

**CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE  
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT  
2003 RESEARCH VESSEL PROGRAMME**

**REPORT: RV CEFAS ENDEAVOUR: CRUISE 10**

**STAFF:**

Part 1	Part 2
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**DURATION:** Part 1: 3 – 19 November. Part 2: 20 November – 4 December

**LOCATION:** Irish Sea, Celtic Sea, western English Channel.

**AIMS:**

1. To carry out a trawl survey of the Irish Sea, Celtic Sea and western Channel (ICES divisions VIIa, e-j), as part of the west coast IBTS series and in support of the EU data regulations, to obtain information on:
  - a. Distribution, size composition and abundance of all fish species.
  - b. Age - length distribution of selected species for ICES WG input and biological studies.
  - c. Biological parameters of selected species.
  - d. Suitability of modified GOV trawl with rockhoppers and standard station grid for this new survey series.
2. To sample areas of VIIg and h with 2 m beam trawl to quantify epibenthos and fish, locate alternative fishing stations, and to collect data on juvenile megrim.
3. To continue the development and testing of electronic data capture equipment and the new Fishing Survey System
4. To collect material for fish identification courses.
5. To monitor the distribution and abundance and to collect data on *Ommastrephid* squids.
6. To collect and preserve frozen, all scallops *Pecten maximus* that are caught (D. Palmer, CEFAS)

7. To collect samples of pollack for genetic studies (Food Research Association)
8. To collect tissue samples from rays (Rajidae) for molecular studies (M. Chevlot, University of Groningen)
9. To collect tissue samples from spurdog *Squalus acanthias* for molecular studies (J. Franks, University of Washington, Seattle)
10. To collect tissue samples from blue-mouth redfish *Helicolenus dactylopterus* and conger eel *Conger conger* for molecular studies (M. A. Aboim, Southampton Oceanography Centre)
11. To collect hake fecundity samples (P. Witthames, CEFAS)
12. To collect 100 0-group whiting and 100 0-group haddock from north and south of the survey area for genetic studies (I. Gibb, FRS, Aberdeen)

#### **NARRATIVE:**

CEFAS ENDEAVOUR sailed from Lowestoft at 17:30 on 03 November, and fishing commenced at first light on 05 November, with two stations fished successfully. The modified GOV trawl, with rockhopper gear, appeared to fish well, with relatively large catches of horse mackerel and mackerel. That evening CEFAS ENDEAVOUR steamed northwards to the outer Bristol Channel, when technical problems occurred with the prop motor/propeller shaft overheating, and the vessel then anchored in St Ives Bay for the night. The following day, CEFAS ENDEAVOUR steamed towards Falmouth and docked in Falmouth at 15:00 on 07 November, for an inspection of the prop shaft. CEFAS ENDEAVOUR sailed from Falmouth at 08:50 on 09 November, and a further three stations in the western English Channel were fished before returning to the Bristol Channel.

Five stations were fished on 10 November, under favourable sea conditions, and catch rates of gadoids, primarily whiting and haddock, were greater than in the western English Channel. The remaining stations in the outer Bristol Channel were fished the following day, although problems with the winch forced the final tow of the day, in the Celtic Deep, to last one hour, as opposed to the usual 30 minutes. On the evening of the 11 November, CEFAS Endeavour steamed to Cardigan Bay and the three stations in this area, and one station further offshore in St George's Channel, were fished successfully the following day. Catches in the shallower waters of Cardigan Bay were relatively diverse, with many inshore demersal fish species caught, and clumps of *Flustra foliacea* were caught in the wings. The following day, CEFAS ENDEAVOUR worked in the southern Irish Sea, and three stations were completed. The station south of Anglesey which was originally included in the survey grid was considered inappropriate for sampling, as this site is typically fished with static gear. Hence, a nearby station from the beam trawl survey grid was fished. That evening, CEFAS ENDEAVOUR steamed around Anglesey and anchored in Red Wharf Bay to shelter from the bad weather expected that night, and bad weather conditions prevented fishing on 14 November.

CEFAS ENDEAVOUR resumed work in the southeastern Irish Sea the following morning, and four stations were fished successfully. Catches were generally light and dominated by whiting, lesser-spotted dogfish and northern squid. Stations in the northeastern Irish Sea, which were comprised primarily of sprat, were completed the following day, and stations in the northwestern Irish Sea fished the day after. The station in the North Channel (prime 401) was not fished due to time constraints and that the site was a likely source of gear damage. CEFAS ENDEAVOUR worked southwards in the eastern Irish Sea and St George's Channel on 18 November, with four stations completed. A previous Irish survey at one of these stations (Prime 511) had reported that their net had come fast, and so this site was steamed over prior to fishing, and was found to be a clear tow. Before shooting the trawl on the last tow of the day (Prime 506), a section of discarded netting was observed trailing off the stern, possibly snagged on the lifting eyebolt, and this was removed. Scanmar headline readings were erratic at the start of the tow, due to the tides causing 17° of set starboard and CEFAS ENDEAVOUR altered course to compensate for this. The echo sounder indicated a small ridge west of the original tow, although no gear damage occurred. Two stations were fished the next day, including the final station in VIIa, and one station south of Cork, before CEFAS ENDEAVOUR steamed to Cork, docking on 19 November at 16:00 for a change of staff.

