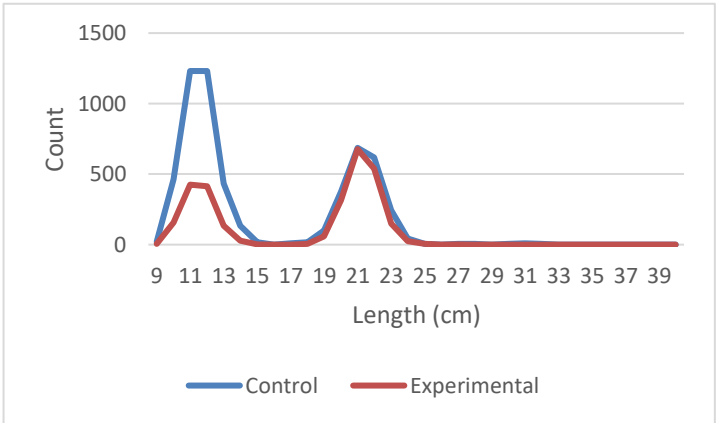


Figure 12 Length/ Frequency plot derived from raised counts of haddock catch for the ING and control gear. September 2019 gear trial.

March 2020

After further modifications to the inclined net grid section, the results from this gear trial indicated that catches of whiting and haddock were reduced in the experimental trawl in much the same manner as they were during the previous testing of this device in September 2019. CPUE and raised counts derived from the catch data indicate that catches of whiting, across the range of lengths, were significantly reduced.

The catch of nephrops was also reduced in the experiential trawl when compared to the control trawl however nephrops losses were lower during this trial when compared to the previous September 2019 trial (Table 3, Figures 13&14).

Table 3 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control 300 SMP	Mean CPUE experimental
Cod	0.2	0.2
Haddock	1.3	0.8
Whiting	5.9	2.5
Nephrops	27.4	19.1

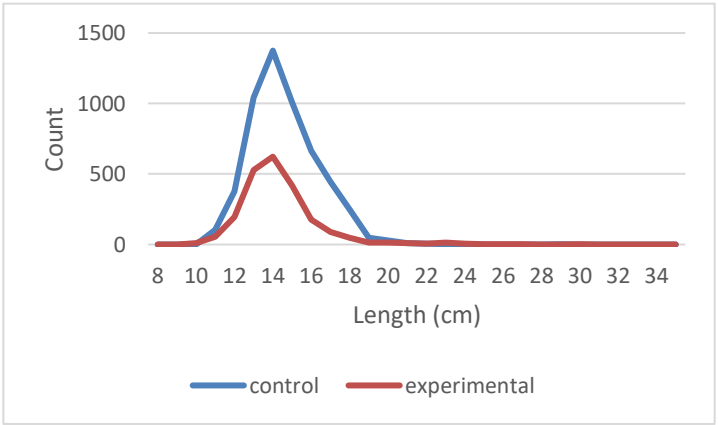


Figure 13 Length/ Frequency plot derived from raised counts of whiting catch for an ING trawl and control gear. March 2020 gear trial.

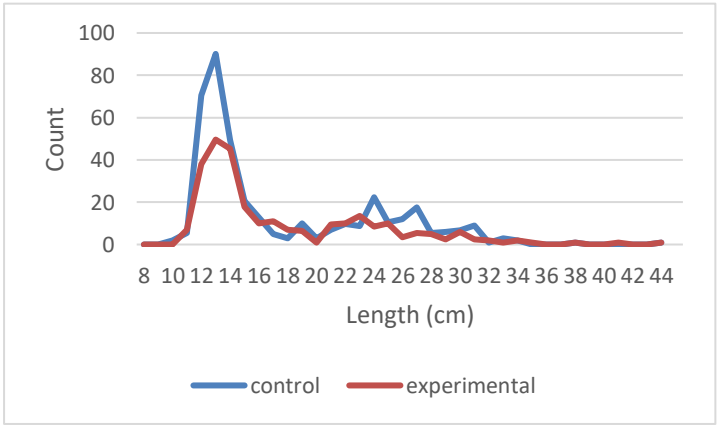


Figure 14 Length/ Frequency plot derived from raised counts of haddock catch for an ING trawl and control gear. March 2020 gear trial.

