

Final Report

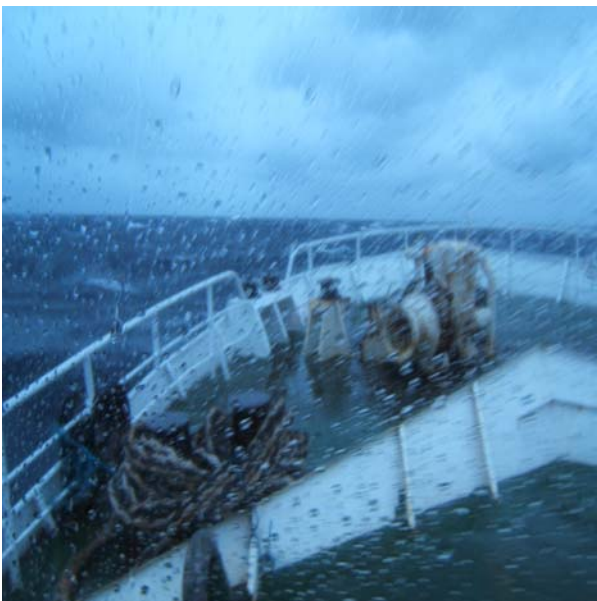
***Programme 5: Western Edge Ghost
Nets (gill net retrieval)***

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and

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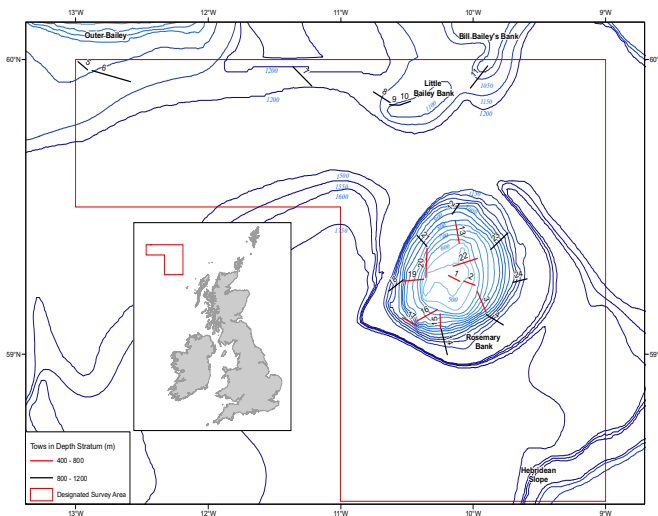


November 2005

Summary

A Fisheries Science Partnership survey was carried out in September/October 2005 to examine the amount and mesh size of lost and discarded gillnets in the anglerfish and shark fisheries on and around Rosemary Bank to the west of Scotland. Information from the recent DEEPNET1 project suggests that lost and discarded gill nets from these fisheries to the west of the British Isles may continue to “ghost fish” for long periods due to a slow rate of bio-fouling.

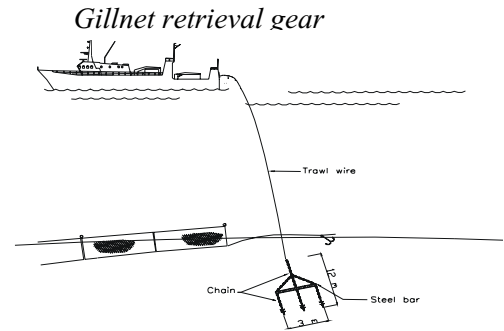
Survey area showing completed transects



Strong winds above force 7 prevented work on the NW Hebridean slope and reduced survey time on Rosemary Bank. Overall, almost 80% of the planned survey was completed. Fragments of gillnet were retrieved at three locations. The mesh size of two fragments (280mm) was as used in the anglerfish fishery. The other fragment (160mm) was 60mm less than used in the deep-water shark fishery. Netting and wire from trawls were retrieved at three other locations. The only catch was a deep-water red crab found in a crab pot.

Two-thirds of the survey was carried out in good conditions with winds up to force 5. Rough seas during the remaining period could potentially have caused difficulty in detecting changes in wire tension during towing and some loss of retrieved gear whilst hauling. However, the largest fragment of gillnet was taken on one of the windiest days surveyed. Slight distortion of some of the grapnel prongs occurred on hard ground, although it is unlikely that this would have prevented detection of large amounts of lost netting had such gear been present on the tow tracks. On balance, there was evidence for only occasional fragments of lost or abandoned gill nets along the completed tow tracks.

Poor weather conditions prevented planned additional work to retrieve specific nets.



The stern trawler FV *Kirkella* was chartered to carry out a gillnet retrieval survey using the same gear as on Norwegian retrieval surveys for lost and discarded Greenland halibut gillnets. The area for the survey was chosen based on information on distribution of fishing activity from VMS data.

Retrieval tows along transects were stratified by depth, the two strata corresponding to the depth range of the anglerfish (400 - 800m) and the deep-water shark (800 - 1200 m) fisheries. Mesh size was used to further attribute retrieved gear to fishery. The size and composition of any catches taken by retrieved nets were recorded.

Tow distances (nautical miles), with planned distances in parenthesis

Survey sub-area	400-800m stratum	800-1200m stratum	Total
Rosemary Bank	54	32	86 (102)
Northern area	-	37	37 (37)
NW Hebrides	0	0	0 (16)

Largest fragment of gillnet retrieved (3-4 m²)



Introduction

The Fisheries Science Partnership (FSP) was established in 2003 to build relationships between fishermen and scientists, and to involve fishermen in the co-commissioning of science. The FSP is funded by the UK Department for Environment, Food and Rural Affairs (Defra). Ten projects were carried out during 2003/04, and a further ten in 2004/05, comprising a mixture of time-series surveys, fishing gear selectivity studies and examination of spatial patterns of catch compositions. Reports for FSP projects already completed are available on the FSP page of the Cefas web site (www.cefas.co.uk).

A further three years of the FSP programme has now been funded by Defra. Industry proposals for FSP projects have typically been developed at a port/regional level, refined and agreed with Cefas and approved by the FSP Steering Group. Charter vessels are selected through an open tendering procedure, and are given dispensations from the relevant quota and effort controls and to fish in non-UK waters where appropriate.

This report presents the results of FSP 2005/06 Programme 5, a gill-net retrieval survey carried out on fishing grounds to the west of Scotland during early autumn 2005. The project used the commercial trawler FV *Kirkella* (skipper Charles Waddy), from 19th September to 1st October 2005.

