

**CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT
2005 RESEARCH VESSEL PROGRAMME**

REPORT: RV CEFAS ENDEAVOUR: CRUISE 19/05

STAFF:

<u>Part 1</u>	<u>Part 2</u>
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DURATION: Part 1: 13 – 30 November. Part 2: 01 December – 13 December

LOCATION: Irish Sea, Celtic Sea, 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), using the modified GOV trawl with rockhopper ground gear on hard grounds and standard IBTS GOV trawl on fine grounds, 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 commercial fish species for ICES WG input and biological studies
 - (c) Biological parameters of selected species
 - (d) Environmental parameters (including CTD profiles and sediment samples) at trawl stations
2. To tag and release specimens of spurdog *Squalus acanthias*, smooth-hound *Mustelus* spp., tope *Galeorhinus galeus* and greater-spotted dogfish *Scyliorhinus stellaris*.
3. To sample the epibenthos in ICES divisions VII f-h with 2m beam trawl
4. To record details of surface sightings of any marine mammals, sea turtles and pelagic fish, and record observations on jellyfish aggregations
5. To undertake scallop sampling in the eastern English Channel (C2282)
6. To collect biological material in support of research projects:

- (a) Samples of sprat *Sprattus sprattus* and anchovy *Engraulis encrasicolus* should be collected at various sites in the survey area (where n=100 per sample) and frozen whole for genetic studies
- (b) Samples of scallop *Pecten maximus* should be frozen (D. Palmer, Cefas)
- (c) Samples of berried edible crab *Cancer pagurus* should be frozen (D. Eaton, Cefas)
- (d) Tissue samples from a wide range of invertebrates should be preserved in ethanol for genetic studies (C. Fox, Cefas)
- (e) Tissue samples of sole *Solea solea* and sand sole *Pegusa lascaris* should be preserved in ethanol for genetic studies
- (f) Tissue samples of tope *Galeorhinus galeus* should be preserved in ethanol for genetic studies
- (g) Samples (whole fish or tissue samples frozen) of spurdog *Squalus acanthias*, pollock *Pollachius pollachius*, Dover sole *Solea solea*, lemon sole *Microstomus kitt*, anglerfish *Lophius piscatorius*, red mullet *Mullus surmuletus*, sea bass *Dicentrarchus labrax*, witch *Glyptocephalus cynoglossus*, sardine *Sardina pilchardus*, ling *Molva molva* and sea-bream (n=5 for each species).

NARRATIVE:

CEFAS ENDEAVOUR sailed from Lowestoft at 07:00 on 13 November, steamed to the eastern English Channel, and arrived at the first site for scallop dredging at 16:30. Seven sites were sampled successfully that evening, with the seventh tow completed at 23:50. The scallop survey continued at 07:30 the following morning, and a further ten tows completed by 23:00. The final eight stations were sampled the following day, with dredging completed by 15:00. CEFAS ENDEAVOUR then steamed westwards, with one member of staff put ashore at Brixham at first light on 16 November.

CEFAS ENDEAVOUR then steamed to the trawling grounds, arriving on the first site at 12:30. The winch failed on shooting the rockhopper trawl at the first station, and was fixed shortly after 18:00 hours. That evening, the trawl was deployed briefly, in order to test the Scanmar units and winches, though major damage to the belly of the net was sustained. Following extensive repairs, the trawl was ready for deployment by 07:30 the following day, and the first station completed successfully. On hauling the trawl at the second station of the day, the cod-end tore whilst the net came over the stern, though the liner was not damaged and the catch processed. Repairs to the cod-end were completed within six hours and a third station sampled successfully.

Sampling stations in the western English Channel was completed on 18 November, with the final three tows sampled without major damage, and CEFAS ENDEAVOUR steamed westwards. Five stations were fished successfully the following day, thereby completing 11 of the hard-ground stations around Devon and Cornwall, and CEFAS ENDEAVOUR steamed northwards towards Cardigan Bay that night.

Sampling in Cardigan Bay commenced at first light on 20 November, with all four stations fished successfully. The following day CEFAS ENDEAVOUR worked off south-eastern Ireland, though gear damage was sustained on the second tow of the day, when the upper wing on the port side tore. After repairs, a third station

was fished successfully. Stations in the northern St George's Channel were sampled on 22 November, with the first two stations fished without incident. The third tow of the day was off the Llyn Peninsula, where a large catch (ca. five tonnes) of spurdog resulted in a delay in getting the catch on board, and also caused some damage to the net. The majority of the spurdog were mature females carrying either term pups or one-year old embryos, and fecundity was recorded for a sub-sample of more than 200 fish.

CEFAS ENDEAVOUR continued fishing in the northern St George's Channel and central Irish Sea on 23-24 November, though sampling was curtailed on 24 November when, in worsening sea conditions and strong north-westerly winds, CEFAS ENDEAVOUR steamed to the Isle of Man to take a member of the crew ashore. CEFAS ENDEAVOUR dodged south of the Isle of Man that afternoon and evening, whilst the rockhopper rig was replaced with the standard GOV trawl, and steamed north towards the Solway Firth that night. Two stations in the north-eastern Irish Sea were fished successfully on 25 November, with a third station not deemed valid due to a low headline height, possibly due to the upper and middle bridles getting twisted in the poor sea conditions. Weather conditions further deteriorated on hauling this tow, and CEFAS ENDEAVOUR returned to the more sheltered conditions of the Solway Firth. That night CEFAS ENDEAVOUR steamed westwards, with stations west of the Isle of Man, Dundrum Bay and Dundalk Bay sampled on 26 November. Unfortunately the tow in Dundalk Bay resulted in significant gear damage, though juvenile cod were relatively abundant, as noted in the previous year.