CEFAS ENDEAVOUR departed from Cork on 21 November at 08:30, and three stations south of Cork were fished that day. The following morning, after one successful tow, CEFAS ENDEAVOUR rendezvoused with the French research vessel THALASSA in order to undertake three comparative tows at the southern end of the Celtic Deep. Unfortunately only the first station, French station Cn305, was fished successfully by both vessels, with gear damage occurring at the other stations. The second station (UK prime station 1), which was a clear tow in previous surveys and fished successfully by RV THALASSA, resulted in damage to the belly of the modified GOV trawl. RV THALASSA suffered similar gear damage at the next station (Cn303). That night CEFAS ENDEAVOUR steamed northwards to the south coast of Ireland, and four stations were fished the following day. Over the following days, CEFAS ENDEAVOUR worked southwards down the survey grid, although catches in this area were generally light. Fishing was disrupted on 26 November due to strong south-westerly winds, and only one station was fished. Although the weather moderated to some extent the following day, fishing was still disrupted as the swell remaining prevented the trawl being deployed and hauled safely, and only 2 core stations were fished. The reliance of the crane to fully haul the net and transfer the catch to the hopper meant that fishing could not be undertaken in moderate sea conditions. The addition of a Samson post and winch system could help alleviate this problem.

Sea and weather conditions on 28 November allowed fishing to recommence, and three stations were fished. The port winch overheated at one of these stations, after a fault with the cooling fan, thus trawling at this site lasted over one hour, and crossed a cable. As the catch at this station contained large cod, ling, pollack and conger eel, it was considered that fishing over the cable may have resulted in a bias catch, and so this station was repeated with the standard tow duration for comparability. That evening, with gale force southerly winds imminent, CEFAS ENDEAVOUR steamed northwards and anchored in St Ives Bay, and sheltered the following day. During the second half of the cruise, whilst fishing in VIIg-h, it was

noted that catches had declined, and it was deemed appropriate to replace the GOV with the Portuguese High Headline Trawl (PHHT), which was undertaken whilst sheltering. The PHHT was used to undertake some repeat tows in order for a preliminary investigation into the different catches of the two gears, although it must be stressed that the timing of trawling were different and observed differences in catches will not be exclusively due to differing trawl types.

In the early morning of 30 November, CEFAS ENDEAVOUR steamed north-east and undertook tows in the Bristol Channel that were previously fished with the GOV trawl, in order to gauge differences in the catches between the two gears. Four stations were completed successfully with the PHHT, and the final tow was repeated with a tickler chain. On this tow, however, a large sheet of metal was hooked onto the portside door, and the belly of the net was torn. That evening, CEFAS ENDEAVOUR steamed northwards to the southern end of St George's Channel and a further four comparative stations were fished off south-eastern Ireland. Catches at stations fished with the PHHT were also light. CEFAS ENDEAVOUR then steamed towards the English Channel, where a further two replicate tows were undertaken, before steaming eastwards to Lowestoft, docking at 17:30 on 3 December.

## **GEAR DESCRIPTION**

The GOV trawl deployed was based on the gear used in the North Sea groundfish survey, although several modifications were made prior to sailing:

- The middle bridle was not used
- The kite was not used, and was replaced by 12 x 11" plastic floats.
- The 50 x 8" aluminium floats (25 each side) were evenly spaced along the headline.
- Rockhopper ground gear was used, and the central section of the ground gear was reduced from 5m to 3m.
- The sweeps were reduced from 50m to 20m, with a 2m length of heavy chain included between the sweep and the splits, and a third swivel added to the end of each sweep.
- Tearing strips were incorporated at strategic points (between panels 4 and 5, and panels 5 and 6, and bunt section of panel 4).
- The Scanmar units were attached to the upper bridles just forward off the wing-ends; to ensure that an appropriate wingspread was achieved whilst fishing.

The gear appeared to fish well, with the shoe of the doors, bobbin and bottom of the fishplate noticeably shined on hauling. The section of 2m heavy chain and the 38m lower bridles exhibited some degree of shining, so was also making ground contact. During the course of the survey, many species of benthic invertebrate were also caught, with the lower wings often collecting hydroids and *Flustra*.

## **RESULTS:**

GOV survey: Stations sampled

A total of 61 stations were fished successfully (Figure 1), with a further 12 additional tows made, which were either repeat tows of one hour duration, or tows made with the PHHT (Figure 2). The most southerly stations in the survey grid were not fished due to time constraints and weather conditions. Only 2 tows were deemed invalid, due to major gear damage. As catches in the GOV were generally moderate, it seems most appropriate that stations are fished for one hour if this gear is used next year. Furthermore, those tows that can be fished from several compass directions without gear damage should be detailed, in order to facilitate efficient sampling under various sea conditions. During the course of the survey, a total of 73 fish species were recorded in the survey grid fished with the GOV trawl (Table 1).

