

**CENTRE FOR ENVIRONMENT, FISHERIES AND AQUACULTURE SCIENCE
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK NR33 OHT
2006 RESEARCH VESSEL PROGRAMME**

REPORT: RV CEFAS ENDEAVOUR: SURVEY 19

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DURATION: Part 1: 06–22 November. Part 2: 23 November–06 December 2006

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 take photographs and preserve sections of gonadal tissue for microscopic validation of macroscopic maturity staging.
3. To tag and release specimens of spurdog *Squalus acanthias*, smooth-hound *Mustelus* spp., tope *Galeorhinus galeus*, greater-spotted dogfish *Scyliorhinus stellaris* and other elasmobranchs.
4. To record details of surface sightings of any marine mammals, sea turtles and pelagic fish, and record observations on jellyfish aggregations
5. To sample the epibenthos in ICES divisions VII f-h with 2m beam trawl

6. To collect a NIOZ core sample from the Irish Sea (54°N 0.1'N 5° 14.9'W) (D. McCubbin, Cefas)

7. To collect biological samples in support of research projects:

(a) Scallop *Pecten maximus* (to be frozen) (D. Palmer, Cefas)

(b) Berried edible crab *Cancer pagurus* (to be frozen) (D. Eaton, Cefas)

(c) Samples of ling *Molva molva* (n = 3)

(d) Tissue samples of tope (to be preserved in ethanol) (C. Chabot, California State University)

(e) Tissue samples from various species of cephalopod (M. Espiñeira Fernández, Vigo)

(f) Collect and freeze one specimen (head and gills for larger species) of each species encountered (D. Rawson, University of Bedfordshire)

NARRATIVE:

CEFAS ENDEAVOUR sailed from Lowestoft at 09:00 on 06 November, and commenced engine trials shortly after. Following these trials, a shakedown tow was undertaken shortly after 18:00 in the southern North Sea in order to check the deployment of the trawl, Scanmar readings and the EDC units. After completing this tow, CEFAS ENDEAVOUR steamed towards the sampling grid in the western English Channel. The mini CTD and Niskin bottle was deployed at the first station shortly after 06:00 on 8 November, with four stations fished that day. Over the following two days, a further seven hard ground stations were fished successfully, and CEFAS ENDEAVOUR steamed northwards to the southern part of St George's Channel during the night of 10 November.

Sampling in St George's Channel commenced on 11 November, with four stations fished off south-eastern Ireland. On the final tow of the day, the starboard section of fishing line parted just past the crimp at the bosom end, although the fishing line remained tight to the rockhopper discs along the net and no other damage was sustained. This was repaired by tying a length of chain from the connecting hammerlock and along the fishing line. Three stations in Cardigan Bay were sampled the following day, though some damage to the port side wing occurred on the first tow of the day. The remaining Cardigan Bay station and two stations off the Llyn Peninsula were fished on 13 November. CEFAS ENDEAVOUR steamed westwards that night and three stations at the northern part of St George's Channel were sampled successfully the following day. Inshore stations along the Irish and Welsh coasts are sometimes fished with static gears, and CEFAS ENDEAVOUR steamed over trawl stations prior to fishing in order to ensure that trawling operations would not interfere with commercial gears.

On 15 November, two stations were fished successfully before CEFAS ENDEAVOUR steamed towards Red Wharf Bay to shelter from poor weather conditions. Whilst at anchor, the rockhopper trawl was replaced with the fine ground gear GOV trawl. CEFAS ENDEAVOUR steamed eastwards early the following morning, and four stations in Liverpool Bay and the south-eastern Irish Sea were sampled successfully, though minor damage occurred at one station. Some of these stations were only fished for 20-25 minutes to reduce the likelihood of large catches of sediment (muddy sand), starfish *Asterias rubens* and brittlestars *Ophiura ophiura* (in Liverpool Bay) or large catches of queen scallops *Aequipecten*

opercularis, broken shells and dead mans fingers *Alcyonium digitatum* (further offshore) tearing the belly of the net. One station was fished the following day, before strong winds and poor sea conditions curtailed sampling, and CEFAS ENDEAVOUR anchored in the Solway Firth. CEFAS ENDEAVOUR steamed to the sampling grid on the morning of 18 November, but once again, strong winds and poor sea conditions prevented fishing operations, and CEFAS ENDEAVOUR steamed westwards and anchored off Ramsey (Isle of Man). Three stations were sampled in the north-eastern Irish Sea the following day, and CEFAS ENDEAVOUR steamed to the western Irish Sea that afternoon in deteriorating weather conditions, with winds of up to 80 knots.