Recent information collected in the DEEPNET1 project (Fishing News, 2005) suggests that lost and discarded gill nets may be a problem in the fisheries to the west of Britain for deep-water sharks (mainly Portuguese dogfish (*Centroscymnus coelolepis*) and the leafscale gulper shark (*Centrophorous squamosus*)) and anglerfish (*Lophius piscatorius*). Available information suggests that these nets may continue to fish (ghost fishing) for much longer in deep water than gill nets deployed in shallow waters on the continental shelf, possibly due to a slower rate of bio-fouling. As well as killing fish, lost and discarded nets can be a considerable problem when taken in trawls. The Norwegians have similar difficulties in the Greenland halibut fishery and these have been addressed by regular net retrieval surveys carried out in close co-operation with the fishing industry (Furevik and Fosseidengen, 2000).

This project complements a similar stratified survey on the continental slope south-east of Rockall and north-west of the Porcupine Bank (see Figure 1 in Appendix 1), carried out by the Irish Sea Fisheries Board (Bord Iascaigh Mhara (BIM)) in August 2005.

Objectives

The primary objective of this project was to carry out a depth stratified survey to examine the amount and mesh size of lost and discarded gillnets in the anglerfish fishery (mainly at depths 400-800m) and shark fishery (800-1200m) within a designated survey area around Rosemary Bank, where, on the basis of VMS records, there is intense gillnet fishing activity. The size and composition of any catches taken by retrieved nets (ghost fishing) were to be recorded.

A secondary objective was to retrieve gill nets at specific locations in the survey area, where, on the basis of information gathered from the industry, nets had been lost or discarded. Again, the size and composition of any catches taken by retrieved nets were to be recorded.

The detailed operational plan was discussed at a meeting between Cefas and J. Marr Ltd on 19th September 2005 (Appendix 1)

The cruise narrative prepared by Cefas seagoing staff is reproduced in Appendix 2.

Methods

Vessel and creeping gear

FV *Kirkella* (H2) is a steel stern trawler built in 1990, overall length 38.5 m and breadth 9.7 m, with a 1268 kW (1700 horsepower) main engine.

Heavy retrieval gear comprising a steel bar with three grappling anchors was used throughout the trip. This gear was attached to a steel warp and towed along the seabed at a speed of 1-2 knots (average 1.5 knots), a technique called ‘creeping’ (Figures 1).

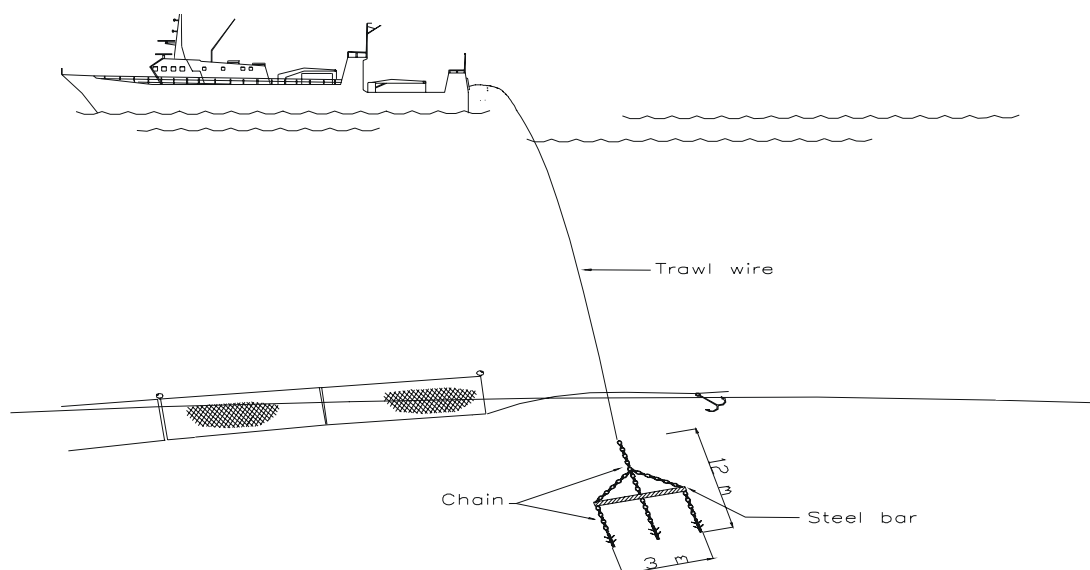


Figure 1. Diagram showing creeping gear and general method of deployment.

The gear was hauled when the tension meters on the winch showed increased loading, indicating that the grappling anchors may have captured fishing gear. The gear and general method of deployment was exactly the same used on the annual Norwegian retrieval surveys for lost and discarded Greenland halibut gillnets.



Inspecting the retrieval gear

Survey design

The survey was designed to provide intensive coverage of the anglerfish fishing grounds (mainly at depths 400-800m) and shark fishing grounds (800-1200m) on the Rosemary Bank, and less intensive coverage to the south and south-east of the outer Bailey Bank, east of Little Bailey Bank and south of Bill Bailey’s Bank, and on the continental slope off the Outer Hebrides. The areas surveyed were, according to the literature (Roberts *et al*, 2003) and expert opinion, relatively free of cold-water corals. The planned survey design is given in Figure 2 of Appendix 1.

The industry was given advanced notice of the survey and asked to remove all live fishing gear from the designated survey area (Appendix 1 annex 1). If for technical reasons (such as the presence of under-sea cables etc) it was not possible to follow a transect, an adjacent transect with a comparable depth stratification was worked. Tows along transects were stratified by depth, the two strata corresponding to the depth range of the anglerfish fishery (400 - 800m) and the deep-water shark fishery (800 - 1200 m) (Table 1).

Table 1. FSP 2005 Programme 5 : Total tow distances in nautical miles, by survey sub-area and depth stratum. Planned distances for each area are in parenthesis.

Survey sub-area	Upper slope stratum (400-800 m)	Deep stratum (800-1200 m)	Total
Rosemary Bank	54	32	86 (102)
Northern transects	0	37	37 (37)
NW Hebrides	0	0	0 (16)
Total Nmiles	54	69	123 (155)

This approach enabled captured fishing gear to be quantified (number and length of nets and other gear (longlines, dahn lines, anchors, wire) per nautical mile crept) and compared by depth stratum. For retrieved gillnets, mesh size was used to further attribute gear to fishery (anglerfish fishery: 250 to 280 mm mesh nets and shark

fishery: 220 mm mesh nets). The state of retrieved gear (new nets, damaged, panels, dumped panel etc) and the dimension of ropes was recorded.

