CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT
2004 RESEARCH VESSEL PROGRAMME

REPORT: RV CEFAS ENDEAVOUR: CRUISE 15

STAFF:

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DURATION: Part 1: 8 – 24 November. Part 2: 25 November – 9 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 English Channel (ICES divisions VII a, 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 relative abundance of fish, cephalopods, and benthic invertebrates
   (b) Age-length distribution of selected species for ICES WG input and biological studies
   (c) Biological parameters of selected species

2. To continue the testing of the modified GOV trawl with rockhopper ground gear on hard grounds off Cornwall and in St George's Channel

3. To continue the development and testing of electronic data capture equipment and the new Fishing Survey System

4. To collect sediment samples at trawl stations

5. To sample areas of VIIg-h with 2m and 3m-beam trawl to quantify epibenthos and fish

6. To record any interesting biological observations regarding rare and unusual fishes, and sightings of cetaceans.

7. To collect biological material for the following projects/courses:

(a) Whole individuals of selected fish species should be frozen for fish identification courses
(b) Whole individuals of scallops *Pecten maximus* should be frozen (D. Palmer, CEFAS)
(c) Whole individuals of berried edible crab *Cancer pagurus* should be frozen (D. Eaton, CEFAS)
(d) Tissue samples from rays (Rajidae) should be preserved for molecular studies (M. Chevolot, University of Groningen / J.Ellis, CEFAS)
(e) Tissue samples from spurdog *Squalus acanthias* should be preserved for molecular studies (J. Franks, University of Washington / J.Ellis, CEFAS)

NARRATIVE:

CEFAS ENDEAVOUR sailed from Lowestoft at 19:15 on 08 November, and steamed to the western English Channel. On 09 November a helicopter was requested to take a deckhand off the ship for medical reasons. Later that day, with north-westerly gales forecast, CEFAS ENDEAVOUR steamed towards the inshore stations off Plymouth. Sampling commenced on 10 November, with four stations fished successfully with the modified GOV trawl with rockhopper ground gear, and three of these stations also sampled with shippek grab. In agreement with the Irish Marine Institute, who also used a similar rig in adjacent survey areas, a modified GOV was used on hard grounds in the survey area, which were unsuitable for the standard GOV. Catches were generally dominated by pilchard and scad, though 99 bass were caught at one station. That evening CEFAS ENDEAVOUR steamed towards Falmouth, and a replacement deckhand brought on board at first light the following day, and two stations were sampled successfully later that day. That night CEFAS ENDEAVOUR steamed to the Bristol Channel. Four stations were successfully sampled with both modified GOV and shippek grab on 12 November. Good catches of gadoids (haddock, whiting, cod, bib, pollack and hake) were made in this area, though one catch was dominated by the sand eel *Hyperoplus immaculatus*. The last catch of the day also included six greater-spotted dogfish, which were tagged and released.

CEFAS ENDEAVOUR steamed northwards in poor sea conditions, ready to commence sampling in St George's Channel at first light. Four stations were fished on 13 November, though strong tides off south-east Ireland hindered fishing operations and one tow was not deemed valid. The following day CEFAS ENDEAVOUR completed three stations in the western parts of St George's Channel and a further three stations fished successfully the following day. These catches were dominated by gadoids and elasmobranchs. On 16 November CEFAS ENDEAVOUR fished the hard ground station south of the Isle of Man, thus completing the stations that were initially selected to be fished with the modified GOV trawl with rockhopper ground gear.

The rockhopper trawl was removed from the net drum and the standard three-bridle GOV net with 5m central section and standard ground gear was rigged while steaming westwards. One station on the *Nephrops* ground was sampled successfully later that day. The trawl was damaged on shooting on the second tow of the afternoon and after repairs were completed, with daylight fading, this tow was reduced to 15 minutes duration. That evening the gear was modified slightly

(see below) so as to improve standardisation with the Irish Marine Institute. At first light on 17 November the two previous stations were re-surveyed, and then CEFAS ENDEAVOUR fished stations in Dundalk and Dundrum Bay. Large numbers of 0-group cod were caught in Dundalk Bay, whereas the catch in Dundrum Bay was dominated by the ascidian *Ascidia mentula*. On 18 November CEFAS ENDEAVOUR completed stations in the north-western Irish Sea and proceeded to the north-eastern Irish Sea, where a good catch of plaice was taken in the Solway Firth. The following day CEFAS ENDEAVOUR worked southwards down the eastern Irish Sea with three stations fished successfully. Some of these stations also contained numerous large specimens of the jellyfish *Rhizostoma*. On the fourth tow of the day the belly of the GOV was torn. As the catch, which comprised dead-mans fingers, queen scallops and lesser-spotted dogfish, was so large, it was probable that the belly was torn on hauling, and the tow was classed as additional. That evening, whilst repairs were made to the net, CEFAS ENDEAVOUR steamed to Liverpool bay and two fine ground stations fished successfully, with good catches of plaice, dab and whiting. Other stations in this area were not sampled as it was decided that the GOV with standard ground gear was likely to suffer further damage on these fishing grounds. That afternoon and night CEFAS ENDEAVOUR steamed southwards to stations at the north end of the Celtic Deep.

