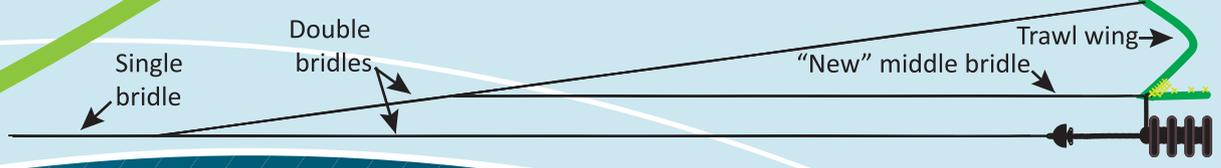
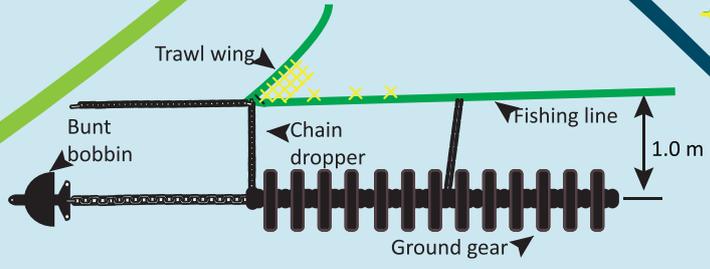
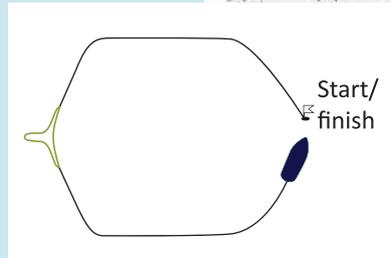


Survivors (Number)	Survival (%)
71	50
19	100



BIM Ireland's Seafood Development Agency

Guide on Technical Solutions to Reduce Unwanted catches

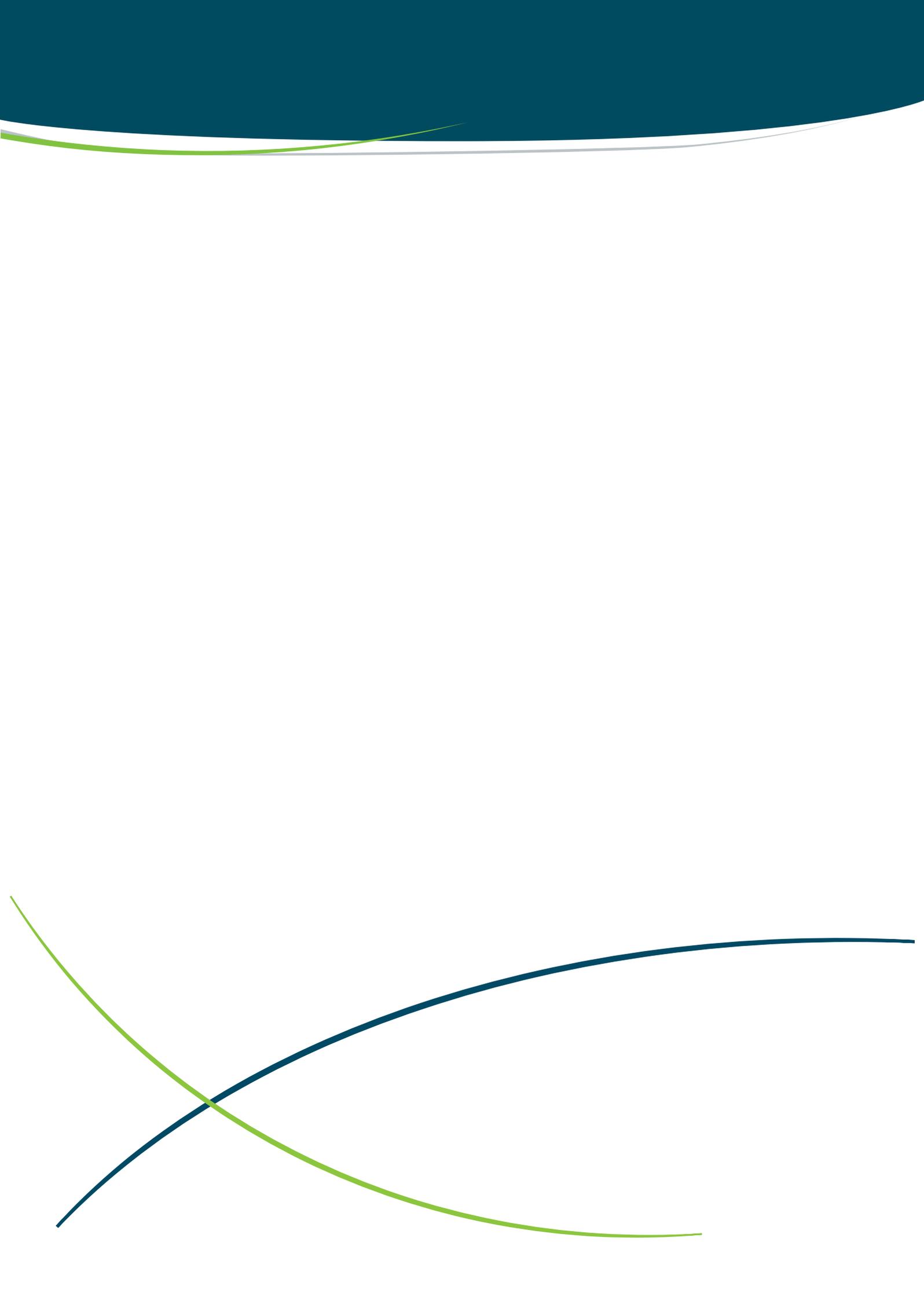
February 2020



An Roinn Talmhaíochta, Bia agus Mara
Department of Agriculture, Food and the Marine



EUROPEAN UNION
This measure is part-financed by the European Maritime and Fisheries Fund



BIM's Fisheries Conservation team works closely with the Irish fishing industry to develop technical solutions that reduce unwanted catches. This helps address challenges posed by the EU landing obligation and boost fisheries sustainability by decreasing landings of small (juvenile), over-quota and non-target species.

This updated guide contains summaries of technical solutions developed since 2014 and categorised as follows:

- A. Small, over quota and non-target fish species in *Nephrops* trawls
- B. Small *Nephrops* in *Nephrops* trawls
- C. Small, over quota and non-target fish species in demersal trawls

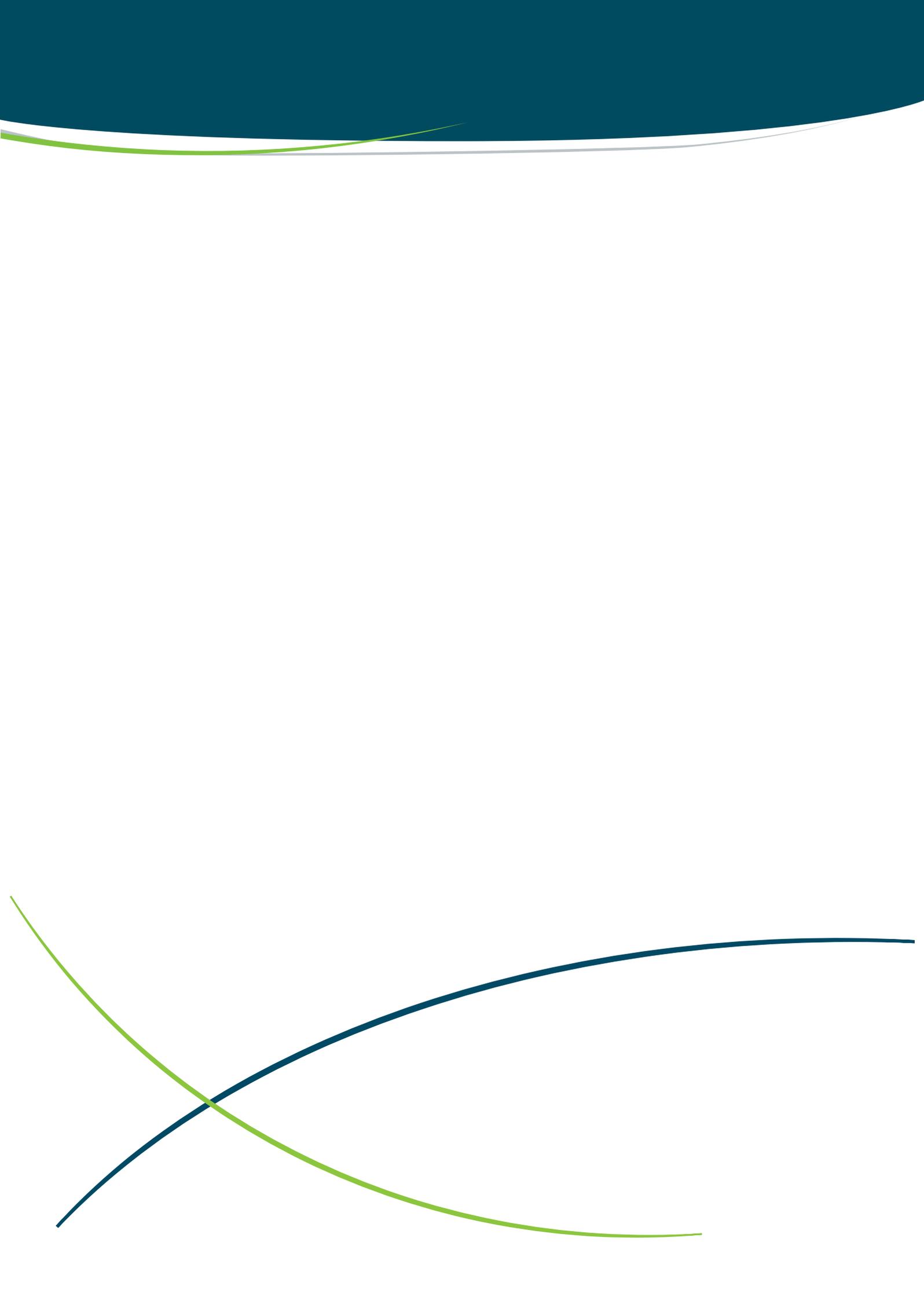
The landing obligation is primarily implemented through discard plans which specify detailed requirements for demersal fisheries in North-Western waters. These include survivability and de minimis exemptions which permit some continued discarding, and gear measures that aim to avoid unwanted catches during fishing. New gear measures are also implemented through other legislation, such as remedial measures under the annual EU Regulations on fishing opportunities.