4.3 Bottom panel of four panel SELTRA box section replaced with luminous netting

A different approach was used for this gear trial. Unlike other gear trials, a vessel was not chartered for this work. A skipper was provided with assistance to trial an idea under normal fishing operations for two weeks and was provided with training and bespoke data recording forms (1). The data was subsequently analysed by AFBI scientists. This allowed for an assessment of a novel approach to gear selectivity to be carried out without committing to the costs of a fully chartered trial. Due to the approach, catch data analysis is not available for publication.

4.4 Bottom panel of four panel SELTRA box section with 3 rows of 5 green lights attached

This gear trial was a continuation of the work undertaken during the unchartered gear trial discussed above. CPUE and raised counts from the catch data for this gear trial indicated that occurrences of species of interest were elevated in the experimental trawl when compared to the control.

Catches of whiting were significantly higher in the illuminated trawl and haddock catches less so. The catch of nephrops was slightly increased in addition to the fish species discussed (Table 4, Figures 15&16).

Table 4 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control SELTRA no light	Mean CPUE experimental
Cod	0.45	0.56
Haddock	0.64	1.27
Whiting	2.60	7.85
Nephrops	33.5	38.8

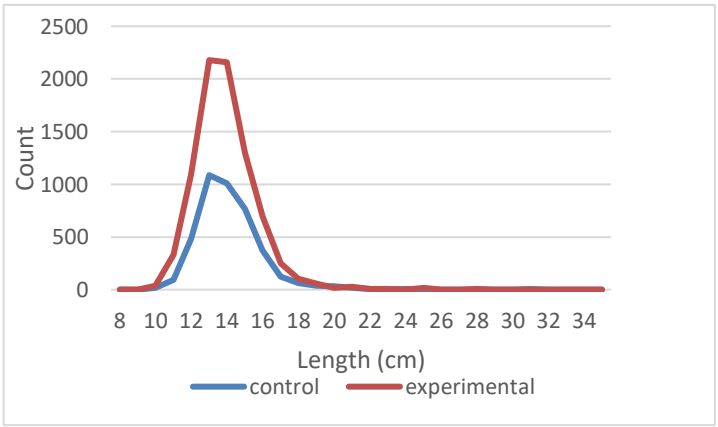


Figure 15 Length/ Frequency plot derived from raised counts of whiting catch for an illuminated SELTRA270 trawl and control gear. February 2020 gear trial.

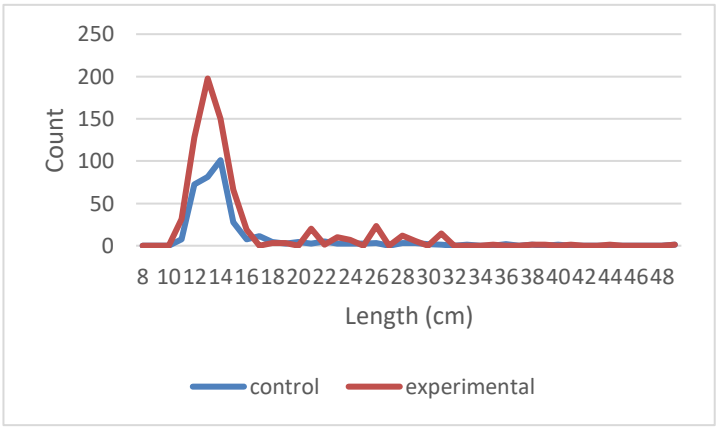


Figure 16 Length/ Frequency plot derived from raised counts of haddock catch for an illuminated SELTRA270 trawl and control gear. February 2020 gear trial.