CEFAS ENDEAVOUR worked in the Celtic Deep on 21 November, and *Nephrops* and whiting were abundant at the three stations, with one tow resulting in approximately three tonnes of whiting. There were numerous French and Irish fishing vessels operating on these grounds. The following morning, samples were collected with 2m-beam trawl and grab, and then three stations were sampled successfully with the GOV trawl. Fishing was disrupted at the start of the day due to the computer and associated monitor displaying the data for the autotrawl system not functioning. Common dolphins were sighted regularly around the vessel during the last two stations. That night CEFAS ENDEAVOUR steamed westwards and four stations in the Bristol Channel fished on 23 November, before steaming towards Milford Haven and docking at 04:00 on 24 November, for a change of staff.

CEFAS ENDEAVOUR sailed at 16:00 on 25 November and steamed southwards to the Celtic Sea. The 2-m beam trawl was fished at 06:30 the following day, and the first trawl with the GOV resulted in major damage to the belly of the net. At this time it was decided to revert back to the modified GOV trawl with rockhopper ground gear and two stations were successfully fished that afternoon. Four stations were fished successfully the following day, and stations in French waters sampled on 28–29 November. CEFAS ENDEAVOUR then worked northwards, completing all stations on the western edge of the survey grid. Scanmar reading were becoming quite erratic at this time, and to ensure it was not due to the additional floats, the 11” floats in the centre of the headline were replaced with the kite. It was subsequently determined that the erratic readings were not reflecting the behaviour of the gear, and after rebooting the Scanmar display on the bridge, readings were more stable. Stations off southern Ireland were fished from 02-04 December, with one station comprising a good catch of large cod. Sprat dominated many of the catches and, once again, large numbers of *Rhizostoma* were also present.

On the evening of 04 December, CEFAS ENDEAVOUR steamed to the most southerly station in Cardigan Bay and three stations fished successfully, before

steaming southwards to the station off Milford Haven, which was fished successfully on the morning of 06 December. Later that day two stations that were fished with the standard GOV ground gear earlier in the survey were re-sampled with the rockhopper GOV. That night CEFAS ENDEAVOUR steamed to the final stations south-west of Cornwall and these two stations were completed by early afternoon, and CEFAS ENDEAVOUR then steamed towards Lowestoft, docking on the morning tide of 09 December.

GEAR DESCRIPTIONS

In order to ensure standardisation of the Q4 IBTS, CEFAS and the Irish Marine Institute have agreed to use similar gears over the survey area. On hard ground the trawl used was a modified GOV with rock hopper ground gear, while on softer ground, the gear consisted of the standard GOV trawl but with some minor changes as noted below.

GOV with rockhopper ground gear

The modified GOV trawl with rockhopper deployed was originally based on the gear used in the North Sea groundfish survey, though it contains several modifications:

- Only two bridles are used (40m upper bridle, 38m lower bridle + bumper chain set to 2m)
- The kite was not used, and was replaced by additional floats. The flotation was provided by a combination of 11" plastic floats, 8" plastic floats and 8" aluminium floats, which provide a lift of 8.4, 3.1 and 2.8kg respectively. The float configuration was 8x11" plastic floats in the square section and, on each wing, 4x8" aluminium floats, 5x8"plastic floats, 1x11" plastic float, 10x8" aluminium floats, 11x8" aluminium floats, and 1x11" plastic float (at the wing end) each side.
- 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 bridles, 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 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, indicating 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*.

This gear was initially used off Cornwall and at stations in St George's Channel. The catches at these stations were composed of a variety of fish and invertebrate species typical of hard ground (e.g. common sea urchin *Echinus esculentus,*

hornwrack *Flustra foliacea*, pollack *Pollachius pollachius* and sea snails *Liparis* spp.).

Tows with this gear were 30–40 minutes in duration, depending on towing speed (3–4 knots, depending on sea conditions). The warp:depth ratio was initially 3.5:1, though increased to 4:1 to improve net geometry. The wingspread of the net was generally around 18–20 m and headline height approximately 3.7–4.4m. No major damage occurred to the net.

GOV with standard ground gear

The standard GOV trawl, as used in the North Sea and as per IBTS specifications, was used though two modifications were made, so as to ensure comparability with the Irish Marine Institute, which also use such a rig. Firstly, the kite was not used, and was replaced by additional floats. The flotation was provided by a combination of 11" plastic floats, 8" plastic floats and 8" aluminium floats (with a lift of 8.4, 3.1 and 2.8kg respectively) and the float configuration was 8x11" plastic floats in the squareom section and, on each wing, 4x8" aluminium floats, 5x8"plastic floats, 1x11" plastic float, 10x8" aluminium floats, 11x8" aluminium floats, and 1x11" plastic float each side. Secondly, the toggle chains were reduced, so that the fishing line was tied onto the first free link of the toggle chain.

Tows with this gear were as recommended by the IBTS manual and consisted of 30 minutes in duration and the towing speed was 4 knots. The warp:depth ratio was 4:1. The wingspread of the net was generally in the range of 17–21m and headline height approximately 4–5m.

RESULTS:

Stations sampled

A total of 56 stations were fished successfully with the modified GOV with rockhopper ground gear (Table 1; Figure 1), with a further two tows not considered valid, as the door spread was reduced and the doors had fallen over for a period of the tow, and an additional two tows were undertaken to repeat stations previously fished with the standard ground gear. The GOV with standard ground gear was fished successfully at 23 stations (Table 1; Figure 1), and three tows classed as additional tows, including one tow where the belly of the net was torn on hauling and two where the toggle chains were set at 30cm. Sediment samples were collected at 55 trawl stations (Figure 2).

Commercial species

Otoliths and biological data were collected for commercially important fish species, and the numbers of each species sampled by strata is summarised in Table 3. In addition to the 3661 otoliths collected, collections of whole sprat were made from

ICES Division VIIa, and biological parameters collected for skates and rays (Rajidae).