(see: <http://fisheriesmanagementchart.ie/>)

Many of the solutions developed in Ireland are included in this EU legislation which greatly assists with industry uptake and implementation. Detailed studies on all of these solutions are available at: <http://www.bim.ie/our-publications/fisheries>

Acknowledgements

Thanks are extended to all the owners, skippers and crews of Irish vessels who collaborated with BIM. The work was funded by the Irish Government and part-financed by the European Union through the EMFF Operational Programme 2014–2020 under the BIM Sustainable Fisheries Scheme.



A. Reduce small, over quota and non-target fish species in *Nephrops* trawls using a:

1. 300 mm square-mesh panel
2. SELTRA sorting box
3. SELTRA sorting box compared with a 300 mm square-mesh panel
4. SELTRA sorting box (with 90 mm mesh)
5. Swedish grid
6. *Nephrops* catch sensor (Notus Echo) on a Swedish grid
7. Dual-codend separator
8. Dual-codend separator compared with a 100 mm codend

Reducing fish catches with a 300 mm square-mesh panel in *Nephrops* trawls

AREA, VESSEL

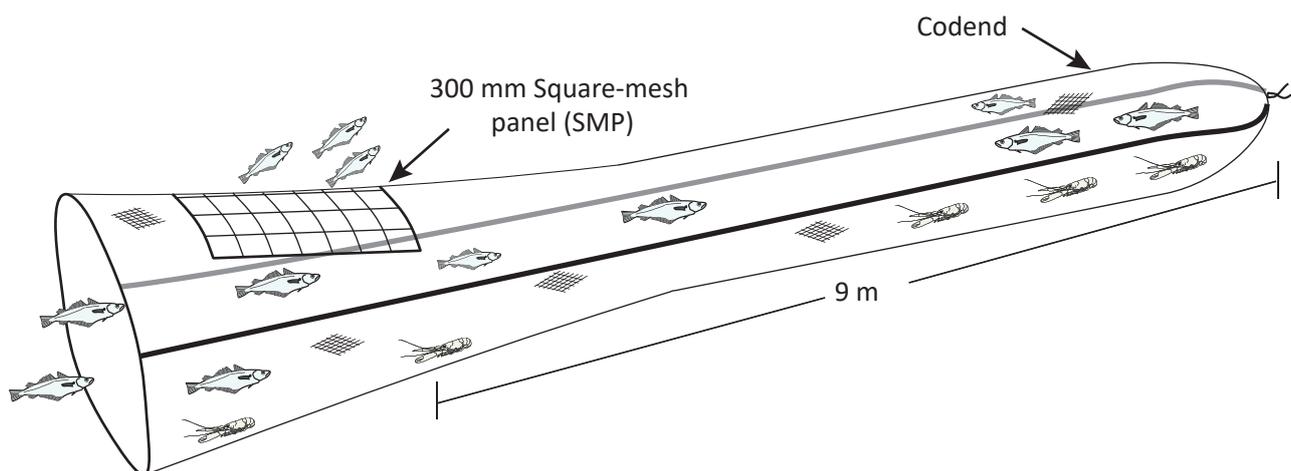
The 23 haul quad-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board the MFV Stella Nova (DA57) (23.5 m, 441 kW) during August 2014, while targeting *Nephrops*.

GEAR MODIFICATION

A 3 m long 300 mm square-mesh panel (SMP) was inserted 9 m from the cod-line in the two-panel test gear. The standard gear was identical but without a square-mesh panel.



Nominal codend mesh size and fishing circle were 70 mm and 386 × 70 mm.



Species	Standard gear (kg)	300 mm SMP (kg)	Difference (%)
Haddock	214	65	-70
Whiting	136	66	-52
<i>Nephrops</i>	1106	1262	14

RESULTS

- Haddock and whiting catches were reduced across most size grades
- *Nephrops* catches were not reduced
- Added as a gear measure in the Celtic and Irish Seas

FURTHER INFORMATION

<https://tinyurl.com/300-mm-smp-geartrials@bim.ie>



Reducing fish catches with a SELTRA sorting box in *Nephrops* trawls

AREA, VESSEL

The twin-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board MFV Ocean Breeze (D96) (17 m, 224 kW) during September 2016, while targeting *Nephrops*.

GEAR MODIFICATION

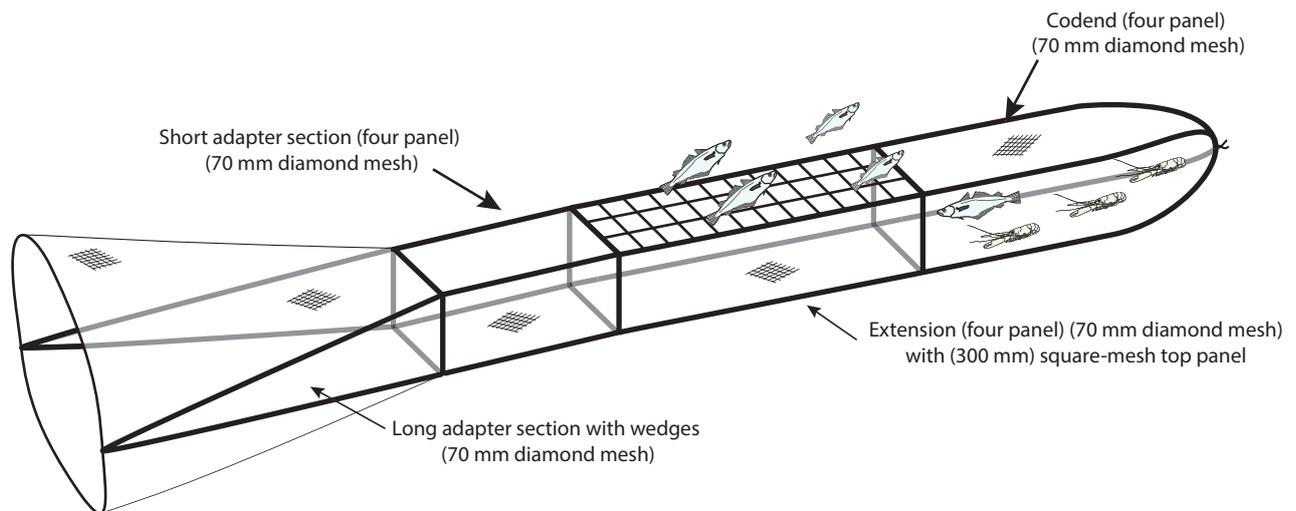
The SELTRA sorting box:

- a 3 m long four-panel section of 70 mm diamond mesh
- with a 3 m long 300 mm square-mesh escape window in the top panel attached 3 m from the cod-line

The standard and SELTRA gears were fished on identical twin-rigged trawls



(380 × 80 mm fishing circle) and both were fitted with a 70 mm codend. A square-mesh panel was not present in the standard gear.



Species	Standard gear (kg)	SELTRA (kg)	Difference (%)
Whiting	152	66	-57
Haddock	126	12	-91
Flatfish	20	6	-69
Monkfish	5	9	72
Dogfish	351	25	-93
<i>Nephrops</i>	362	396	9

RESULTS

- Substantial reductions in catches of most fish species
- Catches of very small whiting < 20 cm not reduced
- *Nephrops* catches not reduced
- Added as a gear measure in the Celtic and Irish Seas

FURTHER INFORMATION

<https://tinyurl.com/bim-seltra-geartrials@bim.ie>



Comparing catches between a SELTRA sorting box and a 300 mm square-mesh panel in *Nephrops* trawls

AREA, VESSEL

The twin-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board MFV Ocean Breeze (D96) (17 m, 224 kW) during December 2016, while targeting *Nephrops*.

GEAR MODIFICATION

The SELTRA sorting box:

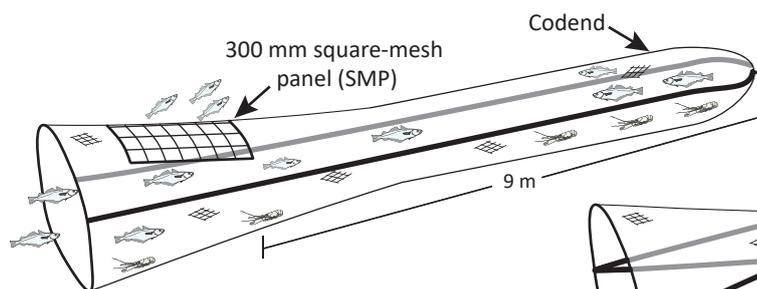
- a 3 m long four-panel section of 70 mm diamond mesh
- with a 3 m long 300 mm square-mesh escape window in the top panel attached 3 m from the cod-line

The standard gear was fitted with a 3 m long 300 mm square-mesh panel (SMP)

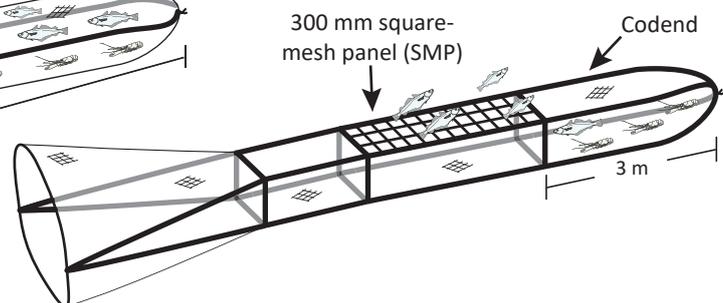


9 m from the cod-line, in a two-panel trawl. Both gears were fished on identical twin-rigged trawls (380 × 80 mm fishing circle) and fitted with 70 mm codends.

