

**CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 0HT**

2019 RESEARCH VESSEL REPORT

REPORT: RV CEFAS ENDEAVOUR: CEND 3/19

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Part 1 (5 February – 19 February)

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Part 2 (20 February – 13 March)

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Samantha Elliott

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Sam Roslyn

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Zachary Radford

Rebecca Skirrow

DURATION: 5th February – 13th March 2019 (37 days).

LOCATION: Celtic Seas/western English Channel (ICES Divisions 7.e–j)

AIMS:

1. To carry out an otter trawl survey of the demersal fisheries resources in the Celtic Sea and western English Channel, using a Jackson BT195 575 otter trawl (hereafter referred to as the 'monkfish trawl'), to provide relevant, standardised data for the assessment of commercial fish stocks.

The main aims were to collect data on:

- a) Distribution, size composition and abundance of all fish and shellfish species caught.
- b) Age – length distribution of selected species.
- c) Distribution of fish in relation to their environment.
- d) Distribution of macrobenthos and anthropogenic debris.
- e) Surface and bottom temperature and salinity data using CTD.
- f) Length, weight, sex and maturity information for individual fish measurements consistent with requirements of the EU Data Regulation.

2. To collect multibeam data and fisheries acoustic data at three operating frequencies (38, 120 & 200 kHz) and continuously throughout the survey if this does not result in interference between the two systems – multibeam data acquisition takes priority over acoustic data that being the case. These data will be used to determine the spatial scale of various habitats. All data will be stored as raw files, but also maintained individually in Olex to aid the subsequent beam trawl survey fishing the same stations on the following survey (CEND 4/19).

SECONDARY AIMS:

3. All dead shad (*Alosa* spp.) and all dead lampreys are to be frozen and returned to the laboratory for analyses, marking samples with the survey, station and date.
4. Tag-and-release selected species of elasmobranch (e.g. undulate ray *Raja undulata*, cuckoo ray *Leucoraja naevus*, blonde ray *Raja brachyura* and common blue skate *Dipturus batis*).
5. To report on cetaceans and seabird observations and send information to SeaWatch Foundation.
6. Collect a vertical ring net sample at the west Gabbard smartbuoy, contributing to the Lifeform project (Defra) as part of the UK monitoring network for zooplankton.
7. Collect, retain and freeze water samples from Ferrybox underway water supply every 12 hours for subsequent nutrients sampling as part of the EMFF ASMIAE project.
8. To electronically tag-and-release specimens of starry smooth-hound *Mustelus asterias* and other elasmobranchs in support of on-going Cefas projects.
9. Collect dead specimens of any unusual species for verification of species identification, and length-weight measurements of selected fish species, where required.
10. Test the feasibility of using the CALPS system to collect microplastic samples from the Ferrybox water supply.
11. To collect biological information (length, weight, sex, maturity) for four-bearded rockling *Enchelyopus cimbrius*.
12. Retain otoliths from uncommon species and extremes of length range as part of an on-going otolith reference collection.
13. Test the feasibility of biologically sampling wrasse species (e.g. ballan wrasse *Labrus bergylta*, cuckoo wrasse *Labrus mixtus*, Baillon's wrasse *Symphodus (Crenilabrus) balloni*, and goldsinny *Ctenolabrus rupestris*)

RESULTS BY AIM:

A standard station consisted of the deployment of the BT195 Jackson 575 Monkfish Trawl, with 16" rockhopper discs, Morgere Ovalfoil doors and a 100 mm cod-end without a liner. Sampling was conducted within a 1 nm radius of the selected survey site and a tow was considered to be valid after successfully trawling for a distance of at least 1.5 nm with valid Scanmar net geometry sensor readings.

Additionally, an ESM2 profiler and Niskin bottle were deployed approximately every 12 hours, in order to collect oceanographic data. Further deployments of a SAIV mini-CTD, to provide Sound Velocity Profiles to calibrate multi-beam sensors, were undertaken when required.

Primary Survey Aims

1. *To carry out an otter trawl survey of the demersal fisheries resources in the Celtic Sea and western English Channel, using a Jackson BT195 575 otter trawl (hereafter referred to as the 'monkfish trawl'), to provide relevant, standardised data for the assessment of commercial fish stocks.*

A total of 96 valid stations were fished successfully during the survey (Tables 1–2; Figures 1–2; Appendix 1), out of an initially planned 138 stations. Fifty-two of these were completed in the western English Channel (Strata 1–13), with sampling in six of the 13 strata completed, six partially sampled, and one stratum not sampled at all. Forty-six stations were completed in the Celtic Sea (Strata B–N), with sampling in five of the 10 strata completed, four partially sampled, and one stratum not sampled at all. Several of the randomly-selected sites could not be sampled, due to shallow water, unfishable ground or other factors (Appendix 2).

One of the main reasons why the primary aim was not completed was due to weather causing lost time, with storms 'Erik', 'Freya' and 'Gareth' all impacting on the survey through its duration. Two incidences of significant gear damage and difficulty finding acceptable ground on which to tow in some of the strata along the French coast also impacted on the fishing time available.

Overall, 102 different taxa were measured on the survey (Table 3), in addition to the benthic species and jellyfish also encountered (Table 4). Forty-six commercial species were sampled for biological information (Table 5). The relative abundance and distribution of selected species are shown in Figure 3, with the length-frequency distributions for these shown in Figure 4.

1.1 Gadiformes

Haddock *Melanogrammus aeglefinus* was the main species caught during the survey (in terms of biomass), with 3.865 t caught across 66 stations. A total of 1 697 individuals were sampled for sagittal otoliths and biological information. Whiting *Merlangius merlangus* had a total catch weight less than half that of haddock (1.690

t), but was observed at more stations (n = 88), and were the third highest species recorded by catch weight. A total of 1 189 whiting were sampled for biological information. More than 200 kg of cod *Gadus morhua* was caught, which comprised 92 individuals (all sampled). Hake *Merluccius merluccius* had a total catch weight of ca. 300 kg and was observed at >60 stations, but this covered many more individuals, of which 454 were biologically sampled.

1.2 Elasmobranchs

Lesser-spotted dogfish *Scyliorhinus canicula* was the second highest species by catch weight, with 3.665 t recorded during the survey. They were the most ubiquitous species, seen at all but two of the stations. Two other elasmobranch species, starry smooth-hound *Mustelus asterias* and spurdog *Squalus acanthias*, were also in the top five species (Table 3). Considering the quantities caught, starry smooth-hound (n = 1004) and spurdog (n = 743) were also the two most biologically sampled elasmobranchs (Table 5; also see the section on tagging). Tope *Galeorhinus galeus* comprised 264 kg of total catch weight, and comprised 37 individuals (of which 31 were >100 cm total length).

Various skate species - spotted ray *Raja montagui*, common blue skate, blonde ray, cuckoo ray, undulate ray and thornback ray *Raja clavata*, all had total catch weights >150 kg each.

1.3 Pleuronectiformes

Plaice *Pleuronectes platessa* was the main flatfish catch (in terms of biomass), with 0.439 t caught and 424 individuals biologically sampled. Lemon sole *Microstomus kitt* and megrim *Lepidorhombus whiffiagonis* are also important catch components (0.176 t and 0.161 t caught, respectively). Dover sole *Solea solea* was caught at 36 stations during the survey, with a total weight of just over 54 kg.

1.4 Pelagic fish

Whilst not target species for the survey, pelagic fish, such as mackerel *Scomber scombrus* and horse mackerel *Trachurus trachurus* were both in the top ten species (by catch weight). Both species had similar total catch weights, with 1.25 t and 1.22 t, respectively, although it should be highlighted that over 800 kg of horse mackerel was caught in the last haul of the survey (Stratum 2, Station 6). Pilchard *Sardina pilchardus* and herring *Clupea harengus* were recorded in much smaller amounts (pilchard = 27 kg, herring = 9.9 kg), as were sprat *Sprattus sprattus* (12.2 kg) and anchovy *Engraulis encrasicolus* (8.4 kg).

1.5 Cephalopods and shellfish

Over 150 common cuttlefish *Sepia officinalis* were measured during the survey, with a catch weight of over 126 kg. Examples of these were frozen and brought back by

internal Cefas request. Of note was the eggs found on marine litter at Stratum E, Station 2, which hatched on board.

European squid *Loligo vulgaris* was the main squid species caught, with 65.51 kg caught, again, examples were frozen and brought back for to aid in identification guides and maturity analysis. The curled octopus was the only octopus species caught during the survey, with 44 individuals counted and weighing over 23 kg.

More than 181 kg of Norwegian lobster *Nephrops norvegicus* was caught – the main shellfish species in the survey, although much of this was caught at a single station (140 kg at Stratum E, Station 5). Commercial crabs, including spider crab *Maja squinado* and brown crab *Cancer pagurus* were also taken, albeit in lower amounts.

1.6 Other notable species

With the monkfish trawl designed to catch anglerfish, both *Lophius piscatorius* and *Lophius budegassa* were important catch components, with a combined total catch weight of nearly 1 tonne. *L. piscatorius* was the third highest species in terms of biological samples taken (n = 627) after haddock and whiting, with 114 specimens of *L. budegassa* also sampled.

European seabass *Dicentrarchus labrax* had a much larger catch weight than expected, with 0.853 t caught. Over 600 kg of this, however, was caught on the first valid tow of the survey (Stratum 6, Station 3). Another 68 kg was also caught on the last station of part 1 of the survey (Stratum B, Station 7), with biological samples collected for nearly 300 individuals.

Gurnard species, such as red gurnard *Chelidonichthys cuculus* and grey gurnard *Eutrigla gurnardus*, were both important catch components (0.618 t and 0.766 t, respectively), and also in occurrence, where both were recorded at 74 of the 96 stations completed. Tub gurnard (*Chelidonichthys lucerna*, 77.3 kg), streaked gurnard (*Trigloporus lastoviza*, 9.0 kg) and long-finned gurnard (*Chelidonichthys obscurus*, 2.8 kg) were present in smaller quantities.

Boarfish *Capros aper* was also in the top ten species by catch weight, with 1.232 t taken across 32 stations. However, this species was characterised by few, large catches with the largest catches at Stratum 8, Station 4 (>800 kg) and Stratum G, Station 2 (>250 kg).

1.7 Ichthyological observations

Species of note seen on the survey included Baillon's wrasse *Symphodus bailloni*, deep-snouted pipefish *Syngnathus typhle*, red sea-bream *Pagellus bogaraveo*, Couch's sea-bream *Pagrus pagrus*, as well as a 77 cm common electric ray *Torpedo nobiliana* and a 63 cm stingray *Dasyatis pastinaca*.

Length-weight relationships were recorded for 12 species, including greater weever *Trachinus draco*, spiny lobster *Palinurus elephas* and large examples of bib *Trisopterus luscus*.

1.8 Macrobenthos

Overall, 134 different macrobenthic taxa were recorded during the survey. Spiny starfish *Marthasterias glacialis* was the most abundant, in both catch weight and number (Table 4). Common whelk *Buccinum undatum* and sea mouse *Aphrodite aculeata* were also prominent species in the catches.

1.9 Anthropogenic debris

Marine litter collected in the monkfish trawl was mainly plastic (Figure 5), with 320 of the total 362 items recorded belonging to this group. Only 15 of the 96 trawl stations had no litter observed. Of interest was a starry smooth-hound specimen with a plastic bottle ring around its neck (Stratum 8, Station 6; Figure 6).

2. To collect multibeam data and fisheries acoustic data at three operating frequencies (38, 120 & 200 kHz) and continuously throughout the survey.

Acoustic data were collected during operational survey time and accordingly the aim was fully completed for the monkfish trawl tows and 26 targeted sampling survey days. These data were collected at three operating frequencies (38, 120 & 200 kHz) throughout the survey for further extrapolation and analysis. Multibeam data were also recorded through Olex to aid subsequent surveys in these areas and raw data were logged during fishing activities. Copies were taken to allow the data to be analysed at the Cefas laboratory.

Secondary survey aims

3. All dead shad (*Alosa spp.*) and all dead lampreys are to be frozen and returned to the laboratory for analyses.

The aim was fully completed for all survey days conducted. Four twaite shad *Alosa fallax* were caught during the survey. As these specimens were dead when brought on board, and so were frozen and retained for further scientific studies.

4. Tag-and-release selected species of elasmobranch

The aim was fully completed for all survey days conducted. During the course of the survey, 487 elasmobranchs (of 10 species) were tagged and released (Table 6). The main species tagged were spurdog (n = 111) and starry smooth-hound (n = 99). Of note, 46 common blue skate were also tagged and released.

5. *To report on cetaceans and seabird observations and send information to SeaWatch Foundation.*

The aim was partially completed over the survey. With no dedicated marine mammal or bird observer on board, observations were limited to ad hoc sightings by SICs. These were recorded and will be reported to the SeaWatch Foundation and MarineLife.

6. *Collect a vertical ring net sample at the west Gabbard smartbuoy, contributing to the Lifeform project (Defra) as part of the UK monitoring network for zooplankton.*

The aim was fully completed on first day of the survey en route to the survey area.

7. *Collect, retain and freeze water samples from Ferrybox underway water supply every 12 hours for subsequent nutrients sampling as part of the EMFF ASMIAE project.*

The aim was fully completed for all survey days conducted. Samples were collected every 12 hours during the survey, with 45 taken in total. This work was also to continue into the next survey (CEND 4/19).

8. *To electronically tag and release specimens of starry smooth-hound for Defra project.*

While no starry smooth-hounds were electronically tagged, four undulate rays and a blonde ray were released successfully with electronic tags (Table 6).

9. *Collect dead specimens of any unusual species for verification of species identification, and length-weight measurements of selected fish species, where required.*

A range of biological samples were frozen for further analysis at Cefas laboratory, containing over 250 individuals. Additional length-weight measurements were recorded on 62 fish (see Section 1.7).

10. *Test the feasibility of using the CALPS system to collect microplastic samples from the Ferrybox water supply.*

This aim was unable to be addressed during the survey and consequently was incomplete. Due to mechanical problems with the regulating computer, and the continuous flow sea water pump, despite attempts to resolve the situation unfortunately the CALPS system was unable to be utilised for this work.

11. *To collect biological information from four-bearded rockling (Enchelyopus cimbrius).*

No four-bearded rockling were caught during the survey.

12. Retain otoliths from uncommon species and extremes of length range as part of an on-going otolith reference collection.

Otoliths were collected from species of interest and retained for a reference collection.

13. Test the feasibility of biologically sampling wrasse species (e.g. Ballan wrasse *Labrus bergylta*, Cuckoo wrasse *Labrus mixtus*, Baillon's wrasse *Symphodus* (*Crenilabrus*) *balloni* and Goldsinny *Ctenolabrus rupestris*)

Three cuckoo wrasse were retained, as well one specimen of Baillon's wrasse.

NARRATIVE (all times G.M.T)

Part One: 5–19th February 2019

RV Cefas Endeavour sailed from Lowestoft at 1012h on February 5th. On-board were 14 Cefas scientific staff and an observer from the Marine Institute (Ireland). Upon departure, the ship travelled 35 nm south, to the Outer Gabbard (Outer Thames) where a plankton sample was collected around 13:00 before moving 7 nm northeast to commence a shakedown tow with the monkfish trawl (a BT195 Jackson 575 monkfish trawl with a 100 mm cod-end (no liner), 16" rockhopper ground gear and Morgere Ovalfoil doors), in order to familiarise the crew with deployment and retrieval of the gear. The 15-minute shakedown tow yielded a small catch of plaice, blonde ray, northern squid *Loligo forbesi*, sole and grey gurnard. A successful mini-CTD deployment to gather a sound velocity profile (SVP) was also undertaken before the vessel began the 214 nm passage to the western Channel to commence the survey in Stratum 6 (Station 3). After the SVP was carried out it was discovered that the SVP data were compromised due to a faulty mini-CTD unit, this was rectified after 15:30 on 6th February.

A standard station comprised of a tow (up to 3 nm, towing speed of 3–3.5 knots) with the monkfish trawl, once the ground had been checked using the multibeam where needed. The catch from the monkfish trawl was separated by species and weighed and/or counted/measured. Biological data (length, weight, sex, maturity and, where appropriate, otoliths) were collected for commercial fish species. Twice per 24 hours the ESM2 profiler and Niskin would be deployed, and surface and bottom water samples taken for salinity. Acoustic data from the EK60 sounder were recorded at 38 KHz, 120 KHz and 200 KHz, and multibeam data were recorded throughout the survey area. A mini-CTD was deployed as required to gather sound velocity profile data to calibrate the multibeam.

RV Endeavour arrived at the first station in the survey area (Stratum 6, Station 3) on 6th February and completed a successful ESM2 profiler and Niskin deployment at 1300h. A subsequent 3 nm fishing tow was conducted and resulted in a large catch (0.63 t) of seabass, including spawning males, and 25 kg of greater-spotted dogfish

Scyliorhinus stellaris (a species tagged-and-released when caught in good condition). The tow speed at this station was reduced to 2 knots, due to a stronger tide and to keep the net geometry readings within their expected ranges. A mini-CTD deployment was also made to obtain SVP data before the ship then moved 5 nm southwest (Stratum 6, Station 1). The monkfish trawl was successfully deployed yielding a much smaller catch consisting mainly of greater-spotted dogfish and undulate ray (17 kg of each, mostly tagged), with a 42cm twaite shad *Alosa fallax* also caught. The tow speed at this station was also reduced due to the strong tides.