The four stations on the *Nephrops* grounds in the north-western Irish Sea were sampled on the 20 November, with inshore stations in Dundrum and Dundalk Bays sampled the following day. These stations were trawled for 20 minutes, as these stations can result in large catches of starfish, dab, juvenile clupeids and in Dundrum Bay, sea-squirts. A short additional tow was also undertaken in Dundrum Bay, in order to examine the species composition, as the presence of static gear can sometimes prevent trawling at the main Dundrum Bay station. With sampling in the Irish Sea completed, CEFAS ENDEAVOUR steamed towards Cobh, docking at about 11:00 on the 22 November, for a change of staff.

CEFAS ENDEAVOUR remained moored in Cobh for the following two days, due to severe gales in the Celtic Sea, and departed at 11:00 on 25 November, arriving at the first fishing station at about 13:00. Two stations were fished that afternoon, though the second tow resulted in severe gear damage. Grab sampling at various fishing stations was undertaken during the evening whilst repairs were made to the trawl. A further two stations in the Celtic Sea were sampled successfully the following day before CEFAS ENDEAVOUR steamed eastwards to shelter from severe weather, and remained at anchor in Combe Martin Bay on the north coast of Devon on 27 November.

CEFAS ENDEAVOUR steamed towards stations in the Bristol Channel in the early hours of 28 November, and four stations were fished successfully that day. The third tow, however, was hauled after only 15 minutes as Scanmar readings were a cause for concern. The net was retrieved successfully, despite the presence of several large boulders in the net. Fortunately only minor damage was made to the net, and most of this whilst getting the net on board and lifting the cod end into the hopper. CEFAS ENDEAVOUR then steamed towards the stations in the Celtic Deep. The trawl was deployed at the first station at first light and appeared to go away well. Due to strange Scanmar readings (a very high headline height, and narrow wing and door spreads), the net was hauled back several minutes after deployment to find that the doors had crossed over. Retrieving the doors and net and sorting out minor damage to the net took several hours and, with weather worsening, CEFAS ENDEAVOUR steamed to Fishguard Bay, anchoring at 14:00 and remaining at anchor on 30 November. CEFAS ENDEAVOUR left Fishguard Bay on 01 December and steamed towards the survey grid, though when it was apparent that sea conditions and wind speed were too severe for trawling, CEFAS ENDEAVOUR returned to the Welsh coast and dodged off Strumble Head. The following morning, CEFAS ENDEAVOUR returned to the Celtic Deep, and, given the poor and deteriorating sea conditions, steamed towards the north coast of Devon, anchoring in Combe Martin Bay at 13:30 hours. CEFAS ENDEAVOUR

departed from Combe Martin Bay at 09:30 on 03 December and steamed towards Lands End in poor sea conditions, before steaming eastwards through the English Channel, arriving at Lowestoft at 08:30 on 06 December. Approximately 11 days were lost due to severe weather over the course of the survey.

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 Sea and Bristol Channel.

The following minor changes were made to the modified rockhopper GOV, all of which were to reduce the likelihood of gear damage.

- The net was made from polyethylene (nylon nets were used in previous years)
- A lifting bag of 200 mm mesh size (double 4 mm twine) covered the cod-end to minimise damage to the cod end when lifting and emptying the cod end.
- A length of 75 cm of chain was used to join the ground gear to the fish plate, so as to ensure that the fishing line and ground gear were tight.

STATIONS SAMPLED:

Overall, 46 fixed trawl stations were fished successfully out of the target 72 stations. Twenty five of these were with the modified GOV with rockhopper ground gear and 21 with the standard ground gear (Figure 1). Two stations resulted in damage and were not re-sampled, though the catch and size composition was recorded at one of these stations (it was classed as an additional tow). An extra tow was made in Dundrum Bay, and this was also classed as an additional tow. The relationships between net geometry measurements (headline height, wing spread and door spread) in relation to water depth are illustrated for the two gears in Figure 2.