4.5 Cover and upper wings of trawl fitted with 400mm diamond mesh, similar to pelagic netting

The results from this gear trial were varied, with the experimental trawl reducing the catch of some fish species whilst increasing the catch of others. CPUE outputs indicate that catch rates of whiting were raised in the experimental gear and catch rates of haddock were lower. CPUE for nephrops catch suggested a small decrease in catch when compared to the control.

The raised counts indicate that whiting catch was raised in the experimental trawl across the range of lengths that were recorded in the sample with numbers of haddock appearing to be relatively unaffected (Table 5, Figures 17&18).

Table 5 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control SELTRA270 with standard cover	Mean CPUE experimental
Cod	0.63	0.31
Haddock	6.34	3.1
Whiting	2.82	3.84
Nephrops	19.69	14.43

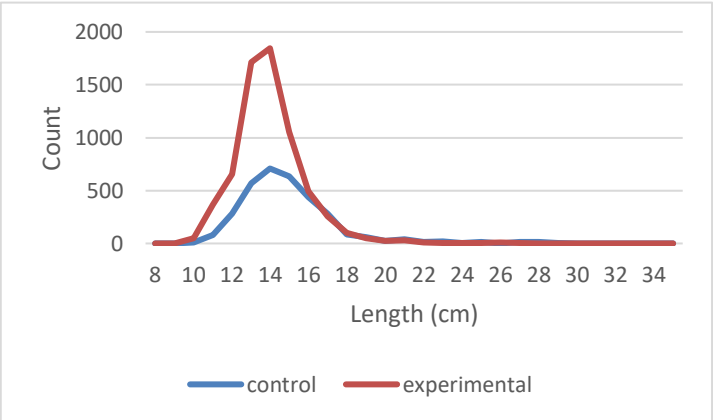


Figure 17 Length/ Frequency plot derived from raised counts of whiting catch for a trawl fitted with a large mesh front cover and control gear. February 2020 gear trial.

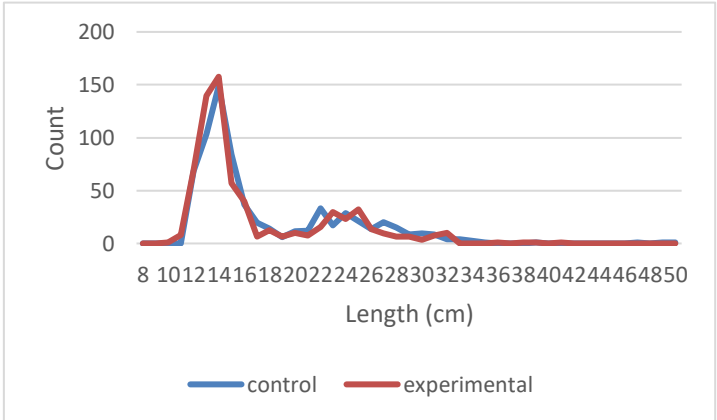


Figure 18 Length/ Frequency plot derived from raised counts of haddock catch for a trawl fitted with a large mesh front cover and control gear. February 2020 gear trial.

4.6 Coverless trawls trialled as a pair

A new approach was undertaken on this gear trial. Instead of trialling an experimental gear design next to a standard trawl in a twin rig set up, a pair of experimental trawls were commissioned and trialled alongside a pair of standard trawls using two comparable fishing vessels.

CPUE results derived from the catch data for whiting and nephrops indicated that catch rates for both species were significantly raised in the experimental trawls when compared to the controls. CPUE for haddock was also increased but to a lesser extent.

With respect to the control trawls, analysis of the raised count data for whiting showed that that there was a 32% reduction in whiting catches of individuals between 10-14cm and no difference in catches of individuals between 15-18cm. The control trawls caught 30% of the total number of whiting between 19-28cm that were caught by the experimental trawls (Table 6, Figures 19&20). The experimental trawls caught about 200 less individual whiting than the controls.

Nephrops catches per haul & over this trial, whilst not published in this report, were in line with the CPUE figure reported here for this species.