The vessel then proceeded overnight to Stratum 9 (Station 1) but, on arrival, the wind strength had increased to gusting up to 40 mph and it was not possible to continue fishing operations in this location. As the wind was changing direction from westerly to south-westerly, the survey moved closer to the English coast (Stratum 5, Station 8), where an ESM2 profiler dip was carried out prior to fishing. The tow at this site was shortened to 1.5 nm due to the loss of door sensor and headline readings. The small catch lesser-spotted dogfish and whiting, with one small-eyed ray *Raja microocellata* tagged-and-released. The vessel then moved northeast (Stratum 5, Station 10) where lesser-spotted dogfish, starry smooth-hound and undulate ray were among the main species recorded. Two of the undulate rays were tagged with electronic tags, and released.

The vessel then proceeded to Stratum 5 (Station 9) which was discovered to be shallower than the 40 m threshold considered to be needed for the effective deployment of the gear. As the chart datum depth was the deepest of the more coastal priority stations in this stratum, Stations 2, 3, 5, 6, and 12 were also discounted for the same reason. Furthermore, Stations 5 and 6 in Stratum 5 were also not considered for fishing, as the Southern IFCA identified that they fell within their Bottom Towed Fishing Gear Byelaw 16 and did not give permission for sampling these sites.

Station 13, which was 7 nm to the southeast, was sampled next, first with the ESM2 profiler and mini-CTD at 1651h, then with the monkfish trawl. The catch contained over 140 kg of lesser-spotted dogfish, 38 kg of seabass, 32 kg of starry smooth-hound, 15 kg of plaice and 14 kg of undulate ray (two of which were tagged with electronic tags). The last haul of the day was conducted to the southwest (Stratum 5, Station 11), and this yielded 370kg of starry smooth-hound and 70 kg of lesser-spotted dogfish. A 41cm twaite shad was also present in the catch. As gale force winds from Storm Erik shifted to a south-westerly direction by midnight, the vessel sheltered in Tor Bay.

The survey resumed at 0900h on 9th February (Stratum 5, Station 4), which was surveyed with multibeam and sampled with the ESM2/Niskin, but fishing was prevented due to the residual post-storm swell. The vessel moved west to Stratum 4 (Stations 7 and 6) which were both successfully fished, and the ESM2/Niskin was deployed at both locations. Both catches were dominated by lesser-spotted dogfish, with several barrel jellyfish *Rhizostoma pulmo* also caught. Spiny lobster *Palinurus elephas* was also recorded, with specimens measured and returned to the sea as soon

as possible. Of note was a large (16 cm) specimen of butterfly blenny *Blennius ocellaris* and a 63 cm male common blue skate, that were captured at Station 6.

Over the next day, several sites were trawled successfully in Stratum 3 (Stations 5, 7, 6, 1, 4 and 8) and Stratum 4 (Station 3), with the ESM2/ Niskin deployed at Stations 1 and 8. One site (Stratum 3, Station 3) was not fished, as it was shallower than 40 m depth. Anglerfish *Lophius piscatorius*, lesser-spotted dogfish and whiting were found at most of these stations. Some of these stations yielded specimens of conger eel *Conger conger* and large specimens of bib.

Overnight, the vessel transited to sites further offshore (Stratum 13, Station 4), where catches comprised lesser-spotted dogfish, whiting and anglerfish. A deployment of the ESM2/Niskin was carried out at the next site (Stratum 13, Station 3) prior to trawling. This catch was comprised primarily of pelagic fish (mackerel, pilchard and anchovy). In order to avoid cables and static gear, a shorter 2 nm tow was completed at the next site (Stratum 3, Station 2), where the catch consisted mainly of bib and horse mackerel. Given it was uncertain whether this site could be sampled, the successful operations allowed a total of seven stations to be completed in Stratum 3.

The vessel then proceeded westwards, conducting a 1.5 nm tow (Stratum 2, Station 1), which was limited in distance due to the presence of static gear. The main species including whiting, haddock, poor cod *Trisopterus minutus* and red gurnard. The last station of the day was carried out further to the north (Stratum C, Station 10), although the tow was reduced to 2.6 nm after the net snagged (although the trawl was retrieved quickly, and no damage was sustained). A large catch of elasmobranchs was recorded here, primarily comprising spurdog, blonde ray, lesser-spotted dogfish, small-eyed ray and spotted ray, with a good catch whiting also noted.

By the start of 12th February, the vessel fished at the next station (Stratum B, Station 2), where much of the catch consisted of haddock (0.52 t) and whiting (0.24 t). The next station (Stratum C, Station 5) to the northeast also yielded a large catch of haddock, as well as lesser-spotted dogfish, plaice and whiting. The ESM2/Niskin was also deployed at this site. The next site (Stratum C, Station 8) was sampled over a 2.25 nm tow, with the main fish species observed including plaice, blonde ray and small-eyed ray. As this station was at the 40 m minimum depth limit, sites further inshore (Stratum C, Stations 3–4, 6–7 and 9) were discounted from sampling. Following the collection of SVP data, the next site was trawled (Stratum C, Station 2) and, once again, the catch consisted mostly of elasmobranchs (starry smooth-hound, blonde ray, lesser-spotted dogfish and tope (a 151 cm specimen), as well as barrel jellyfish and plaice. The vessel then steamed 72 nm to the next site (Stratum C, Station 1), which was again dominated by elasmobranchs (lesser-spotted dogfish, blonde ray, spotted ray and thornback ray.

The next 24 hours started with an ESM2/Niskin deployment and a trawl deployment (Stratum C, Station 12), of which the 0.5 t catch comprised mainly female spurdog (392 kg) including some with near-term pups. A site to the west (Stratum B, Station 4) was sampled next, which comprised a large catch of haddock, grey gurnard, spotted ray

and lesser-spotted dogfish. An attempt to work at the next site (Stratum C, Station 11) was abandoned, due to being denied permission to operate within the Castlemartin firing range at that time. Hence, the vessel moved westwards to a nearby site (Stratum B, Station 6) where an ESM2/Niskin deployment was carried out. The trawling operation was limited to 2.3 nm, due to the net snagging on the seabed, although no damage was sustained. Again, the catch was dominated by elasmobranchs (mainly lesser-spotted dogfish and starry smooth-hound). Multibeam data collected at the next site (Stratum B, Station 5) indicated untrawable grounds and so the vessel then steamed to the next station (Stratum D, Station 2).

This site was sampled successfully in the early hours of 13th February, with elasmobranchs (e.g. lesser-spotted dogfish and spotted ray) being abundant again. The catch also included specimens of greater-spotted dogfish, of which nine were tagged and released. The trawl sample at the next site (Stratum D, Station 5) yielded good catches of lesser-spotted dogfish and haddock. Of additional note at this site was a 77 cm specimen of electric ray, two juvenile common blue skate (30–43 cm long) and three large (99–111 cm) cod.

The vessel then progressed eastwards, where the catch at the next site (Stratum B, Station 1) was dominated by lesser-spotted dogfish and spotted ray. An ESM2/Niskin deployment was also carried out at this location. The vessel then worked across Stratum D (Stations 3, 1 and 4), which all produced similar catches (including lesser-spotted dogfish and haddock). The catch at Station 3 also included cod, three juvenile specimens of common blue skate and a male tope, whilst the catch at Station 4 also included many juvenile male spurdog (74 individuals <45 cm).

On the afternoon of 14th February, a long transit was started towards Stratum G (Station 2) where the ESM2/Niskin was deployed successfully before towing the next day. This station produced a small catch (32 kg), which included a 92 cm hake and two juvenile flapper skate *Dipturus intermedius*. The next site (Stratum G, Station 6) was then sampled successfully, with the catch dominated by boarfish (0.8 t) and haddock (0.1 t). The vessel then moved eastwards, but fishing at the next site (Stratum E, Station 1) resulted in extensive gear damage, and three and a half belly panels of the net had to be replaced over the course of the following 12 hours, over which time the vessel moved eastwards.

The repair work was completed early on the morning of 16th February, and the next site (Stratum B, Station 3) was completed on the second attempt (the net came fast on the seabed after 3 minutes on the first attempt, and so the deployment was repeated). This small catch at this site comprised mostly lesser-spotted dogfish, plaice and whiting. A successful ESM2/Niskin deployment was also conducted here. The vessel then moved southwards, with the next site (Stratum F, Station 5) mainly comprised of haddock.

The vessel then steamed westwards again, in the hope of fishing at sites to the north-west of the grid, including where gear damage had been sustained. Strong southerly winds and increasing swell, however, made fishing operations unsafe. The vessel

stayed on station (Stratum F, Station 3) over the course of the night of 16th February, but 3.8 m swells that were forecast to moderate actually increased to 4.1 m. As the vessel was due to dock on 19th February, for the scheduled mid-survey break, the vessel moved eastwards over the course of 16th February towards Stratum D. The swell remained unworkable for the deployment of the trawl, although multibeam data were collected at the next planned stations (Stratum F, Stations 8 and 2; Stratum D, Station 6).

Fishing resumed in the early hours the next day, with similar catch compositions (dominated by haddock and lesser-spotted dogfish) recorded at the next two stations (Stratum F, Station 2 and Stratum D, Station 6). The final station completed before heading towards Falmouth for the mid-survey crew (Stratum B, Station 7) resulted in a large (1.2 t) catch dominated by haddock (0.48 t) and whiting (0.23t).

Part Two: 20th February–13th March

RV Cefas Endeavour sailed from Falmouth at 1800h on 20th February and headed southeast towards the French coast to recommence survey deployments on the morning of the 21st February.

At 0708h on the 21st February, the ESM2/Niskin was deployed and the monkfish trawl was deployed at the same site (Stratum 6, Station 2) at 0831h. The tide was running extremely fast (>3.5 knots) and the gear did not settle, with net geometry readings outside acceptable parameters and the vessel struggled to tow at over 0.5 knots over the ground. After 30 minutes, and having only covered 0.5nm, the tow was abandoned until the tide speed reduced. At 1018h, the trawl was redeployed, this time successfully for the recommended 3 nm. Starry smooth-hound and John dory *Zeus faber* were two of the main catch components. The vessel then steamed to Stratum 9 (Station 1) and, although still subject to strong tides, another successful deployment was undertaken. The catch here comprised mackerel, undulate ray and anglerfish mainly. The final trawl tow of the day (Stratum 6, Station 6) was also successfully fished, with grey gurnard and anglerfish forming the bulk of the catch. The ESM2/Niskin was then deployed before the end of the day.

The following morning, at first light, the ESM2/Niskin was deployed before collecting multibeam data (Stratum 9, Station 6). This site had to be fished at first light, due to it being in a known potting zone, and it wasn't long before three different sets of static gear were seen along the tow. Given that no trawlable area was found outside areas of static gear, the vessel transited to nearby sites (Stratum 11, Stations 12 and 14), for which multibeam data were collected whilst the spring tides slacked to an appropriate speed. Whilst doing this, the vessel was contacted by both the Guernsey Government and the skipper of the FV *Hayley B*, proving information of areas of static gear, and the skipper of the *Hayley B* advised that the static gear seen earlier (Stratum 9, Station 6) was his, supporting the decision to abandon this tow. Fishing was carried out successfully at two sites in Stratum 11 (Station 13 and 14), although due to the strong tides and the requirement to steam to the next stations (Stratum 11, Station 17) in

daylight, the tow length was reduced to 1.5 nm. These sites yielded large catches of tope, starry smooth-hound, John dory and conger eel.

Although the vessel was able to arrive at the next site (Stratum 11, Station 17) in good time, the untrawlable ground meant this potential site had to be discounted, and so the vessel steamed to northwest to collect multibeam data. Whilst the ground here (Stratum 9, Station 7) was better, and a clear 2 nm tow identified, fishing was delayed due to strong tidal conditions. An ESM2/Niskin deployment was carried out whilst the tide speed reduced, and the trawl was finally deployed just after midnight on the 23rd February, with starry smooth-hound making up much of the catch. The vessel then steamed southwards overnight to arrive at the next station (Stratum 10, Station 6) at first light on 23rd February.

A CTD (to collect SVP data) was successfully deployed at 0634h and then the required tow was run to collect multibeam data and to check for static gear, with some observed close to one end of the preferred tow line. A French potting vessel that was operating close to RV Cefas Endeavour was deploying gear to the east of the tow. The trawl was deployed but retrieved after towing for 2 nm, due to the presence of static gear.

RV Cefas Endeavour then headed northwards (to Stratum 10, Station 5). This site was fished successfully for 3 nm, and the catch comprised of a mixture of black sea-bream *Spondyliosoma cantharus*, bib and undulate ray (which were tagged and released). The vessel then steamed a little further offshore to complete tows in the deeper water, with the catch at that site consisting of black sea-bream, starry smooth-hound and whiting.

Whilst fishing the final station of the day, the door sensors showed the doors being extended beyond their normal width but then coming back to normal readings and staying stable for the rest of the tow. However, on hauling, significant gear damage was evident, with the starboard lower wing being ripped from a point 6 m from the wing end to over 20 m into the sleeve, and down into the lower belly panels, extending for another 30 m (approximately). This resulted in an invalid tow. The crew then spent the next 17 hours mending the net whilst the vessel dodged west-south-west, initially towards stations in Stratum 12. During the afternoon of 24th February, whilst the net was being mended, multibeam data were collected for a survey station (Stratum 12, Station 1), but the ground was not found to be trawlable. Consequently, the vessel steamed towards Stratum K.

Survey activity recommenced at 1537h on 24th February with a CTD deployment (and SVP data collection) undertaken (Stratum K, Station 2) followed by trawl deployment. The catch here comprised mainly grey gurnard and starry smooth-hound. The gear came fast at the next site (Stratum K, Station 6) and, whilst no gear damage was noted, the limited sampling distance (1.35 nm) resulted in this station being deemed invalid.

The vessel then headed to the next site (Stratum J, Station 2) and shot on what appeared to be a clear tow. The net was, however, hauled early (after 2.7 nm) due to

a charted wreck near the end of the tow. On recovering the trawl, there was found to be one large boulder in the cod-end and numerous holes in the sleeve and cod-end. This tow was therefore deemed invalid. The vessel then steamed back to another site (Stratum 12, Station 1) to make a second attempt at identifying a clear tow. Having found a clear tow at this site, the gear was deployed, but the tow was limited to 2.1 nm due to a patch of rough ground. The varied catch was comprised mostly of starry smooth-hound and anglerfish. The vessel then steamed 70 nm southwards (to Stratum J, Station 1).

On arrival, the CTD was deployed to collect SVP data (for the multibeam) and then the only visually clear tow in the area was assessed with multibeam. This indicated an extremely hard and uneven ground with a 10 m high bank. Given this, no tow was attempted, and the vessel steamed westwards, where two tows were successfully completed (Stratum N, Stations 3–4).

On 26th February, the nearby site (Stratum N, Station 6) was assessed by multibeam in a north-south direction. The ground looked poor, with 5 m peaks at the north of the tow and 3 m peaks in the south. The southern part of the tow was trawled and, despite the net coming fast at the end of a 1.7 nm tow, the trawl was retrieved without damage and a valid sample processed. The vessel then travelled 10 nm northwards to a site (Stratum K, Station 1) on the edge of the Ushant Traffic Separation Scheme (TSS). This station was fished for 2 nm, due to cables being present at either end of the tow, and the catch comprised mainly lesser-spotted dogfish, red gurnard, haddock and cuckoo ray, the lively ones of which were tagged and released.

The vessel then steamed northwards (to Stratum H, Station 2) where, even though the ground was characterised of peaks of 3–7 m height, a clear tow of 2 nm was completed. Red gurnard was the most abundant species in the catch. Five common dolphins were observed at this station whilst the multibeam was being run.

Another successful tow was then fished (Stratum N, Station 2), although the net came fast after 2 nm, with conger eel, megrim and red gurnard the main species recorded. Both the ESM2/Niskin and trawl were deployed successfully at the end of the day (Stratum N, Station 5), with mackerel and cuckoo ray important catch components.

The 27th February started with sampling in relatively deep water (163 m; Stratum N, Station 1). The catch consisted mainly of boarfish and haddock, with common blue skate also caught ($n = 6$; 30 kg). The vessel then steamed onto Stratum G (Station 1) carrying out a CTD station to collect SVP data before trawling. Whilst towing at this site, 12 common dolphins were observed around the vessel. The catch here included 0.45 t of mackerel. As a period of fine weather continued, a further three stations were fished (Stratum G, Station 5 and Stratum E, Stations 2 and 6).

February 28th started at Stratum E (Station 7), with catches of common blue skate, hake and haddock making up more than half of the relatively small catch. The next station (Stratum E, Station 4) also resulted in a small catch, this time containing spurdog, anglerfish and a small quantity of *Nephrops*. The ESM2/Niskin and trawl were

both deployed successfully at the next site (Stratum E, Station 5), with over 140 kg of *Nephrops* and 74 kg of common blue skate caught. Similarly, common blue skate and spurdog, as well as haddock were caught at the next site (Stratum H, Station 4). The final station of the day consisted of trawl and ESM2/Niskin deployments (Stratum H, Station 1), with boarfish the main fish species caught.

On March 1st, RV Cefas Endeavour fished at six stations, three in Stratum H, one in Stratum K and two in Stratum 8. There was minor damage to the lower portside wing of the net at one site (Stratum 8, Station 4), but given the limited damage, the position of the damage and that the net geometry readings were stable throughout the tow, this was deemed to be a valid haul. The catch here yielded 0.25 t of boarfish and several spurdog. An even greater catch (0.21 t) of spurdog was recorded at the next site (Stratum 8, Station 6). The final haul of the day yielded a relatively small catch of haddock, red gurnard and lesser-spotted dogfish. Whilst the trawl snagged after fishing for 2.5 nm, no damage occurred.