Vertical profiles with the mini CTD and Niskin bottle were collected at 29 stations, sediment samples were collected with shippek grab at 10 trawl stations and one beam trawl sample was taken in the Celtic Sea (Figure 3). The number of stations 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/stock for which otoliths were collected is summarised in Table 2. In addition to the 2,518 otoliths collected, biological parameters were also collected for all species of skate (Table 3).

Gadiforms: Cod *Gadus morhua* were caught at 23 of the 48 valid and additional stations (Figure 4), with the best catches in the western Irish Sea and off the northern coast of Cornwall. Haddock *Melanogrammus aeglefinus* were captured at 32 stations (Figure 4), and the maximum CPUE was $>400 \text{ kg.hr}^{-1}$. Whiting *Merlangius merlangus* were also abundant, being captured at 43 of the stations

(Figure 4), and the maximum CPUE was 176 kg.hr⁻¹. Hake *Merluccius merluccius* were only captured at 17 stations (Figure 4), as poor weather conditions in the Celtic Sea precluded sampling of those grounds that generally yield good catches of juvenile hake.

Anglerfish: Catches of anglerfish *Lophius piscatorius* (Figure 5) and black-bellied anglerfish *L. budegassa* were relatively low, with *L. piscatorius* only caught at 14 stations, mainly in the south-western parts of the survey grid and in the north-western Irish Sea.

Flatfish: Lemon sole *Microstomus kitt* were relatively common off southern Ireland and in the Bristol Channel (Figure 5), and the maximum CPUE was 6.0 kg.hr⁻¹. Megrim *Lepidorhombus whiffiagonis* were only caught at 5 stations (Figure 5), as poor weather in the Celtic Sea prevented extensive sampling of this area. Plaice *Pleuronectes platessa* were recorded at 29 stations (Figure 5), with good catches in Dundrum Bay, eastern Irish Sea and Carmarthen Bay.

Pelagic fish: Herring *Clupea harengus* were caught at 34 stations, with the largest catches in the north-western Irish Sea (Figure 6). Mackerel *Scomber scombrus* were caught at 20 stations, with the largest catches off the Cornish peninsula. Catches of pilchard *Sardina pilchardus* and anchovy *Engraulis encrasicolus* were greatest in the western English Channel, though anchovy were also taken in relatively good numbers in the northern St George's Channel and north-eastern Irish Sea (Figure 6).

Elasmobranchs: Spurdog *Squalus acanthias* were caught at 14 stations, with the largest catch made off the Llyn Peninsula. Thornback skate *Raja clavata* were taken at 19 stations and were most abundant in Liverpool Bay and the northern Bristol Channel (Figure 7).

Shellfish: Stations in the north-western Irish Sea and, to a lesser extent, off Cumbria and Cork, yielded good samples of *Nephrops*, though the Celtic Deep was not sampled due to poor weather. Catches of northern squid *Loligo forbesi* were made off the Cornish peninsula (Figure 7).

Ichthyological observations: Overall, 92 species of fish were recorded during the survey (Table 4), and most of the species caught were relatively common. Unusual fish species caught included specimens of sea trout *Salmo trutta* and salmon *Salmo salar* in Cardigan Bay and Dundalk Bay respectively, and a 105 cm electric ray *Torpedo nobiliana* just south of Milford Haven.

Benthic observations: The benthic by-catch was quantified at the majority of stations, though the species present were only recorded as observed at two stations, and not recorded at the additional station in Dundrum Bay due to time constraints. Catches of invertebrates in the rockhopper GOV trawl were generally small, though large numbers of shrimps were captured in St George's Channel, and queen scallops were taken in large numbers in some areas. The wings of the trawl 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. More benthic invertebrates were captured with the standard ground gear, and echinoderms and crustaceans (shrimps, swimming crabs, spider

crabs and hermit crabs) were the major taxa caught. A list of the invertebrates caught by the main survey trawls is given in Table 5. Most of the species observed are caught routinely in this survey, with observations of special note including two specimens of sponge crab *Dromia personata* that were captured in Cardigan Bay.

Miscellaneous studies: Data on the relationship between mantle length and total weight were collected for various species of squid, so as to provide additional data for condition factors (Figure 8). Data on the stomach contents of John Dory *Zeus faber* and some other fish species were also recorded, and the otoliths from a variety of teleost species taken for the otolith collection.