#### GOV survey: Commercial species

Otoliths and biological data were collected for commercially important fish species, and the numbers of each species sampled by ICES division is summarised in Table 2. In addition to the 1690 otoliths collected, collections of whole sprat were made from both VIIa and VIIe, and biological parameters were collected for skates and rays.

**Gadiforms:** Cod were caught at 15 of the 61 core stations (Figure 3a), with catch per unit effort (CPUE, numbers per hour) ranging from 2-6 ind.hr<sup>-1</sup>, and they were also recorded at two of the additional stations. Haddock were captured at 44 of the core stations (Figure 3b), and the maximum CPUE was >1200 ind.hr<sup>-1</sup>. Whiting were also relatively abundant, were captured at 52 of the core stations (Figure 3c), and the maximum CPUE was >11,000 ind.hr<sup>-1</sup>. Hake were captured at 34 of the core stations (Figure 3d), and comparatively few mature female hake were captured. Larger fish tend to occur further west in deeper waters. The maximum CPUE was 164 ind.hr<sup>-1</sup>, and juveniles dominated the catch at this site (station 57).

**Anglerfish:** Catches of anglerfish (Figure 4a) and black-bellied anglerfish were relatively low and the utility of further modifications of the GOV to better sample anglerfishes should be explored.

**Flatfish:** Catches of commercial flatfish were moderate, as the rockhopper groundgear used was not optimal for flatfish. Nevertheless, this survey may be able to provide information that supplements the data collected during the September beam trawl surveys. Although megrim were caught regularly in the Celtic Sea (Figure 4b), the survey grid does not extend far enough west to fully sample this population. Furthermore, the gear does not sample juveniles to any great extent. Juvenile megrim may be better sampled by other gears (e.g. beam trawl) and, therefore, the utility of additional gears to provide data on megrim during this survey, or extending the beam trawl surveys further west, should be considered. Lemon sole were relatively common off south-east Ireland and in the Bristol Channel (Figure 4c), and the maximum CPUE was 36 ind.hr<sup>-1</sup>.

#### Fish tagging

During the course of the survey, a total of 69 fishes were tagged with Petersen discs and released, with summary details given in Table 3 and release locations shown in Figure 2.

### Ichthyological observations

Overall, 73 species of fish were recorded during the survey (Table 1), and most of the species caught were relatively common. Unusual fish species caught included one specimen of electric ray *Torpedo nobiliana* (station 60) and three specimens of common skate *Dipturus batis* (stations 56 and 66).

### Benthic observations

Whereas the gear used is not considered suitable for the quantitative analysis of benthic and epibenthic invertebrates, data on abundance were collected, as this will provide additional indications of the bottom type. Catches of invertebrate were light, with echinoderms (sea urchins and starfish) and crustaceans (swimming, spider and hermit crab) the major taxa caught. The wings of the net would regularly contain various hydroids and bryozoans when coarser grounds were fished, although the majority of this material did not pass down to the codend of the net. A list of the invertebrates caught by the main survey trawls is given in Table 4.

### Beam trawl survey

Certain sites within ICES divisions VIIg and VIIh were also sampled with 2m beam trawl (Figure 2) to supplement data collected on March cruises (2000-2002). Samples were dominated by echinoderms and crustaceans and were typical for the Celtic Sea, as characterised by the presence of species such as *Crangon allmanni*, *Pagurus prideaux*, *Astropecten irregularis* and *Astarte sulcata*.

### Collection of biological material

Several requests for biological material were undertaken:

- Samples of scallop *Pecten maximus*: Only 2 specimens were collected, as the gears used were not appropriate for sampling this species.
- Selected fish species were retained for fish identification courses
- Detailed biological sampling of 18 maturing and mature male and three mature female hake *Merluccius merluccius* was undertaken. Mature female hake were rarely captured during the survey, and are usually found nearer the shelf edge.
- Tissue samples from three specimens of pollack *Pollachius pollachius* for genetic studies were collected, as requested.
- Tissue samples were collected from spotted ray *Raja montagui* (n=30), thornback ray *Raja clavata* (n=16), blonde ray *Raja brachyura* (n=15) and common skate *Dipturus batis* (n=2) for genetic studies. Although shagreen ray *Leucoraja fullonica* and cuckoo ray *L. naevus* are usually captured in the study area, these species were not captured during the survey.
- Tissue samples from eight specimens of spurdog *Squalus acanthias* were collected for genetic studies, the remaining spurdog caught were tagged and released and tissue samples were not collected from these individuals.
- Tissue samples from 17 specimens of conger eel *Conger conger* were collected for genetic studies.