300 mm SMP gear



SELTRA



Species	300 mm SMP (kg)	SELTRA (kg)	Difference (%)
Whiting	362	277	-24
Haddock	639	314	-51
Cod	43	8	-81
Flatfish	118	53	-55
Monkfish	123	107	-12
Dogfish	1617	419	-74
<i>Nephrops</i>	610	725	19

RESULTS

- Substantial reductions in catches of most species
- Catches of very-small whiting < 20 cm not reduced
- Greater *Nephrops* catches in the SELTRA
- SELTRA is a superior gear measure

FURTHER INFORMATION

<https://tinyurl.com/bim-seltra-geartrials@bim.ie>



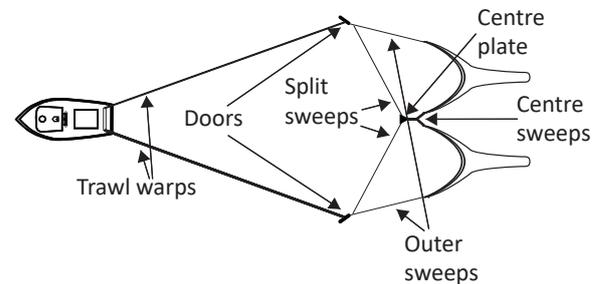
Reducing catches of small fish with a SELTRA sorting box with 90 mm codend

AREA, VESSEL

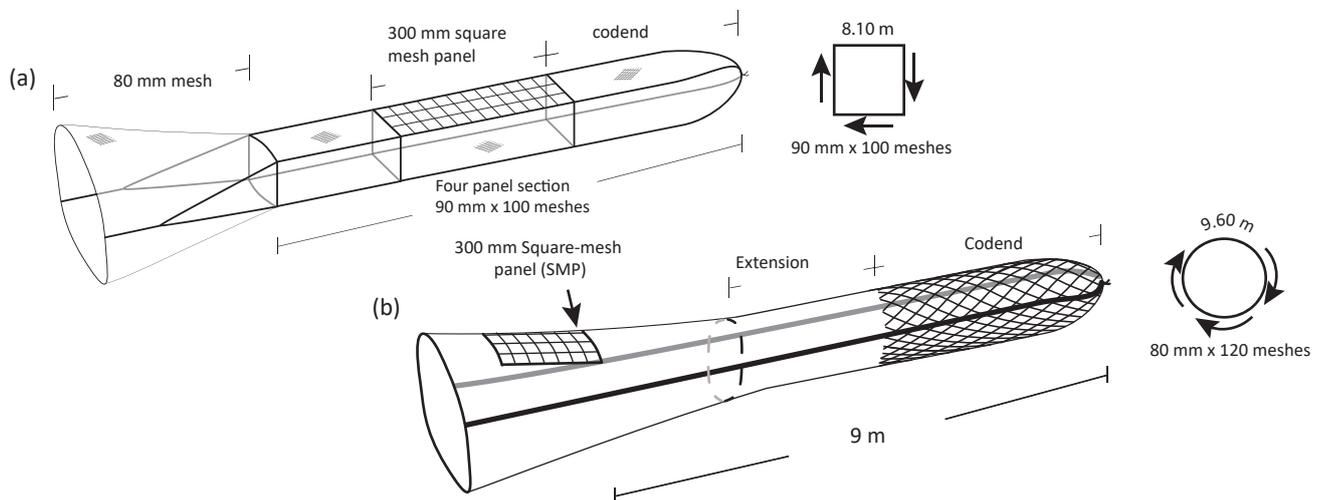
A catch comparison trial was conducted in the western Irish Sea (ICES 7a) in June 2018 on board an 18 m vessel.

GEAR MODIFICATION

Trawl gear comprised 2 x 37 m footrope *Nephrops* trawls towed using two warps in a half quad-rig configuration. (a) The test gear consisted of a four-panel 90 mm SELTRA sorting box with a 300 mm SMP mounted 3.7 m metres from the codline.



(b) The standard gear consisted of a two-panel aft section with a 300 mm SMP and 80 mm codend.



Percentage of total catch weight in each codend

Species	Standard 80 mm (kg)	SELTRA 90 mm (kg)	Difference (%)
Whiting			
≥ 27 cm [#]	4	2	-56
< 27 cm [#]	54	13	-75
< 20 cm	42	9	-78
Haddock			
≥ 30 cm [#]	29	11	-62
< 30 cm [#]	289	85	-70
< 20 cm	166	51	-69
<i>Nephrops</i>			
≥ 25 mm [*]	1009	814	-19
< 25 mm [*]	48	31	-34

[#]MCRS: minimum conservation reference size
^{*}carapace length

RESULTS

- Catches of very-small whiting < 20 cm were reduced by 78%.
- Concerns over mortality of very small whiting escaping through codend meshes
- Reduction in *Nephrops* catches mainly occurred for tail grades

FURTHER INFORMATION

<https://tinyurl.com/bim-seltra-90-mm-geartrials@bim.ie>



Reducing fish catches with a Swedish grid in *Nephrops* trawls

AREA, VESSEL

The 12 haul quad-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board MFV Our Lass II (DA261) (21.7 m, 484 kW) during September 2015, while targeting *Nephrops*.

GEAR MODIFICATION

The test gear was fitted with:

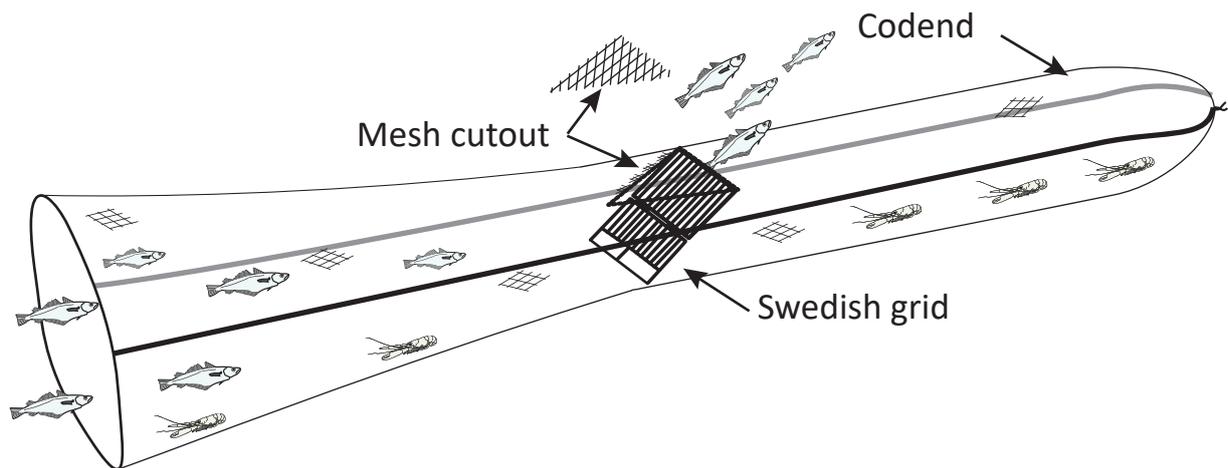
A Swedish grid with vertical bars:

- spaced 35 mm apart and
- a 15 cm high gap at the bottom

An escape hole in the top sheet of the trawl forward of the grid. The standard



gear was identical but without a grid. Nominal codend mesh size was 70 mm for both gears and fishing circle was 380 × 80 mm.



Species	Standard gear (kg)	Swedish grid (kg)	Difference (%)
Whiting	183	42	-77
Cod	75	0	-100
Haddock	42	4	-90
<i>Nephrops</i>	1908	1834	-4

RESULTS

- Substantial reductions in key fish species across all size classes
- Little difference in *Nephrops* catches
- Added as a gear measure in the Celtic and Irish Seas

FURTHER INFORMATION

<https://tinyurl.com/swedish-grid-geartrials@bim.ie>



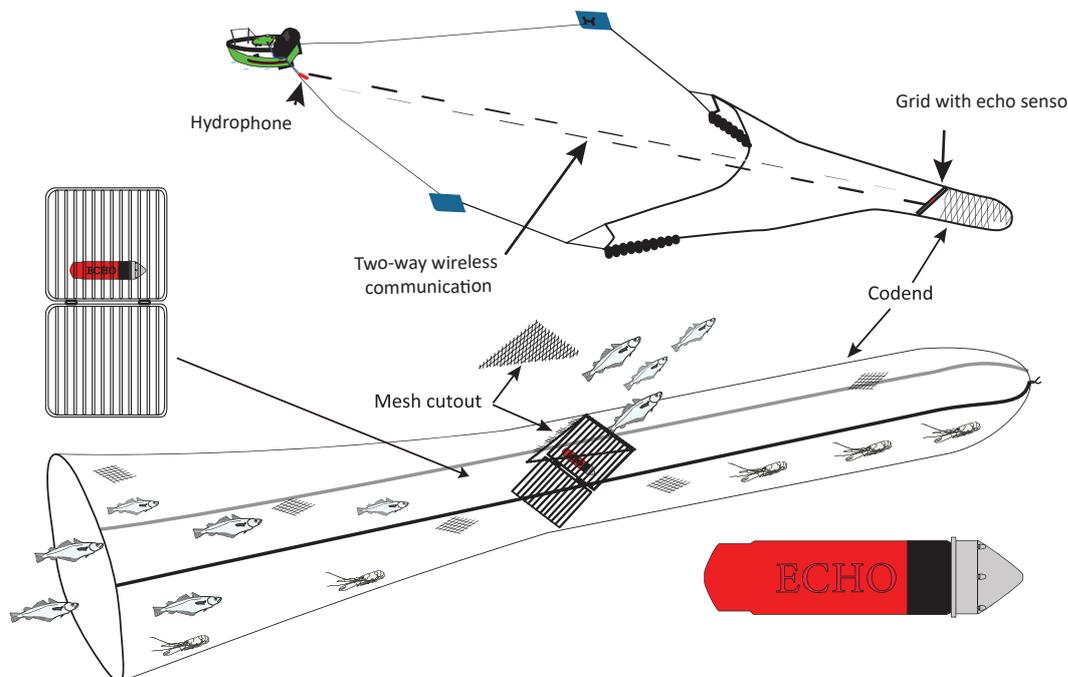
Assessment of the Notus Echo catch sensor in the Irish *Nephrops* fishery

AREA, VESSEL

The trial took place on the Galway and Aran fishing grounds (ICES 7b) on board a 11.6 m trawler during Summer 2019.

GEAR MODIFICATION

A Notus Echo sensor was placed on an aluminium Swedish grid to assess its functionality in detecting *Nephrops*. The sensor was tested at different positions and sensitivities to determine optimal settings for *Nephrops*.