Information on the position of lost and discarded nets in the survey area was collected before and during the survey from the industry, with the intention of carrying out specific tows to retrieve nets when all of the transects had been completed

Sorting and processing catches taken by retrieved fishing gear (ghost fishing)

All catches and catch components were quantified by weight and number. The physical condition of all catches was recorded using a seven-stage scale (see Appendix 1 annex 2).

Collecting information from vessels fishing in and around the survey area

Vessels were contacted and the salient points made in communications were recorded.



Shooting the retrieval gear

Results

Retrieval tows along transects

Gale force winds in excess of force 7 were experienced for much of the trip and it was not possible to shoot and haul the retrieval gear in these conditions with the required degree of safety for the crew and scientists. Retrieval tows could only be made while in the centre of low pressure cells or in lulls between gales. Lost time due to poor weather prevented surveying of the two transects on the NW Hebridean slope. However, by creeping almost continuously during calmer weather, all the northern transects and 84% of the planned tow distance on Rosemary Bank were completed. Tow details and a description of fishing gear and ghost catches retrieved are given in Appendix 3. The distribution of completed creeping effort, expressed in nautical miles, by survey sub-area and depth stratum is summarised in Table 1. The geographical positions of completed tows are shown in Figure 2.

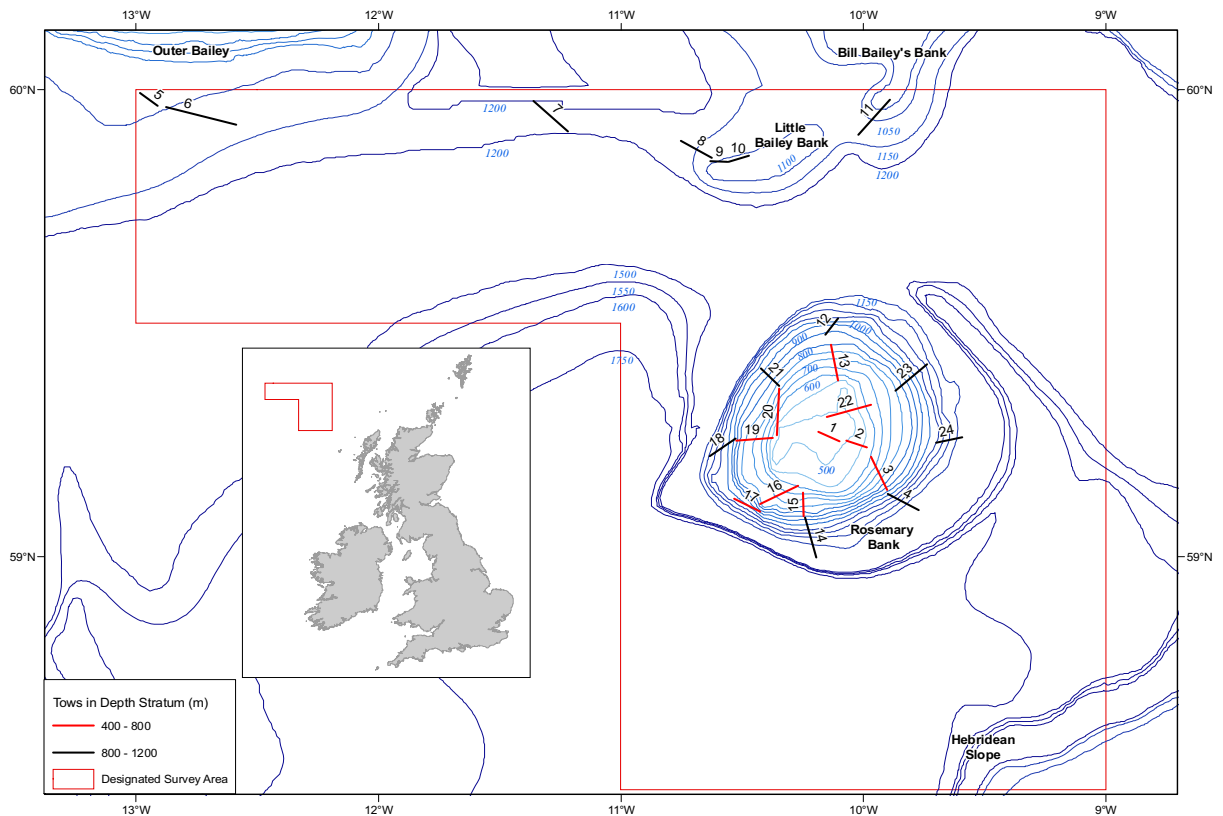


Figure 2. Geographical positions of completed creeping tows along transects.

Creeping commenced on transects in the south-eastern part of Rosemary Bank but due to bad weather arriving from the south-east it was decided to attempt the northerly transects (100% completed) before returning to Rosemary Bank where 84% of the planned tow distance was achieved with good coverage of both depth strata. The short transects to the north-west of the Hebrides were not attempted because of lack of time due to bad weather. However, these accounted for only 10% of the survey transect target. Overall, 80% of the planned tow distance was completed.

Fishing gear retrieved from tows along transects

Details of retrieved gear are given in Appendix 3 and summarised in Table 2 below.

Table 2. Details of fishing gear retrieved (see Fig. 2 for tow positions)

Tow	Grounds	Stratum	Gear retrieved	Quantity	Mesh size
7	SE outer Bailey	deep	Wire (unknown)	<2m	
8	Little Bill Bailey	deep	Trawl wire	200m	
14	Rosemary Bank	deep	Gillnet fragment	< 1m ²	280mm
15	Rosemary Bank	shallow	Trawl wire	20m	
18	Rosemary Bank	deep	Crab pot	single	
19	Rosemary Bank	shallow	Trawl codend	1m ²	70mm
20	Rosemary Bank	Shallow	Gillnet fragment	< 1m ²	280mm
22	Rosemary Bank	Shallow	Long-line	400m	
24	Rosemary Bank	deep	Gillnet fragment	3 – 4 m ²	160mm

Only fragments of gill netting were retrieved; no fleets or panels of gill nets were found.

Given the small amounts of fishing gear retrieved, a full quantitative analysis of retrieved gear per nautical mile crept by depth stratum was not carried out and a descriptive account of retrieved gear is therefore presented. The fishing gear retrieved appeared to have been used previously but it was not possible to identify if it had been dumped or lost.

The mesh size of the two small fragments of gillnet retrieved from tows 14 and 20 (280 mm) was as used in the anglerfish fishery. The mesh size of the other fragment (160mm) was 60mm less than typically used in the deep-water shark fishery.