- No specimens of blue-mouth redfish *Helicolenus dactylopterus* were captured, as fishing operations were generally restricted to waters <130m deep, whereas blue-mouth redfish, which are frequently taken in the March survey, occur typically in waters of >150m depth.
- Collections of 0-group whiting and haddock from the north and south of the survey grid were requested for genetic studies. Samples of 100 juvenile (0 and I-groups) whiting *Merlangius merlangus* were collected from three sites (stations 11, 21 and 26). Few 0-group haddock *Melanogrammus aeglefinus* were caught, and one sample of 100 juvenile (I-group) haddock was made from one site (station 35).

### Cetacean sightings

Sightings of cetaceans were recorded during the survey, with all sightings made in the outer Bristol Channel and Celtic Sea (ICES Divisions VIIIf-h). Most observations were for common dolphin (*Delphinus delphis*), and are summarised in Table 5.

We thank the officers and crew for their hard work during the course of the survey

J Ellis  
4 December 2003

SEEN IN DRAFT

A. Reading (Master)  
A. Lincoln (Senior Fishing Mate)

INITIALLED:

Dr R.S. Millner

DISTRIBUTION:

Basic list	
Staff on Cruise (+ Steve Flatman)	Ireland (via FCO)
Mike Montgomery, Seafish, Hull	France (via FCO)
South Wales SFC	Devon SFC
Isles of Scilly SFC	Cornwall SFC
Wales & NW SFC	National Marine Aquarium
Natural History Museum	

**TABLE 1:** List of fish species caught during the survey

<b>Species</b>	<b>No</b>	<b>%</b>	<b>Species</b>	<b>No</b>	<b>%</b>
<i>Squalus acanthias</i>	37	0.03	<i>Zeus faber</i>	126	0.10
<i>Scyliorhinus canicula</i>	742	0.60	<i>Capros aper</i>	83	0.07
<i>Scyliorhinus stellaris</i>	9	0.01	<i>Syngnathus acus</i>	4	<0.01
<i>Galeorhinus galeus</i>	22	0.02	<i>Trigla lucerna</i>	14	0.01
<i>Mustelus asterias</i>	14	0.01	<i>Eutrigla gurnardus</i>	1219	0.98
<i>Mustelus mustelus</i>	1	<0.01	<i>Aspitrigla cuculus</i>	54	0.04
<i>Dipturus batis</i>	3	<0.01	<i>Myoxocephalus scorpius</i>	1	<0.01
<i>Raja brachyura</i>	15	0.01	<i>Taurulus bubalis</i>	1	<0.01
<i>Raja montagui</i>	27	0.02	<i>Agonus cataphractus</i>	8	0.01
<i>Raja clavata</i>	16	0.01	<i>Liparis montagui</i>	1	<0.01
<i>Torpedo nobiliana</i>	1	<0.01	<i>Trachurus trachurus</i>	39405	31.67
<i>Conger conger</i>	11	0.01	<i>Spondyllosoma cantharus</i>	1	<0.01
<i>Clupea harengus</i>	1093	0.88	<i>Mullus surmuletus</i>	2	<0.01
<i>Sprattus sprattus</i>	39355	31.63	<i>Cepola rubescens</i>	2	<0.01
<i>Sardina pilchardus</i>	993	0.80	<i>Dicentrarchus labrax</i>	5	<0.01
<i>Engraulis encrasicolus</i>	1672	1.34	<i>Crenilabrus melops</i>	1	<0.01
<i>Argentinidae</i>	15	0.01	<i>Echiichthys vipera</i>	2	<0.01
<i>Maurolicus muelleri</i>	9	0.01	<i>Trachinus draco</i>	11	0.01
<i>Lophius piscatorius</i>	39	0.03	<i>Hyperoplus lanceolatus</i>	8	0.01
<i>Lophius budegassa</i>	4	<0.01	<i>Hyperoplus immaculatus</i>	5	<0.01
<i>Gadus morhua</i>	23	0.02	<i>Callionymus lyra</i>	91	0.07
<i>Pollachius virens</i>	4	<0.01	<i>Callionymus maculatus</i>	16	0.01
<i>Pollachius pollachius</i>	6	<0.01	<i>Callionymus reticulatus</i>	5	<0.01
<i>Melanogrammus aeglefinus</i>	2917	2.34	<i>Scomber scombrus</i>	2777	2.23
<i>Enchelyopus cimbrius</i>	1	<0.01	<i>Scophthalmus maximus</i>	1	<0.01
<i>Phycis blennoides</i>	12	0.01	<i>Scophthalmus rhombus</i>	7	0.01
<i>Trisopterus minutus</i>	6044	4.86	<i>Arnoglossus imperialis</i>	4	<0.01
<i>Trisopterus luscus</i>	5	<0.01	<i>Phrynorhombus norvegicus</i>	1	<0.01
<i>Trisopterus esmarki</i>	3425	2.75	<i>Lepidorhombus whiffiagonis</i>	63	0.05
<i>Merlangius merlangus</i>	21792	17.51	<i>Glyptocephalus cynoglossus</i>	17	0.01
<i>Molva molva</i>	3	<0.01	<i>Hippoglossoides platessoides</i>	313	0.25
<i>Gaidropsarus vulgaris</i>	3	<0.01	<i>Limanda limanda</i>	370	0.30
<i>Gadiculus argenteus</i>	2	<0.01	<i>Microstomus kitt</i>	135	0.11
<i>Micromesistius poutassou</i>	515	0.41	<i>Pleuronectes platessa</i>	359	0.29
<i>Merluccius merluccius</i>	411	0.33	<i>Solea solea</i>	4	<0.01
<i>Belone belone</i>	1	<0.01	<i>Buglossidium luteum</i>	2	<0.01
			<i>Microchirus variegatus</i>	62	0.05