On March 2nd, the day started off with knowledge that the vessel needed to steam to Falmouth to drop off a crew member, which would restrict work. On heading to the first planned site (Stratum K, Station 5), the vessel was notified by Ushant Traffic that the planned station was in the TSS and should not be fished. Given this, RV Cefas Endeavour then steamed to a nearby alternative station (Stratum K, Station 7) and collected multibeam data. Due to the position of this station at the mouth of the TSS, various cables surrounding the position and poor ground, it was not possible to find a minimum distance over which to trawl, and therefore this site was also abandoned. The vessel then headed to another site (Stratum K; Station 4) in the hope of finding a clear tow at this site. Whilst a potential area to trawl was identified and the gear deployed, the trawl soon snagged on the seabed. The trawl was retrieved successfully and there was no gear damage, however the weather had deteriorated, and fishing operations were suspended.

RV Cefas Endeavour then steamed northwards, to just off Falmouth, in order to make the unscheduled crew change. This was completed by 1700h, and the vessel, having travelled over to the English coast, steamed to Lyme Bay in the hope of fishing in the lee of the forecast Storm Freya. However, on arriving at this station (Stratum 4, Station 4), the weather was too poor for the safe deployment/retrieval of the trawl, and fishing operations were suspended.

On the morning of 4th March, with a lull in the winds, RV Cefas Endeavour transited to the French coast in the hope of fishing stations in Stratum 10. However, once the vessel had arrived, the weather deteriorated again and so the vessel dodged off the French coast. At first light on 5th March, with the winds having decreased, the vessel left its shelter and trawled at a nearby site (Stratum 10, Station 2), with this 2 nm tow yielding starry smooth-hound and both greater- and lesser-spotted dogfish. The next two sites (Stratum 10, Station 1 and Stratum 9, Station 4) were then appraised with multibeam, but no clear tows could be found. With both the wind and sea state deteriorating, the vessel returned to inshore areas to shelter.

Despite a forecast of poor conditions for 6th March, the weather abated somewhat, and trawling resumed. Sites in Stratum 10 were completed (Stations 8, 7 and 4), with black sea-bream caught in each of these tows. The final haul of the day was then completed (Stratum 6, Station 5).

The plan for the morning of the 7th March was to fish sites in Stratum 7 (Stations 2–3), however information from the multibeam indicated that there were no clear tows (due to extremely uneven ground), with cables elsewhere in the vicinity. The next site considered (Stratum 4, Station 1) was sampled successfully, with starry smooth-hound an important part of the catch. The vessel then steamed inshore (to Stratum 6, Station 4). On arrival, the weather had again deteriorated and trawling was not possible. Consequently, the grounds at the next sites (Stratum 6, Stations 4 and 7; Stratum 5, Station 1; Stratum 7, Station 1) were assessed using the multibeam to identify trawlable grounds. After the weather had improved enough to be able to safely deploy/retrieve the trawl, a 2 nm tow was successfully undertaken at Stratum 4 (Station 2).

On 8th March, the next site (Stratum 5, Station 4) was sampled successfully, with the three main species being lesser-spotted dogfish, starry-smooth hound and whiting. The vessel then steamed 20 nm east-north-east (to Stratum 5, Station 1) where a small catch of whiting, lesser-spotted dogfish and poor cod was taken. Following this, a further four sites were sampled successfully (Stratum 6, Station 4; Stratum 5, Station 7; Stratum 4, Station 4; and Stratum 7, Station 1).

On March 9th, the first trawl site (Stratum 7, Station 5) was fished for 1.5 nm, as the rough grounds did not allow for longer tows to be undertaken. The next site (Stratum 7, Station 7) was fished successfully, despite the strong tide. The catch here was largely comprised of whiting (78 kg). At the next site (Stratum 7, Station 8), the trawl came fast on a 3 m peak (after towing for 0.8 nm), but was freed quickly and the tow resumed. After towing for 1.8 nm an even larger peak (>4 m) appeared on the echosounder, and so the gear was hauled. The trawl had not suffered any damage, and the catch (largely lesser-spotted dogfish, red gurnard and whiting) was duly processed. The next site (Stratum 7, Station 4) was fished without incident, and there were six fishing vessels working close to this location.

At the next station (Stratum 7, Station 6) both the trawl and ESM2/Niskin were deployed successfully, and then the vessel moved into Stratum 13 to fish at Stations 6 and 2. A large (0.2 t) catch of whiting was recorded at the first of these, despite having to haul early due to a large peak appearing on the echosounder. Again, fishing vessels were active at both sites. With the weather deteriorating, operations were suspended at 2100h and RV Cefas Endeavour steamed towards Brixham to find shelter.

On the afternoon of 11th March, there appeared to be a weather window, and so the vessel left shelter and headed to a nearby station (Stratum 2, Station 5) to see if it could be fished. Unfortunately, no clear tows could be identified at this site, due to extensive static gear. With the fair weather continuing, the vessel transited further offshore (to Stratum 2, Station 6) where a large (1.3 t) catch was made, comprising

mostly horse mackerel (0.8 t), bib and haddock. A final CTD cast was then made before RV Cefas Endeavour headed inshore to shelter from Storm Gareth, anchoring off Falmouth until docking at 1130h on March 13th.

Table 1: Number of gear deployments, during the survey, by validity.

Gear	Valid	Additional	Invalid	Total
Jackson 575 Monk Trawl	96 ¹	1 ²	6 ³	103
ESM2 Profiler and Niskin	41	10 ⁴	0	51
200µ WP2 Plankton Ring Net	1	0	0	1

¹ 44 valid tows in the Celtic Sea and 52 in the Western Channel

² Shakedown tow

³ Three due to gear damage and three due to hauling with <1.5 nm completed

⁴ Sound Velocity Profiles

Table 2: Stations fished successfully, with strata (Str) sampled completely indicated in green. Strata 1–13 in the western Channel, and Strata B–N in the Celtic Sea.

Str 1	Str 2	Str 3	Str 4	Str 5	Str 6	Str 7	Str 8
	Station 1	Station 1	Station 1	Station 1	Station 1	Station 1	Station 4
	Station 6	Station 2	Station 2	Station 4	Station 2	Station 4	Station 6
		Station 4	Station 4	Station 7	Station 3	Station 5	
		Station 5	Station 5	Station 8	Station 4	Station 6	
		Station 6	Station 6	Station 10	Station 5	Station 7	
		Station 7	Station 7	Station 11	Station 6	Station 8	
		Station 8		Station 13			
Str 9	Str 10	Str 11	Str 12	Str 13	Str B	Str C	Str D
Station 1	Station 2	Station 13	Station 1	Station 2	Station 1	Station 1	Station 1
Station 2	Station 4	Station 14		Station 3	Station 2	Station 2	Station 2
Station 7	Station 5			Station 4	Station 3	Station 5	Station 3
	Station 6			Station 6	Station 4	Station 8	Station 4
	Station 7				Station 6	Station 10	Station 5
	Station 8				Station 7	Station 12	Station 6
Str E	Str F	Str G	Str H	Str J	Str K	Str N	
Station 2	Station 2	Station 1	Station 1		Station 1	Station 1	
Station 3	Station 5	Station 2	Station 2		Station 2	Station 2	
Station 5		Station 5	Station 3		Station 3	Station 3	
Station 6		Station 6	Station 4			Station 4	
Station 7			Station 5			Station 5	
			Station 6			Station 6	

Table 3: Measured species caught in valid tows ranked in descending order of total catch weight

Species Common Name	Species Scientific Name	Cefas Code	Total Catch Weight (kg)
Haddock	<i>Melanogrammus aeglefinus</i>	HAD	3865.619
Lesser-spotted dogfish	<i>Scyliorhinus canicula</i>	LSD	3665.476
Whiting	<i>Merlangius merlangus</i>	WHG	1690.172
Starry smooth hound	<i>Mustelus asterias</i>	SDS	1549.490
Spurdog	<i>Squalus acanthias</i>	DGS	1347.770
Mackerel	<i>Scomber scombrus</i>	MAC	1257.622
Boar fish	<i>Capros aper</i>	BOF	1232.811
Horse mackerel	<i>Trachurus trachurus</i>	HOM	1227.424
European sea bass	<i>Dicentrarchus labrax</i>	ESB	853.460
Bib pouting	<i>Trisopterus luscus</i>	BIB	846.365
Anglerfish (monkfish)	<i>Lophius piscatorius</i>	MON	826.549
Grey gurnard	<i>Eutrigla gurnardus</i>	GUG	766.136
Conger eel ³	<i>Conger conger</i>	COE	664.395
Red gurnard	<i>Chelidonichthys cuculus</i>	GUR	618.491
Spotted ray	<i>Raja montagui</i>	SDR	609.839
Plaice	<i>Pleuronectes platessa</i>	PLE	439.754
Blonde ray	<i>Raja brachyura</i>	BLR	310.333
Common blue skate	<i>Dipturus batis</i>	SKG	291.088
Greater-spotted dogfish	<i>Scyliorhinus stellaris</i>	DGN	289.892
Hake	<i>Merluccius merluccius</i>	HKE	289.258
Tope	<i>Galeorhinus galeus</i>	GAG	264.304
Cuckoo ray	<i>Leucoraja naevus</i>	CUR	262.258
Poor cod	<i>Trisopterus minutus</i>	POD	239.208
Undulate ray	<i>Raja undulata</i>	UNR	222.786
Cod	<i>Gadus morhua</i>	COD	209.581
Norwegian lobster	<i>Nephrops norvegicus</i>	NEP	181.636
Lemon sole	<i>Microstomus kitt</i>	LEM	176.070
Thornback ray	<i>Raja clavata</i>	THR	173.510
Black-bellied anglerfish	<i>Lophius budegassa</i>	WAF	168.227
Black sea bream	<i>Spondyliosoma cantharus</i>	BKS	164.588
Megrim	<i>Lepidorhombus whiffiagonis</i>	MEG	161.682
John dory	<i>Zeus faber</i>	JOD	145.840
Small-eyed ray	<i>Raja microocellata</i>	PTR	135.965
Common cuttlefish	<i>Sepia officinalis</i>	CTC	126.772
Tub gurnard	<i>Chelidonichthys lucerna</i>	TUB	77.346
Dab	<i>Limanda limanda</i>	DAB	69.028
Common Ling	<i>Molva molva</i>	LIN	66.560
European squid	<i>Loligo vulgaris</i>	LLV	65.510

Species Common Name	Species Scientific Name	Cefas Code	Total Catch Weight (kg)
Dover sole	<i>Solea solea</i>	SOL	54.152
Pollack	<i>Pollachius pollachius</i>	POL	51.844
Greater spider crab	<i>Maja squinado</i>	SCR	38.280
Red mullet	<i>Mullus surmuletus</i>	MUR	34.380
Turbot	<i>Scophthalmus maximus</i>	TUR	29.325
Great scallop ¹	<i>Pecten maximus</i>	SCE	27.415
Pilchard	<i>Sardinia pilchardus</i>	PIL	27.159
Common dragonet	<i>Callionymus lyra</i>	CDT	24.498
Witch	<i>Glyptocephalus cynoglossus</i>	WIT	20.511
Blue whiting	<i>Micromesistius poutassou</i>	WHB	19.188
Brill	<i>Scophthalmus rhombus</i>	BLL	12.489
Sprat	<i>Sprattus sprattus</i>	SPR	12.191
European lobster	<i>Homarus gammarus</i>	LBE	12.135
Flounder	<i>Platichthys flesus</i>	FLE	11.910
Greater weever fish	<i>Trachinus draco</i>	WEG	10.115
Herring	<i>Clupea harengus</i>	HER	9.855
Norway pout	<i>Trisopterus esmarki</i>	NOP	9.701
Common electric ray	<i>Torpedo nobiliana</i>	ECR	9.080
Streaked gurnard	<i>Trigloporus lastoviza</i>	GUS	8.958
Northern squid	<i>Loligo forbesi</i>	NSQ	8.869
European anchovy	<i>Engraulis encrasicolus</i>	ANE	8.370
Common spiny lobster ²	<i>Palinurus elephas</i>	SLO	7.939
Common squids	<i>Loligo spp.</i>	SQC	7.590
Edible crab ³	<i>Cancer pagurus</i>	CRE	6.712
Ballan wrasse	<i>Labrus bergylta</i>	BNW	5.747
Greater fork-beard	<i>Phycis blennoides</i>	GFB	5.663
Long-rough dab	<i>Hippoglossoides platessoides</i>	PLA	4.879
Saithe	<i>Pollachius virens</i>	POK	4.840
Cuckoo wrasse	<i>Labrus mixtus</i>	CUW	3.705
Twaite shad	<i>Alosa fallax</i>	TAS	2.999
Long-finned gurnard	<i>Chelidonichthys obscurus</i>	GUL	2.827
Velvet swimming crab	<i>Necora puber</i>	MLP	2.468
Argentine	Argentinidae	ARG	1.848
Sting-ray	<i>Dasyatis pastinaca</i>	SGR	1.820
Elegant cuttlefish	<i>Sepia elegans</i>	SEE	1.809
Lesser flying squid	<i>Todaropsis eblanae</i>	OME	1.209
Common skate complex	<i>Dipturus batis</i> -complex	SKT	1.085
Three-bearded rockling	<i>Gaidropsarus vulgaris</i>	TBR	0.867
Imperial scald fish	<i>Arnoglossus imperialis</i>	ISF	0.843
Topknot	<i>Zeugopterus punctatus</i>	TKT	0.684

Species Common Name	Species Scientific Name	Cefas Code	Total Catch Weight (kg)
Flapper skate	<i>Dipturus intermedius</i>	SKF	0.478
Pink cuttlefish	<i>Sepia orbingnyana</i>	SEO	0.354
Sand sole	<i>Pegusa lascaris</i>	SOS	0.312
Northern short-fin squid	<i>Illex (Loligo) coindetii</i>	SQI	0.245
Red sea-bream	<i>Pagellus bogaraveo</i>	SBR	0.225
Couch's sea-bream	<i>Pagrus pagrus</i>	SBC	0.220
<i>Alloteuthis subulata</i>		ATS	0.196
Blue-mouth redfish	<i>Helicolenus dactylopterus</i>	RBM	0.174
Baillon's wrasse	<i>Symphodus bailloni</i>	BLW	0.158
Greater sandeel	<i>Hyperoplus lanceolatus</i>	GSE	0.155
Four-spot megrim	<i>Lepidorhombus boscii</i>	LBI	0.154
Scald fish	<i>Arnoglossus laterna</i>	SDF	0.145
Lesser weever fish	<i>Trachinus vipera</i>	WEL	0.145
Thick-back sole	<i>Microchirus variegatus</i>	TBS	0.140
Spotted dragonet	<i>Callionymus maculatus</i>	SDT	0.073
Solenette	<i>Buglossidium luteum</i>	SOT	0.072
Immaculate sandeel	<i>Hyperoplus immaculatus</i>	ISE	0.050
Sandeels	Ammodytidae	SAX	0.039
Small sandeel	<i>Ammodytes tobianus</i>	TSE	0.026
Pogge (armed bullhead)	<i>Agonus cataphractus</i>	POG	0.024
Tompot blenny	<i>Parablennius gattorugine</i>	TBY	0.015
Norwegian top-knot	<i>Phrynorhombus norvegicus</i>	NKT	0.013
Deep-snouted pipefish	<i>Syngnathus typhle</i>	DPF	0.003
Sand goby	<i>Pomatoschistus minutus</i>	POM	0.001

¹Four great scallops were also weighed and counted (700 g)

²Two common spiny lobsters were also weighed and counted (573 g)

³This species was also recorded as an observation, where measurement was not possible

Table 4: Non-measured species sampled from valid tows ranked in descending order of total catch weight (kg), including total numbers counted (or number of stations where the species was observed).