Gear repairs were conducted whilst steaming eastwards to Liverpool Bay, and four stations in the eastern Irish Sea were fished successfully on 27 November, with good catches of plaice, sole and thornback ray made in Liverpool Bay. The following day, a further four stations in the Irish Sea were sampled, and CEFAS ENDEAVOUR steamed southwards to the Celtic Sea that night. Three stations in the Celtic Deep were fished on the morning of the 29 November, before CEFAS ENDEAVOUR steamed to Cork for a change of staff, docking at 22:00 that night.

CEFAS ENDEAVOUR departed Cork at 16:00 on 01 December, following a short delay, and steamed eastwards in poor sea conditions. Three stations were fished in the Bristol Channel on the morning of 02 December, though the third tow resulted in severe gear damage, and a replacement trawl was rigged. The following morning, beam trawl sampling was undertaken in the outer Carmarthen Bay to collect additional samples of sand sole, and CEFAS ENDEAVOUR then steamed westwards towards Milford Haven. Fishing was delayed that morning, as worsening sea conditions extended the steaming time. CEFAS ENDEAVOUR finally arrived on station at midday, and one successful haul was made in parallel with the RV THALASSA. The second tow of the day, however, resulted in further extensive gear damage, and the standard GOV was then replaced with the modified GOV on rockhopper ground gear.

Weather conditions slowly improved and fishing operations from 04 December to 06 December in the northern Celtic Sea passed without incident. Weather conditions slowly deteriorated on 07 December, with two stations fished successfully, until strong winds and large swell prevented fishing operations. Sea conditions improved over the following days, and CEFAS ENDEAVOUR worked

southwards, sampling stations in the Celtic Sea without any major incidents. The final fishing station was sampled on the morning of 12 December, and CEFAS ENDEAVOUR then steamed eastwards, docking in Falmouth at 15:00 hours.

GEAR DESCRIPTIONS:

The modified GOV with rockhopper ground gear was used on fishing grounds around the Cornish Peninsula, St George's Channel and central Irish Sea, whilst the standard ground gear was used on softer grounds in the Irish Sea, Celtic Deep and Bristol Channel. Following on from extensive gear damage to the standard GOV trawl in the outer Bristol Channel, the rest of the grid was sampled with rockhopper GOV. More detailed gear descriptions are given in the cruise report for the 2004 survey.

STATIONS SAMPLED:

Overall, 73 of 87 fixed stations were fished successfully, four stations resulted in damage and were not re-sampled, and ten sites were not sampled due to time constraints. A total of 55 stations were fished successfully with the modified GOV with rockhopper ground gear (Figure 1), with a further one tow not considered valid as the upper wing sustained damage. The GOV with standard ground gear was fished successfully at 18 stations (Figure 1), one tow was classed as additional, as the headline height was low, and three tows classed as invalid due to major damage to the belly of the net. Sediment samples were collected with shippek grab at 38 of the trawl stations (Figure 2), and beam trawl samples were collected at nine stations, with a further tow undertaken to collect sand sole. All 25 designated sites for scallop sampling in the eastern English Channel were fished. The number of tows by gear are summarised in Table 1.

RESULTS:

(1) TRAWL SURVEY

Otoliths and biological data were collected for commercially important fish species, and the numbers of each species for which otoliths were collected is summarised in Table 3. In addition to the 3149 otoliths collected, biological parameters were also collected for all species of skate and ray (Rajidae), with caudal thorns also collected for thornback ray *Raja clavata* and smalleyed ray *Raja microcellata*.

Gadiforms: Cod *Gadus morhua* were caught at 36 of the 74 valid and additional stations (Figure 3), with good catches of juveniles in the eastern Irish Sea. Haddock *Melanogrammus aeglefinus* were captured at 52 stations (Figure 3), and the maximum CPUE was $>710 \text{ kg.hr}^{-1}$. Whiting *Merlangius merlangus* were also abundant, being captured at 61 of the stations (Figure 3), and the maximum CPUE was $>1338 \text{ kg.hr}^{-1}$. Hake *Merluccius merluccius* were captured at 49 stations (Figure 3), and consisted mainly of juvenile fish.

Anglerfish: Catches of anglerfish *Lophius piscatorius* (Figure 4) and black-bellied anglerfish *L. budegassa* were relatively low, with *L. piscatorius* only caught at 22 stations.

Flatfish: Catches of commercial flatfish were light, as the rockhopper ground gear 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 4), and the maximum CPUE was 11.5 kg.hr⁻¹. Though megrim *Lepidorhombus whiffiagonis* were caught regularly in the Celtic Sea (Figure 4) and were recorded at 26 stations, catch per unit effort was low, with even the best catches yielding less than 4 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 more effectively by other gears (e.g. beam trawl). Plaice *Pleuronectes platessa* were recorded at 50 stations (Figure 4), and catches of > 160 kg.hr⁻¹ were made in the Solway Firth.

Ichthyological observations: Overall, 84 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 allis shad *Alosa alosa* and twaite shad *Alosa fallax*. One specimen of river lamprey *Lampetra fluviatilis* was recorded in the eastern Irish Sea. Numerous specimens of sea snail *Liparis liparis* were recorded from a station in the southern St George's Channel. A large catch of mature female spurdog was made off the Llyn Peninsula, and the fecundity-length relationship from additional biological sampling is illustrated in Figure 5.

