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Small Scale Semi-Pelagic Trawling Trial in the South West

FISHERIES SCIENCE PARTNERSHIP – FSP (2018-19) (59)

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World Class Science for the Marine and Freshwater Environment

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The collaboration of Roger Nowell and his crew on the MFV Imogen III is gratefully acknowledged. Rod Barr at Coastal Nets modified the semi-pelagic and rigged it to be ready to operate. Mike Montgomerie of Seafish supplied and operated the Scanmar® monitoring equipment. Many thanks to all.



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Executive Summary

This work was carried out as part of the Fisheries Science Partnership (FSP) programme. The fishing vessel *Imogen 3* PZ 110 was chartered to undertake the trials in the South West of England otter trawl fishery in August and September 2018. Eleven days of fishing trials were conducted in ICES area VIIIE, statistical rectangles 28E3 and 28E4, with a total of 27 hauls completed, 25 of these were considered valid for examination. The specific objective of this trial was to investigate the operation and profitability of a semi-pelagic trawl towed higher in the water column to catch non-quota species. It was thought that John Dory (*Zeus faber*), Hake (*Merluccius merluccius*), Black Seabream (*Spondyllosoma cantharus*), Cuttlefish (*Sepia officinalis*) and Squid (*Loligo forbesi* & *Loligo vulgaris*) could be caught in greater quantities than when using a demersal trawl.

The SW otter trawl fishery has seen large catches of haddock since 2013 and vessels have struggled to find ways of directing effort to other species without exceeding haddock quota allocations. Article 15 of the reformed Common Fisheries Policy (CFP) Basic Regulation introduced a discard ban (also known as a landing obligation) for regulated species. This will cover all quota stocks in EU waters (and those with a Minimum Landing Size in the Mediterranean) by January 2019. This reformed CFP seeks to reduce unwanted catches and eliminate discards. Quotas will place a cap on fishing mortality, requiring all catches (not just landings) to be deducted from the quota and once the quota allocation for a species is reached, fishing activities must stop. To maximize revenue from quotas, fishermen will need to avoid catching undersized or low-value fish that will be deducted from their quota for little or no profit as they will result in a premature end to a fishing season.

In these trials fishing took place between the 20th of August and the 3rd of September 2018. A demersal trawl was used for 13 tows (52 hours 50 minutes), whilst 12 tows (45 hours 35 minutes) considered valid were made using the semi-pelagic trawl. It was observed that it was possible to operate the semi pelagic rig from a conventional demersal trawler, but for maximum efficiency modifications to the hydraulic systems would be necessary.

As a means of avoiding quota species and increasing catches of other species the semi pelagic rig was unsuccessful. Catches of marketable species were lower and no other species than those caught by the demersal net were observed. There was a significant decrease in the number of species and quantities caught by the semi-pelagic trawl. Examination of the income per hour towed over the trial reveals that the demersal trawl provided £137.22/hr whilst the semi-pelagic provided £17.69/hr. This represents an 89% reduction in income. The latter figure did not cover the operating expenses of the vessel, thus in this location in the period of the trials the semi pelagic rig is not a financially viable option for fishermen.

Table of Contents

1	Introduction	3
1.1	The Fisheries Science Partnership	3
1.2	Background	3
1.3	Objective	4
2	Materials and Methods	4
2.1	Vessel	4
2.2	Gear	5
2.2.1	Demersal Gear	5
2.2.2	Semi Pelagic Gear	5
2.2.3	Gear monitoring	7
2.3	Area and period of the survey	8
2.4	Experimental Design	9
2.5	Sampling Plan	9
3	Results	9
3.1	Fishing activity	9
3.2	Catch comparisons.....	11
3.2.1	Overview:.....	11
4	Discussion.....	13
5	Appendices.....	15
5.1	Detailed Operations Plan	15
5.2	Net Plans	18
5.2.1:	Caedmon Nets Whitby 27m Box Trawl.....	18
5.2.2:	Le Drezen 39.5m/ 40.0m	19
5.3	Shooting and hauling times, depths and positions.....	20
5.4	List of fish species caught	21

1 Introduction

1.1 The Fisheries Science Partnership

The Fisheries Science Partnership (FSP) is a Defra-funded collaborative research programme of scientific research between the UK fishing industry and scientists. Since it was established in 2003 the programme has undertaken numerous (c 100) trials, covering annual time-series surveys of stocks subject to traditional assessments and *ad hoc* trials on, e.g., gear selectivity, discard survival, tagging and migration, and fishery development. A full description of the aims and all completed reports of the FSP programme can be found on the Cefas website (www.cefass.defra.gov.uk). Charter of suitable fishing vessels for the trials is approved by Defra and its FSP steering committee. It is arranged through an open tendering procedure, with scientific and operational work plans developed in line with the agreed and commissioned trial between Cefas and the selected vessel.

1.2 Background

Discarding fish, caught during commercial fishing, back to the sea is considered wasteful by fishers, conservationists and fisheries managers alike, as some discards are returned dead or dying. Article 15 of the reformed Common Fisheries Policy (CFP) Basic Regulation, which came into force on January 1st, 2014, introduced a discard ban (also known as a landing obligation) for regulated species. This was phased in, beginning with pelagic fisheries from 1st January 2015 and will cover all quota stocks in EU waters (and those with a Minimum Landing Size in the Mediterranean) by January 2019. The reformed CFP seeks to reduce unwanted catches and eliminate discards. Quotas will place a cap on fishing mortality, requiring all catches (not just landings) to be deducted from the quota and once the quota allocation for a species is reached, fishing activities must stop. To maximize revenue from quotas, fishermen will need to avoid catching undersized or low-value fish that will be deducted from their quota for little or no profit as they will result in a premature end to a fishing season.

Fishing gear selectivity has featured highly in the FSP programme and both scientists and industry continue to seek ways of improving gear design to minimise discarding. The SW otter trawl fishery has seen large catches of haddock since 2013 and vessels have struggled to find ways of directing effort to other species without exceeding haddock quota allocations. This contrasts with the situation in 2004 when the decline in demersal stocks in general gave cause for concern. Research on “Off-bottom” trawling techniques was carried out by SEAFISH to exploit non-pressure stock species as a means of diversification¹. These trials concentrated on the practicalities of operating the gear.

This trial sought to investigate the operation and profitability of a semi-pelagic trawl towed higher in the water column to catch non-quota species. It was anticipated that John Dory (*Zeus faber*) and Hake

¹ SR568 “Off-bottom” trawling techniques for the sustainable exploitation of non-pressure stocks in Cornish inshore waters. Artley K, Caslake R. DEFRA Cornish Objective 1 Programme: Project reference No. FEP 592

(*Merluccius merluccius*) would be the main species caught, but as this fishing method had not been used commercially in the area it was thought that Black seabream (*Spondyliosoma cantharus*), Cuttlefish (*Sepia officinalis*) and Squid (*Loligo forbesi* & *Loligo vulgaris*) could also feature.

1.3 Objective

The aim of this trial was to investigate the feasibility of using a semi pelagic trawl as a means of avoiding quota allocated species and increase catches of non-quota species.

The specific object of the trial was to compare the catch rates of the vessel's standard demersal trawl against an experimental semi pelagic trawl both quantitatively and financially.