Common name	Scientific Name	Cefas code	Total weight (kg)	Count
Spiny starfish	<i>Marthasterias glacialis</i>	MAG	133.2	1140
Edible sea urchin	<i>Echinus esculentus</i>	URS	69.59	399
Assorted rocks	-	ROK	50.785	-
Whelk eggs	-	WES	44.884	-
Common whelk	<i>Buccinum undatum</i>	WHE	44.453	912
Broken shell	-	BSL	40.819	-
-	<i>Diazona violacea</i>	DIV	23.284	-
Curled octopus	<i>Eledone cirrhosa</i>	EDC	23.121	116
Sea mouse	<i>Aphrodite aculeata</i>	AAC	21.57	795
Sponges	Porifera	PFZ	19.555	-
Yellow boring sponge	<i>Cliona celata</i>	CLI	19.246	-
Hermit in whelk	<i>Eupagurus/pagurus in buccinum</i>	HIW	18.35	395
Sponge	<i>Suberites</i> spp.	SUB	15.66	-
Dead-men's fingers	<i>Alcyonium digitatum</i>	DMF	15.394	-
Common starfish	<i>Asterias rubens</i>	STH	14.959	287
Anemones	Actiniaria (order)	AMU	13.86	237
-	<i>Actinauge richardi</i>	ACR	10.81	339
Queen Scallop	<i>Aequipecten opercularis</i>	QSC	10.581	532
Common sunstar	<i>Crossaster papposus</i>	CTP	10.321	220
-	<i>Luidia ciliaris</i>	LDC	10.318	132
Starfish	<i>Luidia</i> spp.	LUI	6.931	30
-	<i>Archidoris pseudoargus</i>	ADP	5.533	152
Sea squirts	Ascidacea	SSX	5.268	1
Hydroids	Hydrioda (order)	HYD	4.085	-
Purple heart urchin	<i>Spatangus purpureus</i>	SPG	3.878	17
Bryozoan	Cellariidae	CEL	3.754	-
-	<i>Echinus acutus</i>	URA	3.69	51
Kelp	<i>Laminaria</i> spp.	LMX	3.146	-
Goose-foot star	<i>Anseropoda placenta</i>	PLM	2.605	129
Hermit in adamsia	<i>Pagurus prideaux/Adamsiaaa</i>	HIA	2.017	145
Swimming crab	<i>Liocarcinus depurator</i>	LMD	2.017	158
Parchment worm tubes	<i>Chaetopterus</i> tubes	CVT	1.978	-
Plumose anemone	<i>Metridium senile</i>	PMA	1.674	35
Sand star	<i>Astropecten irregularis</i>	API	1.399	99
Hornwrack	<i>Flustra foliacea</i>	FAF	1.37	-
Sea cucumbers	Holothuroidea	HTZ	1.217	5
Ross coral	<i>Pentapora foliacea</i>	PET	1.133	-
-	<i>Raspailia</i> spp.	RAS	1.069	-

Common name	Scientific Name	Cefas code	Total weight (kg)	Count
Dog cockle	<i>Glycymeris glycymeris</i>	GLG	0.956	25
Red cushion star	<i>Porania pulvillus</i>	PPV	0.655	19
Curly weed	<i>Alcyonium diaphanum</i>	ALG	0.574	-
-	Polymastiidae	PMX	0.565	-
-	<i>Psammechinus miliaris</i>	PMM	0.542	87
-	<i>Henricia oculata</i>	HEO	0.458	35
Circular crab	<i>Atelocyclus rotundatus</i>	ALR	0.454	41
Seaweeds	<i>Fucus</i> spp.	FUX	0.45	-
Sponge crab	<i>Dromia personata</i>	DRP	0.448	10
Dahlia anemone	<i>Urticina felina</i>	DHA	0.442	10
Squid eggs	-	SQS	0.442	-
Common swimming crab	<i>Polybius (Liocarcinus) holsatus</i>	LMH	0.427	82
Cushion star	<i>Asterina gibbosa</i>	ATG	0.381	10
-	<i>Ophiura ophiura</i>	OHT	0.379	63
-	<i>Echinocardium</i> spp.	ECV	0.379	18
Common brittle star	<i>Ophiothrix fragilis</i>	OPF	0.353	335
Star ascidian	<i>Botryllus schlosseri</i>	BIS	0.293	-
-	<i>Asciidiella aspersa</i>	ASB	0.285	-
Swimming crab	<i>Macropipus tuberculatus</i>	MPT	0.252	27
-	<i>Scaphander lignarius</i>	SDL	0.248	13
-	<i>Stichastrella rosea</i>	SLR	0.244	15
Sponge	<i>Haliclona oculata</i>	HAO	0.241	-
-	<i>Dysidea fragilis</i>	DYS	0.24	-
Unidentified benthic species	-	[YYY]	0.219	-
-	<i>Luidia sarsi</i>	LUS	0.218	18
-	<i>Pachymatisma johnstonia</i>	PMJ	0.211	-
-	Processidae	PCY	0.211	55
Devonshire cup-coral	<i>Caryophyllia smithii</i>	DCC	0.206	8
Masked crab	<i>Corystes cassivelaunus</i>	CCV	0.205	16
-	<i>Calliactis parasitica</i>	CAR	0.204	7
Slender-leg spider crab	<i>Inachus leptochirus</i>	INL	0.181	94
Scorpion spider crab	<i>Inachus dorsettensis</i>	IND	0.18	37
Gibb's sea spider	<i>Pisa armata</i>	PAA	0.143	20
-	<i>Nemertesia antennina</i>	NEA	0.127	-
Fan mussel	<i>Atrina fragilis</i>	AFR	0.125	1
Atlantic mud shrimp	<i>Solenocera membranacea</i>	SOA	0.107	28
-	Sepiolidae	SPY	0.106	4
Barnacles	<i>Cirrepedia</i> spp.	CIZ	0.104	-
Squat lobster	<i>Munida rugosa</i>	MNR	0.102	6
Benthos (unidentified)	-	BEN	0.101	-

Common name	Scientific Name	Cefas code	Total weight (kg)	Count
Ray egg cases	<i>Raja</i> egg cases	RES	0.097	1
Cuttle eggs	Cuttlefish eggs	CEG	0.096	-
Norway cockle	<i>Laevicardium crassum</i>	LCC	0.085	2
Hermit crabs	Paguridae	PAY	0.084	7
-	<i>Tritonia hombergi</i>	TNH	0.075	4
-	<i>Dichelopandalus bonnieri</i>	PDB	0.075	22
-	<i>Ascidia mentula</i>	ASM	0.072	3
-	<i>Bolocera tuediae</i>	BCT	0.064	2
Hermit in suberites	<i>Eupagurus/Suberites</i> spp.	HIS	0.053	3
-	<i>Axinella infundibuliformis</i>	AXI	0.047	-
-	<i>Pandalus propinquus</i>	PDP	0.042	3
Pink shrimp	<i>Pandalus montagui</i>	PRM	0.042	23
-	<i>Acanthocardia</i> spp.	ACY	0.039	5
Sea slugs	Nudibranchia	NBX	0.037	4
Striped venus	<i>Chamelea gallina</i>	VST	0.037	1
-	<i>Tethya aurantia</i>	TAA	0.033	-
-	<i>Ophiocomina nigra</i>	OPN	0.029	10
Long-leg spider crab	<i>Macropodia rostrata</i>	MCR	0.025	58
Dogfish egg case	Dogfish egg cases	DEG	0.024	2
Marbled swimming crab	<i>Liocarcinus marmoreus</i>	LMM	0.02	5
-	<i>Crangon allmanni</i>	CGA	0.019	19
Brown seaweeds	Phaeophyceae	SWB	0.017	-
-	<i>Nemertesia ramosa</i>	NER	0.016	-
-	Ophiurida (order)	OPH	0.016	3
Hermit (naked)	<i>Pagurus bernhardus</i>	PEB	0.016	3
Sickle hydroid	<i>Hydrallmania falcata</i>	HYH	0.015	-
-	<i>Pontobdella muricata</i>	PDM	0.015	2
Bivalves	Bivalvia (indet.)	BIV	0.014	2
Slender spider crab	<i>Macropodia tenuirostris</i>	MCT	0.012	9
American slipper limpet	<i>Crepidula fornicata</i>	ASL	0.011	5
Squat lobsters	<i>Galathea</i> spp.	GLX	0.011	2
Horse mussels	<i>Modiolus</i> spp.	MOD	0.011	1
Ragworms	<i>Nereis</i> spp.	NEX	0.01	1
Long-clawed porcelain crab	<i>Pisidia longicornis</i>	PIS	0.008	15
Little cuttlefish	<i>Sepiolo atlantica</i>	SPA	0.008	2
Xanthidae	Xanthid crab	XAN	0.008	5
Ascidian	<i>Ascidia conchilega</i>	ASD	0.006	1
-	<i>Pasiphaea</i> spp.	PAS	0.006	7
Feather star	<i>Antedon bifida</i>	ADB	0.005	3
-	<i>Ascidella scabra</i>	ASS	0.005	3

Common name	Scientific Name	Cefas code	Total weight (kg)	Count
-	<i>Armina loveni</i>	AAL	0.004	2
-	<i>Pleurobranchus</i> spp.	PBM	0.003	1
Pink sea fan	<i>Eunicella verrucosa</i>	EUV	0.003	-
Great spider crab	<i>Hyas araneus</i>	HYA	0.003	2
Edible mussel	<i>Mytilus edulis</i>	MUS	0.003	1
Contracted crab	<i>Hyas coarctatus</i>	HYC	0.002	1
-	<i>Inachus</i> spp.	INX	0.002	1
-	<i>Macropodia linaresi</i>	MCL	0.002	2
-	<i>Scalpellum scalpellum</i>	SCA	0.002	3
Dwarf-swimming crab	<i>Liocarcinus pusillus</i>	LPU	0.002	1
Toothed wrack	<i>Fucus serratus</i>	WRS	0.001	-
Hermit crab	<i>Anapagurus laevis</i>	APL	0.001	1
Bryozoan	<i>Bugula</i> spp.	BUG	0.001	-
	<i>Hyalinoecia tubicola</i>	HYT	0.001	1
Sand mason	<i>Lanice conchilega</i>	LCE	0.001	1
Peacock worm	<i>Sabellidae</i>	PWX	0.001	1
			Number of stations observed	
Crystal jellyfish	<i>Aequorea</i> spp.	CRI		34
Barrel jellyfish	<i>Rhizostoma pulmo</i>	BAR		25
Compass jellyfish	<i>Chrysaora hysocella</i>	COJ		1
Unidentified jellyfish	-	JEL		1
-	<i>Calliactis parasitica</i>	CAR		7
Edible sea urchin	<i>Echinus esculentus</i>	URS		1
Dogfish egg case	Dogfish egg cases	DEG		4
Ray egg cases	Raja egg cases	RES		3

Table 5. Numbers of each species sampled for biological information by sex and area.

Common Name	Scientific Name	Cefas code	Celtic Sea			Western Channel			Total
			F	M	U	F	M	U	
Species sampled for length, weight, sex, maturity and collection of otoliths									
Haddock	<i>Melanogrammus aeglefinus</i>	HAD	766	717	11	120	83	-	1 697
Whiting	<i>Merlangius merlangus</i>	WHG	262	133	4	453	330	7	1 189
Anglerfish (monkfish)	<i>Lophius piscatorius</i>	MON	158	155	15	155	123	21	627
Hake	<i>Merluccius merluccius</i>	HKE	161	202	21	45	22	3	454
Plaice	<i>Pleuronectes platessa</i>	PLE	107	78	-	160	79	-	424
Megrim	<i>Lepidorhombus whiffiagonius</i>	MEG	270	87	-	7	1	-	365
European seabass	<i>Dicentrarchus labrax</i>	ESB	6	49	-	106	135	-	296
Black sea-bream	<i>Spondylusoma cantharus</i>	BKS	-	-	-	125	102	4	231
Lemon sole	<i>Microstomus kitt</i>	LEM	82	29	-	60	48	-	219
Mackerel	<i>Scomber scombrus</i>	MAC	42	44	1	42	48	-	177
Red mullet	<i>Mullus surmuletus</i>	MUR	14	10	-	92	58	3	177
Tub gurnard	<i>Chelidonichthys lucerna</i>	TUB	39	8	-	51	30	-	128
Black-bellied anglerfish	<i>Lophius budegassa</i>	WAF	61	46	4	2	1	-	114
Cod	<i>Gadus morhua</i>	COD	39	40	3	7	3	-	92
Dover sole	<i>Solea solea</i>	SOL	48	7	-	24	11	-	90
Witch	<i>Glyptocephalus cynoglossus</i>	WIT	38	48	1	1	-	-	88
Dab	<i>Limanda limanda</i>	DAB	43	16	-	10	8	1	78
Herring	<i>Clupea harengus</i>	HER	18	19	1	17	21	-	76
Streaked gurnard	<i>Trigloporus lastoviza</i>	GUS	4	2	-	31	15	1	53
Sprat ¹	<i>Sprattus sprattus</i>	SPR	13	7	4	19	10	-	53
European anchovy ¹	<i>Engraulis encrasicolus</i>	ANE	-	-	-	17	19	1	37
Common Ling	<i>Molva molva</i>	LIN	15	14	-	2	5	-	36
Pilchard	<i>Sardinia pilchardus</i>	PIL	-	-	-	17	13	-	30
Pollack	<i>Pollachius pollachius</i>	POL	3	4	-	8	5	-	20
Long-finned gurnard	<i>Chelidonichthys obscurus</i>	GUL	-	-	-	12	4	-	16
Turbot	<i>Scophthalmus maximus</i>	TUR	4	2	-	3	5	-	14
Brill	<i>Scophthalmus rhombus</i>	BLL	2	1	-	5	-	-	8
Saithe	<i>Pollachius virens</i>	POK	1	1	-	-	-	-	2
Four-spot megrim	<i>Lepidorhombus boscii</i>	LBI	-	1		-	-	-	1

Table 5 (continued): Numbers of each species sampled for biological information by sex and area.

Common Name	Scientific Name	Cefas code	Celtic Sea			Western Channel			Total
			F	M	U	F	M	U	
Species sampled for length, weight, sex and maturity only (otoliths not collected)									
Starry smooth hound	<i>Mustelus asterius</i>	SDS	135	164	-	375	332	-	1 006
Spurdog	<i>Squalus acanthias</i>	DGS	260	320	-	115	48	-	743
Spotted ray	<i>Raja montagui</i>	SDR	325	340	-	27	16	-	708
Cuckoo ray	<i>Leucoraja naevus</i>	CUR	121	114	-	8	10	-	253
Blonde ray	<i>Raja brachyura</i>	BLR	64	74	-	6	6	-	150
Greater-spotted dogfish	<i>Scyliorhinus stellaris</i>	DGN	8	43	-	30	25	-	106
Common blue skate	<i>Dipturus batis</i>	SKG	35	32	-	7	9	-	83
Thornback ray	<i>Raja clavata</i>	THR	30	17	-	18	13	-	78
Small-eyed ray	<i>Raja microcellata</i>	PTR	27	23	-	4	5	-	59
Undulate ray	<i>Raja undulata</i>	UNR	-	-	-	24	26	-	50
Tope	<i>Galeorhinus galeus</i>	GAG	3	3	-	25	10	-	41
Flapper skate	<i>Dipturus intermedius</i>	SKF	1	1	-	-	-	-	2
Common skate complex	<i>Dipturus</i> spp.	SKT	-	2	-	-	-	-	2
Common electric ray	<i>Torpedo nobiliana</i>	ECR	-	1	-	-	-	-	1
Sting-ray	<i>Dasyatis pastinaca</i>	SGR	-	-	-	-	1	-	1
John dory ²	<i>Zeus faber</i>	JOD	57	34	2	85	24	3	205
Conger eel ³	<i>Conger conger</i>	COE	-	-	86	-	1	62	149

¹Collected as whole fish for subsequent analysis after the survey

²No otoliths were extracted from John Dory as this species is not aged using sagittal otoliths

³Conger eels generally sampled for individual length and weight, before release (i.e. sex, maturity and otoliths not collected)

Table 6: Total number of elasmobranchs tagged during the survey, including minimum and maximum lengths

Common Name	Scientific Name	Cefas Code	Length Range (cm)	No. Tagged	No. Electronically tagged
Spurdog	<i>Squalus acanthias</i>	DGS	69–120	111	–
Starry smooth-hound	<i>Mustelus asterias</i>	SDS	61–130	99	–
Greater-spotted dogfish	<i>Scyliorhinus stellaris</i>	DGN	67–111	69	–
Cuckoo Ray	<i>Leucoraja naevus</i>	CUR	52–73	63	–
Common blue skate	<i>Dipturus batis</i>	SKG	50–136	46	–
Undulate ray	<i>Raja undulata</i>	UNR	54–99	42	4
Tope	<i>Galeorhinus galeus</i>	GAG	95–151	26	–
Blonde ray	<i>Raja brachyura</i>	BLR	66–101	15	1
Small-eyed ray	<i>Raja microocellata</i>	PTR	56–85	12	–
Spotted ray	<i>Raja montagui</i>	SDR	68–75	4	–

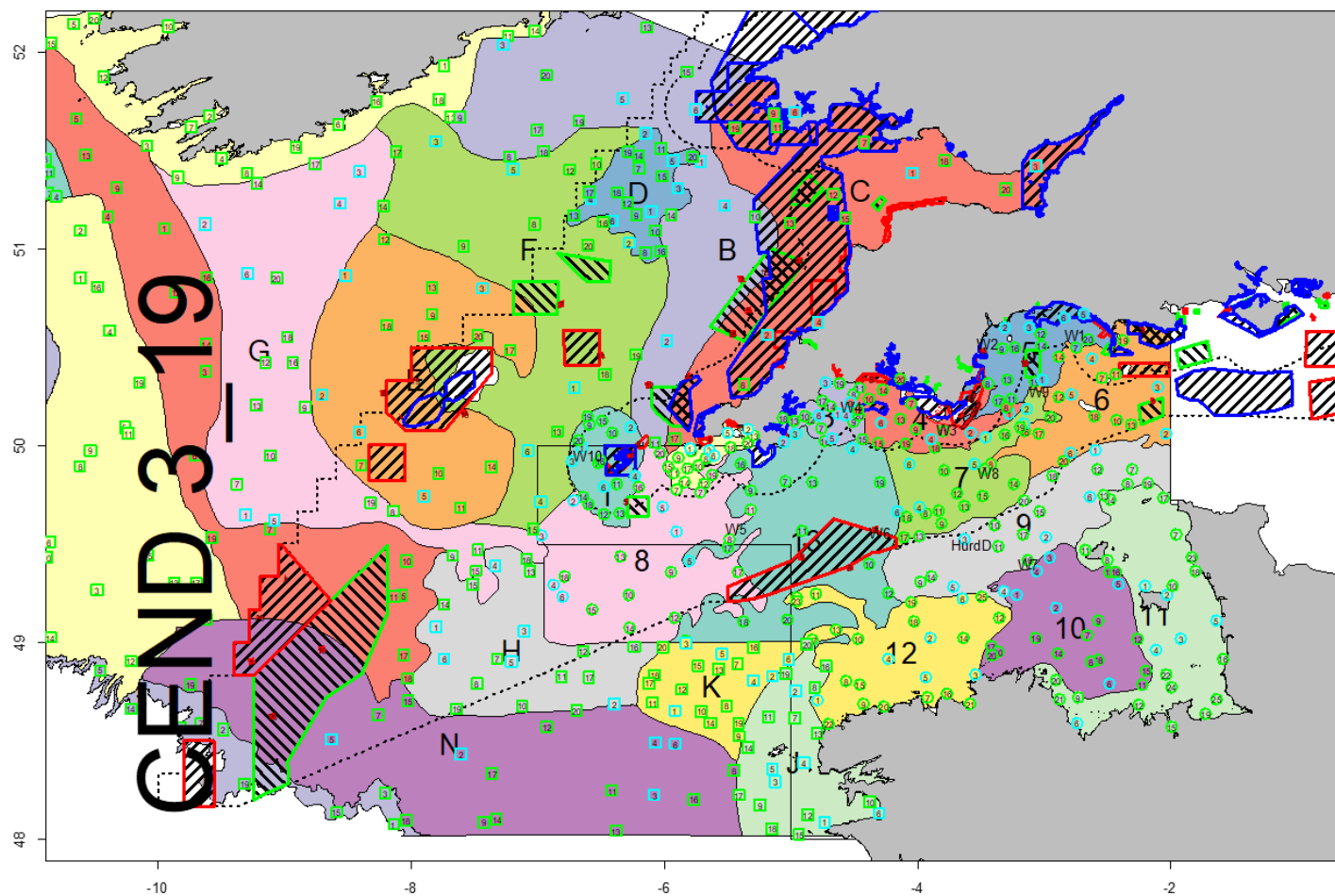


Figure 1: Map of the survey area showing strata and the randomly selected stations for survey CEND 3/19