Voltage	Position on grid	<i>Nephrops</i> detection
0.60	Lower half	Inflated
1.25	Lower half	Reduced
1.00	Upper half	Optimum

RESULTS

- Optimal *Nephrops* detection (at 1.00 v) with sensor on top half of grid
- Potential uses on other grid types
- Potential to improve operational efficiency

FURTHER INFORMATION

<https://tinyurl.com/Nephrops-catch-sensor-geartrials@bim.ie>



Reducing catches of small fish with a dual-codend separator in *Nephrops* trawls

AREA, VESSEL

The catch comparison trial took place at the Smalls (ICES 7g) on board MFV Stella Nova (DA57) (23.5 m, 441 kW) during October 2016, while targeting *Nephrops*.

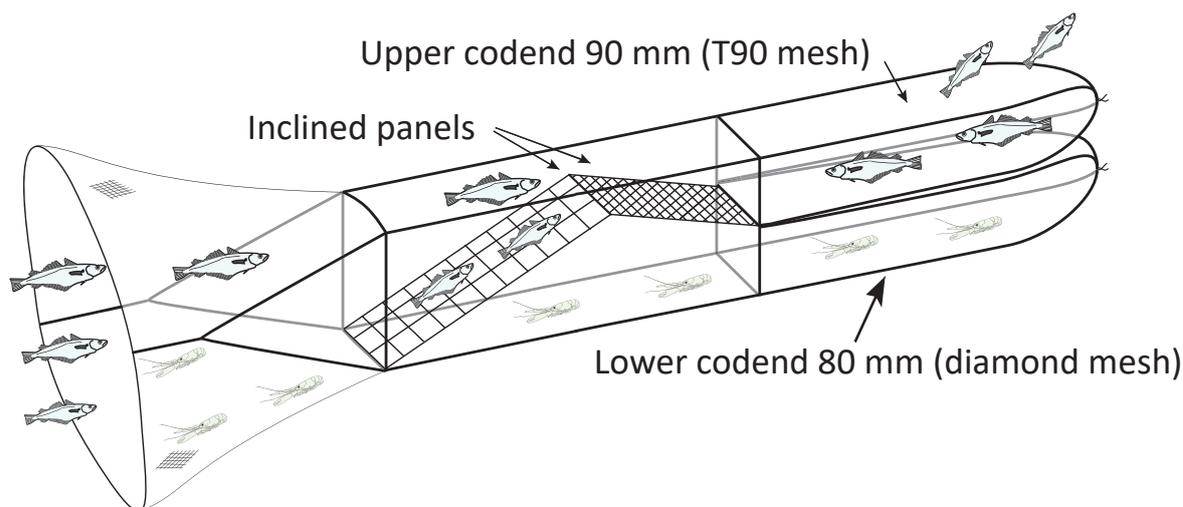
GEAR MODIFICATION

The test gear consisted of:

- a four-panel 80 mm diamond-mesh extension piece
- a 300 mm inclined square-mesh panel
- an 80 mm inclined diamond-mesh panel
- an upper codend with 90 mm T90 mesh
- a lower 80 mm diamond-mesh codend



The standard codend and extension piece were constructed with 80 mm diamond mesh. A square-mesh panel was not present in either gear.



Species	Standard gear (kg)	Test gear (kg)	Difference (%)
Haddock < 30 cm [#]	100	52	-49
Haddock ≥ 30 cm [#]	254	277	9
Whiting < 32 cm [§]	1435	401	-72
Whiting ≥ 32 cm [§]	874	553	-37
<i>Nephrops</i>			
< 25 mm ^{**}	325	289	-11
≥ 25 mm ^{**}	2103	2094	0

[#]minimum conservation reference size (MCRS)

^{*}carapace length

[§]market size

FURTHER INFORMATION

<https://tinyurl.com/dual-codend-geartrials@bim.ie>

RESULTS

- Substantial reduction in catches of small fish
- Loss of market-size whiting
- No loss in larger *Nephrops*
- Added as gear measure in the Celtic Sea



Comparing catches between the dual codend and a 100 mm codend with 120 mm square-mesh panel

AREA, VESSEL

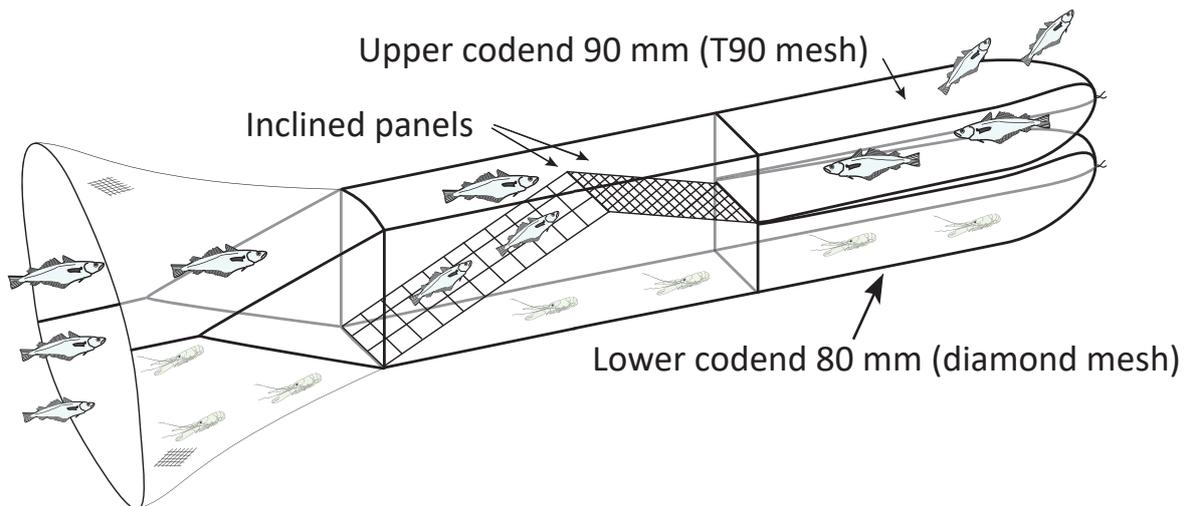
The 6 haul twin-rig catch comparison trial took place in the Celtic Sea (ICES 7g) on board MFV Ocean Pioneer (S45) (22.4 m, 440 kW) during December 2019, while targeting *Nephrops*.

GEAR MODIFICATION

The test gear comprised, a four-panel 80 mm diamond-mesh extension piece (made with 4 mm Ø single twine), a 300 mm inclined square-mesh panel with an 80 mm inclined diamond-mesh panel, an upper codend with 90 mm T90 mesh, and a lower



80 mm diamond-mesh codend. The standard codend and extension piece were made with 100 mm diamond mesh. A 120 mm square-mesh panel was only present in the standard gear.



Species	Standard gear (kg)	Dual (kg)	Difference (%)
<i>Nephrops</i> < 25 mm [#]	5	22	>100
<i>Nephrops</i> ≥ 25 mm [#]	123	228	85
<i>Nephrops</i> estimated value	€1149	€1445	20
Haddock < 30 cm [#]	641	504	-21
Haddock ≥ 30 cm [#]	32	29	-9
Whiting < 27 cm [#]	27	22	-19
Whiting ≥ 27 cm [#]	24	12	-50
Cod < 35 cm [#]	5	5	0
Cod ≥ 35 cm [#]	11	10	-9

[#]minimum conservation reference size (MCRS)

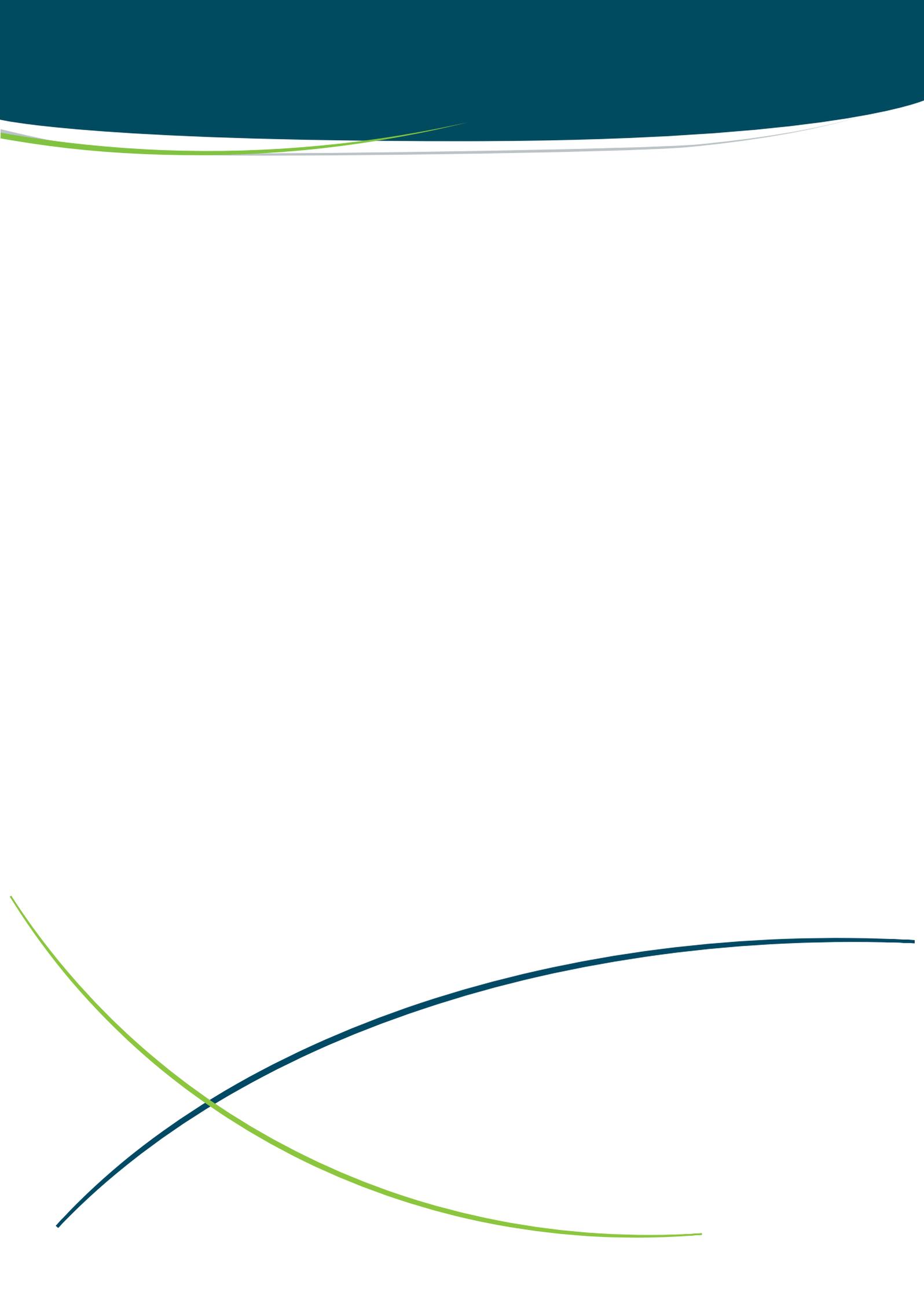
*carapace length

RESULTS

- 20% increase in *Nephrops* catch value
- Little difference in haddock catches
- Substantial reduction in whiting catches
- Dual codend is a superior option targeting *Nephrops* and fish