(2) MATURITY STUDIES

Digital photographs were taken and samples of gonadal tissue were collected (if required) for three hake (two female, one male), two female anglerfish and eight male spotted skate.

(3) FISH TAGGING

During the course of the survey, a total of 218 elasmobranchs were tagged with Petersen discs and released, with summary details given in Table 6 and release locations shown in Figure 9. Several specimens of smalleyed and blonde skate were also tagged and released in the Bristol Channel (VIIf) this year to complement tagging programmes for these species being undertaken in Jersey.

(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 western English Channel, outer Bristol Channel, and Celtic Sea (ICES Divisions VIIe-g). These observations are summarised in Table 7. There were no surface sightings of large pelagic fish or jellyfish aggregations, though a small number of *Rhizostoma* were caught in the eastern Irish Sea.

(5) EPIBENTHIC SAMPLING

Only one site in the Celtic Sea was sampled with 2m-beam trawl (Figure 3).

(6) NIOZ CORE SAMPLE IN THE NORTH-WESTERN IRISH SEA

Due to unfavourable sea conditions, it was not possible to deploy the NIOZ corer whilst the vessel was in proximity to the requested sampling site in the north-western Irish Sea.

(7) COLLECTION OF BIOLOGICAL MATERIAL

- (a) The flat shells of 17 specimens of scallop *Pecten maximus* were retained.
- (b) No berried edible crab *Cancer pagurus* were recorded during the survey.
- (c) One specimen of ling *Molva molva* was retained

(d) Tissue samples were collected from 5 specimens of tope *Galeorhinus galeus*, with most of these samples taken as fin clips, as tope were tagged and released whenever possible.

(e) Specimens of various cephalopod species were frozen for genetic studies.

(f) Specimens or tissue samples were collected and frozen for most of the fish species observed during the survey.

We thank the officers and crew for all their hard work during the course of the survey, much of which was conducted in poor weather conditions

J Ellis

06 December 2006

SEEN IN DRAFT

R McCurry (Master)

A Simpson/R. Reynolds (Senior Fishing Mates)

INITIALLED:

Dr R.S. Millner

DISTRIBUTION:

Basic list

Staff on Cruise

Ireland (via FCO)

Devon SFC

Isles of Scilly SFC

North Wales & NW SFC

France (via FCO)

Cornwall SFC

South Wales SFC

Cumbria SFC

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)

TABLE 1: Summary of gear deployments.

Gear	Valid	Additional	Invalid	Total
GOV (Rockhopper)	25	2 ^(a)	0	27
GOV (Standard ground gear)	21	1 ^(b)	1 ^(c)	23
Niskin Bottle/Mini CTD	29	0	0	29
Shippek grab	10	0	0	10
2m beam trawl	1	0	0	1
TOTAL				90

^(a) Includes the shakedown tow in the southern North Sea, and one station in the main survey area where there was some damage to the wing of the trawl; ^(b) Additional tow in Dundrum Bay; ^(c) Major damage to the trawl (belly out)

TABLE 2: Number of commercial fishes for which biological information and otoliths were collected during the survey.

Species	ICES Stock	Number collected
Cod <i>Gadus morhua</i>	VII a	40
	VII e-k	25
Haddock <i>Melanogrammus aeglefinus</i>	VII a	253
	VII b-k	153
Whiting <i>Merlangius merlangus</i>	VII a	279
	VII e-k	174
Hake <i>Merluccius merluccius</i>	Northern	85
Megrim <i>Lepidorhombus whiffiagonis</i>	VII b,c,e-k, VIII a,b,d	25
Lemon sole <i>Microstomus kitt</i>	–	108
Plaice <i>Pleuronectes platessa</i>	VII a	675
	VII e and VII f-g	91
	VII a	54
Sole <i>Solea solea</i>	VII a	54
	VII e and VII f-g	54
Turbot <i>Psetta maximus</i>	–	7
Brill <i>Scophthalmus rhombus</i>	–	7
¹ Anglerfish <i>Lophius piscatorius</i>	VII b-k	24 ²
Anglerfish <i>Lophius budegassa</i>	VII b-k	4
³ Bass <i>Dicentrarchus labrax</i>	–	5
Red mullet <i>Mullus surmuletus</i>	–	22
Herring <i>Clupea harengus</i>	VII a	200
	Celtic Sea	37
Mackerel <i>Scomber scombrus</i>	Western	196
	Total	2518

¹ Includes ilicia

² Included four specimens from the Irish Sea (VII a)

³ Scales

TABLE 3: Number of skates for which maturity data were collected.