Table 6 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control SELTRA270s	Mean CPUE modified
Haddock	1.34	2.30
Whiting	5.60	10.11
Nephrops	63.90	152.92

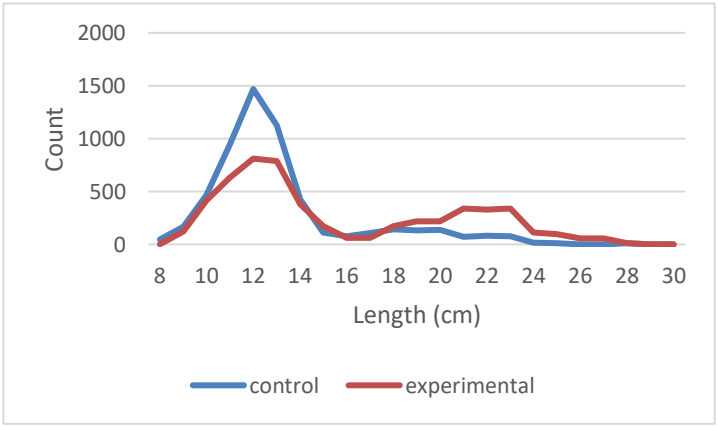


Figure 19 Length/ Frequency plot derived from raised counts of whiting catch for a set of coverless trawls and control gears. September 2020 gear trial.

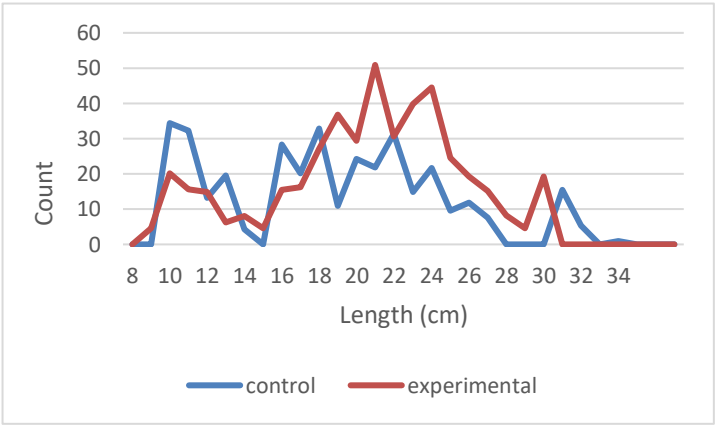


Figure 20 Length/ Frequency plot derived from raised counts of haddock catch for a set of coverless trawls and control gears. September 2020 gear trial.

4.7 Inclined Net Grid complete trawl trialled as a single gear

This was the first time that the inclined net grid was manufactured as a complete trawl and trialled in a single rig set up beside another single rig vessel.

The CPUE and raised count outputs derived from catch data collected during this gear trial indicated that the experimental gear significantly lowered the catch rate for whiting when compared to the control. The raised count results show that the experimental trawl reduced the number of whiting caught, over the range of sizes that were represented in the catch. Haddock catches were low throughout the trial and therefore any catch differences between both trawls are unclear.

Nephrops catch was slightly raised in the experimental trawl when compared to the control (Table 7, Figures 21&22).

Table 7 Catch per unit effort results for control and experimental trawls. Figures in kg/hr.

Species	Mean CPUE control 200 SMP	Mean CPUE modified
Haddock	2.48	1.12
Whiting	12.48	4.18
Nephrops	20.16 (total weight 477 kg)	22 (total 567 kg)