2 Materials and Methods

2.1 Vessel

Following an open tendering process, the fishing vessel *Imogen 3* PZ 110 (Figure 2.1) was awarded a contract to undertake the survey work associated with this trial over a period of 10-15 days. MFV *Imogen 3* is a 14.20m steel-hulled trawler based at Newlyn, in the southwest of England. Landings were made into Newlyn.



Figure 2.1: Imogen 3 PZ110, 27.54t, 14.5 oal, 220kw.

2.2 Gear

2.2.1 Demersal Gear

The vessel's own commercial trawl made by Caedmon Nets Whitby (See Appendix 5.2.1) was used for the first part of the trials to establish a record of the species on the grounds and the income received from those landed. It had a 328 mesh x 135 mm fishing circle, with ground gear of 15 fathom (27m) constructed from 6 and 15cm rubber discs. It had a square mesh panel of 90mm T45 in the regulation position i.e. within 12m of the cod line and was spread using Bison number 8 trawl doors and 25 fathom (46m) sweeps (See Fig2.2.1).

Imogen 3 Demersal gear

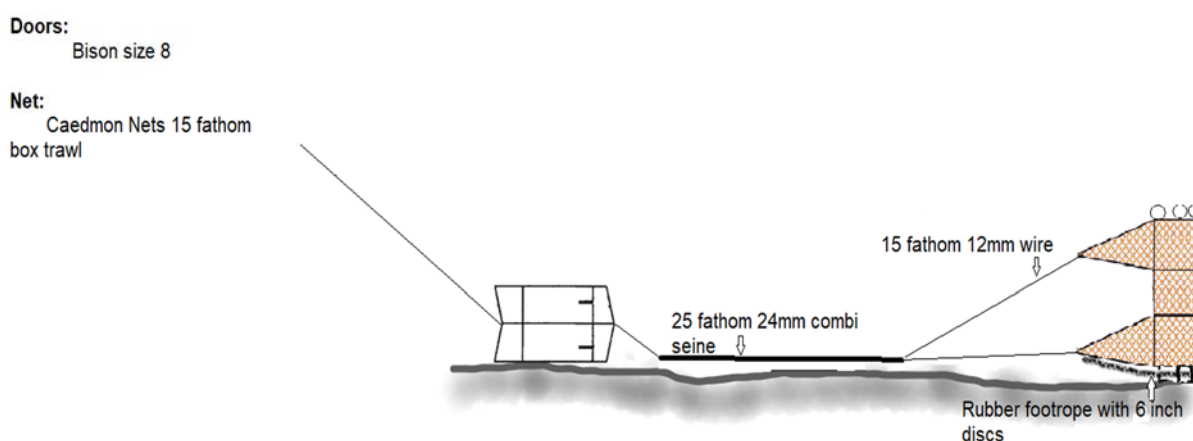


Figure 2.2.1: Demersal rig used.

2.2.2 Semi Pelagic Gear

The method of semi-pelagic fishing is to tow a net above and not touching the sea bed. To achieve this, it was decided to spread the pelagic net using the "pony door" system, using two different configurations (See Figs 2.2.2 and 2.2.5). The vessel's own Bison size 8 trawl doors were used as the ground contact door attached to the bottom wing. Suberkrub style pelagic doors constructed for previous trials by SEAFISH¹ were attached as the "pony doors" to the middle and top wings. As in their trials three 8-inch floats were attached to the top of these doors to provide some stability. The vessel supplied the pelagic net which was a Le Drezen 39.5m/ 40.0m (See Appendix 5.2.2) which had the sleeve and cod end replaced with 100mm netting constructed from 2mm Polyethylene twine with a square mesh panel (regulation size and position) in the top sheet by Coastal Nets Brixham. Coastal Nets also attached all relevant bridles etc. to the net to ensure a level point of connection for whatever warp, used. Pelagic nets are usually used to catch shoaling species and feature very large meshes in the wing and first part of the net (See Fig 2.2.4).

Semi pelagic Rig 1

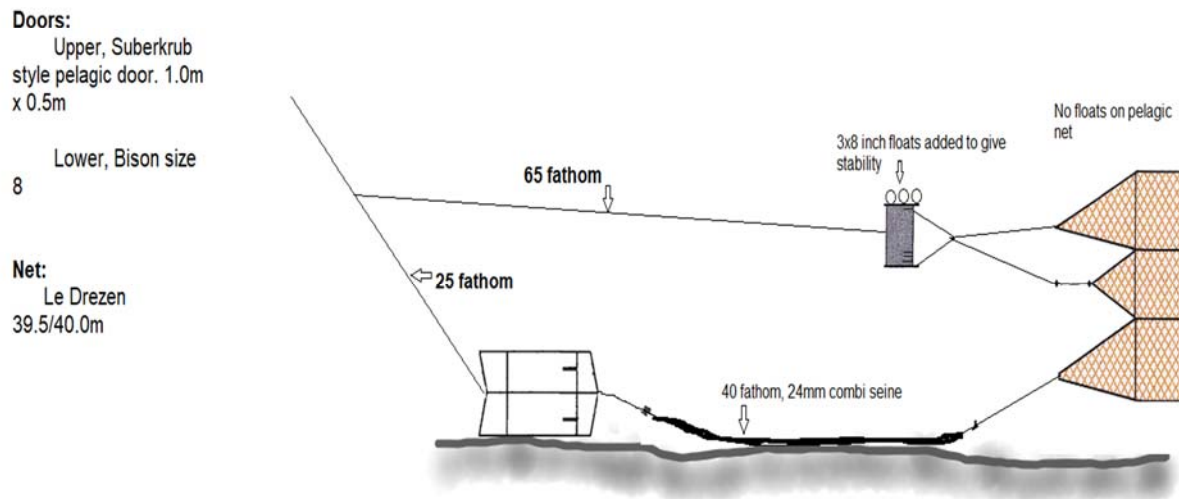


Figure 2.2.2: Semi-pelagic Rig 1.

In the first experimental semi-pelagic configuration (Fig. 2.2.2), the upper doors were attached to the end of the warps by 65 fathom (119m) of wire and then connected to the net. The lower ones by 25 fathom (46m) of wire and then 40 fathoms of spreaders before being connected to the net. In the second configuration (Fig.2.2.5), both doors were attached to the end of the warp by 65 fathom (119m) of wire before being connected to the net.

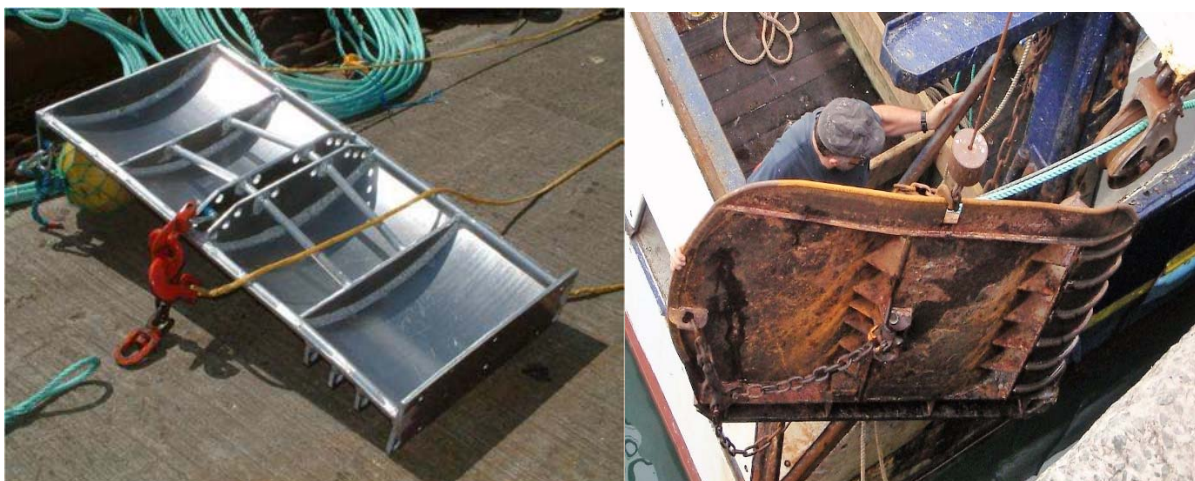


Figure 2.2.3: Aluminium, Suberkrub style pelagic door 1.0m x 0.5m (left) and Bison 8 (right).