Gadiforms: Cod *Gadus morhua* were caught at 38 of the 86 valid and additional stations (Figure 4a), with good catches of juveniles in Dundalk Bay and a good catch of larger individuals off southern Ireland. Haddock *Melanogrammus aeglefinus* were captured at 64 stations (Figure 4b), and the maximum CPUE was >520 kg.hr^{-1}. Whiting *Merlangius merlangus* were also abundant, being captured at 67 of the stations (Figure 4c), and the maximum CPUE was >9,000 kg.hr^{-1}. Hake *Merluccius merluccius* were captured at 59 of the core stations (Figure 4d), and consisted mainly of juvenile fish.

Anglerfish: Catches of anglerfish *Lophius piscatorious* (Figure 5a) and black-bellied anglerfish *L budegassa* were relatively low, with *L piscatorious* only caught at 27 of the stations.

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. Lemon sole *Microstomus kitt* were relatively common off south-east Ireland and in the Bristol Channel (Figure 5b), and the maximum CPUE was 8.9 kg.hr^{-1}. Though megrim *Lepidorhombus whiffiagonis* were caught regularly in the Celtic Sea (Figure 5c) and were recorded at 25 stations, catch per unit effort was low (<7.9 kg.hr^{-1}) and the survey grid does not extend far enough to the west to fully sample this population. Furthermore, the rockhopper gear may not sample 0-group megrim effectively and this age class may be sampled better by other gears (e.g. beam trawl). Plaice *Pleuronectes platessa* were recorded at 39 stations (Figure 5d) and the inclusion of certain inshore sites in the Bristol Channel and Irish Sea that were fished with the standard ground gear GOV improved the sampling of this species in comparison to the 2003 survey. Good catches of plaice were made in the Solway Firth.

Fish tagging

During the course of the survey, a total of 136 elasmobranchs were tagged with Petersen discs and released, with summary details given in Table 4 and release locations shown in Figure 3.

Ichthyological observations

Overall, 92 species of fish were recorded during the survey (Table 2), and most of the species caught were relatively common. Unusual fish species caught included specimens of stingray *Dasyatis pastinaca*, red sea bream *Pagellus bogaraveo* and Yarrell's blenny *Chirolophis ascanii* in the western English Channel. Catches from stations in the northern parts of St George's Channel yielded numerous specimens of sea snail *Liparis* spp. In total, five specimens of lampern *Lampetra fluviatilis* were recorded from three stations in the eastern Irish Sea. Catches in the Bristol Channel included several specimens of triggerfish *Balistes capriscus* and one juvenile common skate *Dipturus batis*. A mature female *D. batis* (135cm total

length, 18.86kg) was recorded at a station in the vicinity of Jones Bank in the Celtic Sea.

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 (shrimps, prawns, swimming crabs, spider crabs 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 cod-end of the net. A list of the invertebrates caught by the main survey trawls is given in Table 5.

Beam trawl survey

Twelve sites within the Celtic Sea (ICES divisions VIIf-h) were also sampled with 2m-beam trawl (Figure 2). 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*.

Cetacean sightings

Sightings of cetaceans were recorded during the survey, with all sightings made in the outer Bristol Channel and Celtic Sea (ICES Divisions VIIf-h). Most observations were for common dolphin (*Delphinus delphis*), and are summarised in Table 6.

Collection of biological material

Several requests for biological material were undertaken:

(a) Whole individuals of selected fish species were frozen for fish identification courses.
(b) Samples of scallop *Pecten maximus* were collected, though catches were not great as the gears used were not appropriate for sampling this species.
(c) No berried edible crab *Cancer pagurus* were recorded during the survey
(d) Tissue samples were collected from spotted ray *Raja montagui* (n=6) and thornback ray *Raja clavata* (n=44) for genetic studies.
(e) Spines were collected from 24 specimens of spurdog *Squalus acanthias*, and it is hoped that tissue from these will be suitable for genetic studies. The remaining spurdog caught were tagged and released and tissue samples were not collected from these individuals.

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

J Ellis
9 December 2004

SEEN IN DRAFT

R McCurry (Master)
A. Lincoln (Senior Fishing Mate)

INITIALLED:

Dr R.S. Millner

DISTRIBUTION:

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

TABLE 1: Summary of gear deployments

Gear	Valid	Additional	Invalid	Total
Rockhopper	56[(a)]	4[(b)]	0	60
Standard ground gear	23	3[(c)]	1	27
Shippek grab	55	0	0	55
2m beam trawl	12	0	0	12

(a) Including 18 stations where the kite was used instead of additional flotation; (b) two tows were not declared valid due to doubts about net geometry, and two stations fished with the standard ground gear were repeated with the rockhopper trawl; (c) two tows were undertaken with the toggle chains set at 30cm, and were then repeated with reduced toggle chains, and one tow in which the belly of the net was ripped was not invalidated due to the large catch, suggesting that the net had likely torn on hauling.