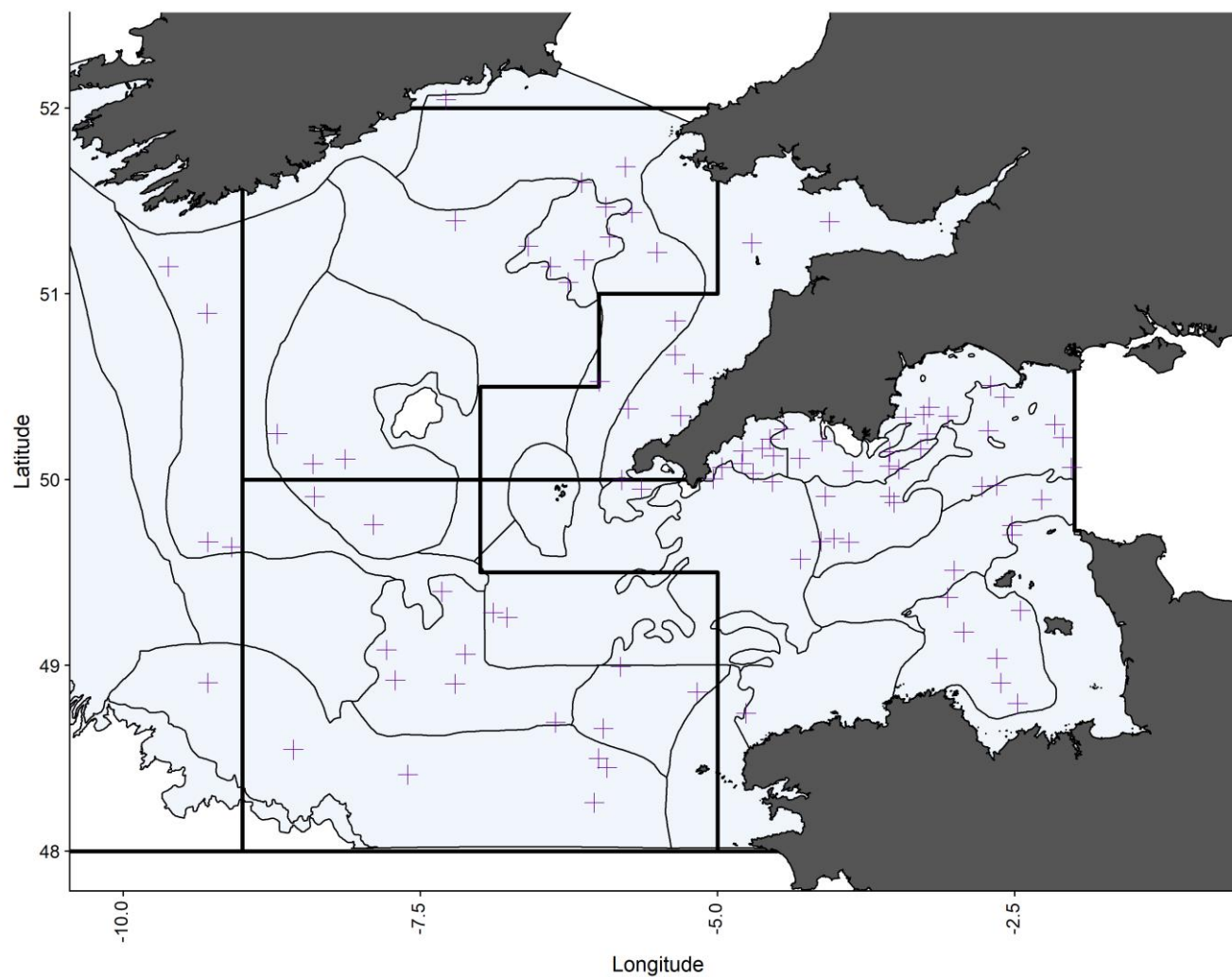


Figure 2: Map of survey area showing station positions successfully fished with the Jackson monkfish trawl (CEND 3/19).

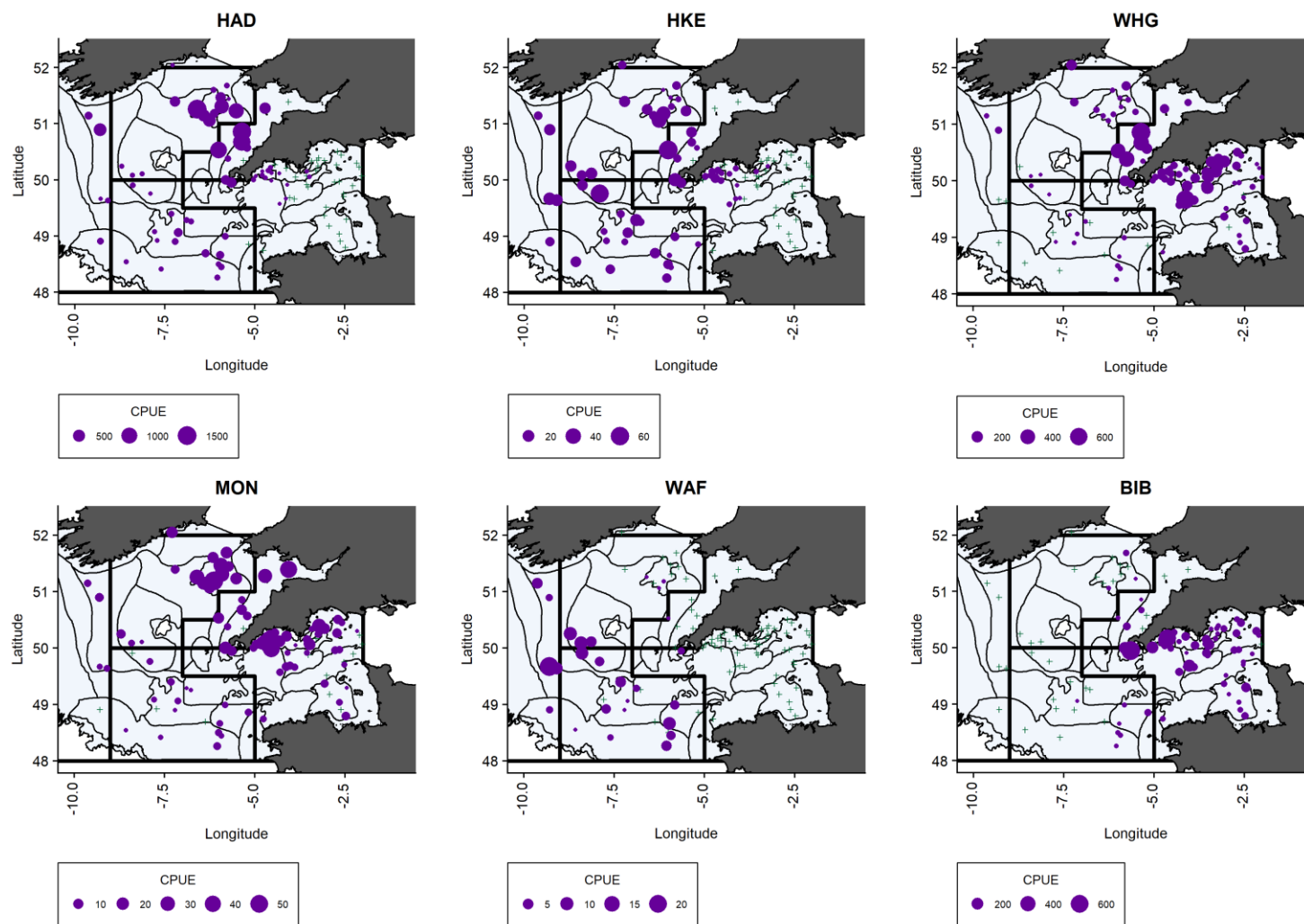


Figure 3: Distribution and relative abundance of selected fish species caught by station (BIB = bib; HAD =haddock; HKE = hake; MON = anglerfish; WAF = black-bellied anglerfish; and WHG = whiting).

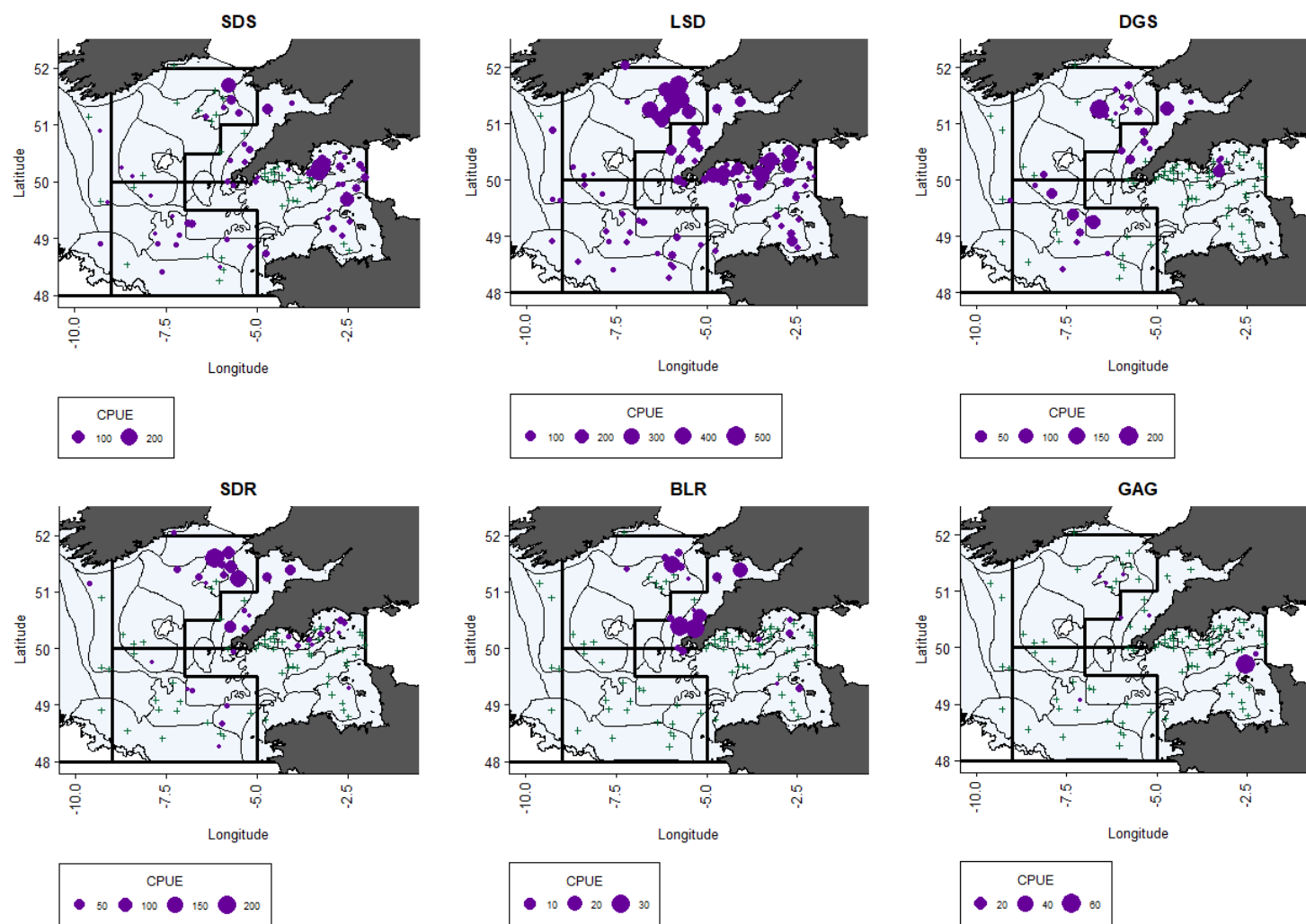


Figure 3 (continued): Distribution and relative abundance of selected fish species caught by station (BLR = blonde ray; DGS = spurdog; GAG = tope; LSD = lesser-spotted dogfish; SDR = spotted ray; and SDS = starry smooth-hound).

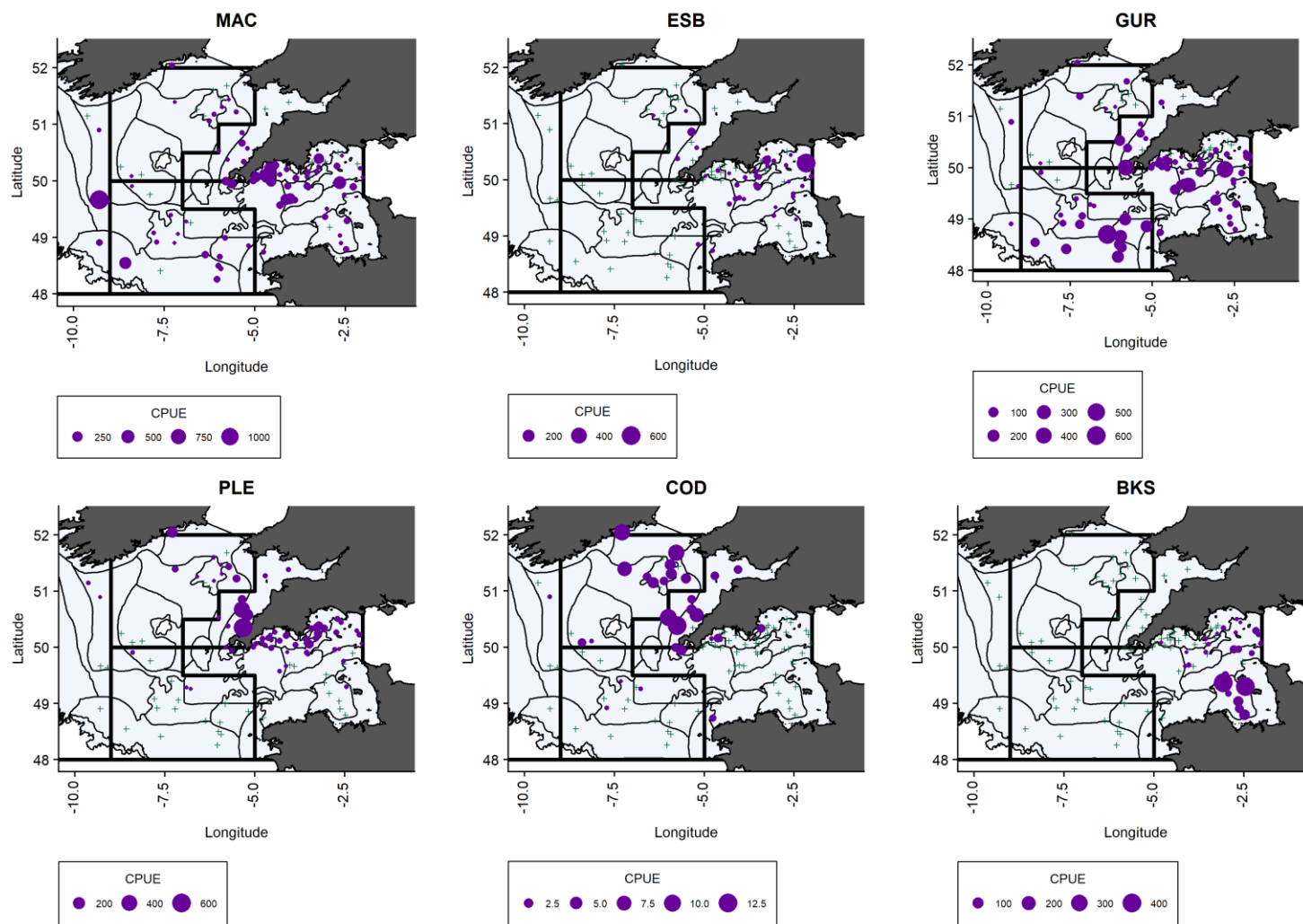


Figure 3 (continued): Distribution and relative abundance of selected fish species caught by station (BKS = black sea-bream; COD = cod, ESB = seabass; GUR = red gurnard; MAC = mackerel; and PLE = plaice).