Benthic observations: Whereas the gears used are not considered suitable for the quantitative analysis of benthic and epibenthic invertebrates, data on abundance were collected, as such data provides additional indications of bottom type. Catches of invertebrates were small, especially with the rockhopper ground gear, and echinoderms (sea urchins and starfish) and crustaceans (shrimps, prawns, swimming crabs, spider crabs and hermit crab) were 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.

(2) FISH TAGGING

During the course of the survey, a total of 154 elasmobranchs were tagged with Petersen discs and released, with summary details given in Table 4 and release locations shown in Figure 6.

(3) EPIBENTHOS SAMPLING

Nine sites within the Bristol Channel and Celtic Sea (ICES divisions VII-f-h) were also sampled with 2m-beam trawl (Figure 2). Samples were dominated by echinoderms and crustaceans, and were characterised by the presence of species such as *Crangon allmanni*, *Pagurus prideaux*, *Astropecten irregularis*, *Luidia sarsi* and *Actinauge richardi*.

(4) OBSERVATIONS ON MARINE MAMMALS, PELAGIC FISH AND JELLYFISH

Frequent sightings of common dolphin *Delphinus delphis* were recorded during the survey, with all sightings made in the outer Bristol Channel, western English Channel and Celtic Sea (ICES Divisions VIIIf-h). These observations are summarised in Table 6.

One tentative sighting of sunfish *Mola mola* was made, with what appeared to be a small group of individuals seen in the wake of the ship whilst shooting the trawl at prime station F13 (09 December, 16:00, 49°40.0'N, 07°56.5'W).

Individual specimens of *Rhizostoma* were recorded in several of the tows in the Irish Sea, though in contrast to the 2004 survey, no large catches of this species were observed. Small numbers of *Aurelia* occurred in several catches in the Celtic Sea.

(5) SCALLOP SAMPLING IN THE EASTERN ENGLISH CHANNEL

Twenty-five stations in the eastern English Channel were sampled for scallop *Pecten maximus*, with station positions and the relative abundance of scallops illustrated in Figure 7.

(6) COLLECTION OF BIOLOGICAL MATERIAL

Several requests for biological material were undertaken:

- (a) Samples of sprat and anchovy were collected at various sites in the survey area, with all samples comprising at least 100 individuals were frozen.
- (b) Very few scallops were recorded, with material frozen.
- (c) No samples of berried edible crab were collected.
- (d) Whole specimens or tissue samples were collected from a wide range of invertebrates, with material preserved in ethanol for genetic studies.
- (e) Tissue samples of sole (n=20) and sand sole (n=15) were collected and preserved in ethanol for genetic studies.
- (f) Tissue samples of tope (n=8) were preserved in ethanol for genetic studies.
- (g) Samples of whole fish or tissue samples were collected and frozen for the following species: spurdog, pollock, sole, lemon sole, anglerfish, red mullet, sea bass, witch, sardine, ling and black sea-bream. Requested sample sizes (n=5) were made for all species, except ling, for which three specimens were collected.

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

J Ellis
13 December 2005

SEEN IN DRAFT

A Reading (Master)
B Salter (Senior Fishing Mate)

INITIALLED:
Dr R.S. Millner

DISTRIBUTION:

Basic list

Staff on Cruise

D Limpenny

Ireland (via FCO)

Devon SFC

Isles of Scilly SFC

North Wales & NW SFC

Natural History Museum

National Marine Aquarium (E-mail: douglas.herdson@national-aquarium.co.uk)

Sea Watch Foundation (E-mail: info@seawatchfoundation.org.uk)

Irish Whale and Dolphin Group (E-mail: enquiries@iwdg.ie)

France (via FCO)

Cornwall SFC

South Wales SFC

Cumbria SFC

TABLE 1: Summary of gear deployments

Gear	Valid	Additional	Invalid	Total
GOV (Rockhopper)	55	1 ^(a)	0	56
GOV (Standard ground gear)	18	1 ^(b)	3 ^(c)	22
Shippek grab	39	0	0	39
2m beam trawl	9	1 ^(d)	0	10
Scallop dredge	25	0	0	25

(a) Upper wing on the port side of the net was damaged, possibly after 20 minutes; (b) Headline height was too low for the tow to be declared valid, the middle bridle may have got twisted up and not observed in the poor sea conditions; (c) three tows (clear in 2004) resulted in significant damage to the belly of the net; (d) additional tow for the collection of sand sole, and the remaining catch was not quantified.