**TABLE 2:** Number of commercial fishes for which otoliths were collected during the survey

Species	Number collected
Cod <i>Gadus morhua</i>	28
Haddock <i>Melanogrammus aeglefinus</i>	321
Whiting <i>Merlangius merlangus</i>	294
Hake <i>Merluccius merluccius</i>	196
Turbot <i>Scophthalmus maximus</i>	1
Brill <i>Scophthalmus rhombus</i>	7
Megrim <i>Lepidorhombus whiffiagonis</i>	92
Lemon sole <i>Microstomus kitt</i>	133
Plaice <i>Pleuronectes platessa</i>	159
Sole <i>Solea solea</i>	5
Anglerfish <i>Lophius piscatorius</i>	43
Anglerfish <i>Lophius budegassa</i>	7
Bass <i>Dicentrarchus labrax</i>	5
Herring <i>Clupea harengus</i>	116
Mackerel <i>Scomber scombrus</i>	283

**TABLE 3:** Summary of fish tagged by species and sex

Species	Male	Female
Spurdog <i>Squalus acanthias</i>	13	12
Greater spotted dogfish <i>Scyliorhinus stellaris</i>	2	8
Tope <i>Galeorhinus galeus</i>	10	12
Starry smoothhound <i>Mustelus asterias</i>	1	8
Smoothhound <i>Mustelus mustelus</i>	0	1
Electric ray <i>Torpedo nobiliana</i>	0	1
Common skate <i>Dipturus batis</i>	1	0