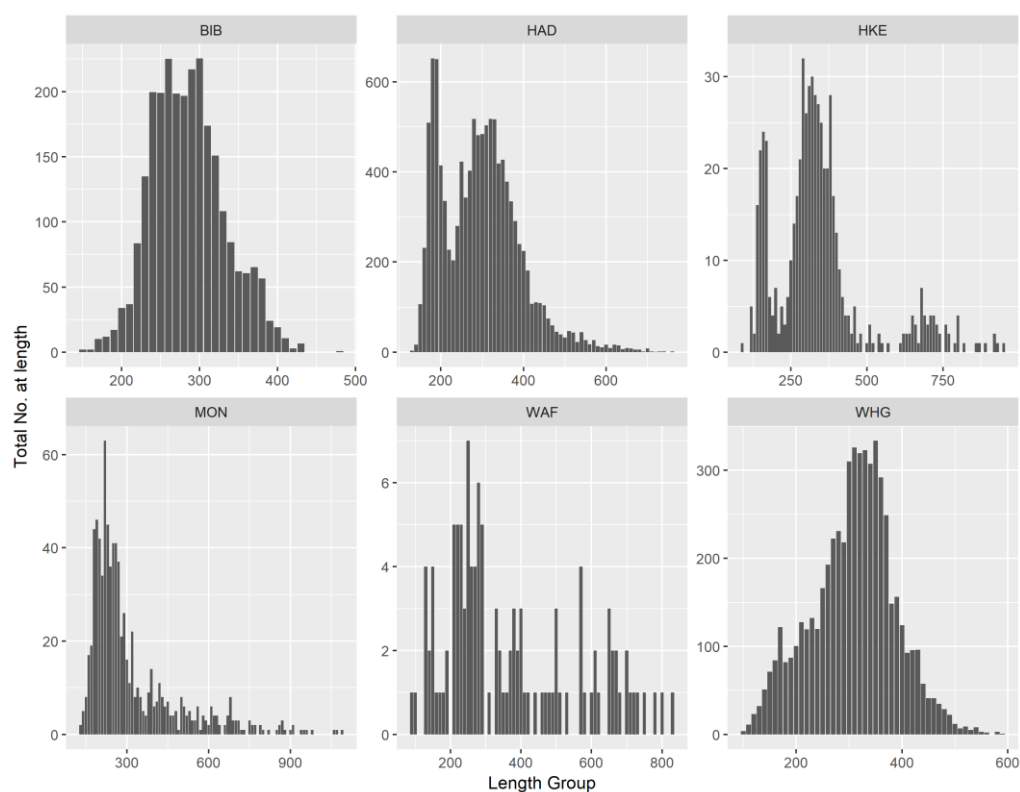


Figure 4: Length-frequency distributions (mm) of selected fish species during the survey (BIB = bib; HAD = haddock; HKE = hake; MON = anglerfish; WAF = black-bellied anglerfish and WHG = whiting).

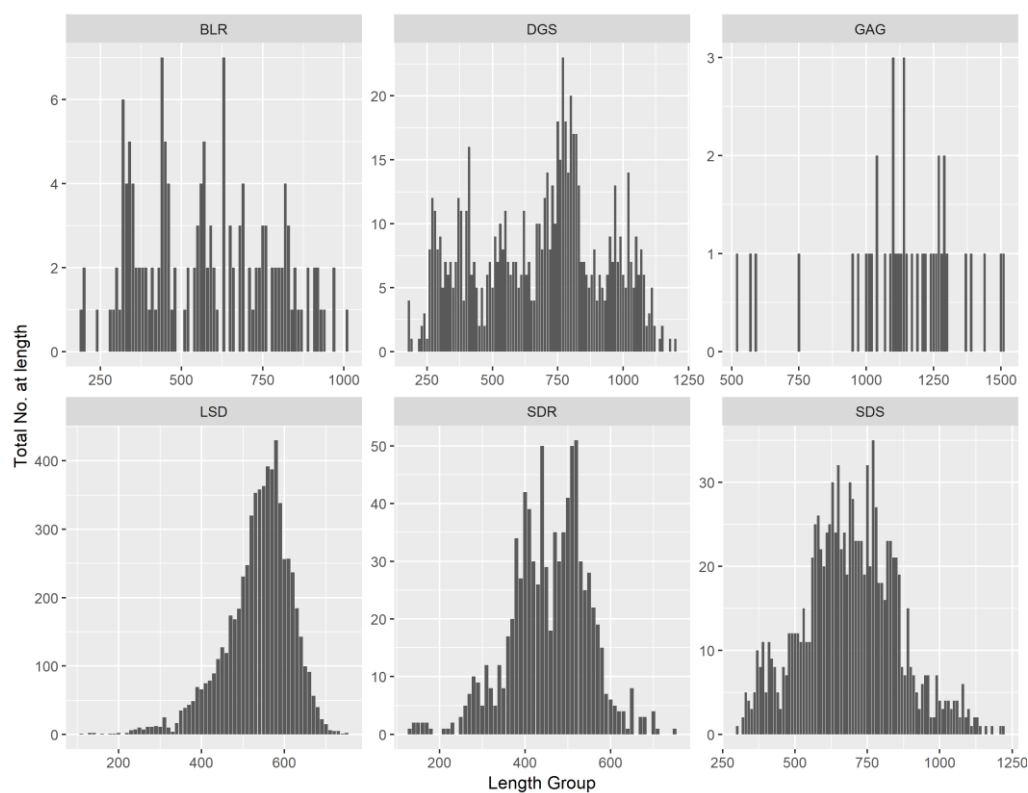


Figure 4 (continued): Length-frequency distributions (mm) of selected fish species during the survey (BLR = blonde ray; DGS = spurdog; GAG = tope; LSD = lesser-spotted dogfish; SDR = spotted ray; and SDS= starry smooth-hound).

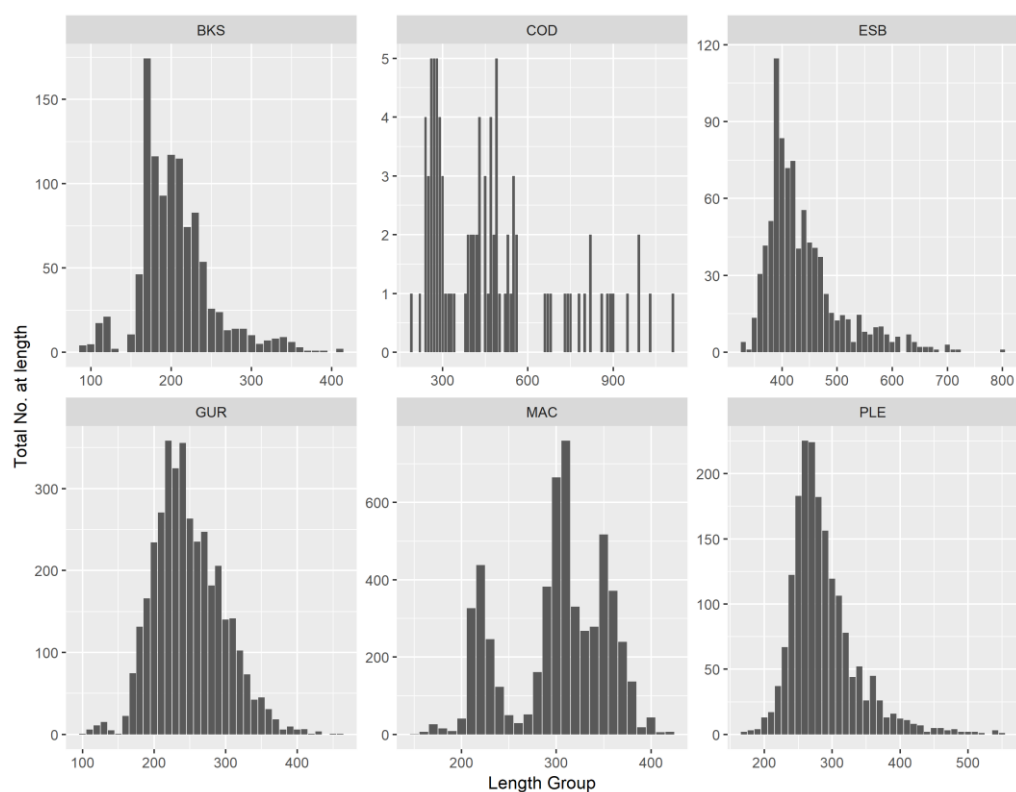


Figure 4 (continued): Length-frequency distributions (mm) of selected fish species during the survey (BKS = black sea-bream; COD = cod, ESB = seabass; GUR = red gurnard; MAC = mackerel; and PLE = plaice).

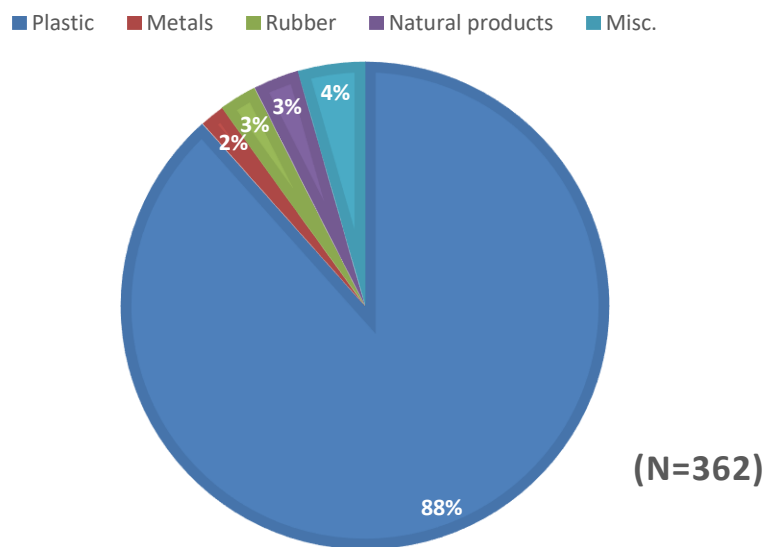


Figure 5: Marine litter recorded during the survey (CEND 03/19)



Figure 6: Starry smooth-hound *Mustelus asterias* with plastic around neck (CEND 03/19; Stratum 8, Station 6).

Appendix 1: Station log information

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
1	05/02/2019 14:09	51	57.57	2	6.88	51	57.57	2	6.88	E	0.0	36.5	36.5	40	40	35	1.5	200	14	0.5			1032	200µm plankton net	V
2	05/02/2019 16:04	52	2.51	2	18.07	52	2.12	2	17.07	E	0.7	48.7	49.4	53	65	31	1.2	200	18	1.0	200	1.2	1031	Jackson 575 otter trawl	A
3	05/02/2019 16:59	52	2.09	2	17.05	52	2.09	2	17.05	E	0.0	50.9	50.9	57	57	32	1.0	200	18	1.0	200	0.7	1031	ESM2 Profiler/niskin	A
4	06/02/2019 13:05	50	18.15	2	3.87	50	18.15	2	3.87	W	0.0	265.7	265.7	55	55	259	1.5	250	8	0.7	230	1.2	1026	ESM2 Profiler/niskin	V
5	06/02/2019 14:42	50	17.76	2	9.77	50	18.18	2	5.14	W	3.1	272.9	276	55	55	267	2.3	250	12	0.7	230	1.7	1023	Jackson 575 otter trawl	V
6	06/02/2019 16:57	50	17.05	2	6.24	50	17.05	2	6.24	W	0.0	278.6	278.6	56	56	284	0.5	190	18	0.7	230	1.2	1022	ESM2 Profiler/niskin	A
7	06/02/2019 19:27	50	13.55	2	5.78	50	13.46	2	10.43	W	3.0	291.7	294.7	60	61	85	2.8	180	16	0.7	230	1.2	1018	Jackson 575 otter trawl	V
8	07/02/2019 08:54	50	21.59	3	22.82	50	21.59	3	22.82	W	0.0	371.9	371.9	55	55	59	1.1	260	30	2.2	240	3.0	1017	ESM2 Profiler/niskin	V
9	07/02/2019 09:44	50	20.10	3	25.13	50	18.99	3	27.19	W	1.5	375.0	376.5	56	55	66	0.7	255	28	1.7	240	3.0	1017	Jackson 575 otter trawl	V
10	07/02/2019 13:08	50	23.33	3	13.19	50	25.07	3	9.34	W	3.0	401.0	404	51	50	242	0.8	260	32	1.7	240	1.5	1018	Jackson 575 otter trawl	V
11	07/02/2019 16:51	50	18.10	3	19.62	50	18.10	3	19.62	W	0.0	425.8	425.8	56	56	248	0.4	260	26	1.7	240	1.7	1018	ESM2 Profiler/niskin	V
12	07/02/2019 17:54	50	20.93	3	15.97	50	18.85	3	19.36	W	3.0	431.7	434.7	56	56	41	0.7	260	26	1.7	240	1.7	1017	Jackson 575 otter trawl	V
13	07/02/2019 20:53	50	14.73	3	14.14	50	13.06	3	18.05	W	3.0	445.0	448	63	62	55	1.0	280	28	1.7	240	2.0	1018	Jackson 575 otter trawl	V
14	09/02/2019 10:42	50	9.74	3	32.61	50	9.74	3	32.61	W	0.0	499.0	499	70	70	63	1.0	250	28	1.7	260	2.7	1014	ESM2 Profiler/niskin	V
15	09/02/2019 15:32	50	12.36	4	7.35	50	12.92	4	2.77	W	3.0	536.8	539.8	57	48	283	0.5	230	26	1.7	240	2.5	1012	Jackson 575 otter trawl	V
16	09/02/2019 17:02	50	12.97	4	1.61	50	12.97	4	1.61	W	0.0	541.3	541.3	50	50	300	0.5	230	25	1.7	240	2.2	1011	ESM2 Profiler/niskin	A
17	09/02/2019 19:10	50	6.81	4	18.54	50	7.48	4	13.96	W	3.1	557.5	560.6	74	70	80	0.4	230	24	1.7	240	2.2	1009	Jackson 575 otter trawl	V
18	09/02/2019 20:51	50	7.95	4	10.40	50	7.95	4	10.40	W	0.0	563.1	563.1	70	70	99	0.7	225	16	1.7	240	1.7	1009	ESM2 Profiler/niskin	V
19	09/02/2019 23:57	50	2.02	4	42.14	50	2.39	4	37.50	W	3.0	589.1	592.1	77	75	224	0.4	240	17	1.7	240	1.7	1004	Jackson 575 otter trawl	V
20	10/02/2019 02:53	50	5.14	4	47.80	50	5.63	4	43.20	W	3.0	604.0	607	70	71	220	0.3	280	24	1.7	260	2.0	1002	Jackson 575 otter trawl	V
21	10/02/2019 05:52	50	9.10	4	47.39	50	8.38	4	51.95	W	3.0	621.5	624.5	66	65	72	0.2	280	24	1.5	260	1.5	1002	Jackson 575 otter trawl	V
22	10/02/2019 08:26	50	10.39	4	35.32	50	10.39	4	35.32	W	0.0	636.9	636.9	67	67	77	0.3	290	26	1.5	260	1.5	1004	ESM2 Profiler/niskin	V
23	10/02/2019 08:55	50	10.00	4	37.45	50	8.88	4	41.79	W	3.0	638.8	641.8	68	67	74	0.3	290	26	1.5	260	1.5	1004	Jackson 575 otter trawl	V
24	10/02/2019 12:23	50	7.59	4	31.85	50	9.99	4	34.73	W	3.1	658.6	661.7	69	63	247	0.1	320	30	1.7	240	2.2	1014	Jackson 575 otter trawl	V
25	10/02/2019 16:57	50	13.05	4	33.60	50	13.58	4	28.97	W	3.0	680.7	683.7	59	59	261	0.1	320	24	1.5	240	2.0	1017	Jackson 575 otter trawl	V
26	10/02/2019 20:07	50	16.23	4	26.54	50	15.68	4	31.17	W	3.1	697.6	700.7	55	54	65	0.6	300	30	1.5	240	1.5	1020	Jackson 575 otter trawl	V
27	10/02/2019 22:06	50	15.40	4	33.12	50	15.40	4	33.12	W	0.0	703.2	703.2	54	54	78	0.4	300	30	1.5	240	1.7	1021	ESM2 Profiler/niskin	V
28	11/02/2019 01:05	49	59.86	4	27.54	49	59.86	4	27.54	W	0.0	728.9	728.9	76	76	243	0.1	300	32	2.0	-	2.0	1023	ESM2 Profiler/niskin	A
29	11/02/2019 02:18	49	59.26	4	32.38	49	59.74	4	27.78	W	3.0	735.4	738.4	76	74	247	0.3	300	26	2.0	-	2.0	1024	Jackson 575 otter trawl	V
30	11/02/2019 07:21	50	2.22	4	58.39	50	2.22	4	58.39	W	0.0	761.2	761.2	71	71	28	0.6	300	22	1.5	-	1.5	1030	ESM2 Profiler/niskin	V