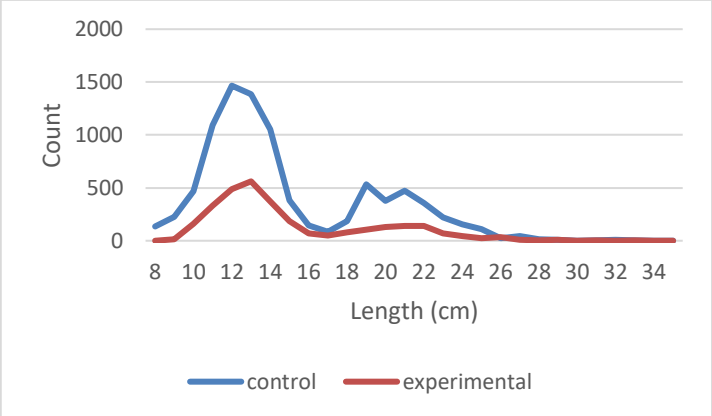


Figure 21 Length/ Frequency plot derived from raised counts of whiting catch for an inclined net grid trawl and control gear. September 2020 gear trial.

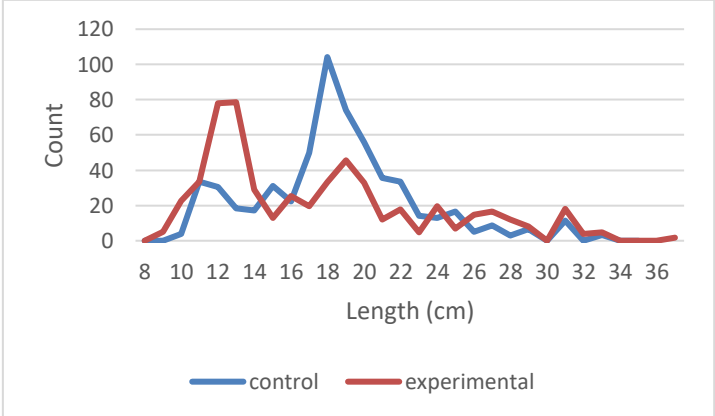


Figure 22 Length/ Frequency plot derived from raised counts of haddock catch for an inclined net grid trawl and control gear. September 2020 gear trials.

5. Industry Input

A lot of the work described in this report has been driven by technical advice and guidance provided to the project through many hours of informal discussions with skippers, owners, and local gear manufacturers. Throughout the last two years and during the initial two-year phase of this current package of gear selectivity development, input from the NI fishing industry has been extremely forthcoming.

Each modification of the inclined net grid trawl and the subsequent commissioning of a complete net grid trawl, the progression from a large mesh cover to a set of coverless trawls and the repositioning of lights over sequential gear trials have largely come from discussions with skippers during gear trials and in the debrief period once a trial has been completed.

Communication of this type is assisting the NI Gear Trials project in moving closer towards identifying a practical solution to the challenges of the Landing Obligation whilst giving cognisance to the requirements of the NI fleet as a whole and as individual vessels.

6. Discussion

Over the last two years the Northern Ireland Gear Trials project has continued to build upon the work that commenced in 2017. The results obtained from recent gear trials indicate a progression towards identifying a selective device that is more efficient than those currently approved for use in the Irish Sea nephrops fishery. The outcomes of gear trials and expert advice from industry has also assisted in refining the approach to how some gear trials are designed and this has helped to foster a sense of confidence from within industry towards the results that have been generated.

With respect to the original aims of the project, “to design, trial and implement more selective fishing gears” to date the work has centred around the first two components of this brief. The project has and continues to receive ideas and suggestions on how to improve gear selectivity and avoid unwanted catch and has developed just a few of these ideas through to a full gear trial. It was evident from early gear trials in 2017/18 that reducing the catch of <MCRS fish was relatively easy however achieving this whilst not reducing the catch of nephrops was more of a challenge. This is pertinent for the “implementation” aspect of the project brief as it is unrealistic to expect widespread uptake of a new design of trawl if it puts a vessel at an economic disadvantage.

The inclined net grid trawl (ING) performed well over successive trials at reducing the catch of whiting (Figures 11&13) but was consistently less efficient at catching/retaining nephrops (Tables 2&3). Because this device is more complex in terms of design than the standard Irish Sea nephrops trawl its performance in the water can also differ. Testing the ING in a twin rig configuration and next to a standard trawl whilst keeping an equal spread on each net was difficult and, on some occasions, not possible. When the ING was trialled as a single gear, the reductions in whiting catch that were noted on previous trials remained, however this time the nephrops catch was unaffected (Table 7, Figure 21). It is therefore likely that a set of inclined net grid trawls would work better than an unbalanced twin rig set up of an

experimental and control gear.