FURTHER INFORMATION
geartrials@bim.ie





B. Reduce small *Nephrops* in *Nephrops* trawls by:

9. Demonstrating *Nephrops* high survivability using a SELTRA
10. Increasing codend mesh size from 70 to 80 mm
11. Modifying the codend circumference
12. Using a *Nephrops* sorting grid

Reducing landings of small *Nephrops* by demonstrating high survivability of discarded *Nephrops*

AREA, VESSEL

The study took place on the Galway and Aran fishing grounds (ICES 7b) on board a 11.6 m (150 kW) trawler and a 9.8 m (63 Kw) creel vessel, during July 2017.

METHODS

A standard SELTRA sorting box with:

- a 3 m long four-panel section
- 80 mm diamond mesh

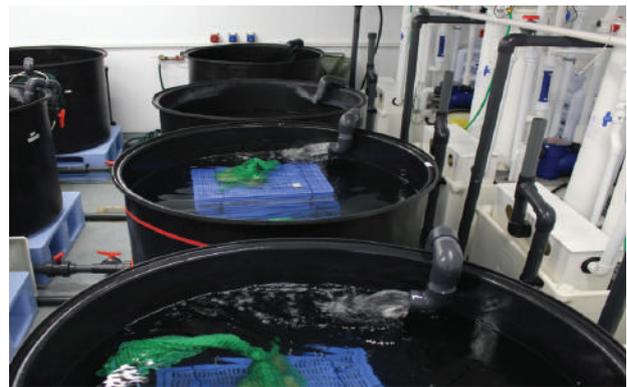
The SELTRA gear was employed on a single-rigged trawl (380 × 80 mm fishing circle) with an 80 mm codend.



Control *Nephrops* caught with creels were stored along with the test *Nephrops* for two weeks at an onshore facility.



Nephrops in storage crate



Onshore holding facility

<i>Nephrops</i>	Number caught	Survivors (Number)	Survival (%)
Trawl	1664	1070	64
Creel	204	200	98

RESULTS

- The overall *Nephrops* survivability was:
 - 64%, trawl
 - 98%, creel
- High survivability exemption with selective gears granted in ICES sub area 7

FURTHER INFORMATION

<https://tinyurl.com/Nephrops-survivability-geartrials@bim.ie>



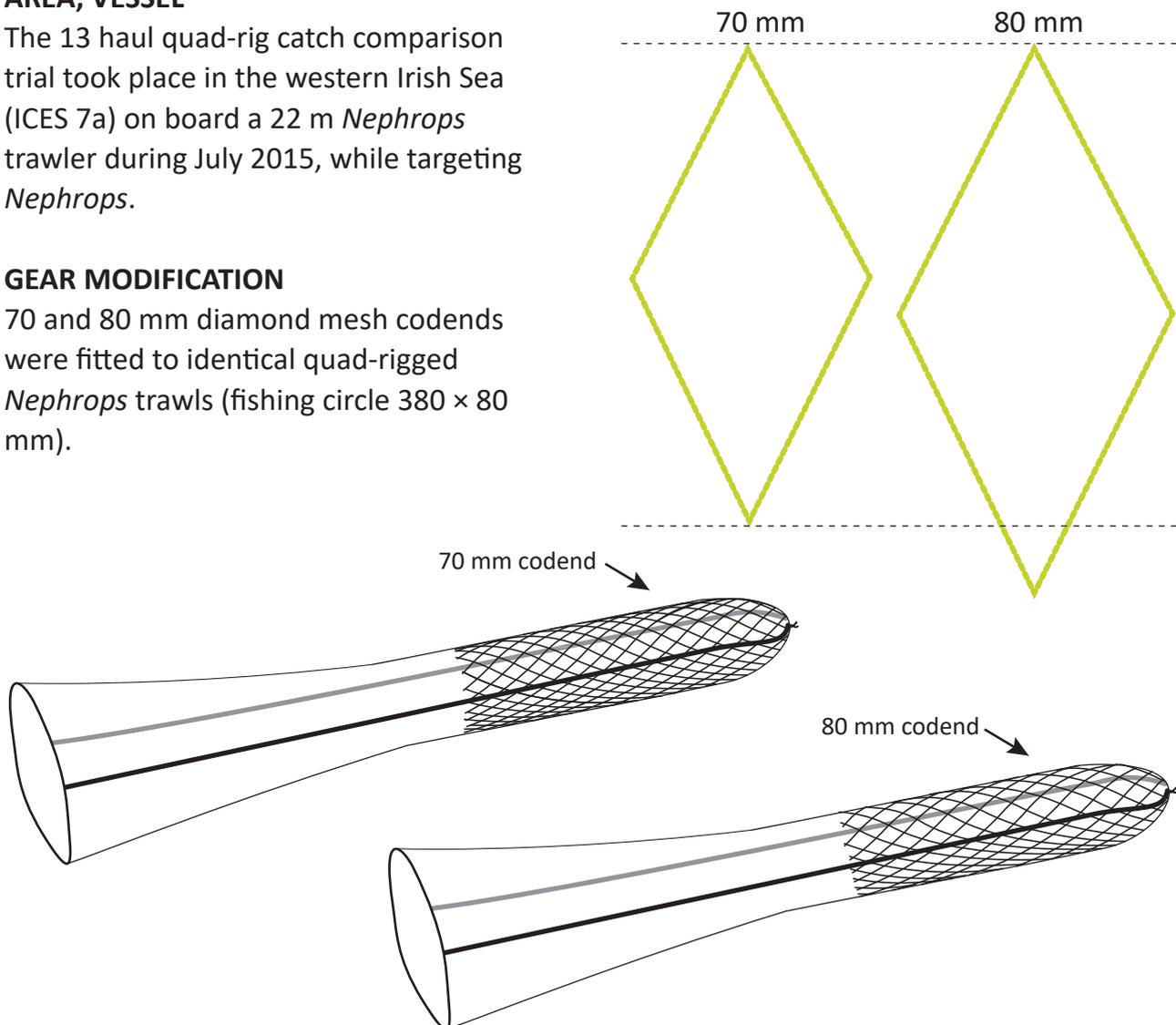
Reducing catches of small *Nephrops* with an increase in codend mesh size from 70 to 80 mm

AREA, VESSEL

The 13 haul quad-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board a 22 m *Nephrops* trawler during July 2015, while targeting *Nephrops*.

GEAR MODIFICATION

70 and 80 mm diamond mesh codends were fitted to identical quad-rigged *Nephrops* trawls (fishing circle 380 × 80 mm).



Species	70 mm codend (kg)	80 mm codend (kg)	Difference (%)
<i>Nephrops</i>			
< 25 mm*	53	29	-45
≥ 25 mm*	2040	1808	-11

*carapace length

RESULTS

- Significant reduction in catches of small *Nephrops*
- Small loss in *Nephrops* >25 mm
- No loss in profitability over the course of a fishing season
- Regulated mesh size increase to 80 mm from 2017

FURTHER INFORMATION

<https://tinyurl.com/70mm-to-80mm>
geartrials@bim.ie



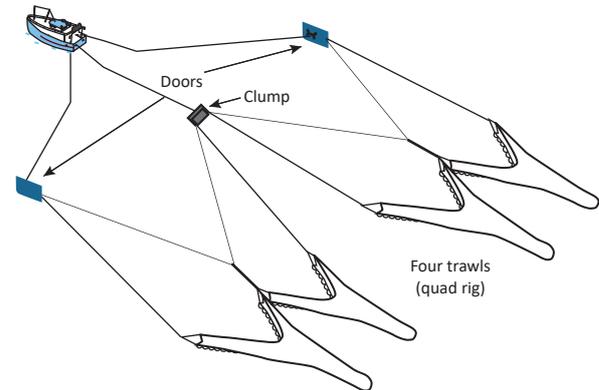
Modifying the codend circumference to reduce catches of small *Nephrops* and whiting in *Nephrops* trawls

AREA, VESSEL

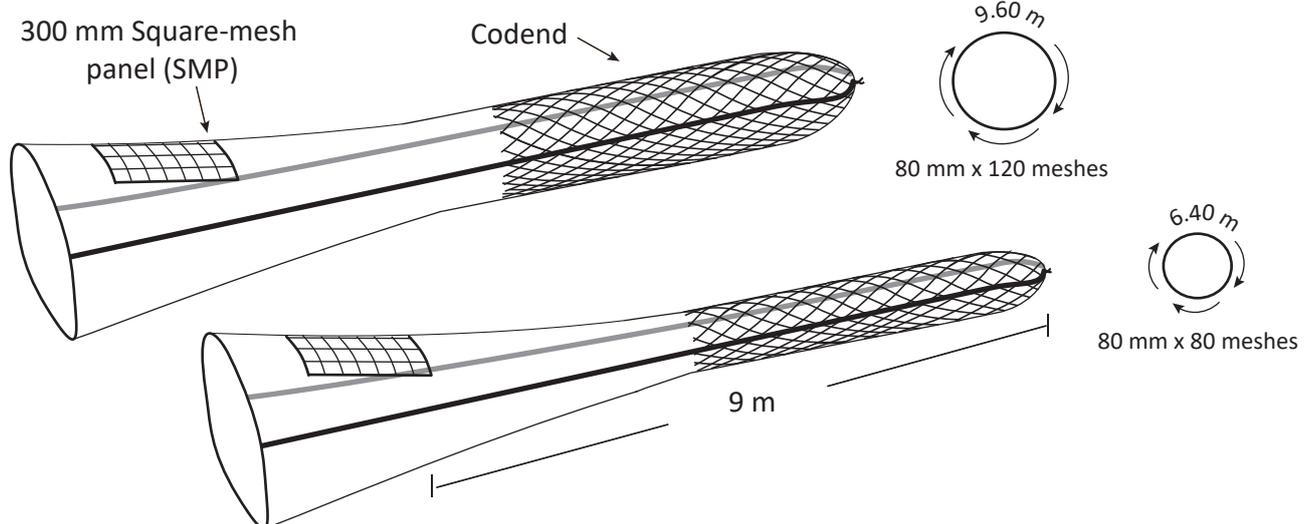
The 12 haul catch comparison trial took place in the Western Irish Sea (ICES 7a) on a 23 m quad-rig trawler, during February 2018, while targeting *Nephrops*.