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

Species	Stns	Species	Stns
<i>Lampetra fluviatilis</i>	1	<i>Trigloporus lastoviza</i>	-
<i>Squalus acanthias</i>	28	<i>Myoxocephalus scorpius</i>	1
<i>Scyliorhinus canicula</i>	110	<i>Taurulus lilljeborgi</i>	-
<i>Scyliorhinus stellaris</i>	19	<i>Agonus cataphractus</i>	12
<i>Galeorhinus galeus</i>	13	<i>Cyclopterus lumpus</i>	1
<i>Mustelus asterias</i>	23	<i>Liparis liparis</i>	3
<i>Mustelus mustelus</i>	4	<i>Liparis montagui</i>	-
<i>Dipturus batis</i>	-	<i>Dicentrarchus labrax</i>	7
<i>Leucoraja naevus</i>	7	<i>Pagellus bogaraveo</i>	-
<i>Raja brachyura</i>	6	<i>Spondylisoma cantharus</i>	1
<i>Raja clavata</i>	28	<i>Trachurus trachurus</i>	57
<i>Raja microocellata</i>	8	<i>Mullus surmuletus</i>	7
<i>Raja montagui</i>	28	<i>Cepola rubescens</i>	3
<i>Dasyatis pastinaca</i>	-	<i>Ctenolabrus rupestris</i>	2
<i>Anguilla anguilla</i>	-	<i>Echiichthys vipera</i>	10
<i>Conger conger</i>	12	<i>Trachinus draco</i>	2
<i>Alosa alosa</i>	1	<i>Ammodytes tobianus</i>	3
<i>Alosa fallax</i>	1	<i>Gymnammodytes semisquamatus</i>	-
<i>Clupea harengus</i>	39	<i>Hyperoplus immaculatus</i>	8
<i>Sprattus sprattus</i>	48	<i>Hyperopus lanceolatus</i>	3
<i>Sardina pilchardus</i>	11	Ammodytidae indet	-
<i>Engraulis encrasicolus</i>	20	<i>Callionymus lyra</i>	49
Argentinidae	21	<i>Callionymus maculatus</i>	19
<i>Maurollicus muelleri</i>	21	<i>Callionymus reticulatus</i>	1
<i>Lophius budegassa</i>	5	<i>Blennius ocellaris</i>	1
<i>Lophius piscatorius</i>	22	<i>Chirolophis acanii</i>	-
<i>Gadiculus argenteus</i>	3	<i>Pholis gunnellus</i>	1
<i>Gadus morhua</i>	36	<i>Gobius niger</i>	1
<i>Melanogrammus aeglefinus</i>	52	<i>Gobius paganellus</i>	-
<i>Merlangius merlangus</i>	61	<i>Lesueurigobius friesii</i>	1
<i>Micromesistius poutassou</i>	38	<i>Pomatoschistus</i> spp.	16
<i>Pollachius pollachius</i>	5	<i>Scomber scombrus</i>	31
<i>Trisopterus esmarki</i>	50	<i>Lepidorhombus whiffiagonis</i>	26
<i>Trisopterus luscus</i>	11	<i>Scophthalmus maximus</i>	7
<i>Trisopterus minutus</i>	72	<i>Scophthalmus rhombus</i>	6
<i>Phycis blennoides</i>	3	<i>Phrynorhombus norvegicus</i>	1
<i>Molva molva</i>	4	<i>Arnoglossus imperialis</i>	7
<i>Ciliata septentrionalis</i>	-	<i>Arnoglossus laterna</i>	13
<i>Ciliata mustela</i>	1	<i>Glyptocephalus cynoglossus</i>	4
<i>Enchelyopus cimbrius</i>	6	<i>Hippoglossoides platessoides</i>	25
<i>Merluccius merluccius</i>	49	<i>Limanda limanda</i>	32
<i>Belone belone</i>	-	<i>Microstomus kitt</i>	30
<i>Zeus faber</i>	48	<i>Platichthys flesus</i>	3
<i>Capros aper</i>	17	<i>Pleuronectes platessa</i>	50
<i>Entelurus aequoreus</i>	1	<i>Buglossidium luteum</i>	18
<i>Syngnathus acus</i>	4	<i>Microchirus variegatus</i>	33
<i>Helicolenus dactylopterus</i>	-	<i>Pegusa lascaris</i>	2
<i>Aspitrigla cuculus</i>	31	<i>Solea solea</i>	21
<i>Eutrigla gurnardus</i>	49	<i>Balistes capriscus</i>	-
<i>Trigla lucerna</i>	21		

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

Species	Number collected
Herring <i>Clupea harengus</i>	225
Cod <i>Gadus morhua</i>	131
Haddock <i>Melanogrammus aeglefinus</i>	603
Whiting <i>Merlangius merlangus</i>	625
Hake <i>Merluccius merluccius</i>	266
Turbot <i>Scophthalmus maximus</i>	7
Brill <i>Scophthalmus rhombus</i>	5
Megrim <i>Lepidorhombus whiffiagonis</i>	97
Lemon sole <i>Microstomus kitt</i>	131
Plaice <i>Pleuronectes platessa</i>	651
Sole <i>Solea solea</i>	129
Anglerfish <i>Lophius piscatorius</i>	37
Anglerfish <i>Lophius budegassa</i>	5
Bass <i>Dicentrarchus labrax</i>	89
Red mullet <i>Mullus surmuletus</i>	11
Mackerel <i>Scomber scombrus</i>	137
TOTAL	3149

TABLE 4: Summary of fish tagged by species and sex

Species	Female	Male
Spurdog <i>Squalus acanthias</i>	23	49
Greater spotted dogfish <i>Scyliorhinus stellaris</i>	17	9
Tope <i>Galeorhinus galeus</i>	5	13
Starry smoothhound <i>Mustelus asterias</i>	15	16
Smoothhound <i>Mustelus mustelus</i>	2	4
Smalleyed ray <i>Raja microocellata</i>	0	1
TOTAL		154