TABLE 2: List of fish species caught during the survey and the number of stations at which they were recorded

Species	Stns	Species	Stns
Squalus acanthias	21	*Myoxocephalus scorpius*	2
Scyliorhinus canicula	73	*Taurulus lilljeborgi*	1
Scyliorhinus stellaris	10	*Agonus cataphractus*	16
Galeorhinus galeus	5	*Cyclopterus lumpus*	1
Mustelus asterias	11	*Liparis liparis*	1
Mustelus mustelus	6	*Liparis montagui*	4
Dipturus batis	2	*Dicentrarchus labrax*	7
Leucoraja naevus	12	*Pagellus bogaraveo*	1
Raja brachyura	6	*Spondyliosoma cantharus*	1
Raja clavata	19	*Trachurus trachurus*	70
Raja microocellata	5	*Mullus surmuletus*	13
Raja montagui	16	*Cepola rubescens*	2
Dasyatis pastinaca	1	*Ctenolabrus rupestris*	3
Lampetra fluviatilis	3	*Echiichthys vipera*	5
Anguilla anguilla	1	*Trachinus draco*	3
Conger conger	18	*Ammodytes tobianus*	1
Clupea harengus	48	*Gymnammodytes semisquamatus*	1
Sprattus sprattus	56	*Hyperoplus immaculatus*	6
Sardina pilchardus	10	*Hyperopus lanceolatus*	5
Engraulis encrasicolus	28	Ammodytidae indet	1
Argentinidae	31	*Callionymus lyra*	59
Maurolicus muelleri	20	*Callionymus maculatus*	31
Lophius budegassa	4	*Callionymus reticulatus*	4
Lophius piscatorius	27	*Blennius ocellaris*	1
Gadiculus argenteus	12	*Chirolophis acanii*	1
Gadus morhua	36	*Gobius paganellus*	1
Melanogrammus aeglefinus	65	*Lesueurigobius friesii*	2
Merlangius merlangus	68	*Pomatoschistus* spp.	23
Micromesistius poutassou	37	*Scomber scombrus*	40
Pollachius pollachius	6	*Lepidorhombus whiffiagonis*	26
Trisopterus esmarki	54	*Scophthalmus maximus*	6
Trisopterus luscus	19	*Scophthalmus rhombus*	5
Trisopterus minutus	83	*Phrynorhombus norvegius*	2
Phycis blennoides	10	*Arnoglossus imperialis*	7
Molva molva	5	*Arnoglossus laterna*	10
Ciliata septentrionalis	1	*Glyptocephalus cynoglossus*	12
Ciliata mustela	1	*Hippoglossoides platessoides*	30
Enchelyopus cimbrius	9	*Limanda limanda*	42
Merluccius merluccius	60	*Microstomus kitt*	37
Belone belone	1	*Platichthys flesus*	2
Zeus faber	54	*Pleuronectes platessa*	39
Capros aper	27	*Buglossidium luteum*	12
Helicolenus dactylopterus	1	*Microchirus variegatus*	31
Aspitrigla cuculus	46	*Pegusa lascaris*	3
Eutrigla gurnardus	53	*Solea solea*	16
Trigla lucerna	21	*Balistes capriscus*	2
Trigloporus lastoviza	1		

TABLE 3: Number of commercial fishes for which otoliths were collected during the survey

Species	Number collected
Herring *Clupea harengus*	241
Cod *Gadus morhua*	159
Haddock *Melanogrammus aeglefinus*	778
Whiting *Merlangius merlangus*	792
Hake *Merluccius merluccius*	247
Turbot *Scophthalmus maximus*	10
Brill *Scophthalmus rhombus*	6
Megrim *Lepidorhombus whiffiagonis*	130
Lemon sole *Microstomus kitt*	139
Plaice *Pleuronectes platessa*	761
Sole *Solea solea*	51
Anglerfish *Lophius piscatorius*	36
Anglerfish *Lophius budegassa*	4
Bass *Dicentrarchus labrax*	75
Red mullet *Mullus surmuletus*	31
Mackerel *Scomber scombrus*	201
TOTAL	3661

TABLE 4: Summary of fish tagged by species and sex

Species	Male	Female
Spurdog *Squalus acanthias*	19	30
Greater spotted dogfish *Scyliorhinus stellaris*	17	11
Tope *Galeorhinus galeus*	2	5
Starry smoothhound *Mustelus asterias*	31	5
Smoothhound *Mustelus mustelus*	10	4
Common stingray *Dasyatis pastinaca*	0	1
Common skate *Dipturus batis*	1	0
TOTAL	136	