GEAR MODIFICATION

An 80 × 80 codend (mesh size (mm) × number of meshes in circumference) was compared against a standard 80 × 120 codend. The circumference and mesh size in the extension piece matched the codend to which it was attached. A 300 mm square



-mesh panel (SMP) was mounted 9–12 m from the codline in each trawl.



Species	80 × 120 (kg)	80 × 80 (kg)	Difference (%)
<i>Nephrops</i>			
< 25 mm*	48	33	-30
≥ 25 mm*	396	350	-12
Whiting			
< 20 cm	144	122	-15

*Carapace length

RESULTS

- Substantial reduction in small *Nephrops*
- Minimal reductions in larger *Nephrops* and very small whiting

FURTHER INFORMATION

<https://tinyurl.com/codend-circumferencegeartrials@bim.ie>



Reducing catches of small *Nephrops* using a *Nephrops* sorting grid

AREA, VESSEL

The 12 haul quad-rig catch comparison trial took place in the western Irish Sea (ICES 7a) on board MFV Our Lass II (DA261) (21.7 m, 484 kW) during September 2015, while targeting *Nephrops*.

GEAR MODIFICATION

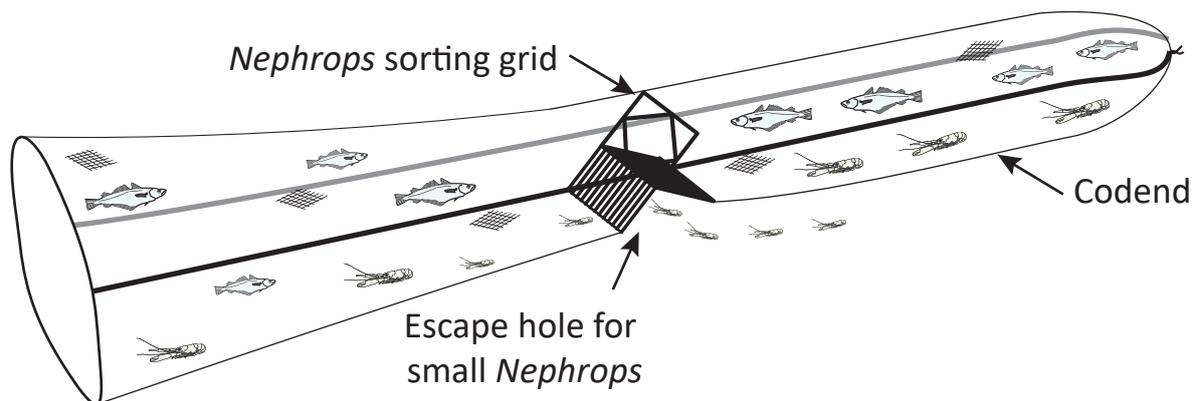
The test gear was fitted with a *Nephrops* sorting grid (NSG):

- Vertical bars spaced 15 mm apart in the lower half
- Reinforced opening in the top half
- Guiding panel and escape hole in trawl's bottom sheet to the rear of the grid



The standard gear was identical but without a rigid grid.

Nominal codend mesh size and fishing circle were 70 mm and 380 × 80 mm.



Species	Standard gear (kg)	NSG (kg)	Difference (%)
<i>Nephrops</i>			
< 25 mm*	454	293	-35
≥ 25 mm*	1454	1232	-15
> 31 mm&*	346	332	-4

*carapace length
& whole grade

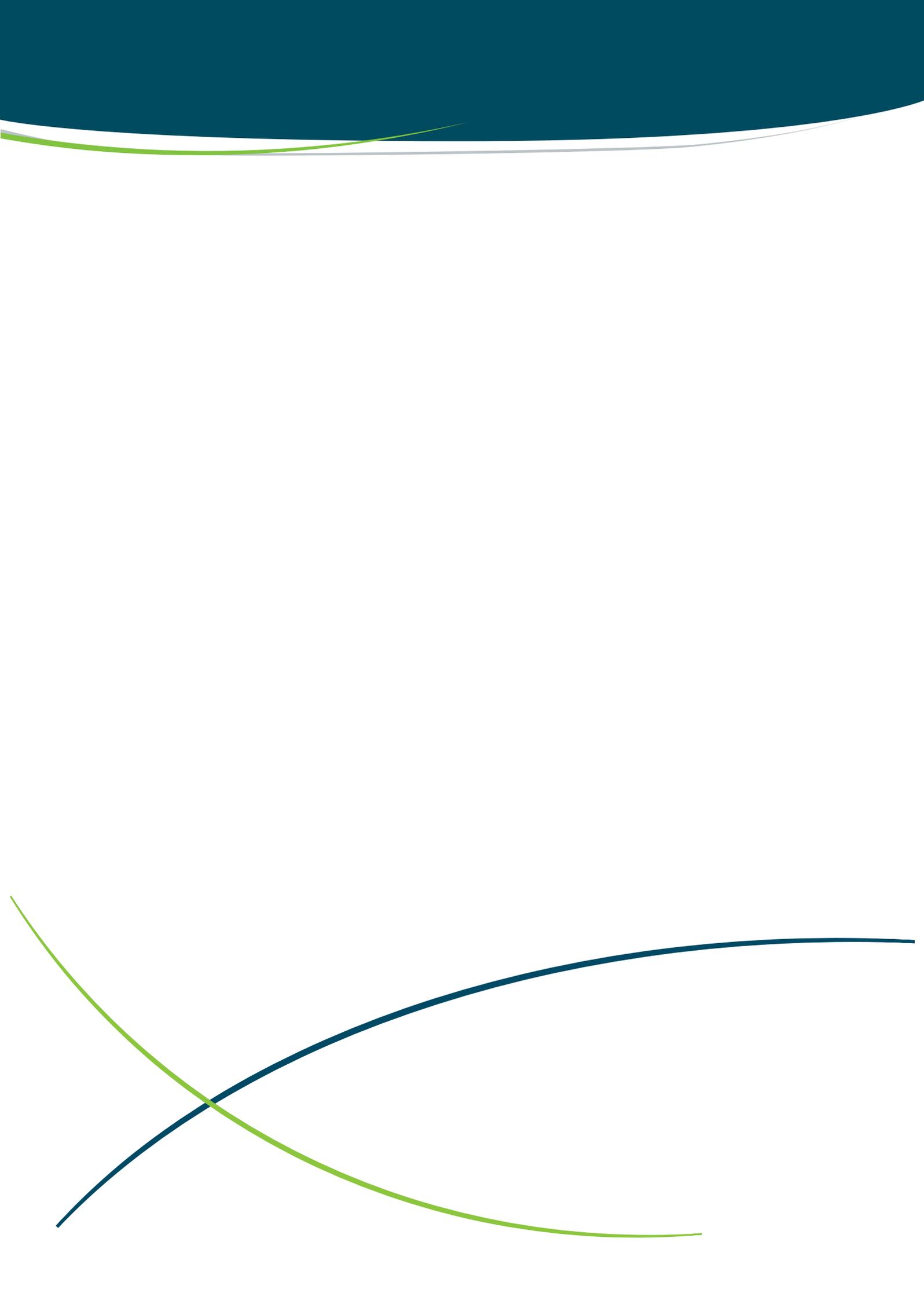
RESULTS

- Substantial reduction in small *Nephrops*
- Small reduction in larger *Nephrops*
- Fish catches maintained

FURTHER INFORMATION

<https://tinyurl.com/Nephrops-sorting-grid>
geartrials@bim.ie





C. Reduce small, over quota and non-target fish species in the demersal trawls targeting fish species by:

13. Using 90 mm T90 mesh codend to reduce catches of small fish
14. Using 80 mm T90 mesh codend to reduce undersize whiting
15. Raising the fishing line to reduce cod catches
16. Staggering the fishing line to reduce unwanted fish catches
17. Using a 120 mm diamond mesh codend to reduce haddock catches
18. Assessing plaice vitality in a seine fishery
19. Assessing post-capture condition of cuckoo ray
20. Assessing sole survivability

Reducing catches of small fish with a 90 mm T90-mesh codend in a whitefish trawl

AREA, VESSEL

The 10 haul twin-rig catch comparison trial took place in the Celtic Sea (ICES 7g) on board MFV Foyle Fisher (G497) (24.7 m, 441 kW) during May 2019, while targeting whitefish.

GEAR MODIFICATION

The test codend and extension piece were constructed from 90 mm T90 (turned 90°) mesh. The standard codend and extension piece were constructed from diamond (T0) 80 mm mesh.



The fishing circle of the twin-rigged hopper trawls was 550 × 80 mm.