**TABLE 4:** List of invertebrates caught during the survey

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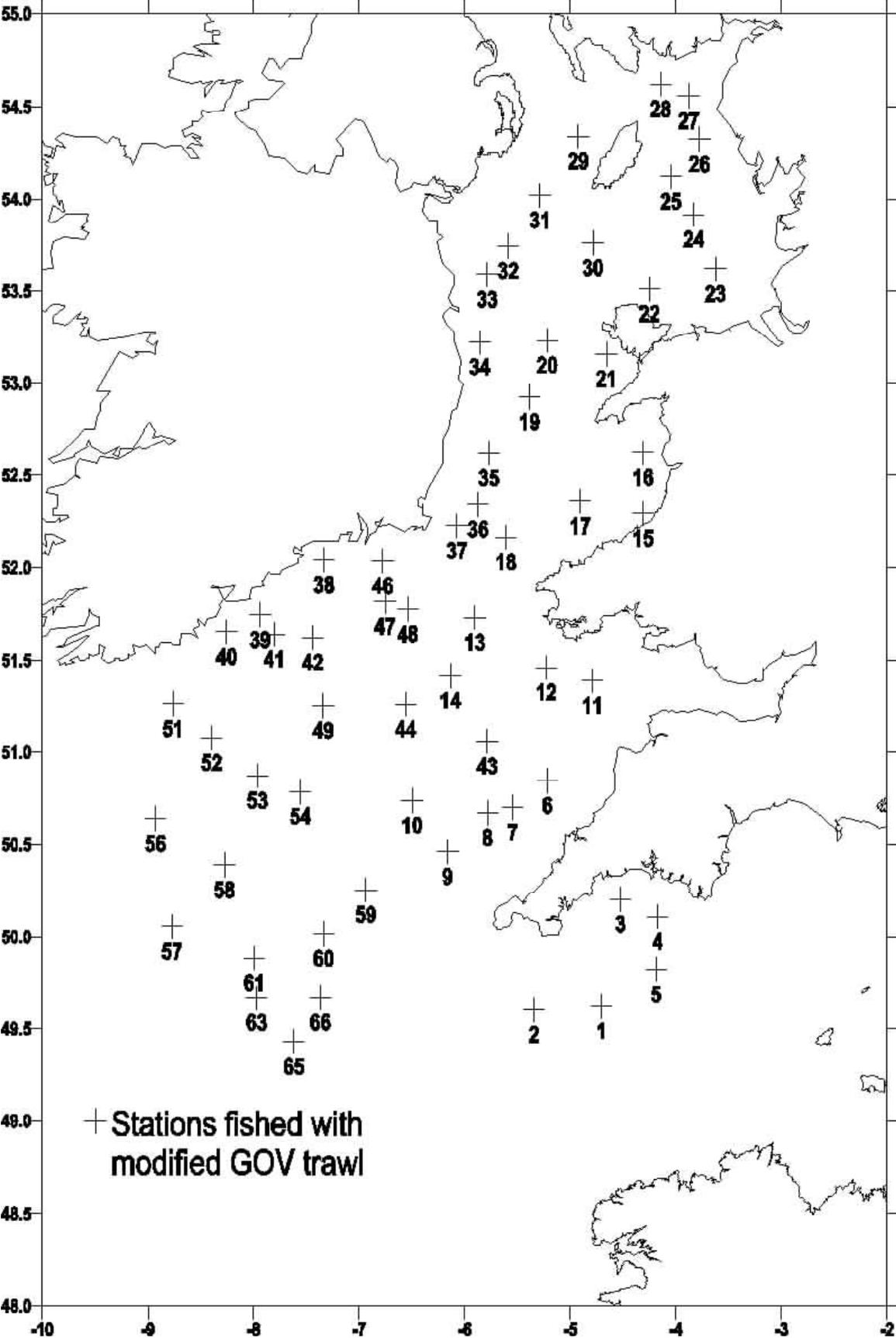
<i>Porifera</i> (indet.)	<i>Scaphander lignarius</i>
<i>Nemertesia antennina</i>	<i>Archidoris pseudargus</i>
<i>Lytocarpia myriophyllum</i>	<i>Tritonia hombergii</i>
Hydrozoa (indet.)	<i>Glycymeris glycymeris</i>
<i>Alcyonium digitatum</i>	<i>Modiolus modiolus</i>
<i>Metridium senile</i>	<i>Aequipecten opercularis</i>
<i>Caryophyllia smithi</i>	<i>Pecten maximus</i>
<i>Aphrodite aculeata</i>	<i>Astarte sulcata</i>
<i>Hyalinoecia tubicola</i>	<i>Rossia macrosoma</i>
<i>Pasiphaea sivado</i>	<i>Sepiola atlantica</i>
<i>Palaemon serratus</i>	<i>Sepia elegans</i>
<i>Processa canaliculata</i>	<i>Sepia officinalis</i>
<i>Pandalus montagui</i>	<i>Loligo forbesi</i>
<i>Dichelopandalus bonnieri</i>	<i>Loligo vulgaris</i>
<i>Crangon allmanni</i>	<i>Alloteuthis subulata</i>
<i>Homarus gammarus</i>	<i>Illex illecebrosus</i>
<i>Nephrops norvegicus</i>	<i>Todaropsis eblanae</i>
<i>Palinurus elephas</i>	<i>Eledone cirrosa</i>
<i>Pagurus bernhardus</i>	<i>Alcyonidium gelatinosum</i>
<i>Pagurus prideaux</i>	<i>Flustra foliacea</i>
<i>Munida rugosa</i>	<i>Pentapora foliacea</i>
<i>Galathea</i> spp	<i>Luidia sarsi</i>
<i>Dromia personata</i>	<i>Luidia ciliaris</i>
<i>Hyas coarctatus</i>	<i>Astropecten irregularis</i>
<i>Inachus dorsettensis</i>	<i>Crossaster papposus</i>
<i>Inachus leptochirus</i>	<i>Porania pulvillus</i>
<i>Macropodia linaresi</i>	<i>Henricia oculata</i>
<i>Macropodia rostrata</i>	<i>Asterias rubens</i>
<i>Macropodia tenuirostris</i>	<i>Marthasterias glacialis</i>
<i>Maia squinado</i>	<i>Stichastrella rosea</i>
<i>Cancer pagurus</i>	<i>Ophiura texturata</i>
<i>Liocarcinus depurator</i>	<i>Ophiocomina nigra</i>
<i>Liocarcinus holsatus</i>	<i>Ophiothrix fragilis</i>
<i>Necora puber</i>	<i>Echinus</i> spp. (indet.)
<i>Goneplax rhomboides</i>	<i>Echinus acutus</i>
<i>Monodeus couchi</i>	<i>Echinus esculentus</i>
<i>Calliostoma papillosum</i>	<i>Psamechinus miliaris</i>
<i>Calliostoma ziziphinum</i>	<i>Botryllus schlosseri</i>
<i>Buccinum undatum</i>	Ascidiacea (indet.)
<i>Neptunea antiqua</i>	