Figure 2.2.4: Mouth of pelagic net showing the use of large meshes.

Semi-pelagic Rig 2

Doors:

Upper, Suberkrub
style pelagic door. 1.0m
x 0.5m
Lower. Bison size
8.

Net:

Le Drezen 39.5m/
40.0m

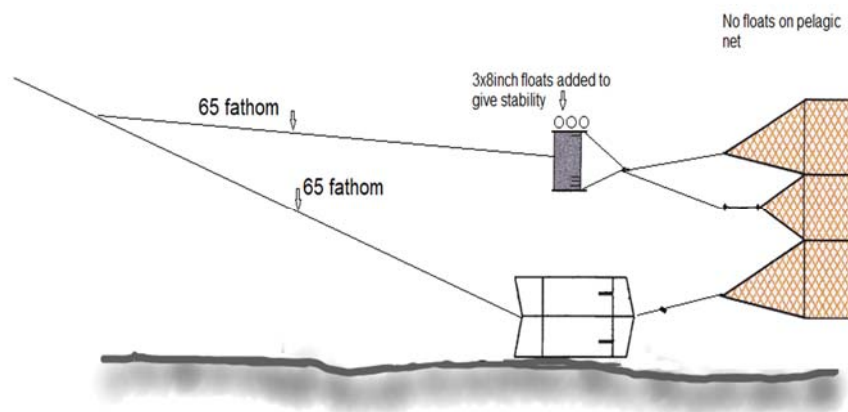


Figure 2.2.5: Semi-pelagic Rig 2.

2.2.3 Gear monitoring

Whilst operating the semi-pelagic rigs Scanmar® gear monitoring devices supplied by SEAFISH and operated by M. Montgomerie were used to monitor gear parameters on some tows. Door sensors were attached to all doors indicating the spreads achieved for each pair. It was anticipated that a Trawl Sensor attached to the headline of the net would give indications of the position of the headline and the footrope relevant to the sea bed. However, this sensor did not work so a headline sensor was used which indicated the distance between the headline and the sea bed.

2.3 Area and period of the survey

Tows of around 4 hours duration, i.e. typical of normal commercial practice, were conducted in the fishing grounds off the South West coast of England (Fig 2.3.1). Towing speed was between 2.5 and 3.0 knots whilst using the demersal trawl and 2.5 and 3.5 knots using the semi-pelagic trawl. All fishing took place in the statistical rectangles 28E3 and 28E4 (ICES area VIIE), bottom depths ranged between 44m and 93 m using the demersal gear and 55m and 86 m using the pelagic gear (See Appendix 5.3 for haul details). Tows were made during daylight and darkness, with a total of 27 completed.

Fishing took place between the 20th of August and the 3rd of September 2018. The vessel's own demersal trawl was used for 13 tows (52 hours 50 minutes) between the 20th and 23rd of August. The first experimental semi pelagic rig was used for 2 tows (6 hours 15 minutes) on the 25th of August. However, the tows using the first semi-pelagic rig were considered invalid (Table 2.3.1). Between the 27th of August and the 3rd of September 12 tows (45 hours 35 minutes) were made using the second semi pelagic rig.

	Number of tows	Valid	Invalid	Time towed. hrs	Valid time towed. hrs
Demersal Trawl	13	13	0	52.833	52.833
Semi-pelagic Trawl	14	12	2	51.833	45.58

Table 2.3.1: Summary of number of tows and time towed during trials.

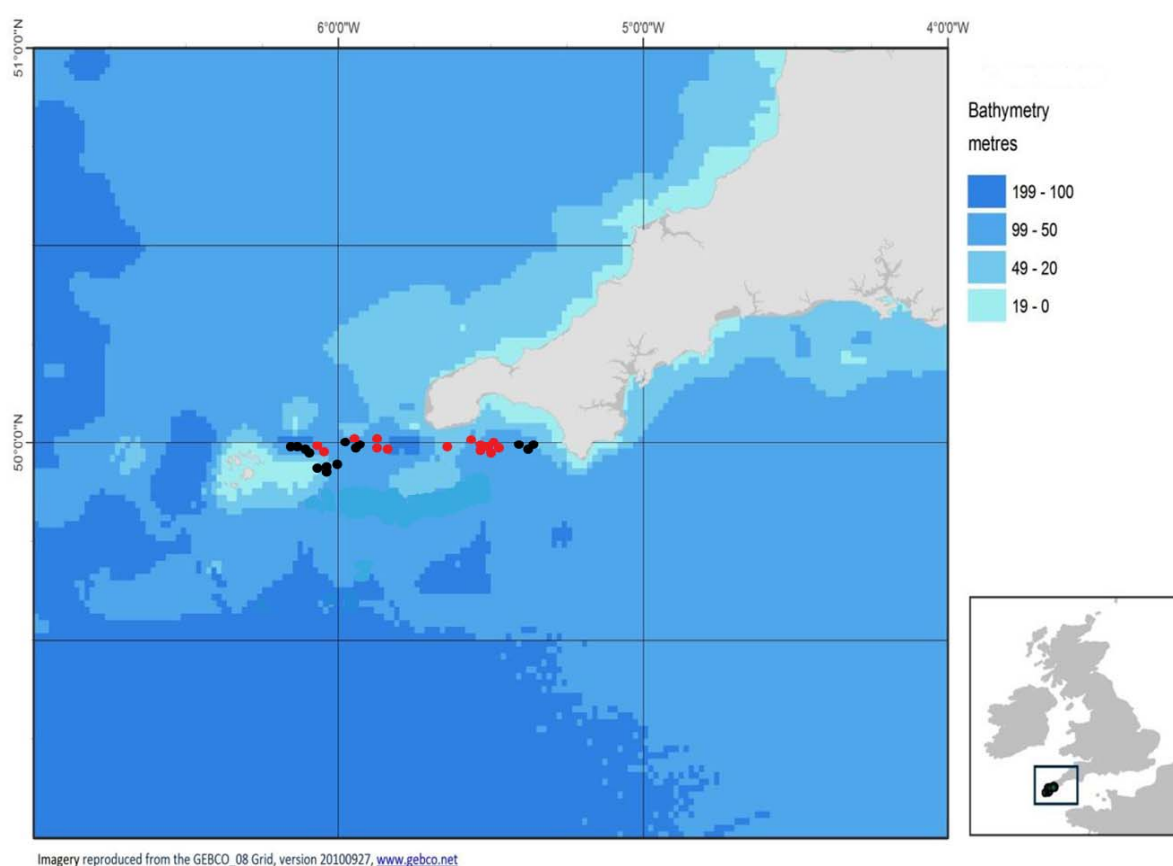


Figure 2.3.1: Area of the survey. (Shooting positions indicated, black for demersal and red for semi-pelagic.)