TABLE 5: List of invertebrates caught during the survey

Haliclona oculata	*Hyas araneus*	*Spisula subtruncata*
Tethya aurantium	*Hyas coarctatus*	*Arctica islandica*
	Eurynome aspera	
Hydrallmania falcata	*Inachus dorsettensis*	*Rossia macrosoma*
Nemertesia antennina	*Inachus leptochirus*	*Sepiola atlantica*
Lytocarpia myriophyllum	*Macropodia linaresi*	*Sepia elegans*
Hydrozoa (indet.)	*Macropodia rostrata*	Sepia officinalis
Virgularia mirabilis	*Macropodia tenuirostris*	*Sepia orbignyana*
Epizoanthus papillosus	*Maia squinado*	*Alloteuthis subulata*
Alcyonium digitatum	*Pisa armata*	*Loligo forbesi*
Caryophyllia smithi	*Atelecyclus rotundatus*	*Illex* spp.
Actinauge richardi	*Corystes cassivelaunus*	*Todaropsis eblanae*
Adamsia carciniopados	*Cancer pagurus*	*Eledone cirrosa*
Calliactis parasitica	*Liocarcinus corrugatus*	
Metridium senile	*Liocarcinus depurator*	*Alcyonidium diaphanum*
Urticina felina	*Liocarcinus holsatus*	*Alcyonidium parasiticum*
	Liocarcinum marmoreus	*Cellaria* spp.
Aphrodita aculeata	*Macropipus tuberculatus*	*Flustra foliacea*
Aphroditidae (indet.)	*Necora puber*	*Pentapora foliacea*
Hyalinoecia tubicola	*Goneplax rhomboides*	
Sabella sp.	*Monodeus couchi*	*Astropecten irregularis*
Sabellaria spinulosa	*Pilumnus hirtellus*	*Luidia ciliaris*
	Xanthidae (indet.)	*Luidia sarsi*
Pontobdella muricata		*Stichastrella rosea*
	Pycnogonum littorale	*Henricia oculata*
Scalpellum scalpellum		*Anseropoda placenta*
Cirolana cranchii	*Calliostoma papillosum*	*Porania pulvillus*
	Calliostoma ziziphinum	*Crossaster papposus*
Pasiphaea sivado	*Polinices fusca*	*Asterias rubens*
Alpheus glaber	*Buccinum humpreysianum*	*Marthasterias glacialis*
Palaemon serratus	*Buccinum undatum*	*Ophiura albida*
Processa canaliculata	*Colus gracilis*	*Ophiura ophiura*
Pandalus montagui	*Neptunea antiqua*	*Ophiocomina nigra*
Pandalus propinquus	*Scaphander lignarius*	*Ophiothrix fragilis*
Dichelopandalus bonnieri	*Philine aperta*	*Ophiothrix lutkeni*
Crangon allmanni	*Archidoris pseudargus*	*Echinus acutus*
Crangon crangon	*Tritonia hombergii*	*Echinus esculentus*
Pontophilus spinosus	*Dendronotus frondosus*	*Echinus* spp. (indet.)
Homarus gammarus	Nudibranchia (indet.)	*Psamechinus miliaris*
Nephrops norvegicus		*Brissopsis lyrifer*
Anapagurus laevis	*Nucula sulcata*	*Echinocardium cordatum*
Pagurus bernhardus	*Aequipecten opercularis*	*Spatangus purpureus*
Pagurus prideaux	*Palliolum tigerinum*	
Galathea strigosa	*Pecten maximus*	*Botryllus schlosseri*
Munida rugosa	*Mytilus edulis*	*Ascidia mentula*
Calocaris macandrea	*Modiolus modiolus*	*Ascidiella scabra*
Ebalia tuberosa	Limidae (indet.)	*Ascidiacea (indet.)*

TABLE 6: Summary of cetacean sightings made during the cruise

Sighting details	Comments
12 November 50°29'N, 06°12'W	A medium-sized group of 20–40 common dolphins were swimming off the port side of the vessel and bow-riding.
22 November, 09:50 50°50.2'N, 06°39.1'W	Three adult common dolphin by vessel.
22 November,14:15- 14:50 51°01.5'N, 06°01.4'W	A small group of 6–12 common dolphins were swimming alongside the vessel and bow-riding whilst fishing at prime station E10.
22 November, 16:10- 16:50 51°05.7'N, 05°48.8'W	A small group of 6–12 common dolphins were swimming alongside the vessel and bow-riding whilst fishing at prime station E11.
26 November, 10:00 50°15.9'N, 06°52.4'W	Two common dolphins alongside vessel.
26 November, 16:00 50°01.2'N, 07°18.7'W	Three common dolphins swimming alongside vessel whilst hauling at prime station F11
27 November, 13:05 49°43.1'N, 07°34.5'W	Small group of common dolphins (ca. 10) by vessel.
27 November, 15:30 49°37.9'N, 07°23.5'W	Small group of common dolphins (ca. 10–15) by vessel.
30 November, 09:30 49°03.6'N, 08°11.8'W 49°04,3'N, 08°26.4'W	Small group of common dolphins (ca. 5–10) by vessel between 09:30 and 10:10.
30 November, 13:30 49°19.2'N, 08°48.9'W	One common dolphin bow-riding.
30 November, 15:40 49°28.4'N, 08°41.4'W	Small group of common dolphins (ca. 5–10) by vessel whilst grab sampling at prime station F15, and a small group observed at 16:30 (49°33.3'N, 08°42.0'W)
01 December, 06:40 50°00.5'N, 08°47.7'W	Relatively large group of common dolphins (>20) whilst beam trawling at prime station F10; 4–6 common dolphin observed whilst hauling the main trawl at 08:25; and a group of 8–10 seen at 50°11.2'N, 08°35.3'W at 09:27, whilst steaming to F8.
01 December, 14:40 50°38.5'N, 08°55.9'W	3–6 common dolphins whilst hauling the main trawl at prime station F7.
02 December, 08:00 51°15.6'N, 08°44.6'W	Unidentified whale between vessel and land whilst shooting the trawl at prime station F3.
02 December, 13:10 50°50.9'N, 07°59.2'W	3–4 common dolphins whilst trawling at prime station F5.
04 December, 13:10 52°01.7'N, 07°23.4'W	10–15 common dolphins whilst trawling at prime station D1
06 December, 13:40 51°11.4'N 05°16.5'W	3 common dolphins by vessel shortly after hauling at prime station E12, and 2–3 seen at 15:00 at 51°02.8'N, 05°27.8'W)
07 December, 09:30 49°14.2'N, 06°59.1'W	8–10 common dolphins shortly after hauling at prime station F19.
07 December, 12:05 49°30.6'N, 06°22.5'W	Approximately 6 common dolphins observed whilst fishing at prime station G11.
07 December, 15:15 49°37.4'N, 05°42.7'W	3–5 common dolphins whilst steaming.