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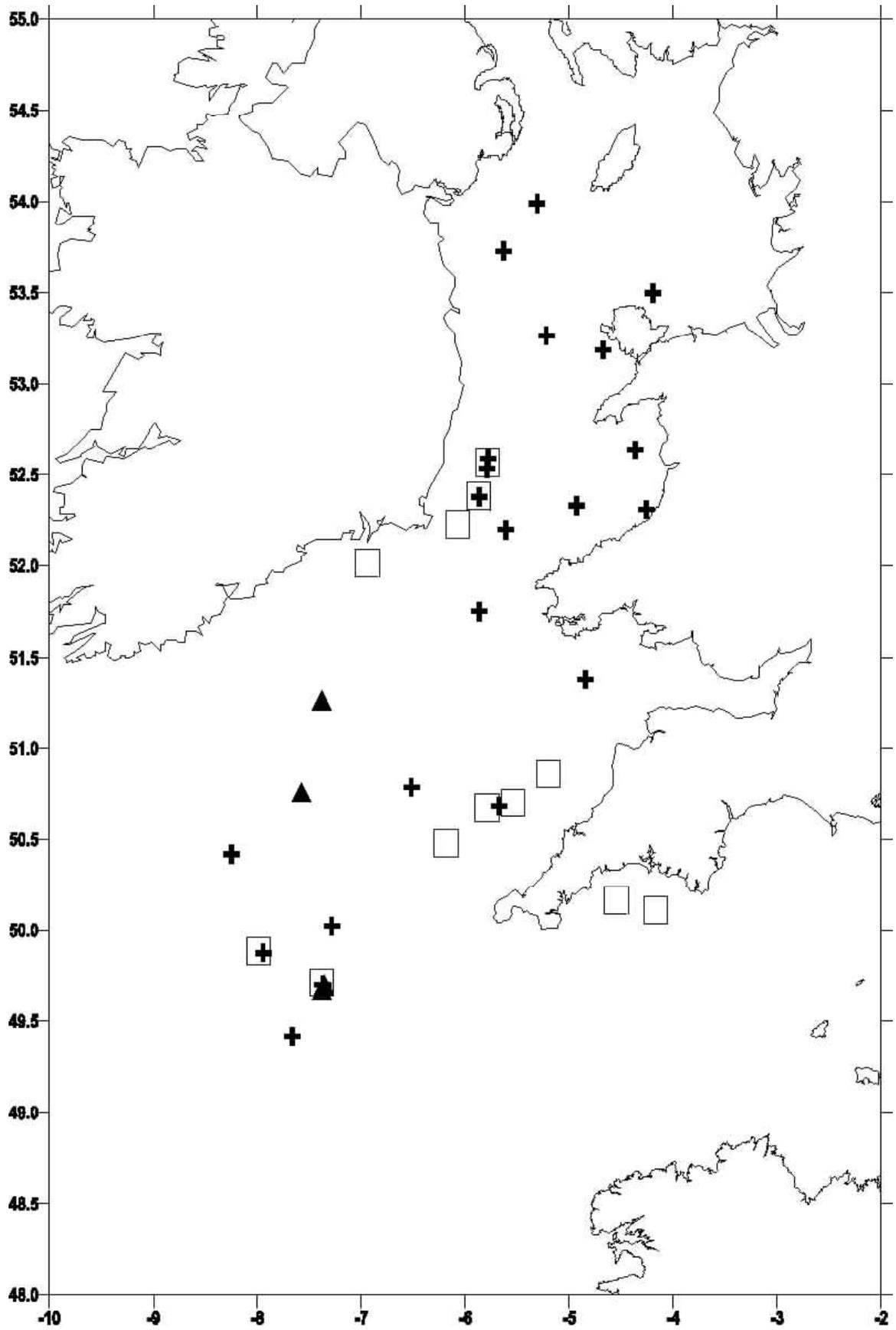
**TABLE 5:** Summary of cetacean sightings made during the cruise

Sighting details	Comments
21 November, 13:10 51°39.0'N 07°49.0'W	A small group of about 5 common dolphins came across the bow of the vessel, remained at distance off the starboard side whilst trawling and came towards the stern of the vessel on hauling.
22 November, 13:00 51°09.1'N 06°34.2'W	One whale was observed spouting between RV Thalassa and RV CEFAS Endeavour, although the species could not be positively identified.
25 November, 16:20 50°26.7'N 08°11.7'W	A small group of common dolphins (13 adults, 2 juveniles) were in the vicinity of the vessel shortly after hauling at station 58.
26 November, 13:15 50°22.0'N 07°09.6'-13.7'W	A small group of common dolphins were observed at occasional intervals crossing the bow for approximately 30 minutes.
27 November, 08:00 50°01.2'N 07°17.7'W	Medium sized group (15-20) common dolphins swimming alongside and astern whilst trawling.
28 November, 03:10 49°40.7'N 08°25.9'W	Medium sized group (10-15) common dolphins swimming alongside vessel
28 November, 08:00 49°42.3-39.0'N 07°34.9-22.1'W	Small group of common dolphins (5-10) appeared periodically around vessel from 08:00 until 11:00 whilst travelling between stations 63 and 64, and whilst towing on station 64.
30 November, 10:30 50°42.6'N 05°30.3'W	A small group (ca. 5) of common dolphins swam alongside and remained in the vicinity, being seen regularly whilst shooting and hauling at station 71 (50°41.92'N, 05°36.33'W at 11:21). At least 5 common dolphin were also observed after hauling at station 72 (50°40.12'N, 05°50.39'W at 13:11)