Species	Number examined for maturity
Cuckoo skate <i>Leucoraja naevus</i>	46
Blonde skate <i>Raja brachyura</i>	27
Thornback skate <i>Raja clavata</i>	163
Smalleyed skate <i>Raja microocellata</i>	93
Spotted skate <i>Raja montagui</i>	67
Total	396

TABLE 4: Taxonomic list of fish species caught during the survey and the number of stations at which they were recorded (includes all tows in the main survey area). Species indicated ‘-’ were not recorded in 2006, but have been reported in earlier surveys.

Species	Stns	Species	Stns
Lamprey <i>Lampetra fluviatilis</i>	-	Haddock <i>Melanogrammus aeglefinus</i>	33
Spurdog <i>Squalus acanthias</i>	14	Whiting <i>Merlangius merlangus</i>	44
Lesser-spotted dogfish <i>Scyliorhinus canicula</i>	45	Blue whiting <i>Micromesistius poutassou</i>	14
Greater-spotted dogfish <i>Scyliorhinus stellaris</i>	20	Pollock <i>Pollachius pollachius</i>	3
Tope <i>Galeorhinus galeus</i>	6	Saithe <i>Pollachius virens</i>	1
Starry smoothhound <i>Mustelus asterias</i>	16	Norway pout <i>Trisopterus esmarki</i>	28
Smoothhound <i>Mustelus mustelus</i>	1	Bib <i>Trisopterus luscus</i>	11
Common skate <i>Dipturus batis</i>	-	Poor cod <i>Trisopterus minutus</i>	48
Cuckoo skate <i>Leucoraja naevus</i>	6	Greater forkbeard <i>Phycis blennoides</i>	2
Blonde skate <i>Raja brachyura</i>	12	Ling <i>Molva molva</i>	2
Thornback skate <i>Raja clavata</i>	19	Northern rockling <i>Ciliata septentrionalis</i>	-
Smalleyed skate <i>Raja microocellata</i>	4	5-bearded rockling <i>Ciliata mustela</i>	2
Spotted skate <i>Raja montagui</i>	20	4-bearded rockling <i>Enchelyopus cimbrius</i>	4
Electric ray <i>Torpedo nobiliana</i>	1	3-bearded rockling <i>Gaidropsarus vulgaris</i>	2
Stingray <i>Dasyatis pastinaca</i>	-	Hake <i>Merluccius merluccius</i>	18
Eel <i>Anguilla anguilla</i>	1	Garfish <i>Belone belone</i>	1
Conger eel <i>Conger conger</i>	10	John dory <i>Zeus faber</i>	20
Allis shad <i>Alosa alosa</i>	-	Boarfish <i>Capros aper</i>	5
Twaite shad <i>Alosa fallax</i>	-	Snake pipefish <i>Entelurus aequoreus</i>	1
Herring <i>Clupea harengus</i>	35	Greater pipefish <i>Syngnathus acus</i>	3
Sprat <i>Sprattus sprattus</i>	33	Blue mouth redfish <i>Helicolenus dactylopterus</i>	-
Pilchard <i>Sardina pilchardus</i>	12	Red gurnard <i>Aspitrigla cuculus</i>	28
Anchovy <i>Engraulis encrasicolus</i>	25	Grey gurnard <i>Eutrigla gurnardus</i>	42
Salmon <i>Salmo salar</i>	1	Tub gurnard <i>Trigla lucerna</i>	19
Sea trout <i>Salmo trutta</i>	1	Streaked gurnard <i>Trigloporus lastoviza</i>	-
Argentine <i>Argentina</i> sp.	9	Bullrout <i>Myoxocephalus scorpius</i>	3
Pearlside <i>Maurolicus muelleri</i>	3	Norwegian bullhead <i>Taurulus lilljeborgi</i>	-
Black-bellied anglerfish <i>Lophius budegassa</i>	2	Pogge <i>Agonus cataphractus</i>	20
Anglerfish <i>Lophius piscatorius</i>	15	Lumpsucker <i>Cyclopterus lumpus</i>	2
Silvery pout <i>Gadiculus argenteus</i>	2	Sea snail <i>Liparis liparis</i>	2
Cod <i>Gadus morhua</i>	24	Montagu's sea snail <i>Liparis montagui</i>	-

Table 4 (continued): Taxonomic list of fish species caught during the survey and the number of stations at which they were recorded (includes all tows in the main survey area). Species indicated ‘-’ were not recorded in 2006, but have been reported in earlier surveys.