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
31	11/02/2019 08:23	50	3.90	4	57.84	50	1.45	5	0.55	W	3.0	767.1	770.1	68	74	42	0.9	300	20	1.2		1.5	1032	Jackson 575 otter trawl	V
32	11/02/2019 11:11	50	0.18	5	2.23	49	58.17	5	1.95	W	2.0	782.3	784.3	74	78	198	0.1	330	10	0.7	240	1.7	1036	Jackson 575 otter trawl	V
33	11/02/2019 16:15	49	59.93	5	48.36	49	58.67	5	47.06	W	1.5	821.9	823.4	68	64	327	1.3	300	8	0.7	290	1.7	1037	Jackson 575 otter trawl	V
34	11/02/2019 20:16	50	22.80	5	45.08	50	21.92	5	48.92	W	2.6	856.7	859.3	70	71	47	0.5	-	-	0.5	290	2.0	1039	Jackson 575 otter trawl	V
35	11/02/2019 21:49	50	20.95	5	49.68	50	20.95	5	49.68	W	0.0	860.8	860.8	71	71	141	0.4	210	10	0.5	290	2.0	1039	ESM2 Profiler/niskin	V
36	11/02/2019 23:51	50	31.66	5	59.74	50	32.73	5	55.32	W	3.0	879.2	882.2	85	83	223	0.4	220	12	0.7	290	1.2	1039	Jackson 575 otter trawl	V
37	12/02/2019 04:21	50	40.60	5	19.69	50	40.60	5	19.69	W	0.0	913.3	913.3	67	67	189	0.1	210	18	1.2	220	1.0	1039	ESM2 Profiler/niskin	V
38	12/02/2019 05:07	50	40.28	5	21.39	50	41.32	5	16.96	W	3.0	917.6	920.6	67	65	134	0.0	210	14	1.0	230	1.0	1039	Jackson 575 otter trawl	V
39	12/02/2019 09:31	50	20.55	5	18.61	50	19.50	5	21.73	W	2.2	953.0	955.2	40	40	29	0.2	210	13	1.0	220	1.0	1039	Jackson 575 otter trawl	V
40	12/02/2019 10:52	50	19.34	5	23.57	50	19.34	5	23.57	W	0.0	956.8	956.8	36	36	189	0.1	200	12	0.7	270	1.2	1039	ESM2 Profiler/niskin	A
41	12/02/2019 13:32	50	34.23	5	12.32	50	36.85	5	9.96	W	3.1	980.8	983.9	57	57	235	0.5	220	14	1.0	270	1.2	1039	Jackson 575 otter trawl	V
42	12/02/2019 20:58	51	23.09	4	8.69	51	23.09	4	8.69	W	0.0	1055.4	1055.4	42	42	84	1.2	190	11	0.5	270	1.5	1039	ESM2 Profiler/niskin	V
43	12/02/2019 22:52	51	23.23	4	3.67	51	23.33	4	8.48	W	3.0	1070.9	1073.9	41	42	120	0.4	210	13	0.7	270	1.5	1039	Jackson 575 otter trawl	V
44	13/02/2019 02:07	51	16.76	4	37.47	51	16.76	4	37.47	W	0.0	1093.6	1093.6	52	52	264	0.7	200	18	0.7	270	1.5	1039	ESM2 Profiler/niskin	A
45	13/02/2019 03:01	51	16.38	4	42.75	51	16.83	4	37.96	W	3.0	1098.7	1101.7	55	51	266	0.7	200	18	0.7	270	1.5	1039	Jackson 575 otter trawl	V
46	13/02/2019 08:12	51	13.85	5	28.48	51	13.85	5	28.48	W	0.0	1136.5	1136.5	76	76	88	0.3	200	24	0.7	250	2.2	1037	ESM2 Profiler/niskin	V
47	13/02/2019 08:50	51	13.38	5	30.67	51	12.15	5	35.14	W	3.1	1138.8	1141.9	77	79	75	0.4	200	30	1.7	250	2.2	1036	Jackson 575 otter trawl	V
48	13/02/2019 15:53	51	43.95	5	45.30	51	43.95	5	45.30	W	0.0	1202.2	1202.2	110	110	337	0.1	200	20	2.0	220	2.2	1035	ESM2 Profiler/niskin	A
49	13/02/2019 17:01	51	40.98	5	46.58	51	43.08	5	45.35	W	2.3	1208.3	1210.6	120	111	179	0.9	200	26	2.0	230	2.2	1035	Jackson 575 otter trawl	V
50	13/02/2019 23:57	51	35.92	6	8.66	51	33.04	6	10.69	W	3.1	1265.2	1268.3	119	120	33	0.4	200	26	2.0	220	1.7	1035	Jackson 575 otter trawl	V
51	14/02/2019 03:32	51	28.00	5	56.48	51	25.02	5	55.88	W	3.0	1287.7	1290.7	103	93	276	0.2	200	20	2.0	220	2.0	1035	Jackson 575 otter trawl	V
52	14/02/2019 05:53	51	26.24	5	43.24	51	26.75	5	38.50	W	3.0	1299.3	1302.3	83	78	187	0.2	200	20	1.5	220	2.0	1036	Jackson 575 otter trawl	V
53	14/02/2019 07:37	51	26.86	5	37.68	51	26.86	5	37.68	W	0.0	1304.2	1304.2	77	77	143	0.3	200	14	1.2	220	2.0	1033	ESM2 Profiler/niskin	V
54	14/02/2019 09:49	51	18.29	5	54.63	51	20.92	5	52.31	W	3.0	1322.6	1325.6	95	91	96	0.3	200	18	1.7	220	2.2	1036	Jackson 575 otter trawl	V
55	14/02/2019 13:23	51	10.85	6	7.60	51	13.02	6	4.31	W	2.9	1345.8	1348.7	101	102	313	0.2	180	16	1.2	240	2.5	1035	Jackson 575 otter trawl	V
56	14/02/2019 17:17	51	15.40	6	35.73	51	13.45	6	39.40	W	3.0	1372.1	1375.1	95	91	239	0.1	180	14	1.5	240	2.2	1033	Jackson 575 otter trawl	V
57	15/02/2019 05:37	51	9.33	9	34.98	51	9.33	9	34.98	W	0.0	1488.8	1488.8	112	112	240	0.3	170	22	1.7	210	2.2	1025	ESM2 Profiler/niskin	V
58	15/02/2019 06:26	51	8.77	9	37.31	51	7.18	9	41.36	W	3.1	1491.0	1494.1	116	121	251	0.3	160	26	1.7	210	2.2	1024	Jackson 575 otter trawl	V
59	15/02/2019 10:42	50	53.68	9	17.76	50	50.71	9	18.53	W	3.0	1518.5	1521.5	121	121	65	0.4	180	28	1.7	200	2.7	1024	Jackson 575 otter trawl	V
60	15/02/2019 16:06	50	52.43	8	31.12	50	51.58	8	31.25	W	0.9	1558.8	1559.7	115	112	223	0.3	180	26	1.7	-	2.7	1024	Jackson 575 otter trawl	I
61	16/02/2019 07:29	52	3.40	7	6.30	52	3.40	7	6.30	W	0.0	1676.6	1676.6	41	41	204	0.6	220	24	1.7	200	2.0	1024	ESM2 Profiler/niskin	V

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
62	16/02/2019 09:44	52	2.63	7	15.20	52	2.53	7	15.30	W	0.1	1694.8	1694.9	49	49	251	0.0	190	26	1.7	220	1.7	1023	Jackson 575 otter trawl	I
63	16/02/2019 11:35	52	2.66	7	17.22	52	0.84	7	18.58	W	2.0	1704.9	1706.9	50	55	9	0.4	195	23	1.7	220	1.7	1023	Jackson 575 otter trawl	V
64	16/02/2019 17:06	51	23.55	7	12.34	51	26.36	7	10.60	W	3.0	1748.2	1751.2	85	82	204	0.1	190	25	2.0	200	2.5	1020	Jackson 575 otter trawl	V
65	16/02/2019 18:43	51	11.16	6	23.71	51	11.16	6	23.71	W	0.0	1908.4	1908.4	104	104	321	0.4	200	30	2.0	220	3.2	1016	ESM2 Profiler/niskin	V
66	18/02/2019 02:41	51	3.66	6	15.41	51	1.38	6	18.53	W	3.0	1960.1	1963.1	110	100	66	0.6	210	26	1.7	220	2.7	1017	Jackson 575 otter trawl	V
67	18/02/2019 06:42	51	8.73	6	24.38	51	7.39	6	28.66	W	3.0	1982.0	1985	101	98	310	0.4	250	22	2.0	220	3.0	1018	Jackson 575 otter trawl	V
68	18/02/2019 11:58	50	49.97	5	27.33	50	49.97	5	27.33	W	0.0	2029.2	2029.2	75	75	149	0.1	260	19	1.7	240	2.7	1022	ESM2 Profiler/niskin	V
69	18/02/2019 12:53	50	51.16	5	21.31	50	50.16	5	25.78	W	3.0	2035.3	2038.3	73	73	66	0.8	250	18	1.7	240	3.0	1022	Jackson 575 otter trawl	V
70	21/02/2019 07:08	50	3.74	2	0.78	50	3.74	2	0.78	W	0.0	2277.3	2277.3	64	64	80	2.6	160	12	0.5	160	1.0	1032	ESM2 Profiler/niskin	V
71	21/02/2019 08:31	50	4.13	1	58.69	50	4.02	1	59.42	W	0.5	2285.3	2285.8	66	64	87	3.4	200	16	0.5	220	1.5	1033	Jackson 575 otter trawl	I
72	21/02/2019 10:18	50	3.82	2	1.33	50	3.12	2	5.89	W	3.0	2289.2	2292.2	66	61	108	0.7	200	16	0.5	220	1.5	1034	Jackson 575 otter trawl	V
73	21/02/2019 14:18	49	58.10	2	39.11	49	58.77	2	34.61	W	2.9	2317.0	2319.9	65	65	246	2.3	210	12	0.5	220	1.5	1035	Jackson 575 otter trawl	V
74	21/02/2019 17:46	49	57.69	2	46.59	49	58.25	2	41.99	W	3.1	2332.7	2335.8	69	70	69	1.4	190	13	0.5	240	1.2	1035	Jackson 575 otter trawl	V
75	21/02/2019 20:23	49	57.86	2	46.83	49	57.86	2	46.83	W	0.0	2343.6	2343.6	70	70	70	2.9	170	12	0.5	240	1.2	1036	ESM2 Profiler/niskin	V
76	22/02/2019 07:05	49	43.99	2	38.11	49	43.99	2	38.11	W	0.0	2376.5	2376.5	81	81	71	1.8	160	11	0.5	190	2.0	1039	ESM2 Profiler/niskin	V
77	22/02/2019 11:35	49	45.08	2	31.53	49	44.17	2	33.40	W	1.5	2399.4	2400.9	82	82	34	2.2	140	10	0.5	220	1.5	1041	Jackson 575 otter trawl	V
78	22/02/2019 13:26	49	42.12	2	31.43	49	42.98	2	29.52	W	1.5	2405.7	2407.2	64	64	234	2.9	140	11	0.5	240	1.0	1040	Jackson 575 otter trawl	V
79	22/02/2019 21:06	49	52.97	2	16.70	49	52.97	2	16.70	W	0.0	2454.9	2454.9	160	160	44	4.4	120	15	0.5	240	0.5	1039	ESM2 Profiler/niskin	V
80	23/02/2019 00:03	49	53.54	2	16.48	49	53.02	2	19.51	W	2.1	2471.9	2474.0	88	81	323	1.0	120	12	0.5	210	0.5	1039	Jackson 575 otter trawl	V
81	23/02/2019 06:34	48	47.85	2	28.72	48	47.85	2	28.72	W	0.0	2546.9	2546.9	42	42	129	3.2	140	9	0.5	240	0.5	1038	ESM2 Profiler/niskin	V
82	23/02/2019 08:11	48	47.63	2	28.70	48	48.91	2	31.07	W	2.0	2556.3	2558.3	46	47	128	1.4	140	8	0.5	240	0.5	1038	Jackson 575 otter trawl	V
83	23/02/2019 12:17	49	17.65	2	27.12	49	17.30	2	22.53	W	3.1	2594.0	2597.1	57	52	252	0.5	150	12	0.5			1038	Jackson 575 otter trawl	V
84	23/02/2019 16:35	49	30.64	3	0.66	49	32.72	2	57.31	W	3.0	2631.1	2634.1	72	72	199	2.5	-	-	0.5	250	0.5	1039	Jackson 575 otter trawl	V
85	23/02/2019 19:12	49	24.10	2	56.82	49	26.89	2	58.58	W	3.1	2645.9	2649.0	71	74	71	1.3	-	-	0.2	250	1.3	1039	Jackson 575 otter trawl	I
86	23/02/2019 20:45	49	26.77	2	59.14	49	26.77	2	59.14	W	0.0	2650.3	2650.3	77	77	58	1.8	-	-	0.2	250	1.2	1039	ESM2 Profiler/niskin	V
87	24/02/2019 15:37	48	50.16	5	9.10	48	50.16	5	9.10	W	0.0	2758.7	2758.7	104	104	275	0.8	-	-	0.2	250	2.0	1039	ESM2 Profiler/niskin	V
88	24/02/2019 16:50	48	51.27	5	10.31	48	49.51	5	6.11	W	2.9	2766.4	2769.3	110	105	49	1.7	-	-	0.2	250	2.0	1039	Jackson 575 otter trawl	V
89	24/02/2019 19:30	48	54.32	5	1.49	48	53.55	5	3.15	W	1.4	2780.5	2781.9	107	107	65	1.4	-	-	0.2	250	2.0	1040	Jackson 575 otter trawl	I
90	24/02/2019 23:18	48	44.51	4	59.53	48	45.91	4	55.93	W	2.7	2805.0	2807.7	107	108	240	1.7	-	-	0.2	250	2.0	1040	Jackson 575 otter trawl	I
91	25/02/2019 03:46	48	44.51	4	45.77	48	42.66	4	47.17	W	2.1	2828.8	2830.9	101	102	268	0.3	-	-	0.5	250	1.5	1040	Jackson 575 otter trawl	V
92	25/02/2019 10:58	48	5.60	4	44.90	48	5.60	4	44.90	W	0.0	2898.5	2898.5	55	55	191	1.6	140	5	0.5	250	1.5	1040	ESM2 Profiler/niskin	V