T0
Diamond



T90
Diamond
turned 90°

Species	Standard gear (kg)	T90 (kg)	Difference (%)
Haddock < 30 cm [#]	312	35	-89
Haddock ≥ 30 cm [#]	876	1,236	41
Whiting < 27 cm [#]	25	1	-97
Whiting ≥ 27 cm [#]	307	60	-80
Whiting ≥ 32 cm [§]	143	56	-61
Cod < 35 cm [#]	64	26	-59
Cod ≥ 35 cm [#]	192	192	0
Monkfish	244	380	56

[#]minimum conservation reference size (MCRS)
[§]market size

FURTHER INFORMATION

<https://tinyurl.com/90-mm-T90geartrials@bim.ie>

RESULTS

- Substantial reductions in catches of whiting, small haddock and small cod
- Substantial increases in catches of monkfish and larger haddock
- Added as gear measure in the Celtic Sea



Reducing catches of small whiting with 80 mm T90 mesh in whitefish trawls

AREA, VESSEL

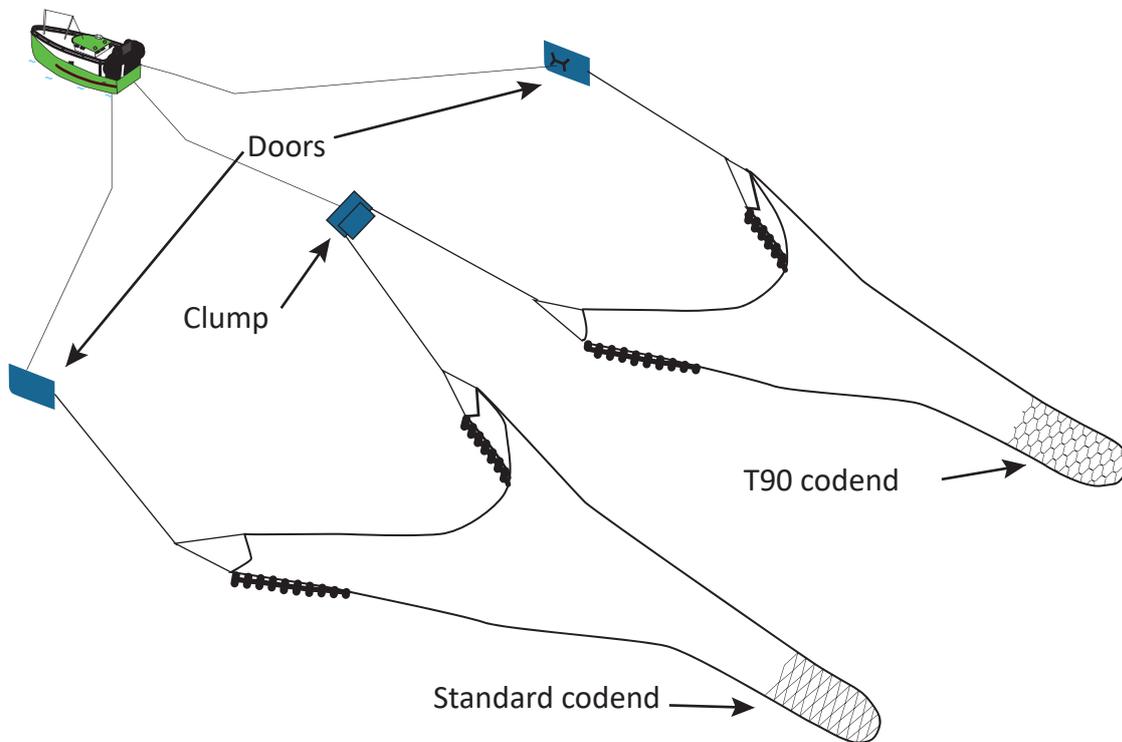
The 13 haul twin-rig catch comparison trial took place in the Celtic Sea (ICES 7g) on board MFV Foyle Fisher (G497) (24.7 m, 441 kW) during April 2016, while targeting whiting.

GEAR MODIFICATION

The test codend and extension piece were constructed from 80 mm T90 (turned 90°) mesh. The standard codend and extension piece were constructed from diamond 80 mm mesh.



The fishing circle of the twin-rigged hopper trawls was 550 × 80 mm.



Species	Standard gear (count)	T90 (count)	Difference (%)
Whiting			
< 32 cm [§]	2628	857	-67
≥ 32 cm [§]	6691	7774	16

[§]market size

RESULTS

- Substantial reduction in small whiting
- Increased catches of larger haddock, whiting and plaice
- Substantial improvement in catch quality



FURTHER INFORMATION

<https://tinyurl.com/80mm-T90geartrials@bim.ie>



Reducing cod catches with a raised fishing line in whitefish trawls

AREA, VESSEL

The twin-rig catch comparison trial took place in the Celtic Sea (ICES 7g) on board a 25 m whitefish trawler during March 2017, while targeting whiting.

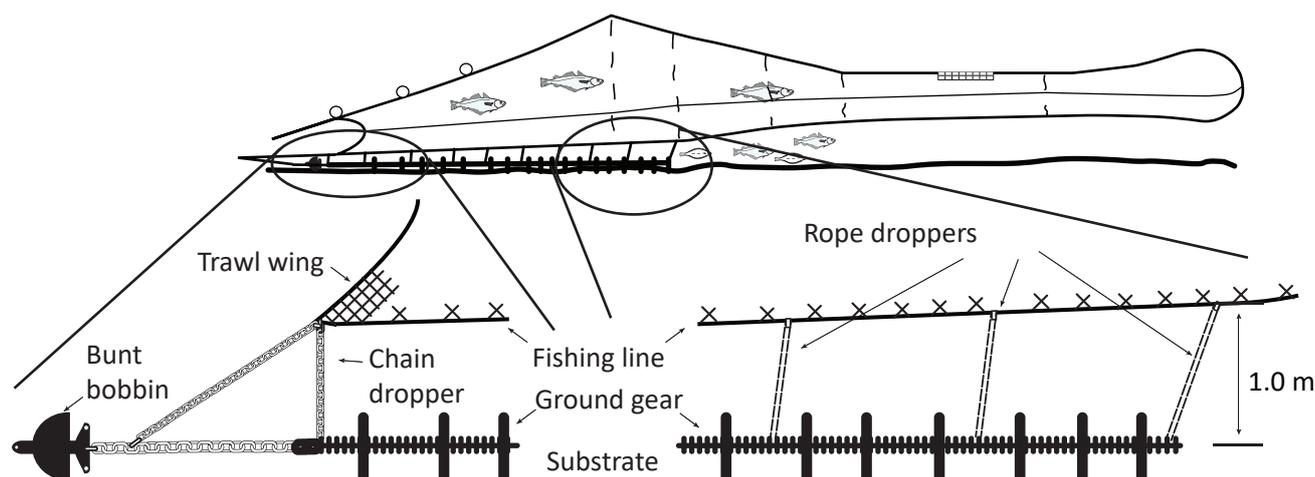
GEAR MODIFICATION

Two identical whitefish trawls (620 × 80 mm fishing circle) were used during the trial.

On the standard gear the ground gear/fishing line arrangement was unaltered. On the test gear the droppers between



the fishing line and the ground gear were lengthened to 1 m.



Species	Standard gear (kg)	Raised fishing line (kg)	Difference (%)
Cod	798	488	-39
Whiting	2706	5069	87
Haddock	1975	2713	37
Flatfish	584	250	-57
Monkfish	202	57	-72
Skate and ray	124	25	-80

RESULTS

- Reduced catches of cod, flatfish, monkfish, and skate and ray
- Substantial increases in whiting and haddock catches
- Total catch value increased by 14%
- Added as gear measure in the Celtic Sea

FURTHER INFORMATION

<https://tinyurl.com/raised-fishingline>
geartrials@bim.ie



Reducing unwanted fish catches with a staggered fishing line in whitefish trawls

AREA, VESSEL

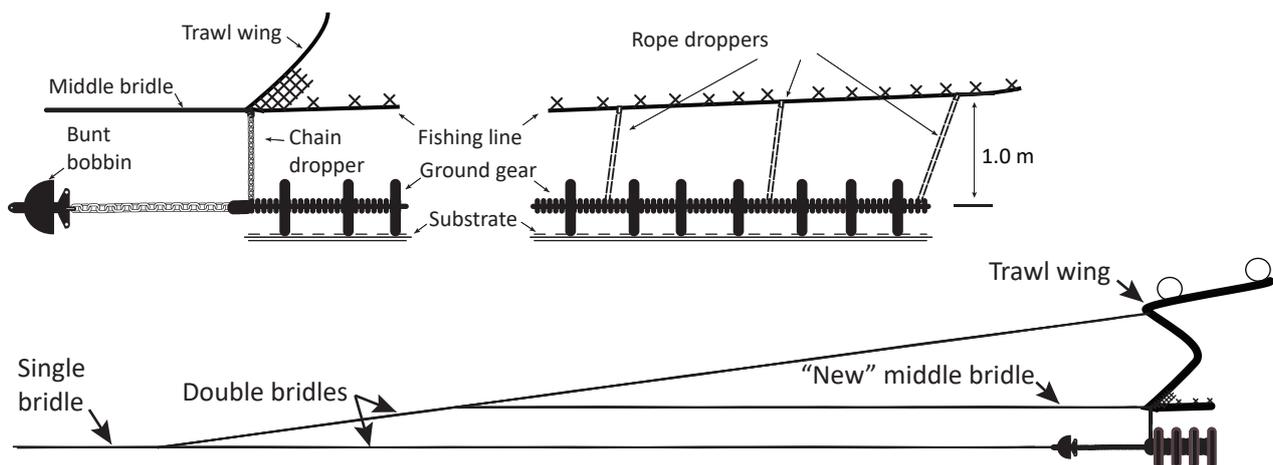
The 24 single-rig alternate-haul catch comparison trial took place in the Celtic and Irish Seas (ICES 7a,g) on board the MFV Northern Celt (SO472) (25 m, 600 Kw) during March and April 2019, while targeting whitefish.



GEAR MODIFICATION

Following on from the previous field and flume tank testing of a trawl with 1 m droppers between the fishing line and ground gear; modifications were made to

the bridle configuration to improve operation. An additional bridle was attached between the fishing line and upper bridle.



Species	Standard gear (kg)	Staggered fishing line (kg)	Difference (%)
Cod	83	59	-29
Haddock	3,057	2,783	-21
Whiting $\geq 31^{\$}$	545	562	3
Whiting $< 31^{\$}$	455	246	-46
Flatfish	609	188	-69
Skate and ray	160	35	-78
Dogfish	1,480	180	-88

[§]market size (cm)

RESULTS

- Moderate reductions in cod and haddock
- Substantial reductions in small whiting, flatfish, skate and ray, and dogfish
- Improves gear performance
- Added as gear measure in the Celtic Sea

FURTHER INFORMATION

<https://tinyurl.com/staggered-line-geartrials@bim.ie>



Reducing haddock catches with a 120 mm diamond-mesh codend

AREA, VESSEL

This industry-led trial took place in the Celtic Sea (ICES 7j&g) on board MFV Róise Catriona (T100) (24 m, 413 kW), a Scottish seiner (SSC), during November 2018.