2.4 Experimental Design

The aim of the experimental trials was to compare the catch rates of the vessel's demersal trawl and that of the experimental semi-pelagic trawl.

Following discussions with the skipper, the experimental plan was agreed:

- The demersal trawl would be used first in a normal fishing trip of 4-5 days to establish a record of the species on the grounds and the income received from those landed.
- The semi-pelagic trawl would then be rigged and the practicalities of using it familiarised and adjusted till it was deemed operable.
- Once operational this net would be used for up to 10 days to investigate the species caught, and income received from those landed.

2.5 Sampling Plan

A fixed routine for handling and sorting the catch was maintained throughout the trials. The trawl was wound onto the net drum then the cod-end was drawn up the vessel's stern and discharged into the reception pound on the deck. The crew sorted the catch as they would normally, with the exception that all material usually discarded was retained in baskets for sampling as the "discard fraction". Retained catch was selected by species into baskets before being sampled. The discard fraction was sampled and then discarded.

The Cefas observer sampled using standard techniques. For each haul all species caught were measured to the nearest cm below, sub sampling was necessary for some species and the discard fraction, but sub samples reflected the total catch composition and raising factors were calculated.

3 Results

3.1 Fishing activity

3.1.1 Demersal Gear

The demersal trawl was used first in a normal fishing trip of 4 days between the 20th and 23rd of August, with landings after the third and fourth day. No problems were encountered and 13 tows representing 52 hours and 50 minutes towing time were achieved. As expected, a mixed range of species were caught and landed (See Figure 3.2.1.1).

3.1.2 Semi-pelagic Gear

Operating the semi-pelagic gear presented the problem of dealing with two doors on each quarter of the vessel. For both rigs, the lightweight construction of the aluminium upper doors meant that this was easily overcome. If the door impeded the warps or sweeps on hauling or shooting it could easily be lifted onto the deck and clear by one person.

3.1.2.1 Semi-pelagic Gear Rig 1

This rig (See Fig 2.2.2) was used on the 25th of August for 2 tows (14 and 15). On hauling the first tow it was apparent that the net was not operating in the manner expected as seaweed and echinoderms were attached to all areas of the net and only one 53cm haddock was caught. It was unsure if there were intrinsic problems with the gear or it had fouled during operation. For the second tow Scanmar door sensors were added to both sets of doors to see if they could highlight any problems. They indicated an upper door spread of 30.5 to 33.5 meters and a lower door spread of 70 to 76 meters. It had been anticipated that the lower doors would have slightly more spread. More than twice the spread of the upper ones indicated that the net would have no vertical opening and was being towed flat on the seabed. This explained the seaweed and echinoderms which were once again evident and no fish at all were caught. A change in the elements of, or the construction of this rig was needed to proceed with the trials.

3.1.2.2 Semi-pelagic Gear Rig 2

Initially it was thought that changing the lower doors (Bison 8) for a smaller pair would solve the over-spreading problems encountered. However, after the skipper had consulted with a skipper in the Channel Islands more familiar with this type of gear, another approach was decided upon and the rig depicted in Fig 2.2.5 was assembled and tried on the 26th of August. Scanmar gear was attached to both sets of doors and the headline of the trawl and an experimental tow of 2.5 hours (Haul 16) was made. During this tow the warp length was varied to monitor the effect on the headline height. It was found that when the total warp length to the bottom door was at a ratio of 2.5/1 to the seabed depth maximum headline height of the net was reached. Table 3.1.2.2.1 shows the extremes of headline height of the net obtained by varying warp length. It had to be assumed that at the maximum headline height the net had achieved its optimum shape. Evidence that the net was now opening was provided on hauling when 8 John Dories were retained, the discards amounted to a quarter basket of mackerel and horse mackerel, both pelagic species.

Seabed depth (m)	Warp length (m)	Ratio	Headline height (m)	Door spread (m) Lower	Door spread (m) Upper
55	137	2.5/1	16.5	35.5	29.5
55	183	3.3/1	9	37.5	30

Table 3.1.2.2.1: Showing the effect of warp length on headline height and door spread at the same seabed depth.

Between the 28th of August and the 3rd of September 11 tows (43 hours 5 minutes) were made. During tows it was attempted to maintain a warp to depth ratio of 2.5/1, but the practicalities when there was a change of seabed depth, (reducing speed to operate hydraulics) meant that the headline height during any given tow varied within the limits shown in Table 3.2.2.1. The height of the footrope above the seabed could not be recorded, but during the 12 tows of operating this rig no flatfish, rays or benthic species were caught, evidence that the footrope was above the seabed.

3.2 Catch comparisons

3.2.1 Overview:

There was a distinct difference between the catch compositions of each trawl. The semi-pelagic trawl caught fewer species and much less bulk than the demersal trawl. See figures 3.2.1.1 and 3.2.1.2 for typical examples of catch from each net.



Figure 3.2.1.1 Typical catch from Demersal trawl.

Boar fish (*Capros aper*) and fish below MLS (Minimum Landing Size) were the main discards from the demersal trawl. Small mackerel (*Scomber scomburus*), horse mackerel (*Trachurus trachurus*) and Pilchards (*Sardina pilchardus*) were discarded from the semi-pelagic net, with very few retained fish below MLS in this trawl.



Figure 3.2.1.2 Typical catch from Semi-pelagic trawl.

3.2.2 Landings:

Figures 3.2.2.1 and 3.3.2.2 show the species landed and the quantities in kilograms from each of the trawls. There were 23 different species landed from the demersal trawl including a variety of flat fish and rays. The semi-pelagic net provided 4 species for landing, however the gurnard was one individual of 1-kilogram weight.