TABLE 5: List of invertebrates caught during the survey

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

TABLE 6: Summary of cetacean sightings made during the cruise

Sighting details	Comments
16 November, 13:00 50°06.6'N, 04°06.9'W	Two common dolphins observed.
17 November, 10:30 50°06.5'N, 04°07'W	Small group of common dolphin by vessel whilst fishing at prime station G8
18 November, 16:00 49°43.3'N, 05°29.2'W	A group of about 20 common dolphins alongside the vessel.
19 November, 07:00 50°15.3'N, 06°55.9'W	A small group (ca 4) common dolphins alongside the vessel and bow-riding whilst fishing at prime station G12.
29 November, 08:00 51°45.6'N, 05°54.4'W	Several common dolphins alongside vessel whilst fishing at prime station E15.
29 November, 10:30 51°28.2'N, 06°07.0'W	Small group (5+) of common dolphins swimming alongside vessel whilst fishing at prime station E16.
04 December, 08:00 51°12.7'N, 05°14.5'W	Small group of common dolphins (3 adult, one young) observed whilst hauling at prime station E12
04 December, 10:00 51°08.1'N, 05°41.6'W	Two common dolphins by vessel.
04 December, 21:00 50°58.7'N, 06°40.1'W 50°08.8'N, 06°38.7'W	Group of common dolphins (ca. 15–20) by vessel between 21:00 and 23:00.
05 December, 08:00 51°46.1'N, 06°31.9'W	Six dolphins observed whilst hauling at prime station E6.
06 December, 08:30 51°39.4'N, 08°15.3'W	Small group of common dolphins (ca. 5–6) by vessel whilst hauling at prime station E1, and in the vicinity of the vessel whilst steaming and fishing at prime station E2 (51°43.2'N, 08°00.9'W).
07 December, 14:00 50°49.3'N, 08°02.3'W	Small group of common dolphins (4–5) alongside vessel
08 December, 09:30 50°47.5'N, 07°41.8'W	Two common dolphins observed.
08 December, 13:30 50°33.9'N, 07°57.8'W	Ten common dolphins alongside vessel.
09 December, 09:30 49°56.9'N, 07°34.8'W	Two common dolphins alongside vessel.
09 December, 10:35 50°01.1'N, 07°20.9'W	8–10 common dolphins whilst trawling at prime station F11.
09 December, 13:20 49°42.6'N, 07°22.7'W	Unconfirmed sighting of an unidentified whale off port side of vessel whilst fishing at prime station F14.
09 December, 16:30 49°38.2'N, 07°57.7'W	Several common dolphins (4-5) observed whilst hauling at prime station F13.
09 December, 20:30 49°50.8'N, 08°28.2'W	Several common dolphins (4-5) observed whilst rod and line fishing in the evening. Several garfish also observed at the surface.
11 December, 09:45 49°11.4'N, 07°53.4'W	Approximately 7 common dolphins observed near vessel.

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

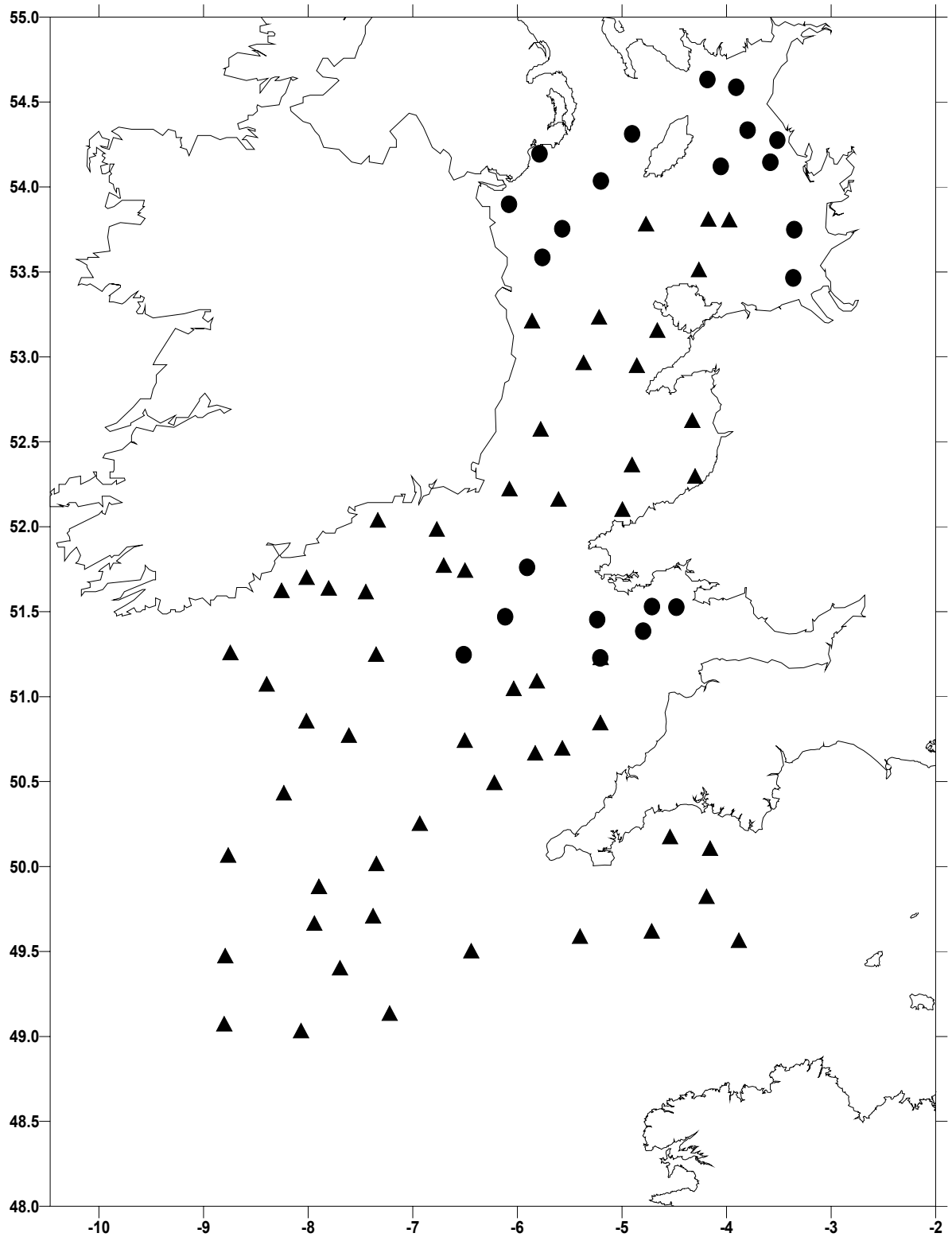


FIGURE 2: Study area indicating sites sampled with 2m-beam trawl (open circles), and shippek grab (solid triangles).