Composition of catches taken by ghost fishing

No catches were found in the small pieces of gillnet retrieved from transects. The only catch taken by ghost fishing was a single deep-water red crab (*Chaceon affinis*) found in the crab pot retrieved at tow 18 in the shallow stratum on the eastern part of Rosemary Bank.

Retrieval tows for gear reported as lost or discarded at specific locations in the survey area

Poor weather conditions prevented planned additional work to retrieve specific nets.

Information collected from vessels fishing in and around the survey area

No gill-netters or dahn buoys were seen in the vicinity of Rosemary Bank, although it is not clear if this was due to requests to the Industry to remove active gear or due to normal seasonal patterns of fishing.

Scientific staff communicated with the skipper of a Faeroese long-liner, 'Ekliptika', fishing for tusk, ling, and blue ling on the top of the Rosemary Bank. The skipper reported gill nets present at a depth of 200 m to the north side of Rockall at 57° 43 N by 14° 15 W and 57° 10 N by 13° 38 W. He suggested that there were so many gill nets that he was unable to shoot his gear.

Single deep-water red crab found in the crab pot retrieved at tow 18





Section of gill net retrieved at tow 24



Length of trawl cable retrieved at tow 8



Section of cod end retrieved at tow 19



Crab pot and long-lines retrieved at tows 18 and 22

Discussion

Recent information collected in the DEEPNET1 project (*Fishing News* 11th March) suggests that lost and discarded gill nets may be a problem in the fisheries for deep-water sharks and anglerfish to the west of Britain. Available information suggests that these nets may continue to fish (ghost fishing) for much longer in deep water than gill nets deployed in shallow waters on the continental shelf, possibly due to a slower rate of bio-fouling. It is therefore important to determine the extent and scale of this problem, if the problem applies to all gillnet fisheries to the west of the British Isles and if it is worse in some fisheries than in others.

The primary aim of this project was to creep along pre-defined transects within a designated survey area around Rosemary Bank to determine the amount and mesh size of lost and discarded gillnets in the anglerfish fishery (mainly at depths 400-800m) and shark fishery (800-1200m) in the area. No lost or abandoned fleets or panels of gill nets were retrieved from tows along transects, even though the survey area included grounds extensively fished by gillnetters. Only three small fragments of gillnet were retrieved from both the deep and shallow depth strata, and the mesh size of two of these fragments indicates that they probably originated from the anglerfish fishery. No netting from the deep-water shark fishery was retrieved in the survey area. The only ghost catch found in retrieved gear was a single deep-water red crab found in a crab pot.

The ability of a retrieval survey to deliver quantitative estimates of quantities of lost or abandoned fishing gear depends critically on the efficiency of the retrieval equipment, which can be affected by weather conditions and any damage to the gear that affect its ability to entangle nets and wires. Only small amounts of gear were retrieved, and no attempt has been made to estimate total quantities of lost and abandoned gear in the survey area based on the quantities retrieved per distance towed. Nonetheless, the qualitative results given in the present report could be affected by changes in gear efficiency and these aspects are discussed below.

Despite poor weather, most of the areas intended to be surveyed were covered, with the exception of the Hebridean slope where only two short transects had been planned but could not be completed. Two-thirds of the completed transects were carried out in conditions considered ideal for gear retrieval, with winds up to force 5. Rough sea conditions during the remaining period could potentially have caused difficulty in detecting changes in warp tension due to contact with lost gear and some loss of retrieved gear whilst hauling. However, fragments of gill net were taken in both ideal conditions and non-ideal conditions, and the largest fragment of gillnet was taken on one of the windiest days surveyed.

Slight distortion of some of the grapnel prongs occurred on hard ground, although it is unlikely that this would have prevented detection of large amounts of lost netting had it been present on the tow tracks.

On balance, there was evidence for only occasional fragments of lost or abandoned gill nets along the completed tow tracks. Furthermore, the fragments of gillnets found had not been ghost fishing.

This project complements a similar stratified survey on the continental slope south-east of Rockall and north-west of the Porcupine Bank (see Figure 1 in Appendix 1), carried out by the Irish Sea Fisheries Board in August 2005. The results from the UK and Irish survey will be formally disseminated in a scientific paper to be published in 2006.

Acknowledgements

Skipper Waddy and the crew of the *Kirkella* are warmly thanked for their help, advice and willing co-operation throughout this project. Nils-Roar Hereide is thanked for working as scientist-in-charge at sea. All Cefas staff involved in data processing and project administration are thanked for their valuable contribution to the success of this project, which was funded by Defra.

References

- Furevik, D.M. and Fosseidengen. 2000. Investigation on naturally and deliberately lost gillnets in Norwegian waters. Working Document to the Fisheries Technology Fish Behaviour Group. Harlem Netherlands, April 10-14, 2000.
- Fishing News. 2005. 'Monks slaughter in deepwater fishery'. *Fishing News*, 11th March.
- Roberts, J.M., Long, D., Wilson, J.B., Mortensen, P.B., Gage, J.D. 2003. The cold-water coral *Lophelia pertusa* (Scleractinia) and enigmatic seabed mounds along the north-east Atlantic margin: are they related? *Mar. Poll. Bull.* 46, 7-20.

Appendix 1: Detailed operation plan

Fisheries Science Partnership 2005/06

Gill net retrieval cruise : September/October 2005

Detailed Operation Plan (as agreed 19th September 2005)

VESSEL

FV *Kirkella*

OBSERVERS

1. Nils-Roar Hareide (Scientist in Charge; Norway)
2. Peter Randall (Cefas)

PERIOD OF SURVEY

The survey will commence on 19th September and should be completed by 13th October.

OBJECTIVES

Primary aim

To carry out a depth stratified survey to determine the amount and mesh size of lost and discarded netting caught-per-mile-crept in two depth zones along the transects described in Figure 2. The two depth zones are 400-800m (upper slope) and 800-1200m (lower slope). It is suggested that the Rosemary Bank is surveyed first and then the three more northerly transects. If, for technical reasons (e.g. live nets etc), it is not possible to follow these transects adjacent transects can be worked providing these are within the declared UK(E+W) survey area and have a comparable depth stratification (Figure 1 and notice to industry attached). Towing speed will be 1-2 knots with an average of 1.5 knots.