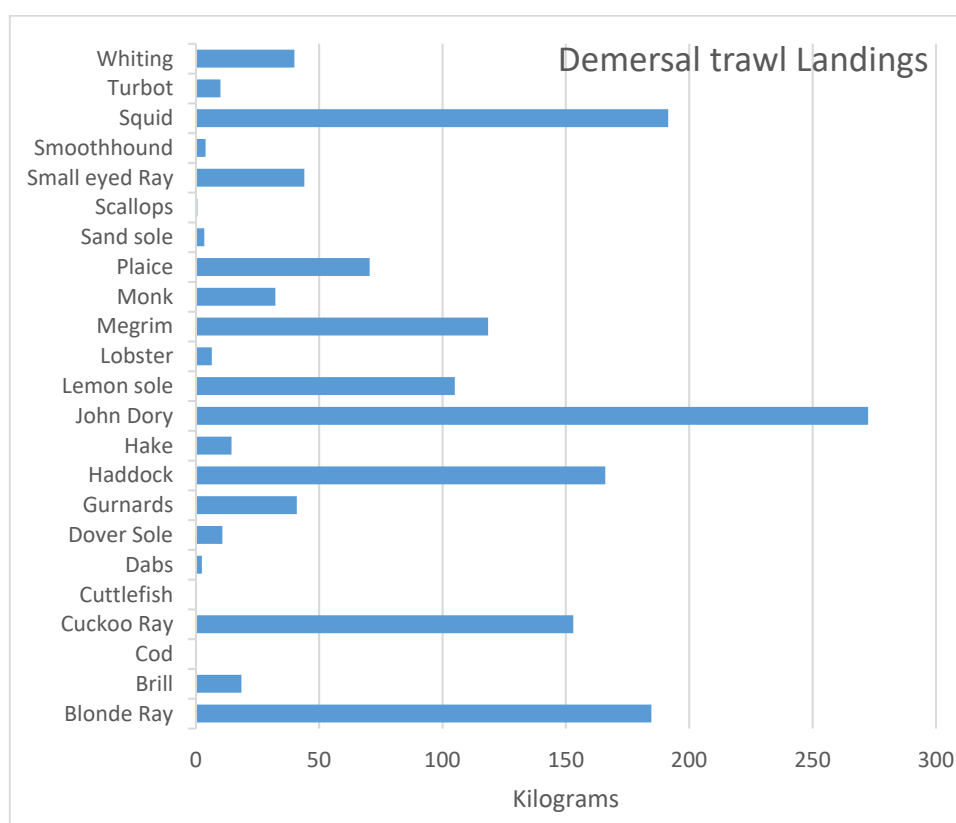


Figure 3.2.2.1 Species and quantities landed in kilograms from the Demersal trawl.

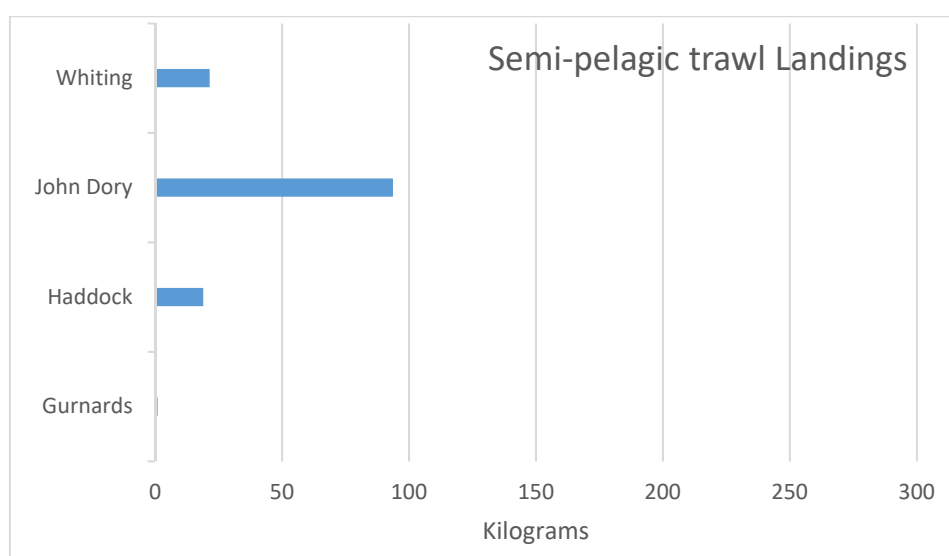


Figure 3.2.2.2 Species and quantities landed in kilograms from the Semi-pelagic trawl.

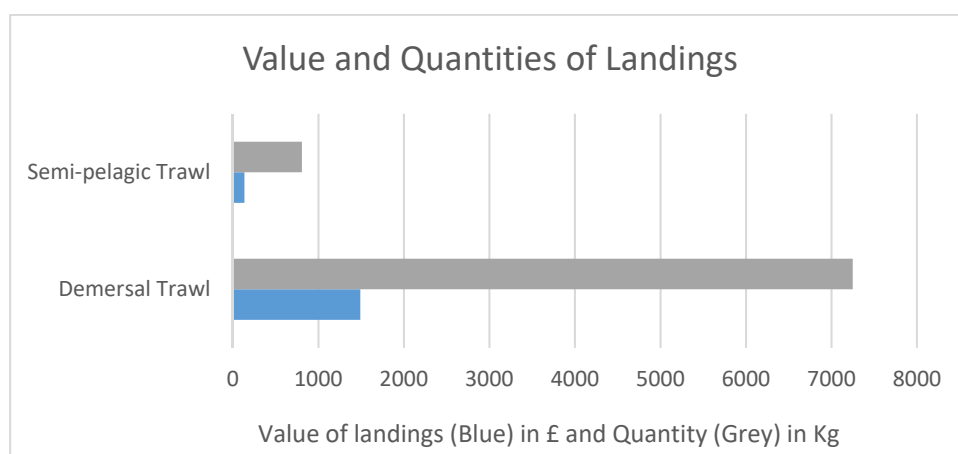


Figure 3.2.2.3 Comparison of value and quantities of Landings .

Examination of the income per hour towed over the trial reveals that the demersal trawl provided £137.22/hr whilst the semi-pelagic provided £17.69/hr (See Fig 3.2.2.4).

Fuel costs per 24-hour period of a fishing trip for the vessel were £275 (price net Sept 2018). This meant that to cover cost of fuel used in any 24-hour period the demersal trawl had to be towed 2.004 hours and the semi pelagic trawl 15.545 hours. It must be noted that fuel cost is only one of the expenses incurred in operating a vessel and it is impossible to achieve 24 hours of towing in any 24-hour period of a fishing trip .

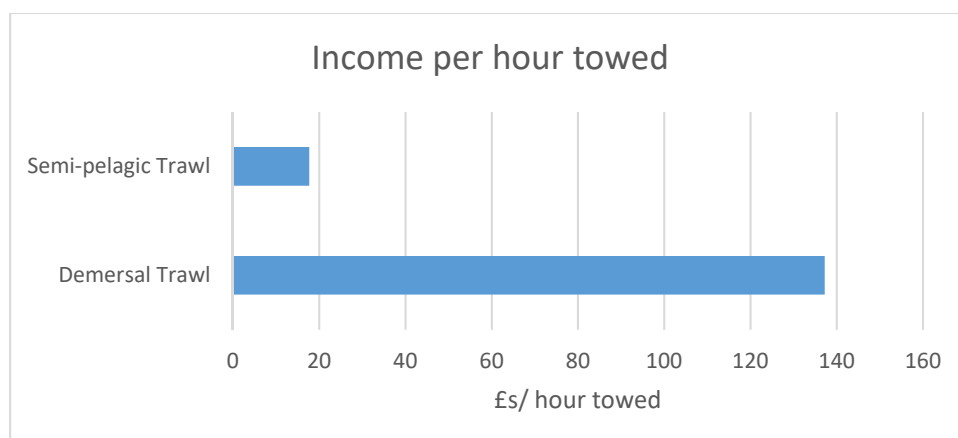


Figure 3.2.2.4 Comparison of the income per hour from each trawl.

4 Discussion

Because the spread of each pair of doors could be monitored, but only the height of the headline from the sea bed was available, the assumption that the semi-pelagic net was acting optimally had to be made. Ideally if information on the height of the footrope from the sea bed had been available this

could have been confirmed. No flatfish, rays or benthic species were caught in any tow, indicating that the footrope had no contact with the seabed. Comparison of catch rates with another vessel working the same gear in the same area would have given some indication of the efficiency of the gear.