FIGURE 1: Map showing stations fished with GOV trawl with rockhopper ground gear (solid triangles) and standard ground gear (solid circles) and sites of additional tows (open circles).

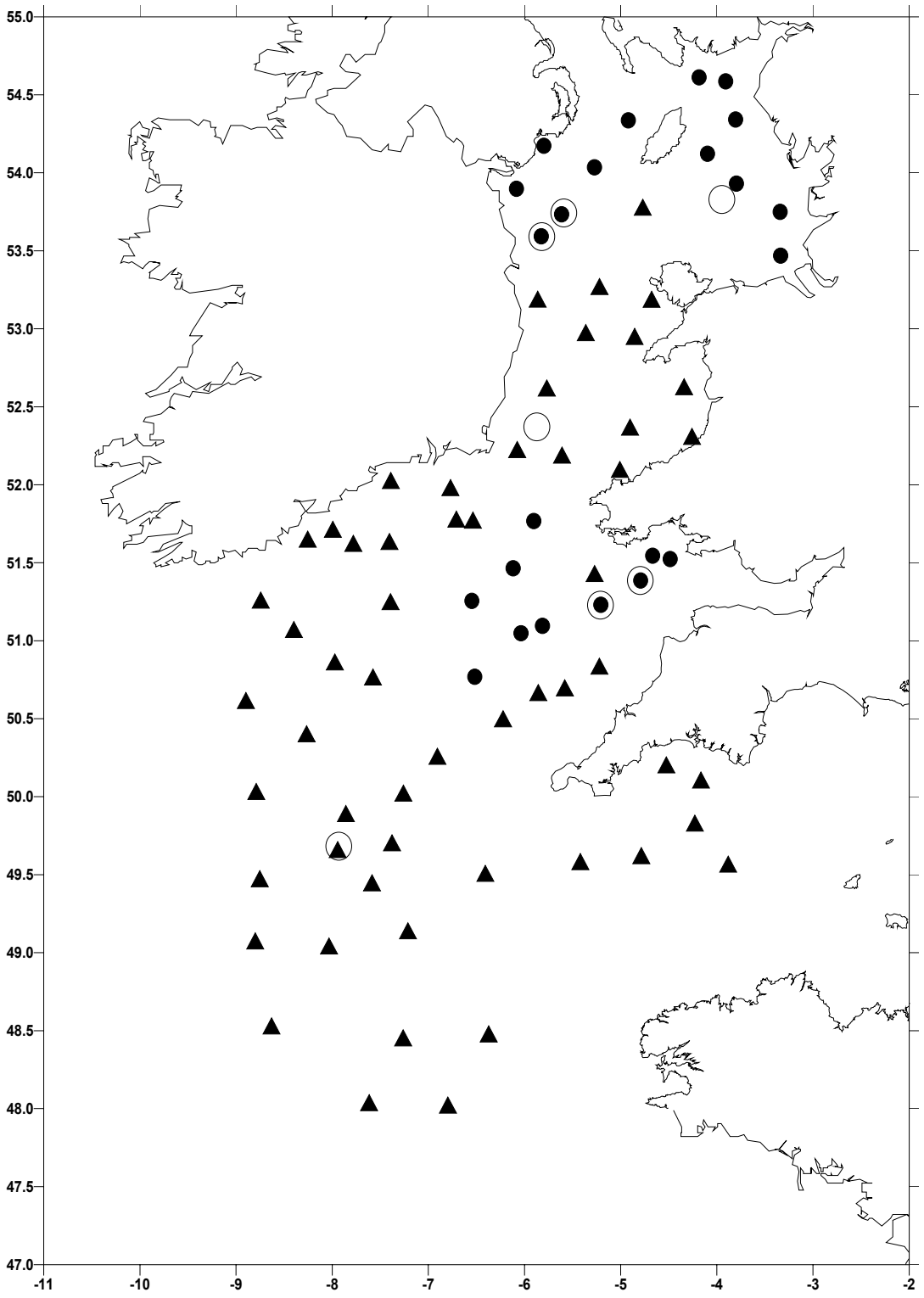

FIGURE 2: Study area indicating sites sampled with 2m-beam trawl (open circles), and shippek grab (solid triangles).