Table 1. Distribution of effort (hours) by area and depth/fishery

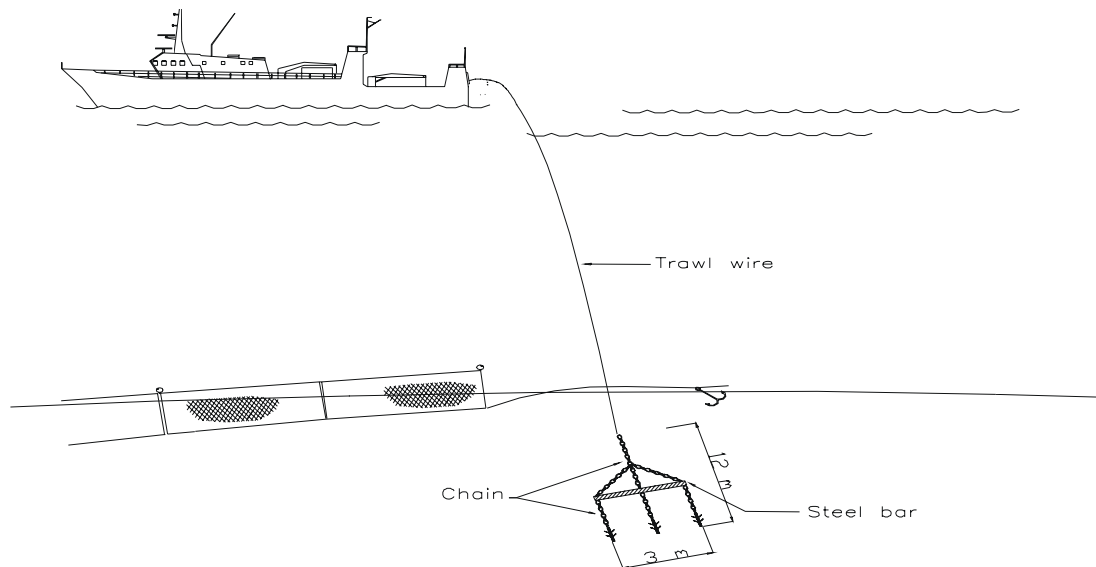
	Depth/fishery		
	Deep	Upper slope	Total
Main area			
North Area	37		37
NW Hebrides	7	9	16
Rosemary	48	53	101
Total	92	62	154

Secondary aim

To creep for lost and discarded nets in areas where, on the basis of information available to the SIC, nets are known to have been lost or discarded. This work must only be carried out in the declared UK(E+W) survey area and should only commence when the primary aim above has been completed.

FISHING GEAR

The retrieval gear to be used comprises a steel bar fitted with grappling anchors:-



DATA COLLECTION

Haul details (SIC with assistance from fishing skipper)

- Date,
- Time
- Position for shooting and hauling
- Distance crept
- Depths
- Bottom conditions (sand rock, corals etc)
- Currents
- VMS tracking of retrieval vessel

Details of nets caught

- Number of nets and other gear. (longlines, dahnlines, anchors, wire etc)
- State of gear (new nets, damaged, panels, dumped panel etc)
- Dimension of ropes
- Mesh size

Details of fish and crustaceans

- Number and weight of all fish and crustaceans by species.
- Quality of fish 7 stages (see attached)
- Length, sex, weight and maturity of main commercial species.

Data on fisheries in the area

- Summary of communication with gillnetters and longliners.

CRUISE REPORT

The observers will maintain a diary of activities, including an electronic copy where possible, and a draft cruise report in standard Cefas format will be prepared for submission to Cefas immediately after the cruise by Peter Randall with technical assistance from the SIC (template provided).

The cruise narrative should be written at sea and read and agreed by the skipper (report will bear the sentence “seen in draft by skipper”).

Signed:

Charles Waddy... (Skipper) 19th September 2005..... (date)

Nils-Roar Hareide...(SIC o.b.o. Cefas) 19th September 2005.....(date)