Hauling and shooting the gear (Rig 2) did not present any problems but maintaining the warp to depth ratio did. Altering warp length meant that the vessel had to be slowed down to engage hydraulics. This meant that the net would be slowed and any herding effect of fish in front of it would be lost. In practice altering the ratio was only done when there was a major change of sea bed depth.

There was a significant decrease in the number of species and quantities caught by the semi-pelagic trawl. Examination of the income per hour towed over the trial reveals that the demersal trawl provided £137.22/hr whilst the semi-pelagic provided £17.69/hr. The figure from the semi-pelagic trawl did not cover operating expenses of the vessel.

The following conclusions can be drawn from this trial:

- It is possible to operate the semi pelagic rig from a conventional demersal trawler.
- Maintaining a warp to depth ratio of 2.5/1 is essential to achieve maximum headline height.
- To operate the semi-pelagic rig a vessel should ideally have a method of engaging hydraulics without losing speed.
- As a means of avoiding quota species the semi pelagic rig was not successful.
- At the time of year and the locations towed the semi pelagic rig caught no different marketable species to the demersal trawl.
- At the time of year and the locations towed the semi pelagic rig was not financially viable for the vessel.

5 Appendices

5.1 Detailed Operations Plan

THE CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE

(Lowestoft Laboratory, Suffolk, NR33 0HT, England)

This document describes the agreements reached by all parties at a planning meeting held in Newlyn on 20th August 2018. Present F. Armstrong & R. Nowell

Detailed Operations Plan

FISHERIES SCIENCE PARTNERSHIP – FSP (2018-19) (59) Small Scale Semi Pelagic Trawling Trial in the South West

Vessel: Imogen PZ 110

Skipper: Roger Nowell

Principal Investigator: Frank Armstrong

Aim of the project:

The primary objective of this project will be to enable inshore boats to continue to operate under a landing obligation, where restricted quotas for some species (e.g. haddock) risk a premature end to fishing. The aim of the project is to investigate the potential for a small-scale semi-pelagic trawl fishery in Cornwall as a mechanism to avoid catching quota limited species and diversify to catch hake and john dory.

Fishing gear:

Conventional: 15 fathom Box Trawl. Caedmon Nets Whitby.

Experimental: 39.5m/40.0m Semi Pelagic Trawl. Le Drezden France.

Area and period of operation:

- The work will take place in August and September 2018
- The vessel will sail from and return to Newlyn.
- The conventional trawl will be worked for a commercial trip in the areas that the experimental trawl will be worked.
- The trials will be conducted in the Southwest approaches, within British fishery limits

Fishing activities:

- The skipper has the experience of fishing and the grounds and should advise where the trials should take place.
- The fishing programme should be agreed by the skipper and the principal investigator.
- The number of tows may be reduced on a given day as dictated by sea condition, volume of catch, gear damage, as agreed by the skipper and the principal investigator.
- If days at sea are lost due to adverse weather conditions and/or mechanical failure, then they should be rescheduled for completion at the earliest opportunity.
- Discarded species will be retained in baskets to ensure the accuracy of quantities before discarding.
- If the vessel encounters large catches there may be a requirement for the vessel to suspend deploying the gear until the previous haul has been processed, to keep the catch from each haul separate.
- The conditions and details of the ITT, contract and dispensation will be upheld.

Legalities and quota:

- Scientific quota has been obtained for the following species and quantities:

Species	Full unprocessed weight	ICES area caught
Haddock	2000kg	VII b-k
Whiting	2000kg	VII b-k
Cod	200kg	VII e-k
Hake	5000kg	VII

- All tows carried out under the charter will be for comparing the experimental gear against conventional gear; no other fishing will take place on these days.
- Undersized fish will be retained on board for measuring but must not be landed.
- The relevant dispensations issued by the MMO and IFCA will be carried on board the vessel for the duration of the trials. It will be made available to any Marine Enforcement Officer on request.
- These dispensations will only be valid if the terms of the issued documents are met.
- For E- logbook completion the reason for sailing (anticipated activity in some e-logs) given in the Departure (DEP) message must be “SCR” (Scientific Research) and not “FSH” (Fishing). This identifies the trip as one subject to Quota dispensations.

Sorting and recording the catch:

- The entire catch must be made available for sampling.
- The crew will be required to assist in sorting the catch and will prepare the retained portion for sale.

Data to be recorded by the skipper:

- Date
- Tow number
- Shooting and hauling times and shooting and hauling position (latitude and longitude to the nearest minute)
- Shooting and hauling depth
- Weather conditions
- Average speed over the ground
- Time and position of any significant change in tow direction
- Log sheets for recording this information will be provided by the principal investigator at the start of the trials.
- The skipper should maintain a diary of activities not recorded in any of the above for each tow.

Data to be recorded by Cefas observers:

- Observers will record length frequencies of all retained and discarded fish species.
- All hauls will be sampled during the trials.
- Where catch quantities are high observers will sub-sample and record accurate raising factors.
- The principal investigator will maintain a diary of activities, to produce a draft cruise report for submission to Cefas immediately after the cruise. The cruise narrative will be written at sea and read, agreed and signed by the skipper (the report will bear the sentence “seen in draft by skipper”).

Safety:

- Safety takes priority over all other aspects of the charter.

- The skipper has ultimate authority on board and is responsible for ensuring the safety of the vessel and all parties on board.
- Emergency procedures, drills and equipment will be made familiar to Cefas observers.
- The attached “Working hours and safety at sea” document sets out the provisions and requirements for Cefas observers.

Provision of sales notes:

- A copy of the landings/sales notes is required by Cefas to enable 95% of the total agreed price (including VAT) to be paid and should be provided to the principal investigator.

Contacts:

- It is the responsibility of the principal investigator to contact the local MMO office (and IFCA office if necessary) to advise the start and end of the trials prior to departure, and to notify the Cefas shore-based contact on sailing and landing.

I agree with the terms of this Detailed Operations Plan and I am willing to participate in these trials.