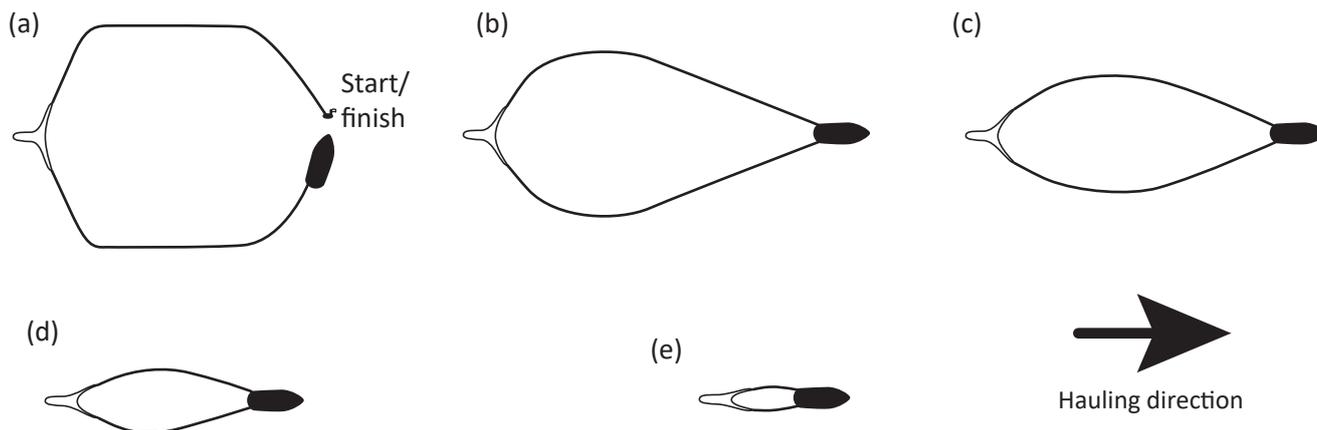


GEAR MODIFICATION

Two identical single-rigged seines (68 m footrope), were fitted with codends made from T90 (turned 90°) 100 mm or diamond 120 mm mesh. There was no square-mesh panel present on either seine.

The gears were fished using alternate hauls with codends rotated once during the trip.

Seining operation:



Percentage of total catch weight in each codend

Species	T90 (%)	120 (%)	Total (kg)
Haddock ≥ 30 cm [#]	66	34	3,089
Haddock < 30 cm [#]	5	95	12
Hake ≥ 27 cm [#]	45	55	2,617
Whiting ≥ 27 cm [#]	27	73	576
Whiting < 27 cm [#]	0	100	1
Cod ≥ 35 cm [#]	58	42	258
Cod < 35 cm [#]	86	14	5
Megrim ≥ 20 cm [#]	62	38	246

[#]minimum conservation reference size (MCRS)

RESULTS

- Very few small fish were caught in either gear
- The 120 mm caught around half as many haddock and three times more whiting
- The 120 mm codend was added as a gear measure in the Celtic Sea

FURTHER INFORMATION

<https://tinyurl.com/120-mm-codend-geartrials@bim.ie>



Plaice vitality in a seine fishery

AREA, VESSEL

This industry-led trial took place in the Celtic Sea (ICES 7j&g) on board MFV Róise Catriona (T100) (24 m, 413 kW), a Scottish seiner (SSC), during October 2019.

METHODS

Plaice were caught using a single seine under normal fishing conditions. All plaice were assessed for vitality and injuries. Comparisons were made with a Danish-



seine (SDN) study completed in ICES division 3a.



Vitality	Plaice (No)	Plaice (%)
Excellent	282	59
Good	136	29
Poor	55	12
Dead	4	1

RESULTS

- Most plaice in excellent or good condition
- 87% survival rate estimate, based on Danish-seine study
- Application made for a high survivability exemption from the landing obligation

FURTHER INFORMATION
geartrials@bim.ie



Post-capture condition of cuckoo ray in an otter trawl fishery

AREA, VESSEL

The study took place in December 2018 in the Irish Sea (ICES 7a), onboard the MFV Eblana (22 m, 442 kw) when targeting skate and ray.

FISHING OPERATIONS

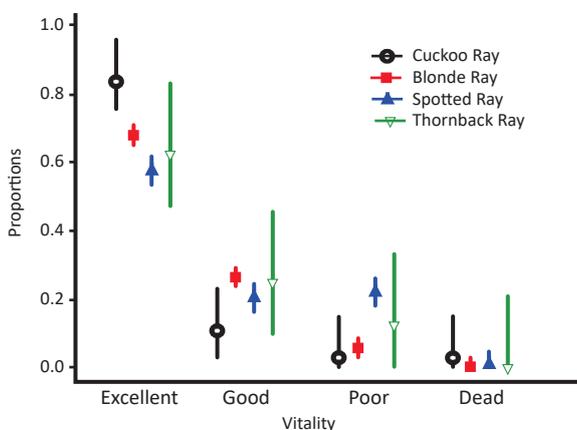
An otter trawl with 16" hoppers and a 120 mm diamond-mesh codend was used.

METHODS

All Cuckoo ray and random samples of the other *Raja* species were assessed for vitality, reflexes and injuries.



Vitalities were categorised as: Excellent, (A); Good, (B); Poor, (C); Dead, (D)



RESULTS

- 84% of Cuckoo ray in excellent condition
- Cuckoo ray condition compares well with other ray species.
- Survival exemption extended from 1 to 3 years

FURTHER INFORMATION

<https://tinyurl.com/Cuckoo-ray-survival>
geartrials@bim.ie



Sole survival in the otter trawl fishery

AREA, VESSEL

The study took place on the Galway and Aran fishing grounds (ICES 7b) on board MFV Karen Mary (11.6 m; 150 kW) during September 2019.

METHODS

A single-rigged trawl (380 × 80 mm fishing circle) with a 300 mm square-mesh panel and an 80 mm diamond mesh codend was used. Sole caught in tows averaging 2 hr



48 min were monitored at the onshore facility in Galway Mayo Institute of Technology.



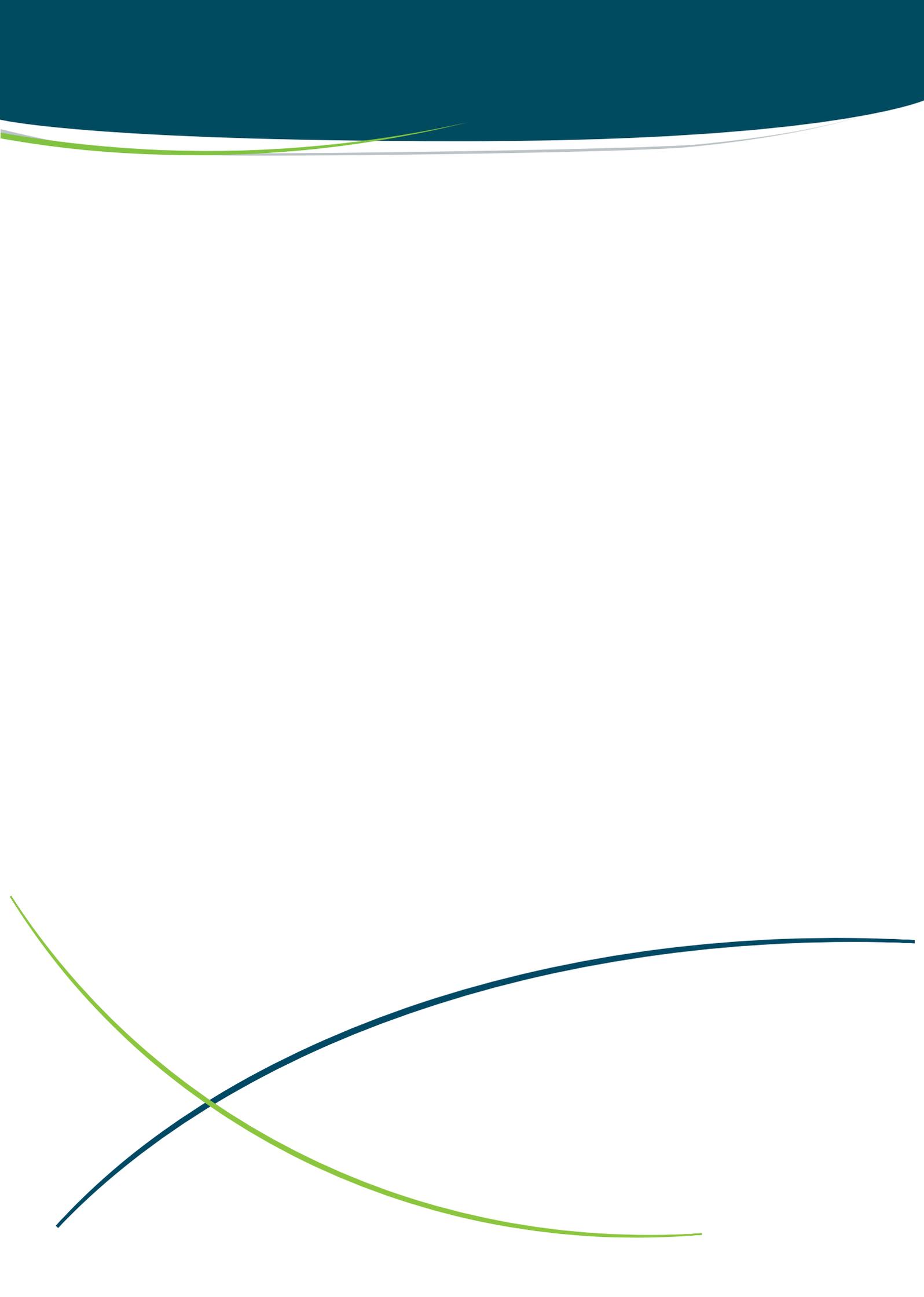
RESULTS

- 50% of sole survived
- High water and air temperatures provided a worst case survival estimate
- Application made for a high survivability exemption from the landing obligation

FURTHER INFORMATION

<https://tinyurl.com/sole-survivability-geartrials@bim.ie>





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