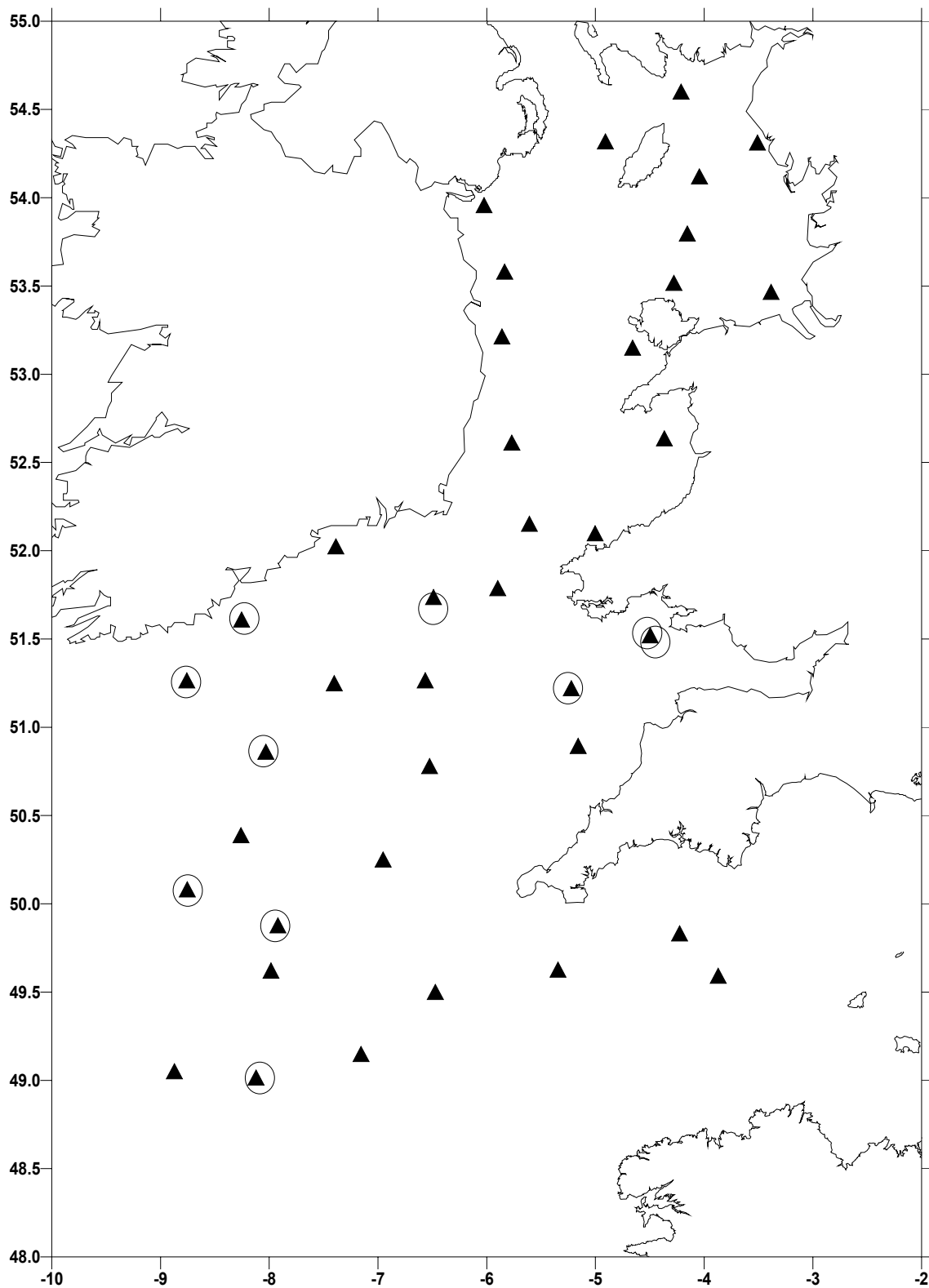


FIGURE 3: Distribution and relative abundance (kg per hour) of cod *Gadus morhua*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus* and hake *Merluccius merluccius*.