Species	Stns	Species	Stns
Bass <i>Dicentrarchus labrax</i>	4	Crystal goby <i>Crystallogobius linearis</i>	4
Red seabream <i>Pagellus bogaraveo</i>	-	Black goby <i>Gobius niger</i>	-
Black seabream <i>Spondylisoma cantharus</i>	-	Steven's goby <i>Gobius gasteveni</i>	2
Scad <i>Trachurus trachurus</i>	42	Rock goby <i>Gobius paganellus</i>	-
Red mullet <i>Mullus surmuletus</i>	11	Fries's goby <i>Lesueurigobius friesii</i>	3
Redband fish <i>Cepola rubescens</i>	2	Sand goby <i>Pomatoschistus</i> spp.	26
Corkwing wrasse <i>Crenilabrus melops</i>	2	Mackerel <i>Scomber scombrus</i>	21
Goldsinny wrasse <i>Ctenolabrus rupestris</i>	7	Megrim <i>Lepidorhombus whiffiagonis</i>	5
Ballan wrasse <i>Labrus bergylta</i>	1	Turbot <i>Psetta maximus</i>	5
Cuckoo wrasse <i>Labrus mixtus</i>	1	Brill <i>Scophthalmus rhombus</i>	6
Lesser weever <i>Echiichthys vipera</i>	12	Norwegian topknot <i>Phrynorhombus norvegicus</i>	4
Greater weever <i>Trachinus draco</i>	4	Imperial scaldfish <i>Arnoglossus imperialis</i>	2
Common sand eel <i>Ammodytes tobianus</i>	3	Scaldfish <i>Arnoglossus laterna</i>	14
Smooth sandeel <i>Gymnammodytes semisquamatus</i>	-	Witch <i>Glyptocephalus cynoglossus</i>	6
Immaculate sandeel <i>Hyperoplus immaculatus</i>	6	Long-rough dab <i>Hippoglossoides platessoides</i>	9
Greater sandeel <i>Hyperopus lanceolatus</i>	5	Dab <i>Limanda limanda</i>	33
Sand eel <i>Ammodytidae</i> indet.	2	Lemon sole <i>Microstomus kitt</i>	23
Common dragonet <i>Callionymus lyra</i>	40	Flounder <i>Platichthys flesus</i>	1
Spotted dragonet <i>Callionymus maculatus</i>	11	Plaice <i>Pleuronectes platessa</i>	29
Reticulated dragonet <i>Callionymus reticulatus</i>	2	Solenette <i>Buglossidium luteum</i>	16
Butterfly blenny <i>Blennius ocellaris</i>	2	Thickback sole <i>Microchirus variegatus</i>	14
Tompot blenny <i>Parablennius gattorugine</i>	1	Sand sole <i>Pegusa lascaris</i>	3
Yarrell's blenny <i>Chirolophis acanii</i>	-	Sole <i>Solea solea</i>	18
Butterfish <i>Pholis gunnellus</i>	-	Triggerfish <i>Balistes capriscus</i>	-
Jeffrey's goby <i>Buenia jeffreysi</i>	3		

TABLE 5: Taxonomic list of invertebrates caught during the survey.