Figure 1 : Map of the area within which sampling will be required

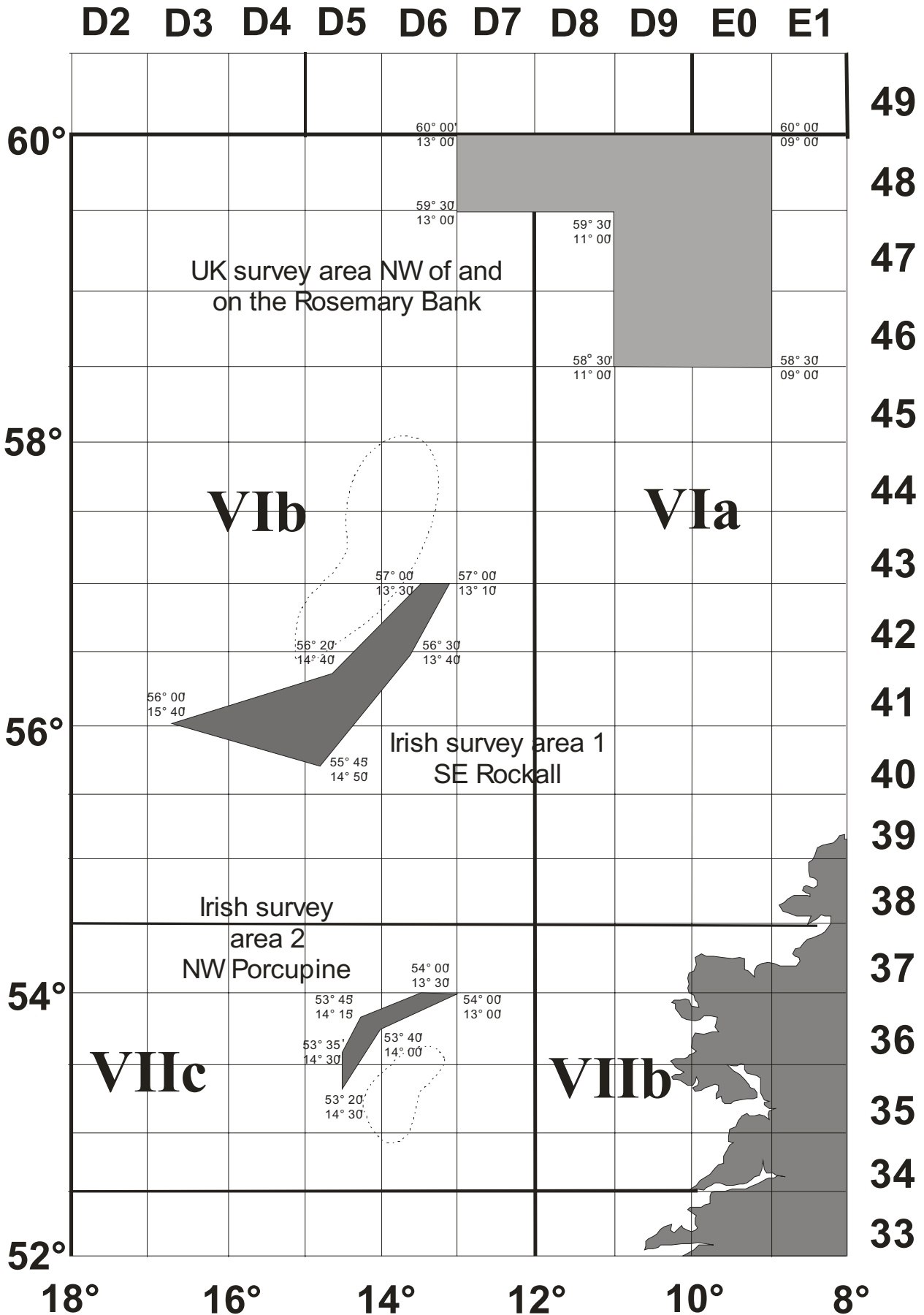
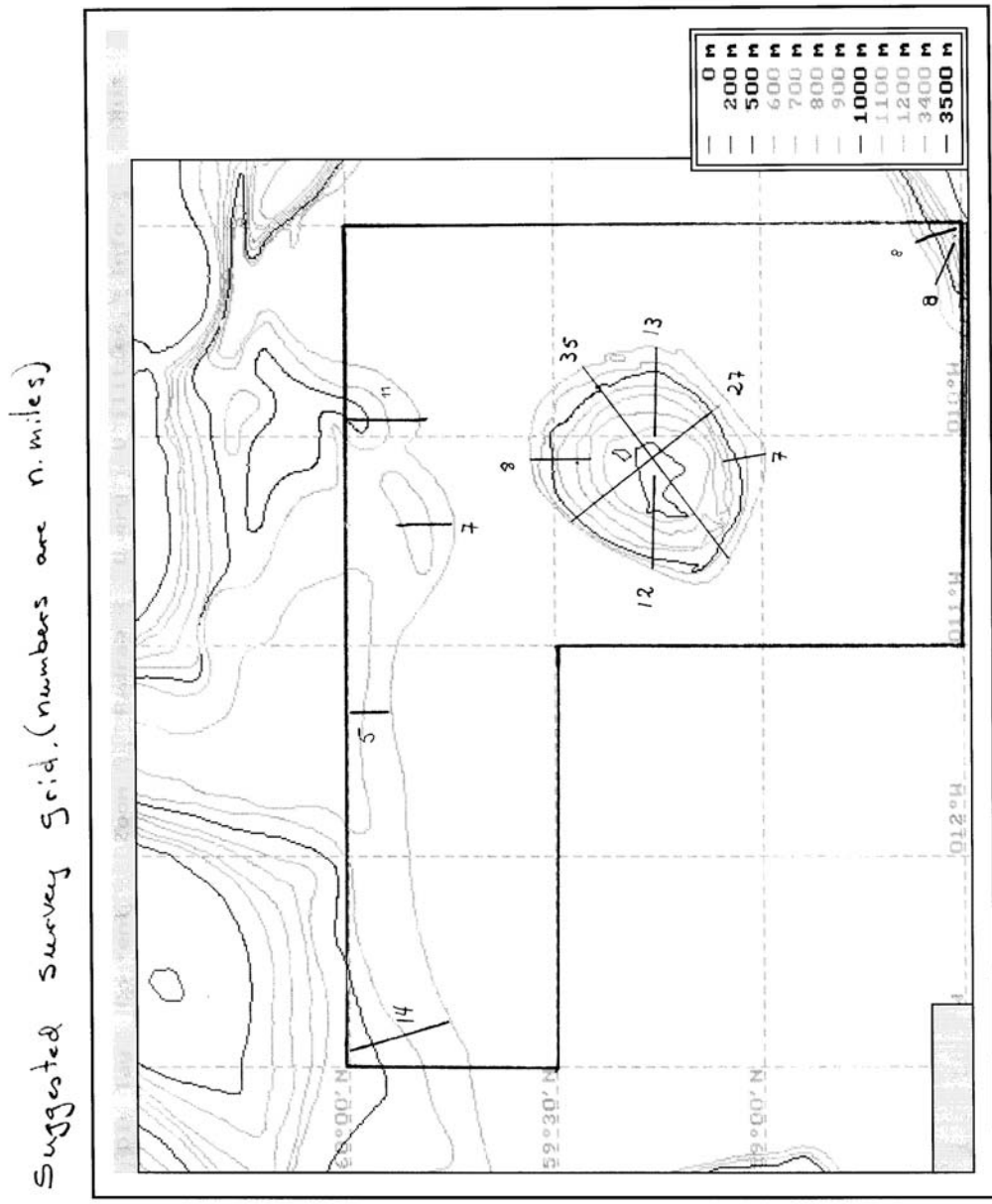


Figure 2 Proposed transect grid.



Annex 1. Notice to Industry (revised)

Revised dates for retrieval surveys for lost or discarded gill nets - Please note changes

We recently issued a notice of work that the UK and Ireland are carrying out to investigate the issue of lost and discarded gill nets in the fisheries for deep-water sharks and shelf-edge monkfish in the waters to the west of Britain. This notice is to let you know that the UK survey has been delayed.

The UK survey North West of, and on, Rosemary Bank (figure 1), has been delayed and is now likely to start on 16 September and to be completed by 10 October.

We should be grateful if you could alert any fishermen who work in the areas covered by the survey. To avoid accidental removal of, or damage to, active fishing gear, fishermen who fish in these areas may wish to remove all fixed gears from these areas for the duration of each survey.

The vessel being used in the survey will be the commercial stern trawler FV Kirkella. Other details remain the same i.e.:

Scientists will be carried onboard the vessels and surveys will be within the depth range 400 –1200m.

The retrieval gear to be used comprises a steel bar fitted with grappling anchors (figure 2).

If you have any queries on the details of these surveys or any information where gill nets have been lost/discarded or taken in trawls, please contact Phil Large at CEFAS (00 44 (0)1502 524491 or p.a.large@cefasc.co.uk).

Annex 2 Classification of fish from retrieved gear.