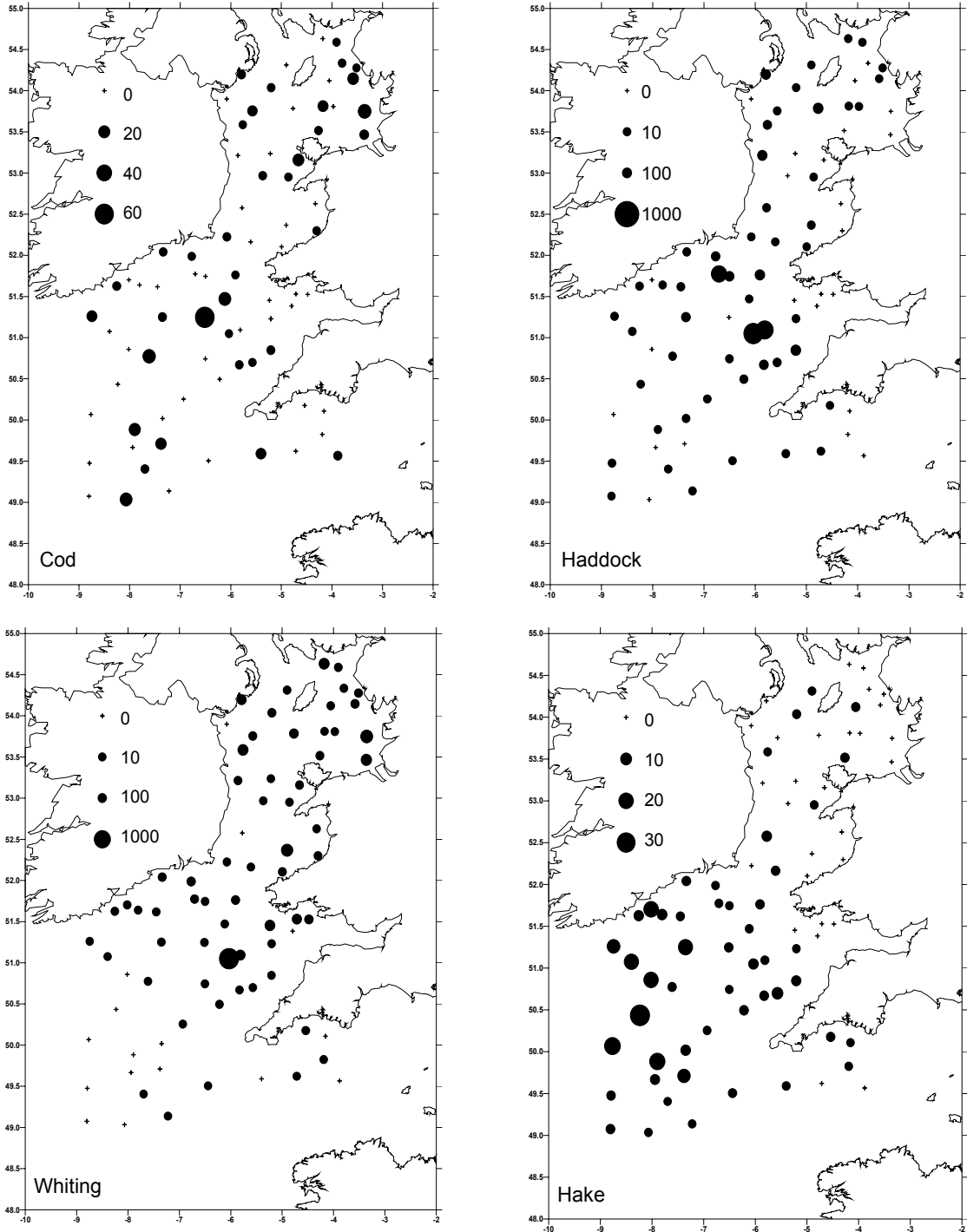


FIGURE 4: Distribution and relative abundance (kg per hour) of anglerfish *Lophius piscatorius*, lemon sole *Microstomus kitt*, megrim *Lepidorhombus whiffiagonis* and plaice *Pleuronectes platessa*