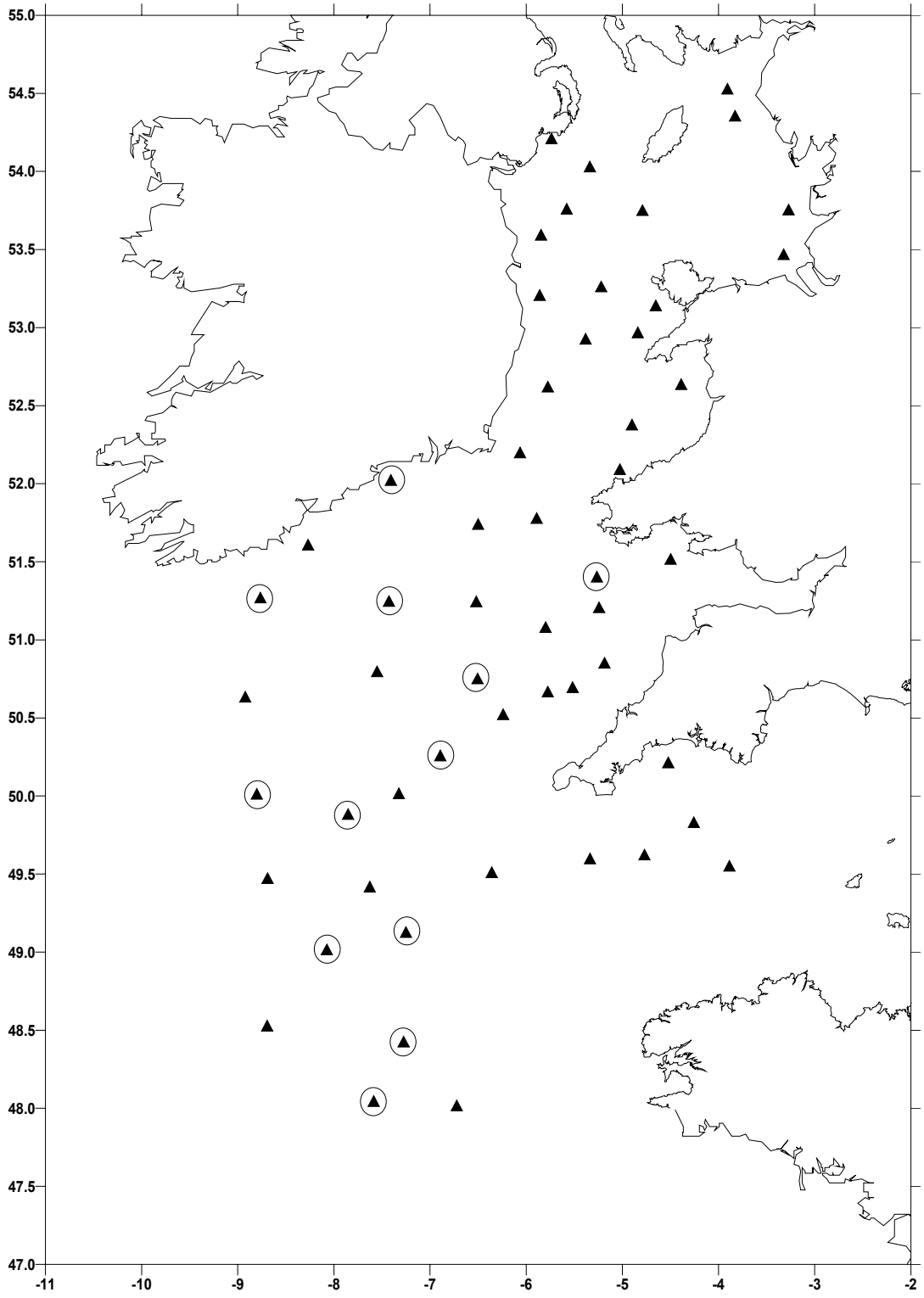

FIGURE 3: Study area indicating sites where elasmobranches were tagged and released.