..... Skipper
CEFAS

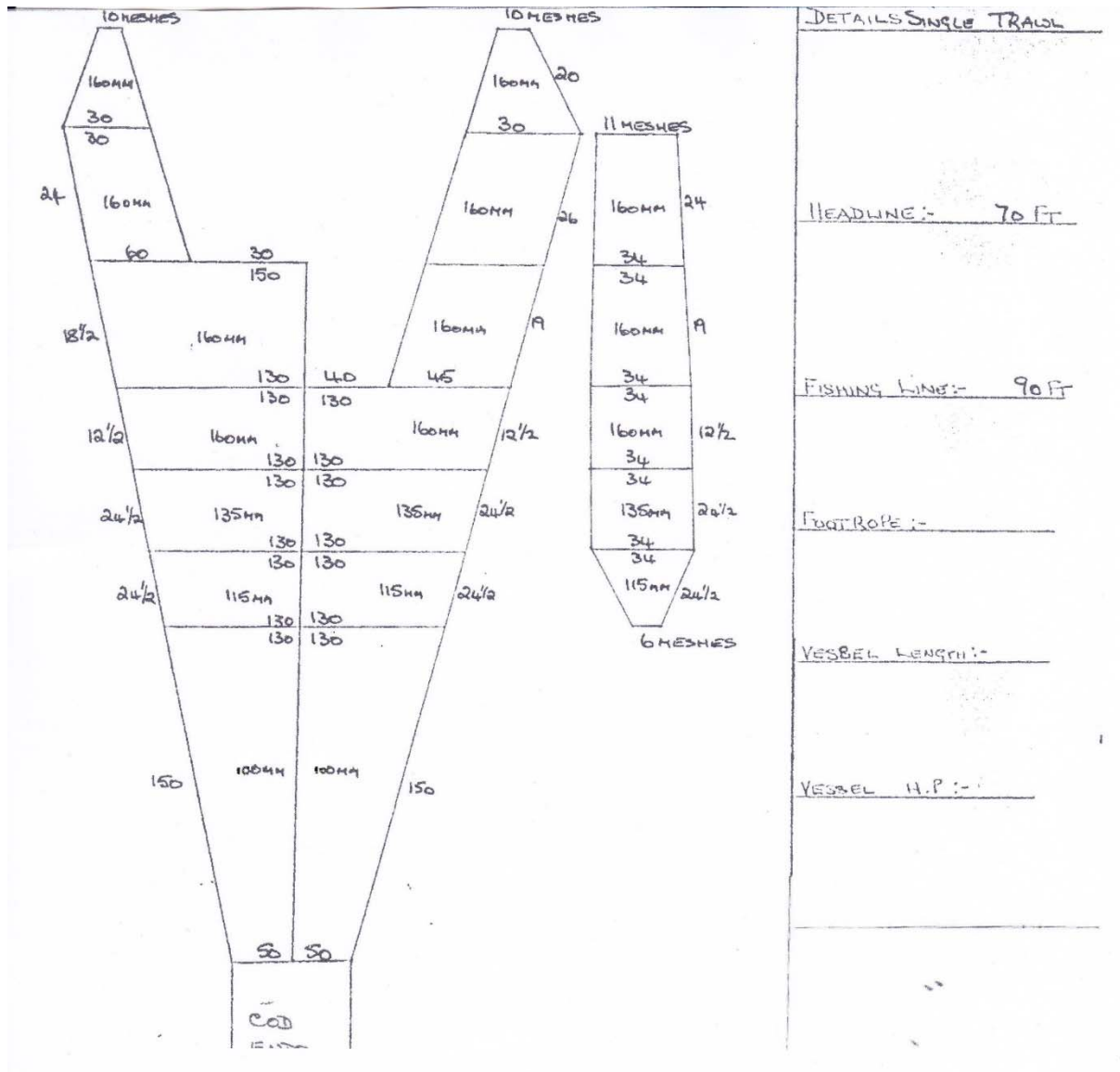
..... P.I.

Date.....

Date.....

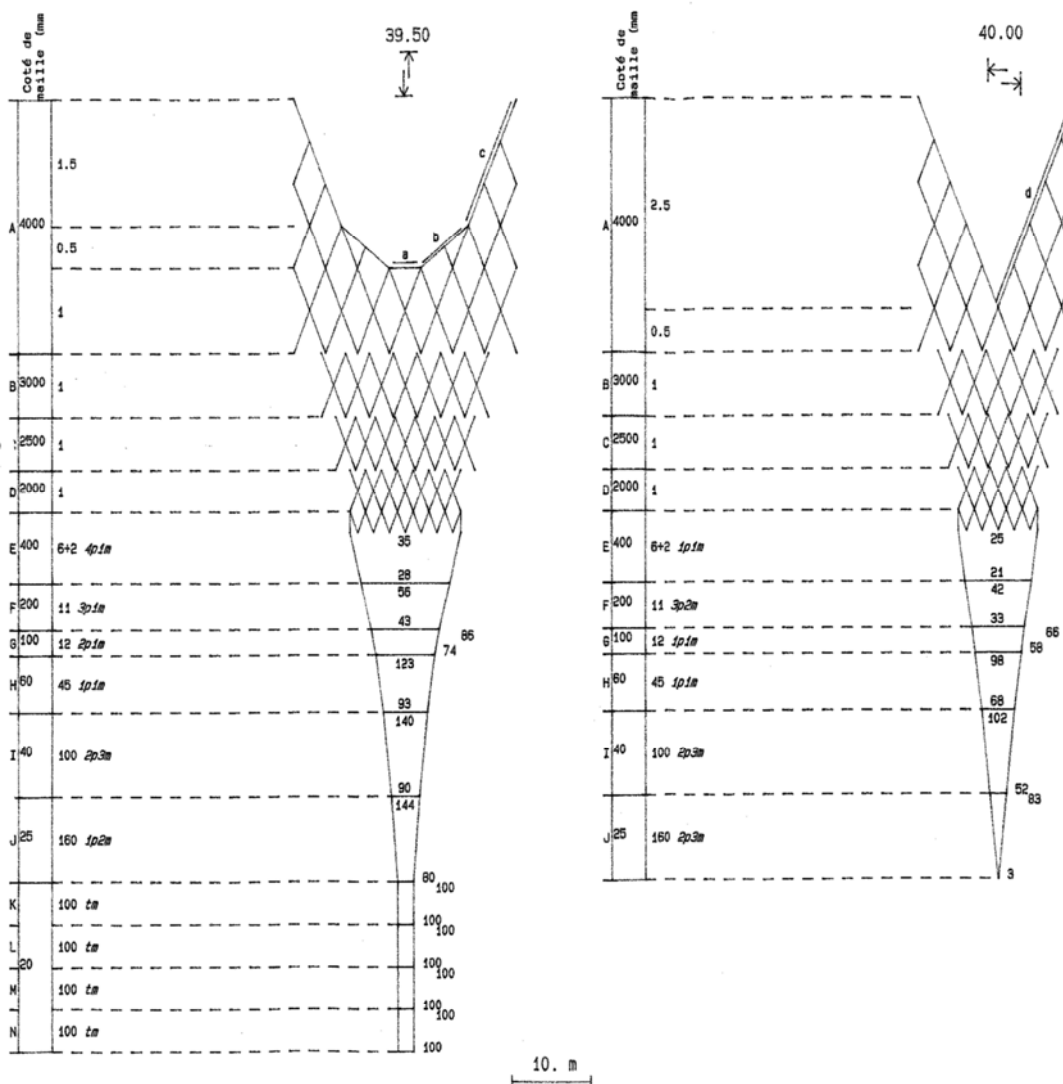
5.2 Net Plans

5.2.1: Caedmon Nets Whitby 27m Box Trawl



5.2.2: Le Drezen 39.5m/ 40.0m

Sections K-N were removed and replaced with 100mm netting constructed with 2mm Polyethylene twine with a square mesh panel (regulation size and position) in the top sheet.