1. Alive fresh: the fish is alive and shows no sign of morphological damage, uniformly dark colour and no faded gills occur.
2. Alive some damage: the fish is alive; disrupt colorization with brighter patches unevenly distributed over the body. Physical damage such as cuts, scratches and skin lacking between fin rays derived from gillnet twine/thread.
3. Dead fresh: faded gills and glossy eyes. (Contraction/cramps might occur).
4. Dead some damage: equivalent to stage 2 but dead.
5. Dead extensive damage: The former damage indicators plus that this stage is characterized of small holes in the flesh caused by scavengers (amphipods and isopods), but with most parts of the body remaining intact. Other criterions that also qualified were white skin or some parts of the fish with exposed flesh.
6. Dead severely damaged: Bones partially exposed (sticking/protruding out from flesh), intestines lacking, larger parts of fish might be missing. Body (carcass?) penetrated with small holes. Both fish clearly eaten off and fish going through bacterial decay were included in this stage.
7. Bone relics: Only skeleton or parts of it remaining.

Appendix 2: Cruise report

FISHERIES SCIENCE PARTNERSHIP PROJECT 5 2005

GILL-NET RETRIEVAL CRUISE – WEST OF SCOTLAND

REPORT: FV KIRKELLA

SKIPPER: Charles Waddy.

OBSERVERS: Nils-Roar Hareide (Scientist in charge at sea).
Peter Randall (Cefas).

DURATION: 19th September to 1st October.

LOCALITY: Rosemary Bank, South of Bailey Bank, Little Bill Bailey Bank.

GEAR: 'Creeper' comprising steel bar fitted with three grappling anchors.

WEATHER: For the most part, use of the 'creeper' was only possible in the brief lulls between gales and while in the centre of low-pressure systems. It was only in the latter half of the second week of the survey that it was possible to work throughout a 24-hour period. Wind speeds varied from force 3-10 over the period of the survey and frequently were between force 6 to severe force 9. Swell height ranged from 1 to 10 metres.

AIMS:

1. To carry out a depth stratified survey to determine the amount and mesh size of lost and discarded netting caught-per-mile-crept in two depths zones within the survey area. The two depth zones are the upper slope (400-800m) and the lower slope (800-1200m).
2. To creep for lost or discarded nets in areas known by the SIC where net loss or net discarding has occurred.

SUMMARY:

We obtained good coverage of the lower slope transects to the north of the survey area (55% complete) and reasonable geographical coverage of the upper and lower depth strata at Rosemary Bank (50% and 36%, respectively), where creeping took place on all transects when weather permitted. The short transects to the NW Hebrides were not covered; however, these accounted for only 10% of the survey target. Small fragments of gill net (<1 metre long) were retrieved from the south, south-western and eastern lower slopes at Rosemary Bank and small amounts of other types of fishing gear (single crab pot, 20m of trawl wire and 400m of long-lines) were caught in various locations. No lost or abandoned fleets or panels of gill nets were retrieved and no gill-netters or dahn buoys were seen in the vicinity of Rosemary Bank, despite this being an area extensively fished by gill-netters. It is possible that in the worst of the

weather conditions, creeping efficiency may have been adversely affected because of difficulty detecting 'real' changes in warp tension and because any fishing gear caught may have broken and been lost during retrieval. The creeper was deployed in wind speeds of force 3 to 7 and in swell heights of 1 to 5 metres. Ideal conditions for creeping are up to and including force 5 winds and about two-thirds of the survey was carried out in these conditions. Aim 2 was not attempted because of lack of time due to bad weather.

NARRATIVE: (All times are in BST, all depths in metres)

Kirkella sailed from Hull at 19:00 Monday 19/09/05. Shortly after sailing, the ship's radar began to malfunction, and so arrangements were made to have it repaired at Scrabster. Landed at Scrabster 09:30 Wednesday 21/09/05 and set sail once more at 10:30 the same day.

Arrived at Rosemary Bank 06:00 Thursday 22/09/05. Conducted four hauls (1-4) in the SE area, none of which retrieved any fishing gear. Due to bad weather arriving from the SE, it was decided to steam NW to the western most of the four northerly transects. Spent most of Friday (23/09/05) dodging in bad weather. Conditions improved to allow survey to resume at 19:30 on Friday. During the remainder of Friday and on Saturday, six tows were conducted (hauls 5-10) covering the northerly transects. Some wire (< 2m) was found around the bar of the creeper on haul 7. A second set of creeping gear was used after haul 7 as some of the grapnel arms were bent. Cable from a trawl was retrieved on haul 8. Some transects were not completed because of telephone cables.

Bad weather prevented further surveying on Sunday until 17:55 (haul 11) when a further northerly transect was completed. After hauling at 22:30 the Kirkella steamed south to continue the survey on the north of Rosemary Bank.

The survey resumed at 00:40 on Monday 26/09/05 with two hauls (12 & 13) on the northern transect of Rosemary Bank. During haul 12, communicated with a Faroese long liner (see additional comments below). Weather deteriorated after haul 13, and so the remainder of Monday and all of Tuesday (27/09/05) were spent dodging.

Weather conditions were much improved by Wednesday morning (28/09/05) and the survey resumed with haul 14 at 07:45 with the southern transect of Rosemary Bank, which resulted in the retrieval a small piece of gillnet (<1 square metre) from the lower slope haul. The upper slope of the southern transect (haul 15) resulted in 20m of wire.

Hauls 16 and 17 were conducted on the south-western transect of Rosemary Bank, neither of which caught any fishing gear. Once on board, after haul 17, all three grapnels of the Creeper were fouled around each other. From here the Kirkella steamed north to begin the western transect of Rosemary Bank.

Haul 18 commenced at 21:56 on Wednesday, and retrieved at 00:35 as gear got stuck. Brought up a crab pot containing a single crab (*Chaceon affinis*). Haul 19 was shot at

01:00 on Thursday and a small piece of cod end (approx. 1 square metre) was retrieved.

The north-western transect of Rosemary Bank began on the upper slope at 03:50 with haul 20. A small amount of gillnet (<1 square metre) was retrieved from this haul. The lower slope of the northwestern transect (haul 21) retrieved no fishing gear. At this point the creeper was changed as some of the grapples were bending.

The Kirkella steamed SE to resume the survey along the north-eastern transect of Rosemary Bank. Approximately 400 metres of long lines were retrieved from the upper slope of the NE region of Rosemary bank (haul 22). No gear was retrieved from the lower slope of this area (haul 23).

The final haul of the survey was conducted on the lower slope of the eastern region of Rosemary Bank at 19:58 (haul 24). The Creeper came fast and it was necessary to turn about to haul the grapnels, resulting in the retrieval of further gill net (several square metres). It took considerable effort and time to lift the creeper back off the bottom.