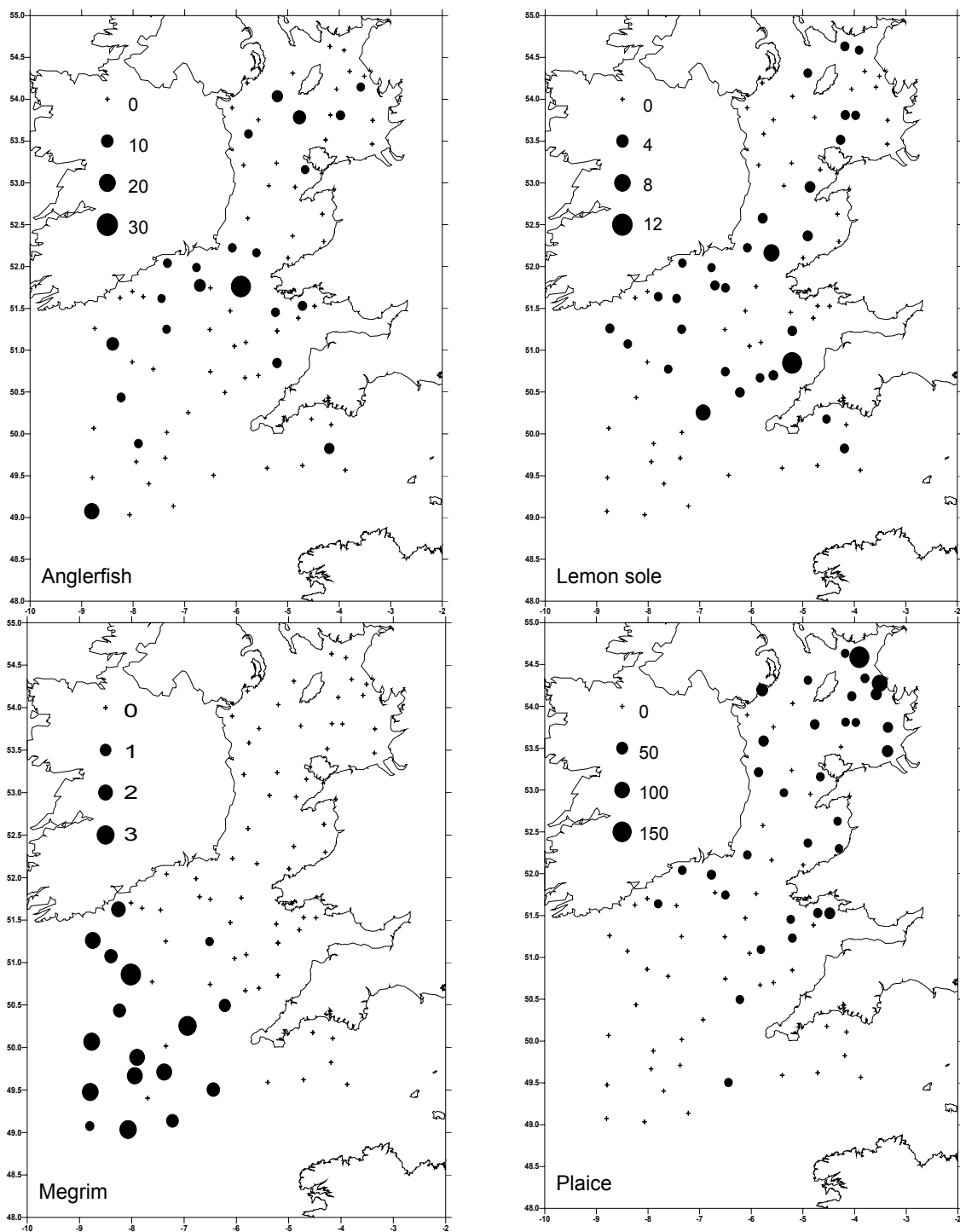


FIGURE 5: Relationship between fecundity and total length of spurdog *Squalus acanthias* in the Irish Sea

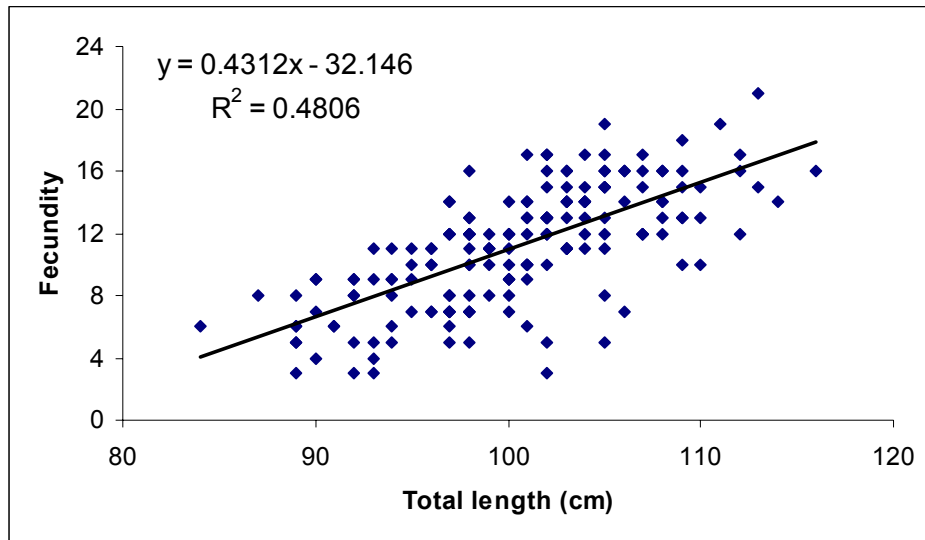


FIGURE 6: Study area and sites where elasmobranchs were tagged and released.

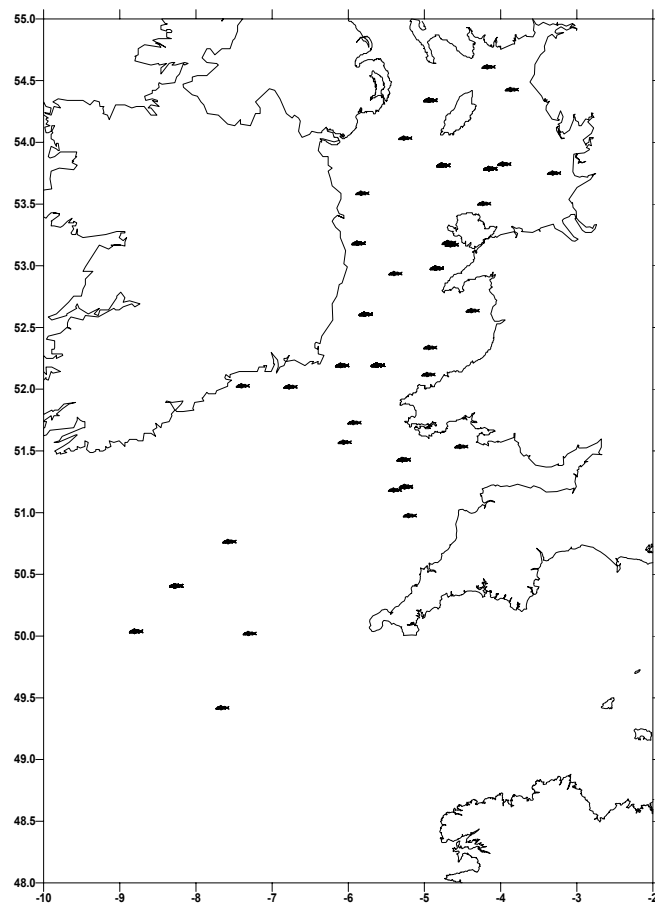


FIGURE 7: Relative abundance of scallop *Pecten maximus* in the eastern English Channel (maximum bubble size = 170 individuals)