RALISQUES		
	LONGS MATERIAU	DIAM
a	3.50 m	0.00
b	6.00 m	0.00
c	12.00 m	0.00
d	20.00 m	0.00
FORCE DU FIL PAR ZONE		
A	4000mm.	6.0 mm. PA
B	3000mm.	6.0 mm. PA
C	2500mm.	6.0 mm. PA
D	2000mm.	6.0 mm. PA
E	400mm.	280.m/Kg TPA
F	200mm.	400.m/Kg TPA
G	100mm.	600.m/Kg TPA
H	60mm.	1000.m/Kg TPA
I	40mm.	1000.m/Kg TPA
J	25mm.	1000.m/Kg TPA
K	20mm.	1000.m/Kg TPA
L	20mm.	600.m/Kg TPA
M	20mm.	600.m/Kg TPA
N	20mm.	400.m/Kg TPA
LES MAILLES DE COUTURE SONT A RAJOUTER AUX LARGEURS INDIQUEES (+10)		
COOP LA BASQUAISE		
M ^{re} MARIN * RESCATOR *		
16/06/93		

Ets LE DREZEN Léchiagat - 29115 Le Guilvinec - France tel: 98.58.10.54 tlx: 940436 télécopie: 98.58.93.33 Copyright du logiciel: CENTRE NATIONAL DE LA MER / IFREMER	Ref : PL039503	CHALUT 39.50m. / 40.00m.	1 BATEAU 180 ch. a 220 ch. Surface fil : 39.37 m ²
	DATE : 16/06/93	TYPE PELAGIQUE 39.50 m x 40 m Especes : DIVERSES Origine : REZ	

5.3 Shooting and hauling times, depths and positions

HAUL	Shot Date	Time	Depth (m.)	Lat. Deg N	Lat. Min N	Lon. Deg W	Lon. Min W	Haul Date	Time	Depth (m.)	Lat. Deg N	Lat. Min N	Lon. Deg W	Lon. Min W	Tow Duration (mins)
1	20/08/2018	13:00	58	49	60	-5	-54	20/08/2018	17:00	75	49	54	-6	0	240
2	20/08/2018	17:45	75	49	52	-6	-9	20/08/2018	21:45	93	49	46	-6	-20	240
3	21/08/2018	03:45	81	49	51	-5	-55	21/08/2018	08:00	90	49	5	-6	-5	255
4	21/08/2018	08:30	91	49	40	-6	-6	21/08/2018	12:35	82	49	51	-6	-1	245
5	21/08/2018	13:15	82	49	51	-5	-59	21/08/2018	17:15	87	49	48	-6	0	240
6	21/08/2018	18:00	89	49	48	-6	-2	21/08/2018	22:00	81	49	55	-6	-1	240
7	21/08/2018	22:45	82	49	51	-6	0	22/08/2018	03:00	67	50	0	-5	-52	255
8	22/08/2018	04:45	64	50	0	-5	-5	22/08/2018	08:45	73	49	54	-6	9	240
9	22/08/2018	09:15	73	49	54	-6	-9	22/08/2018	13:15	73	49	57	-6	-5	240
10	22/08/2018	14:00	73	49	57	-6	-7	22/08/2018	18:00	73	49	56	-6	-7	240
11	23/08/2018	01:15	46	49	59	-5	-22	23/08/2018	05:15	42	49	58	-5	20	240
12	23/08/2018	06:00	44	49	58	-5	-20	23/08/2018	10:00	44	49	59	-5	-23	240
13	23/08/2018	10:15	48	49	58	-5	-24	23/08/2018	14:30	55	50	0	-5	-29	255
14	25/08/2018	08:00	60	49	59	-5	-33	25/08/2018	11:00	59	49	58	-5	-31	180
15	25/08/2018	11:45	62	49	58	-5	-35	25/08/2018	15:00	53	50	0	-5	-29	195
16	27/08/2018	15:00	55	49	59	-5	-29	27/08/2018	18:30	53	50	3	-5	-31	210
17	28/08/2018	16:45	92	49	47	-6	-18	28/08/2018	18:45	86	49	51	-6	-8	120
18	28/08/2018	19:45	84	49	51	-6	-4	28/08/2018	22:45	70	49	55	-5	54	180
19	29/08/2018	00:15	68	49	56	-5	-54	29/08/2018	04:15	60	50	0	-5	-57	240
20	29/08/2018	05:30	64	50	0	-5	-57	29/08/2018	09:30	66	49	58	-5	-36	240
21	29/08/2018	10:45	55	49	59	-5	-32	29/08/2018	15:30	75	49	53	-5	-23	245
22	29/08/2018	20:45	57	50	1	-5	-31	30/08/2018	01:15	62	49	59	-5	-36	270
23	30/08/2018	02:30	64	49	58	-5	41	30/08/2018	06:45	71	50	6	-5	-57	255
24	30/08/2018	07:45	71	50	6	-5	57	30/08/2018	12:15	66	49	59	-5	-44	255
25	02/09/2018	18:45	55	49	59	-5	-29	02/09/2018	22:45	73	49	54	-5	-26	240
26	02/09/2018	23:15	73	49	54	-5	-27	03/09/2018	03:15	65	49	58	-5	-42	240
27	03/09/2018	04:00	66	49	58	-5	-44	03/09/2018	08:00	64	49	58	-5	-46	240

Hauls 14 and 15 considered invalid.

5.4 List of fish species caught

Common name	Scientific name	Cefas code
Anglerfish, or Monk	<i>Lophius piscatorius</i>	MON
Red Gurnard	<i>Aspitrigla cuculus</i>	GUR
Bib, or Pout	<i>Trisopterus luscus</i>	BIB
Blonde Ray	<i>Raja brachyura</i>	BLR
Boar fish	<i>Capros aper</i>	BOF
Brill	<i>Scophthalmus rhombus</i>	BLL
Cod	<i>Gadus morhua</i>	COD
Common dragonet	<i>Callionymus lyra</i>	CDT
Cuckoo ray	<i>Leucoraja naevus</i>	CUR
Cuttle fish	<i>Sepia officinalis</i>	CTC
Dab	<i>Limanda</i>	DAB
Dover Sole	<i>Solea</i>	SOL
Edible crab	<i>Cancer pagurus</i>	CRE
Grey gurnard	<i>Eutrigla gurnardus</i>	GUG
Haddock	<i>Melanogrammus aeglefinus</i>	HAD
Hake	<i>Merluccius</i>	HKE
Horse mackerel	<i>Trachurus</i>	HOM
Imperial scaldfish	<i>Arnoglossus imperialis</i>	ISF
John Dory	<i>Zeus faber</i>	JOD
Lemon sole	<i>Loligo vulgaris</i>	LEM
Lesser sandeel	<i>Ammodytes tobianus</i>	TSE
Lesser spotted dogfish	<i>Lepidorhombus whiffiagonis</i>	LSD
Lobster	<i>Homarus gammarus</i>	LBE
Mackerel	<i>Scomber scomberus</i>	MAC
Megrim	<i>Lepidorhombus whiffiagonis</i>	MEG
Northern squid	<i>Pleuronectes platessa</i>	NSQ
Nursehound	<i>Sciliorhinus stellaris</i>	DGN
Painted ray	<i>Raja microocellata</i>	PTR
Pilchard	<i>Sardina pilchardus</i>	PIL
Plaice	<i>Trisopterus minutus</i>	PLE
Poor cod	<i>Pecten maximus</i>	POD
Sand sole	<i>Pegusa lascaris</i>	SOS
Scaldfish	<i>Arnoglossus laterna</i>	SDF
Scallop	<i>Pecten maximus</i>	SCE
Solonette	<i>Buglossidium luteum</i>	SDT
Spotted Ray	<i>Raja montagui</i>	SDR
Spur Dog	<i>Squalus acanthius</i>	DGS
Tub gurnard	<i>Trachinus draco</i>	TUB
Turbot	<i>Echiichthys vipera</i>	TUR
Whiting	<i>Merlangius merlangus</i>	WHG



Centre for Environment Fisheries & Aquaculture Science



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