With the weather deteriorating again ahead of a poor forecast, the decision was made to terminate the trip and the Kirkella docked at Scrabster on 1st October.

The scientific staff acknowledge the effort put into this survey by Skipper Waddy and his crew and express thanks for the hospitality and friendship received.

ADDITIONAL COMMENTS:

1. Hauls could only be made while in the centre of low pressures or in lulls between gales. It was only near the end of the survey that it was possible to work through a 24-hour period. It may be advisable to perform any future surveys of this type, earlier in the year, when weather conditions would be more conducive.
2. Communicated with a Faeroese long-liner, 'Ekliptika', fishing for tusk, ling, and blue ling on the top of the Rosemary Bank. Reported gill nets present at 200m to the north side of Rockall at 57° 43 N by 14° 15 W and 57° 10 N by 13° 38 W. Suggested that there were so many gill nets that he was unable to shoot his gear.
3. Occasionally the grapnels came up bent due to getting stuck in the sediment. This occurred more frequently when creeping uphill. In future it may be advisable to only use the creeper down slope in the same way fishermen only trawl down slope in areas where ground type is unknown
4. Skipper Waddy suggested that the creeper used in the present survey might not be suitable for use on hard ground, as the arms bend and therefore loss of retrieved gear is likely during hauling. Kirkella's own grapnel appears less likely to bend and may be more suitable for use in areas with hard sediment.

Appendix 3. Tow details and description of fishing gear and ghost catches retrieved.

Tow	ICES Division	Fishing Ground	Time		Depth		Time		Depth		LAT	LONG	LAT	LONG	Wind direction	Wind force	Swell (m)	Distance trawled (Nm) ¹	Gear retrieved	Quantity of gear	Mesh size (mm)	Catch retrieved
			Date	shot	(m)	(m)	hauled	(m)														
1	Vla	Rosemary Bank	22/09	07:55	489	59	16.0	10	11.1	W	09:40	447	59	14.8	10	06.0	W	5	2	5.1	None	None
2	Vla	Rosemary Bank	22/09	10:10	455	59	14.9	10	04.2	W	11:45	585	59	14.0	09	59.2	W	3-4	1	5.0	None	None
3	Vla	Rosemary Bank	22/09	12:25	600	59	12.8	09	58.2	W	15:30	800	59	08.5	09	54.2	W	Variable	3	1	4.6	None
4	Vla	Rosemary Bank	22/09	16:25	817	59	08.0	09	54.0	W	19:40	1230	59	05.9	09	46.4	W	Variable	3-4	1	7.7	None
5	Vlb	S. of Outer Bailey	23/09	19:30	878	59	59.6	12	59.0	W	21:25	984	59	57.9	12	54.7	W	WNW	6-7	4-5	4.4	None
6	Vlb	S. of Outer Bailey	23/09	22:00	947	59	57.7	12	52.6	W	02:30	1039	59	55.5	12	35.2	W	N	6	5	17.4	None
7	Vla	SE. of Outer Bailey	24/09	06:40	1170	59	58.5	11	21.6	W	11:15	1203	59	54.6	11	13.1	W	Variable	4-5	3-4	8.7	Wire - unknown
8	Vla	Little Bill Bailey	24/09	13:00	1140	59	53.4	10	45.1	W	15:10	1068	59	51.2	10	37.5	W	Confused	4	1-2	7.7	Cable from trawl
9	Vla	Little Bill Bailey	24/09	15:50	1066	59	50.8	10	37.8	W	16:30	1055	59	50.7	10	33.7	W	Variable	4	1-2	4.1	None
10	Vla	Little Bill Bailey	24/09	17:10	1053	59	50.7	10	33.4	W	19:30	1084	59	51.5	10	28.3	W	SE	7	4	5.1	None
11	Vla	South of Bailey	25/09	17:55	1120	59	58.7	09	53.4	W	22:00	1172	59	54.2	10	01.2	W	N	5-6	4	8.1	None
12	Vla	Rosemary Bank	26/09	00:40	1002	59	30.6	10	06.3	W	02:20	960	59	28.5	10	09.4	W	SE	6-7	2-6	3.3	None
13	Vla	Rosemary Bank	26/09	14:20	631	59	22.6	10	06.3	W	16:20	880	59	27.2	10	08.1	W	SE	6-7	4-5	3.0	None
14	Vla	Rosemary Bank	28/09	07:45	1154	58	59.9	10	11.7	W	10:50	787	59	05.0	10	14.4	W	W	6	4	3.8	Part of gillnet
15	Vla	Rosemary Bank	28/09	11:15	802	59	05.2	10	14.8	W	13:15	520	59	08.2	10	15.0	W	W	6	4	1.6	Wire from trawl
16	Vla	Rosemary Bank	28/09	13:30	537	59	09.1	10	16.2	W	17:53	809	59	06.7	10	25.5	W	NW	5	3	9.4	None
17	Vla	Rosemary Bank	28/09	17:05	762	59	05.8	10	25.6	W	21:00	814	59	07.4	10	32.0	W	NW	5	3	6.5	None
18	Vla	Rosemary Bank	28/09	21:56	1062	59	12.9	10	38.0	W	00:35	720	59	15.1	10	31.6	W	NW	6	3-4	6.5	Crab pot
19	Vla	Rosemary Bank	29/09	01:00	780	59	14.9	10	31.5	W	03:30	383	59	15.2	10	22.4	W	NW	4-5	2-3	9.1	Cod end
20	Vla	Rosemary Bank	29/09	03:50	410	59	15.6	10	21.4	W	08:31	751	59	21.6	10	20.9	W	NW	4-5	3-4	3.1	Part of gillnet
21	Vla	Rosemary Bank	29/09	08:45	762	59	21.9	10	20.9	W	11:05	1045	59	24.2	10	25.4	W	NW	4-5	3-4	4.6	None
22	Vla	Rosemary Bank	29/09	12:26	510	59	17.9	10	09.1	W	15:25	668	59	19.5	09	58.2	W	W	5	3-4	10.9	Long-line
23	Vla	Rosemary Bank	29/09	16:00	820	59	21.3	09	52.1	W	18:35	1136	59	24.7	09	44.2	W	Variable	2	1-3	8.1	None
24	Vla	Rosemary Bank	29/09	19:58	1204	59	15.3	09	35.6	W	21:45	1080	59	14.6	09	42.0	W	S	6-7	3-4	6.41	Part of gillnet

¹ from track plotter