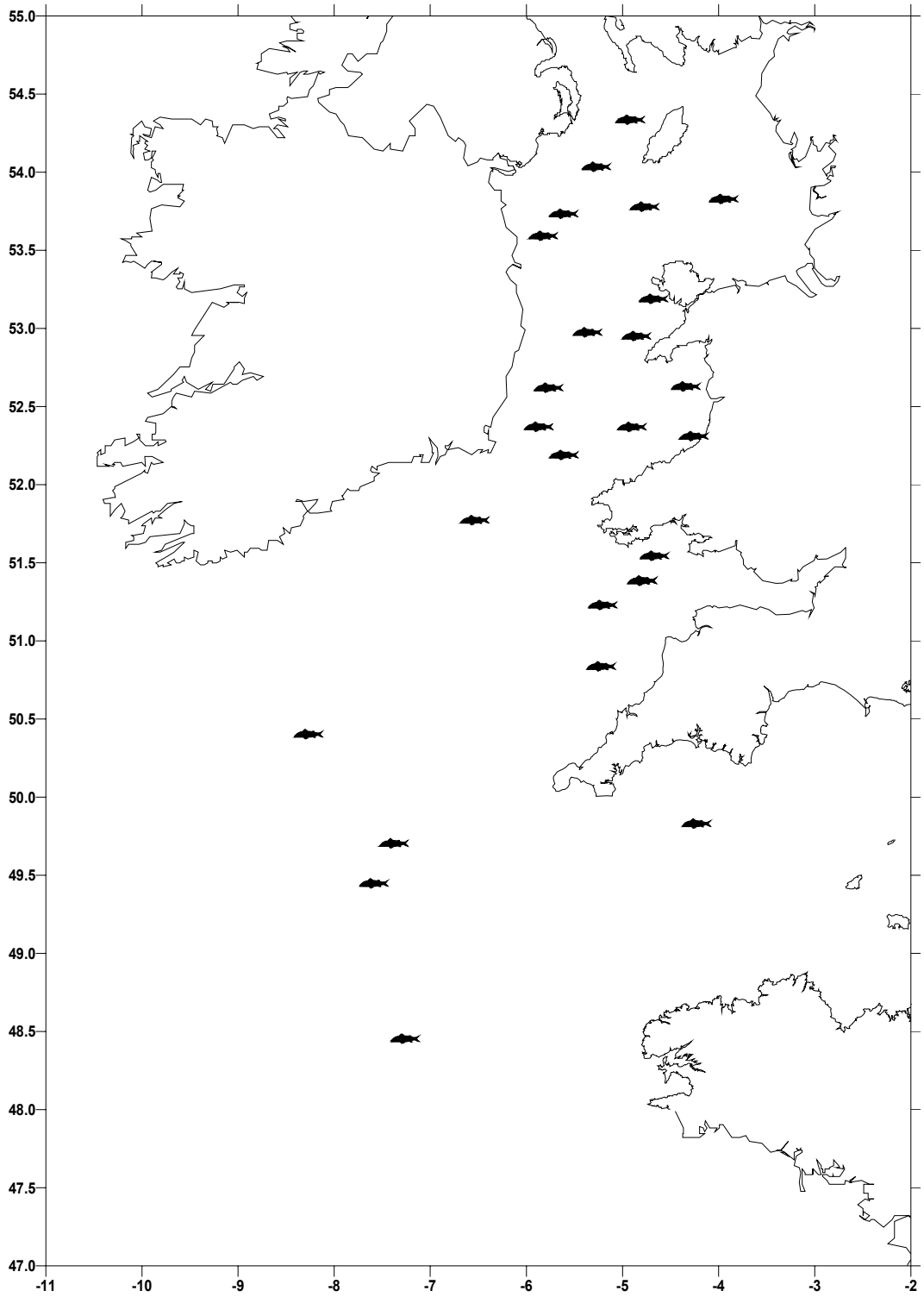

FIGURE 4: Distribution and relative abundance (ln (1 + kg per hour)) of (a) cod *Gadus morhua*, (b) haddock *Melanogrammus aeglefinus*, (c) whiting *Merlangius merlangus* and (d) hake *Merluccius merluccius.*

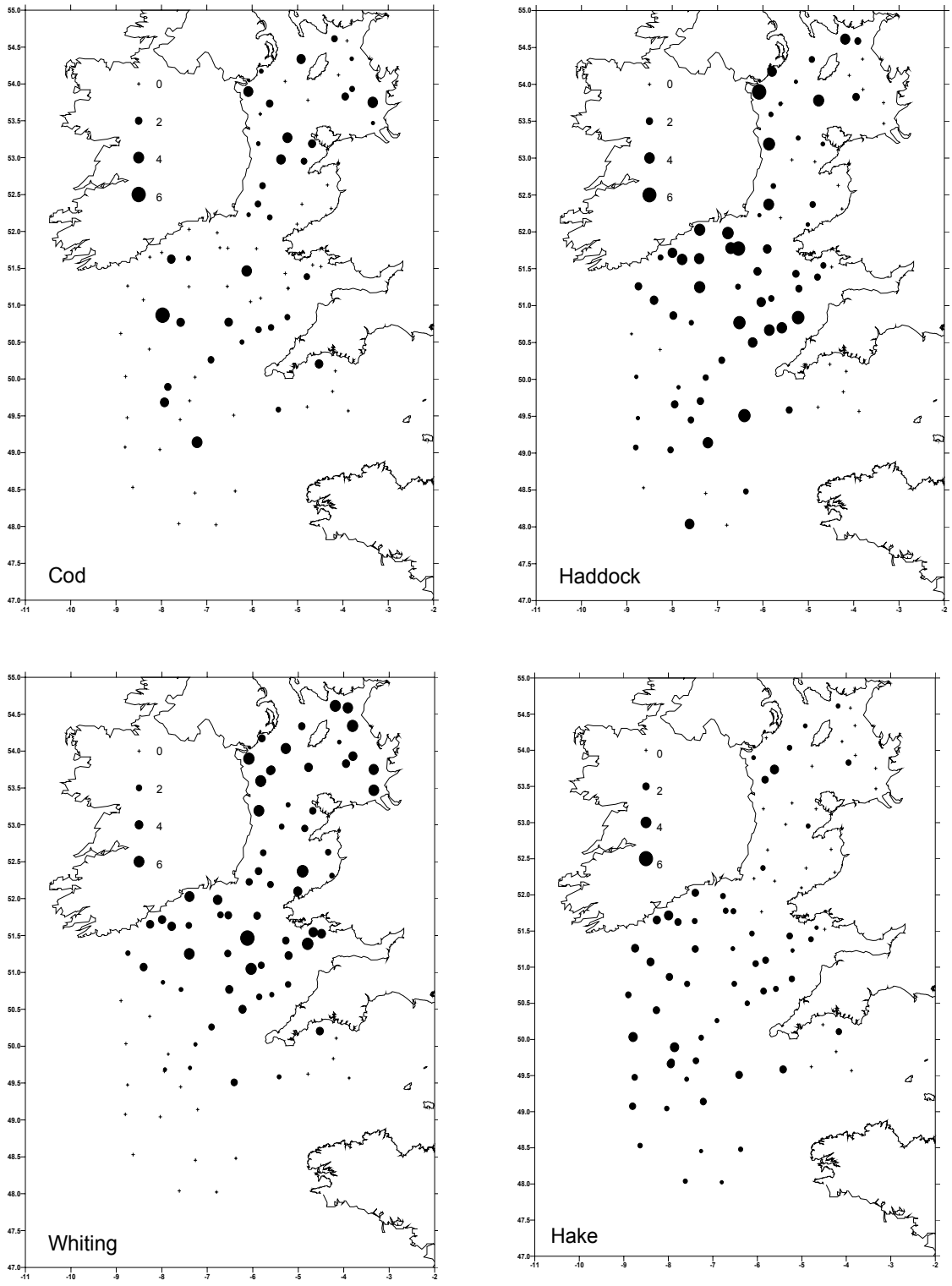

FIGURE 5: Distribution and relative abundance (ln (1 + kg per hour)) of (a) anglerfish *Lophius piscatorius*, (b) lemon sole *Microstomus kitt*, (c) megrim *Lepidorhombus whiffiagonis* and (d) plaice *Pleuronectes platessa*