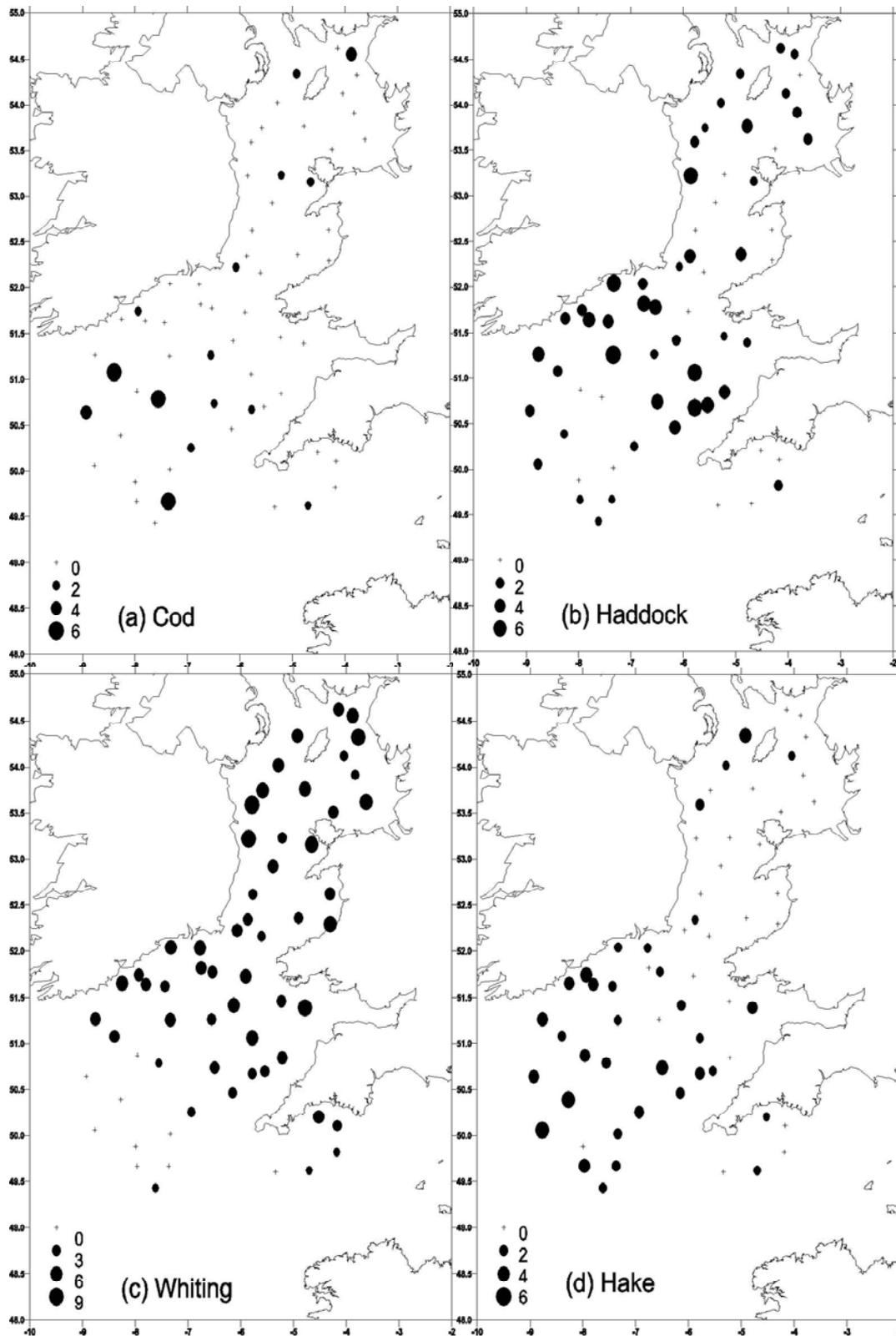
**FIGURE 1:** Map showing stations completed with the modified GOV trawl



**FIGURE 2:** Study area indicating sites sampled with additional tows (□) and 2m-beam trawl (▲), and the release locations of tagged fish (✚)



**FIGURE 3:** Distribution and relative abundance of (a) cod *Gadus morhua*, (b) haddock *Melanogrammus aeglefinus*, (c) whiting *Merlangius merlangus* and (d) hake *Merluccius merluccius*. Data for cod are number per hour, data for haddock, whiting and hake are based on Ln (1+ number per hour).



**FIGURE 4:** Distribution and relative abundance (number per hour) of (a) anglerfish *Lophius piscatorius*, (b) lemon sole *Microstomus kitt*, and (c) megrim *Lepidorhombus whiffiagonis*.