Although the ING has shown potential to be more effective at reducing the catch of whiting than the currently used selective devices, other considerations need to be given such as manufacturing costs, ease of use and repair. The ING is more expensive to produce, can be prone to blocking with seaweed and when this happens the inclined panel is difficult to access for clearing. For these reasons, encouraging uptake of the ING would be difficult to justify.

The large mesh cover gear trial was a first attempt in modifying a trawl at the front end. This idea was the suggestion of a local fisherman who felt that if <MCRS fish catch was to be reduced the focus should be on preventing them from entering the net as opposed to releasing them at a point further down the gear. Through feedback from skippers and gear manufacturers it was decided by the project steering group to take this idea a stage further and commission a set of coverless nephrops trawls. The large mesh cover was an attempt to mimic the effects of coverless trawls but proved to be a complex manufacturing job (Figure 6).

The results from the gear trial of the set of coverless trawls indicated that this design may be an effective way of reducing the catch of whiting. It is worth considering that the control nets used on this trial consisted of a 3m long 270mm diamond escape panel forward of the codend and a 3m long 90mm square mesh panel situated in the first tapered section. Given that the coverless trawls had no escape panels, the results support further testing of this design over longer periods and at different times of the year. Although the coverless trawls caught more of the larger whiting in the catch they also caught less of the smaller whiting and less fish overall (Figure 19).

Due to the design of the coverless trawls, when towed they perform differently to standard trawls. Because the wings are not restricted by the netting that would usually make up the cover, the spread of these nets is greater. As the mouth is larger this may account for the increased nephrops catch that was observed (Table 6). If this can be repeated and given that the disadvantages that are associated with the ING are not applicable to the coverless trawl this design has a greater chance of uptake within the fishery.

Over the last two years the project has added to the knowledge base on light technology and selectivity with 2 gear trials completed between 2019/20. From the data obtained to date, including that gathered during the initial two years of this project, lights situated in close proximity to an escape point on a trawl discourage fish from passing through it. Previous light trials placed lights on the escape panel and on an inclined net panel (5) and during the February 2020 trial lights were placed on the belly of the net directly below the escape panel (Figure 5). Unfortunately, further work with lights was curtailed in 2020 due to Covid-19 however further light research is anticipated over the next 2 years.

7. Conclusions

The results obtained from the final 2 gear trials of 2020 are the most positive to date under the current package of gear development work involving the NI TR2 fleet and are the product of good collaboration between industry, scientists, and policy makers. The focus of this work remains in assisting industry to develop their own solutions to the challenges of the Landing Obligation and whilst Brexit and Covid-19 are more urgent subjects of attention at present, the NI industry continues to progress its conservation objectives.

Running gear trials in September 2020 required significantly more planning than normal due to the present situation and soon after these trials were completed much of the industry entered into a voluntary tie up scheme. Had this not happened it is likely that a few further weeks of development support post the coverless trawl trial would have encouraged a skipper to use these trawls commercially over a longer period whilst making further adjustments.

The Northern Ireland Gear Trials Project has secured EMFF funding to continue with this work until 2022 end and will be planning the next gear trials for 2021 imminently. The resources are there to allow for further trialling and development of the coverless trawls and other devices and so it will be important for the project steering group to consider how these resources can be effectively deployed to encourage uptake of a new selective device into the fishery.

8. References

1. NI Gear Trials Project 2019 Report.pdf (dropbox.com)
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3. Fishing Gear Database — Seafish
4. Minimum Conservation Reference Sizes (MCRS) in UK waters - GOV.UK (www.gov.uk)
5. NI Gear Trials Project 2017-2019 Report.pdf (dropbox.com)