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
93	25/02/2019 17:50	48	13.30	6	4.80	48	13.30	6	4.80	W	0.0	2968.7	2968.7	135	135	8	0.9	-	-	0.2	250	2.0	1038	ESM2 Profiler/niskin	V
94	25/02/2019 18:50	48	15.63	6	2.39	48	13.22	6	4.87	W	2.8	2974.0	2976.8	135	135	57	0.9	-	-	0.2	250	2.0	1038	Jackson 575 otter trawl	V
95	25/02/2019 22:35	48	29.92	6	0.22	48	29.45	6	4.26	W	2.7	3000.8	3003.5	124	124	109	0.5	-	-	0.2	250	1.7	1038	Jackson 575 otter trawl	V
96	26/02/2019 02:03	48	26.90	5	55.91	48	28.50	5	55.27	W	1.7	3021.2	3022.9	122	120	2	1.4	-	-	0.5	250	1.5	1039	Jackson 575 otter trawl	V
97	26/02/2019 05:15	48	39.58	5	57.77	48	39.50	5	54.74	W	2.0	3039.7	3041.7	119	118	292	0.6	-	-	0.5	250	1.0	1037	Jackson 575 otter trawl	V
98	26/02/2019 08:34	48	40.73	6	25.32	48	40.73	6	25.32	W	0.0	3064.1	3064.1	142	142	68	0.8	-	-	0.5	250	1.5	1036	ESM2 Profiler/niskin	V
99	26/02/2019 10:04	48	41.56	6	21.86	48	40.88	6	24.72	W	2.0	3072.3	3074.3	138	140	111	0.3	-	-	0.5	250	1.5	1036	Jackson 575 otter trawl	V
100	26/02/2019 16:43	48	24.71	7	36.46	48	26.69	7	36.18	W	2.0	3133.5	3135.5	175	177	183	0.1	150	10	0.5	240	2.0	1033	Jackson 575 otter trawl	V
101	26/02/2019 21:55	48	30.09	8	37.51	48	30.09	8	37.51	W	0.0	3179.3	3179.3	180	180	35	0.6	180	8	0.5	240	2.0	1032	ESM2 Profiler/niskin	V
102	26/02/2019 23:10	48	32.78	8	34.29	48	30.46	8	37.21	W	3.0	3185.8	3188.8	180	180	131	0.5	180	16	1.0	240	2.0	1032	Jackson 575 otter trawl	V
103	27/02/2019 04:44	48	54.35	9	17.45	48	54.28	9	12.90	W	3.1	3229.1	3232.2	163	161	294	0.2	160	15	0.5	240	2.0	1030	Jackson 575 otter trawl	V
104	27/02/2019 10:03	49	38.52	9	18.31	49	38.52	9	18.31	W	0.0	3278.3	3278.3	150	150	67	0.5	160	12	0.5	240	2.0	1029	ESM2 Profiler/niskin	V
105	27/02/2019 10:57	49	39.82	9	17.34	49	37.74	9	20.70	W	3.0	3282.5	3285.5	150	151	101	0.4	160	12	1.0	240	2.0	1029	Jackson 575 otter trawl	V
106	27/02/2019 14:07	49	38.17	9	5.24	49	35.17	9	5.55	W	3.0	3300.0	3303.0	150	149	-	-	160	17	1.0	220	1.5	1028	Jackson 575 otter trawl	V
107	27/02/2019 19:24	50	14.77	8	42.26	50	17.78	8	42.22	W	3.1	3348.0	3351.1	135	123	47	0.3	170	11	0.5	220	1.5	1026	Jackson 575 otter trawl	V
108	27/02/2019 22:47	50	4.61	8	24.95	50	4.61	8	24.95	W	0.0	3370.5	3370.5	135	135	50	0.3	170	15	0.5	220	1.5	1025	ESM2 Profiler/niskin	V
109	27/02/2019 23:35	50	5.05	8	24.26	50	3.27	8	28.02	W	3.0	3373.9	3376.9	138	135	62	0.2	170	11	0.5	220	1.5	1024	Jackson 575 otter trawl	V
110	28/02/2019 02:12	49	54.49	8	23.56	49	51.49	8	23.53	W	3.0	3386.8	3389.8	110	139	164	0.2	230	20	0.5	220	1.5	1025	Jackson 575 otter trawl	V
111	28/02/2019 05:36	50	6.56	8	8.04	50	8.81	8	4.94	W	3.0	3410.9	3413.9	125	121	229	0.3	230	11	0.5	220	1.5	1024	Jackson 575 otter trawl	V
112	28/02/2019 10:20	49	45.06	7	53.42	49	45.06	7	53.42	W	0.0	3442.1	3442.1	131	131	39	0.4	240	26	1.0	240	2.5	1026	ESM2 Profiler/niskin	V
113	28/02/2019 11:03	49	45.40	7	53.81	49	44.33	7	58.16	W	3.1	3445.0	3448.1	132	132	47	0.4	240	26	1.0	240	2.5	1026	Jackson 575 otter trawl	V
114	28/02/2019 16:20	49	23.78	7	19.13	49	23.22	7	23.67	W	3.1	3485.6	3488.7	130	128	259	1.4	270	24	1.0	250	2.5	1029	Jackson 575 otter trawl	V
115	28/02/2019 20:40	49	4.95	7	47.21	49	5.43	7	51.75	W	3.0	3514.3	3517.3	140	147	46	0.2	270	17	1.0	260	2.5	1031	Jackson 575 otter trawl	V
116	28/02/2019 22:54	49	4.87	7	48.17	49	4.87	7	48.17	W	0.0	3522.9	3522.9	135	135	62	0.2	270	14	1.0	260	2.2	1031	ESM2 Profiler/niskin	V
117	01/03/2019 00:41	48	55.18	7	42.82	48	55.14	7	47.37	W	3.0	3537.2	3540.2	150	153	97	0.1	270	15	1.0	260	2.0	1031	Jackson 575 otter trawl	V
118	01/03/2019 04:21	48	54.03	7	13.71	48	54.03	7	13.71	W	0.0	3565.0	3565.0	117	117	261	0.2	260	14	1.0	260	2.0	1030	ESM2 Profiler/niskin	A
119	01/03/2019 05:03	48	54.03	7	12.67	48	54.28	7	8.13	W	3.0	3567.2	3570.2	133	137	262	0.3	260	13	0.5	260	2.0	1029	Jackson 575 otter trawl	V
120	01/03/2019 07:32	49	3.58	7	7.38	49	4.45	7	2.99	W	3.0	3581.8	3584.8	132	133	268	0.2	-	-	0.5	260	1.5	1029	Jackson 575 otter trawl	V
121	01/03/2019 10:30	49	17.00	6	53.37	49	19.52	6	50.93	W	3.1	3600.0	3603.1	126	122	46	0.2	190	14	0.5	260	1.5	1028	Jackson 575 otter trawl	V
122	01/03/2019 13:13	49	17.99	6	51.79	49	17.99	6	51.79	W	0.0	3610.1	3610.1	124	124	107	0.1	190	16	0.5	250	1.5	1026	ESM2 Profiler/niskin	V
123	01/03/2019 15:28	49	15.49	6	46.25	49	13.29	6	49.38	W	3.0	3622.8	3625.8	122	122	192	0.2	200	19	0.5	240	1.5	1023	Jackson 575 otter trawl	V

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
124	01/03/2019 21:10	48	59.56	5	49.09	49	1.72	5	47.35	W	2.5	3671.6	3674.1	117	114	301	0.3	220	25	1.0	230	2.0	1021	Jackson 575 otter trawl	V
125	05/03/2019 10:07	49	10.62	2	54.58	49	10.62	2	54.58	W	0.0	4103.3	4103.3	71	71	274	2.6	230	12	0.5	270	2.5	1014	ESM2 Profiler/niskin	V
126	05/03/2019 11:32	49	10.68	2	55.88	49	10.77	2	52.82	W	2.0	4111.7	4113.7	67	65	285	2	230	16	0.5	270	1.5	1015	Jackson 575 otter trawl	V
127	06/03/2019 05:54	48	54.19	2	37.47	48	54.19	2	37.47	W	0.0	4234.7	4234.7	49	49	130	1	170	14	0.5	190	1.0	1000	ESM2 Profiler/niskin	V
128	06/03/2019 06:54	48	54.29	2	37.10	48	55.85	2	37.32	W	1.5	4237.8	4239.3	49	50	329	0.5	160	16	0.5	190	1.0	999	Jackson 575 otter trawl	V
129	06/03/2019 08:52	49	2.23	2	39.01	49	0.37	2	37.89	W	2.0	4247.9	4249.9	55	50	323	1.2	160	16	0.5	180	1.5	998	Jackson 575 otter trawl	V
130	06/03/2019 13:06	49	21.89	3	3.82	49	21.89	2	59.52	W	2.9	4283.3	4286.2	68	67	183	1.5	200	21	0.5	250	1.5	996	Jackson 575 otter trawl	V
131	06/03/2019 21:06	50	15.46	2	47.91	50	15.46	2	47.91	W	0.0	4346.6	4346.6	60	60	83	1.6	290	22	1.0	250	2.0	996	ESM2 Profiler/niskin	V
132	06/03/2019 22:17	50	15.79	2	43.42	50	15.76	2	46.58	W	2.1	4353.5	4355.6	60	59	94	1	280	24	1.5	250	2.0	996.5	Jackson 575 otter trawl	V
133	07/03/2019 03:38	50	9.86	3	17.50	50	9.90	3	15.15	W	1.5	4393.4	4394.9	63	65	231	0.9	280	21	1.0	250	2.0	1000	Jackson 575 otter trawl	V
134	07/03/2019 10:30	50	30.03	2	47.52	50	30.03	2	47.52	W	0.0	4436.2	4436.2	46	46	118	0.8	270	26	2.0	250	2.5	1003	ESM2 Profiler/niskin	A
135	07/03/2019 18:18	50	2.91	3	26.80	50	2.91	3	26.80	W	0.0	4484.5	4484.5	72	72	38	0.9	270	28	1.5	260	2.5	1010	ESM2 Profiler/niskin	V
136	07/03/2019 19:48	50	4.16	3	34.15	50	4.16	3	34.15	W	0.0	4491.1	4491.1	68	68	57	1.6	280	27	1.0	260	2.2	1013	ESM2 Profiler/niskin	A
137	07/03/2019 21:08	50	4.37	3	33.45	50	4.68	3	36.54	W	2.1	4499.4	4501.5	69	69	61	0.7	285	21	0.5	260	2.0	1014	Jackson 575 otter trawl	V
138	08/03/2019 00:30	50	8.96	3	33.08	50	8.65	3	29.98	W	2.0	4519.2	4521.2	67	63	222	0.9	280	16	0.5	260	1.5	1017	Jackson 575 otter trawl	V
139	08/03/2019 03:54	50	20.42	3	3.72	50	20.51	3	0.60	W	2.0	4542.8	4544.8	57	57	262	0.8	290	13	0.5	260	1.0	1019	Jackson 575 otter trawl	V
140	08/03/2019 06:58	50	26.62	2	35.41	50	26.26	2	40.09	W	3.0	4564.0	4567.0	51	53	82	1	-	-	0.5	260	1.0	1021	Jackson 575 otter trawl	V
141	08/03/2019 09:21	50	30.01	2	44.79	50	30.01	2	44.79	W	0.0	4574.2	4574.2	48	48	114	1.8	270	10	0.5	230	1.0	1021	ESM2 Profiler/niskin	V
142	08/03/2019 10:03	50	30.32	2	42.12	50	30.34	2	45.27	W	2.0	4578.3	4580.3	46	45	124	1.9	250	12	0.5	230	1.0	1021	Jackson 575 otter trawl	V
143	08/03/2019 16:25	50	2.67	3	51.94	50	4.06	3	47.78	W	3.1	4634.9	4638.0	73	73	88	0.6	220	30	1.5	230	2.5	1017	Jackson 575 otter trawl	V
144	08/03/2019 19:13	50	1.84	3	52.99	50	1.84	3	52.99	W	0.0	4646.1	4646.1	76	76	95	1.1	260	27	1.0	240	2.2	1017	ESM2 Profiler/niskin	V
145	08/03/2019 22:52	50	3.36	3	28.46	50	3.32	3	33.13	W	3.0	4675.0	4678.0	68	67	49	0.6	270	22	1.5	240	2.0	1020	Jackson 575 otter trawl	V
146	09/03/2019 02:29	49	54.54	3	33.24	49	54.52	3	30.91	W	1.5	4696.6	4698.1	70	69	233	1.7	260	16	1.0	260	2.0	1022	Jackson 575 otter trawl	V
147	09/03/2019 04:33	49	52.60	3	30.96	49	52.88	3	26.33	W	3.0	4707.2	4710.2	73	73	228	1.2	260	19	0.5	260	2.0	1023	Jackson 575 otter trawl	V
148	09/03/2019 08:57	49	39.70	3	53.80	49	39.47	3	56.56	W	1.8	4735.4	4737.2	83	81	70	0.7	270	23	1.0	260	2.0	1024	Jackson 575 otter trawl	V
149	09/03/2019 10:57	49	40.90	4	1.24	49	40.95	3	56.61	W	3.0	4743.4	4746.4	81	79	247	0.2	270	21	1.0	260	2.0	1027	Jackson 575 otter trawl	V
150	09/03/2019 14:23	49	54.58	4	5.63	49	54.77	4	0.98	W	3.0	4766.0	4769.0	74	75	257	0.8	270	21	1.0	260	2.0	1027	Jackson 575 otter trawl	V
151	09/03/2019 16:13	49	54.64	4	3.79	49	54.64	4	3.79	W	0.0	4772.8	4772.8	75	75	254	0.2	280	15	1.0	260	1.5	1026	ESM2 Profiler/niskin	V
152	09/03/2019 17:55	49	39.98	4	7.83	49	39.86	4	11.44	W	2.3	4788.6	4790.9	85	85	77	1	260	14	0.5	260	1.5	1025	Jackson 575 otter trawl	V
153	09/03/2019 19:55	49	34.27	4	18.21	49	33.67	4	22.75	W	3.1	4798.3	4801.4	90	89	65	0.5	200	16	0.5	260	1.5	1023	Jackson 575 otter trawl	V
154	11/03/2019 16:18	49	56.89	5	38.47	49	57.59	5	36.26	W	1.6	5029.4	5031.0	73	70	287	0.7	220	24	1.0	260	2.0	1034	Jackson 575 otter trawl	V

Stn.	Date & time shot	Shot Lat.		Shot Long.		Haul Lat.		Haul Long.		E/W	Dist. (nm)	Log (nm)		Depth (m)		Tide		Wind		Sea ht. (m)	Swell		Barom.	Gear	Val.
		°N	Min.	°N	Min.	°N	Min.	°N	Min.			Shot	Haul	Shot	Haul	Dir.	Spd.	Dir.	Spd.		Dir.	Ht. (m)			
155	11/03/2019 18:00	49	56.83	5	36.43	49	56.83	5	36.43	W	0.0	5037.1	5037.1	72	72	300	0.4	220	25	1.0	250	4.5	1032	ESM2 Profiler/niskin	V

Appendix 2: Randomly selected sites that could not be sampled

Stratum	Priority Number	P Reference Number	Reason for not sampling	Alternative Priority station worked
1	1	P16043	No time remaining to complete stratum	N/A
1	2	P16799	No time remaining to complete stratum	N/A
1	3	P16008	No time remaining to complete stratum	N/A
1	4	P15928	No time remaining to complete stratum	N/A
1	5	P15890	No time remaining to complete stratum	N/A
1	6	P15915	No time remaining to complete stratum	N/A
2	2	P20995	Below agreed minimum water depth (40 m)	No time remaining to complete stratum
2	3	P20364	Informed by fishermen that location was intensive static gear area	No time remaining to complete stratum
2	4	P21061	Runnel's Stone MPA and cables prevent identification of a suitable tow location	No time remaining to complete stratum
2	5	P20983	Intensive static gear fishing prevented tow	No time remaining to complete stratum
3	3	P24433	Below agreed minimum water depth (40 m)	Stratum 3 Station 7
4	5	P24561	Below agreed minimum water depth (40 m)	Stratum 4 Station 7
5	2	P27259	Below agreed minimum water depth (40 m)	Stratum 5 Station 7
5	3	P27213	Below agreed minimum water depth (40 m)	Stratum 5 Station 8
5	5	P29603	Below agreed minimum water depth (40 m) & IFCA refused trawling on site	Stratum 5 Station 10
5	6	P29574	Below agreed minimum water depth (40 m) & IFCA refused trawling on site	Stratum 5 Station 11
5	9	P27143	Below agreed minimum water depth (40 m)	Stratum 5 Station 13
5	12	P27232	Below agreed minimum water depth (40 m)	N/A
7	2	P26896	Unfishable ground	Stratum 7 Station 7
7	3	P26825	Unfishable ground	Stratum 7 Station 8
8	1	P20591	No time remaining to complete stratum	N/A
8	2	P16319	No time remaining to complete stratum	N/A
8	3	P16287	No time remaining to complete stratum	N/A
8	5	P16270	No time remaining to complete stratum	N/A
9	6	P28713	Intensive static gear fishing prevented tow	Stratum 9 Station 7 & No time remaining to complete stratum
10	1	P25675	Unfishable ground	Stratum 10 Station 7
10	3	P28352	Unfishable ground	Stratum 10 Station 8
11	1	P28139	Below agreed minimum water depth (40 m)	Stratum 11 Station 13
11	2	P28168	Below agreed minimum water depth (40 m)	Stratum 11 Station 14
11	3	P30087	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	4	P27625	Below agreed minimum water depth (40 m)	All alternative stations exhausted

Stratum	Priority Number	P Reference Number	Reason for not sampling	Alternative Priority station worked
11	5	P30156	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	6	P27927	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	7	P30176	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	8	P28382	Informed by Guernsey that it was intensive static gear area	All alternative stations exhausted
11	9	P27791	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	10	P30040	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	11	P28486	Informed by Guernsey that it was intensive static gear area	All alternative stations exhausted
11	12	P27890	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	15	P29980	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	16	P29921	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	17	P28625	Unfishable ground	All alternative stations exhausted
11	18	P30131	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	19	P29998	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	20	P27736	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	21	P27871	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	22	P27829	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	23	P30074	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	24	P29879	Below agreed minimum water depth (40 m)	All alternative stations exhausted
11	25	P29963	Below agreed minimum water depth (40 m)	All alternative stations exhausted
12	2	P26021	No time remaining to complete stratum	N/A
12	3	P25463	No time remaining to complete stratum	N/A
12	4	P22923	No time remaining to complete stratum	N/A
12	5	P25487	No time remaining to complete stratum	N/A
12	6	P25813	No time remaining to complete stratum	N/A
13	1	P23389	No time remaining to complete stratum	N/A
13	5	P19757	No time remaining to complete stratum	N/A
B	5	P17965	Unfishable ground	Stratum B Station 7
C	3	P27518	Below agreed minimum water depth (40 m)	Stratum C Station 8
C	4	P24737	Below agreed minimum water depth (40 m)	Stratum C Station 10
C	6	P25260	Below agreed minimum water depth (40 m)	Stratum C Station 12
C	7	P25283	Below agreed minimum water depth (40 m)	N/A
C	9	P22190	Below agreed minimum water depth (40 m)	N/A

Stratum	Priority Number	P Reference Number	Reason for not sampling	Alternative Priority station worked
C	11	P22089	Below agreed minimum water depth (40 m) & refused accessed to Castlemartin firing range	N/A
E	1	P9734	Sustained gear damage during tow - station not reattempted	Stratum E Station 7
E	4	P9325	No time remaining to complete stratum	N/A
F	1	P16467	No time remaining to complete stratum	N/A
F	3	P13975	No time remaining to complete stratum	N/A
F	4	P15841	No time remaining to complete stratum	N/A
F	6	P12139	No time remaining to complete stratum	N/A
G	3	P10145	No time remaining to complete stratum	N/A
G	4	P10276	No time remaining to complete stratum	N/A
J	1	P22456	Unfishable ground	No time remaining to complete stratum
J	2	P22809	Gear damage sustained - unfishable ground	No time remaining to complete stratum
J	3	P18903	Unfishable ground	No time remaining to complete stratum
J	4	P22551	Below agreed minimum water depth (40 m)	No time remaining to complete stratum
J	5	P18800	No time remaining to complete stratum	N/A
J	6	P22438	Below agreed minimum water depth (40 m)	No time remaining to complete stratum
J	7	P22710	No time remaining to complete stratum	N/A
J	8	P22869	No time remaining to complete stratum	N/A
J	9	P18782	No time remaining to complete stratum	N/A
J	10	P22602	Below agreed minimum water depth (40 m)	No time remaining to complete stratum
K	4	P19455	No time remaining to complete stratum	N/A
K	5	P19272	Denied access by French Marine Traffic	No time remaining to complete stratum
K	6	P19045	No time remaining to complete stratum	N/A
K	7	P19398	Unfishable ground	No time remaining to complete stratum