<i>Cliona celata</i>	<i>Macropodia rostrata</i>	<i>Hiatella arctica</i>
<i>Dysidea fragilis</i>	<i>Macropodia tenuirostris</i>	<i>Rossia macrosoma</i>
Porifera (indet.)	<i>Maia squinado</i>	<i>Sepiola atlantica</i>
<i>Hydrallmania falcata</i>	<i>Pisa armata</i>	<i>Sepia elegans</i>
<i>Nemertesia antennina</i>	<i>Dromia personata</i>	<i>Sepia officinalis</i>
<i>Lytocarpia myriophyllum</i>	<i>Atelecyclus rotundatus</i>	<i>Alloteuthis subulata</i>
Hydrozoa (indet.)	<i>Corystes cassivelaunus</i>	<i>Loligo forbesi</i>
<i>Epizoanthus papillosus</i>	<i>Cancer pagurus</i>	<i>Illex</i> spp.
<i>Alcyonium digitatum</i>	<i>Liocarcinus arcuatus</i>	<i>Todaropsis eblanae</i>
<i>Caryophyllia smithi</i>	<i>Liocarcinus corrugatus</i>	<i>Eledone cirrosa</i>
<i>Actinauge richardi</i>	<i>Liocarcinus depurator</i>	<i>Alcyonidium diaphanum</i>
<i>Adamsia carciniopados</i>	<i>Liocarcinus holsatus</i>	<i>Alcyonidium parasiticum</i>
<i>Metridium senile</i>	<i>Liocarcinus marmoreus</i>	<i>Cellaria</i> spp.
<i>Urticina felina</i>	<i>Liocarcinus pusillus</i>	<i>Flustra foliacea</i>
Anemone (indet.)	<i>Macropipus tuberculatus</i>	<i>Pentapora foliacea</i>
<i>Aphrodita aculeata</i>	<i>Necora puber</i>	<i>Antedon bifida</i>
<i>Hermione hystrix</i>	<i>Goneplax rhomboides</i>	<i>Astropecten irregularis</i>
<i>Hyalinoecia tubicola</i>	<i>Monodeus couchi</i>	<i>Luidia ciliaris</i>
<i>Scalpellum scalpellum</i>	<i>Pilumnus hirtellus</i>	<i>Luidia sarsi</i>
<i>Cirolana cranchii</i>	<i>Calliostoma papillosum</i>	<i>Stichastrella rosea</i>
<i>Epimeria conchilega</i>	<i>Calliostoma zizyphinum</i>	<i>Henricia oculata</i>
<i>Pasiphaea sivado</i>	<i>Turritella communis</i>	<i>Anseropoda placenta</i>
<i>Palaemon serratus</i>	<i>Simnia patula</i>	<i>Porania pulvillus</i>
<i>Processa canaliculata</i>	<i>Polinices catena</i>	<i>Crossaster papposus</i>
<i>Pandalus montagui</i>	<i>Aporrhais pespelecani</i>	<i>Asterias rubens</i>
<i>Pandalus propinquus</i>	<i>Buccinum humphreysianum</i>	<i>Marthasterias glacialis</i>
<i>Dichelopandalus bonnieri</i>	<i>Buccinum undatum</i>	<i>Ophiura albida</i>
<i>Spirontocaris lilljeborgi</i>	<i>Colus gracilis</i>	<i>Ophiura ophiura</i>
<i>Crangon allmanni</i>	<i>Neptunea antiqua</i>	<i>Ophiocomina nigra</i>
<i>Crangon crangon</i>	<i>Scaphander lignarius</i>	<i>Ophiothrix fragilis</i>
<i>Pontophilus spinosus</i>	<i>Philine aperta</i>	<i>Echinus acutus</i>
<i>Homarus gammarus</i>	<i>Pleurobranchus membranaceous</i>	<i>Echinus esculentus</i>
<i>Nephrops norvegicus</i>	<i>Archidoris pseudargus</i>	<i>Psamechinus miliaris</i>
<i>Calocaris macandreae</i>	<i>Tritonia hombergii</i>	<i>Echinocardium cordatum</i>
<i>Anapagurus laevis</i>	<i>Dendronotus frondosus</i>	<i>Spatangus purpureus</i>
<i>Pagurus bernhardus</i>	<i>Nudibranchia</i> (indet.)	<i>Holothouroidea</i> (indet.)
<i>Pagurus prideaux</i>	<i>Aequipecten opercularis</i>	<i>Botryllus schlosseri</i>
<i>Munida rugosa</i>	<i>Palliolum tigrinum</i>	<i>Ascidia mentula</i>
<i>Calocaris macandrea</i>	<i>Pecten maximus</i>	<i>Ascidella aspersa</i>
<i>Jaxea nocturna</i>	<i>Mytilus edulis</i>	<i>Ascidella scabra</i>
<i>Ebalia tuberosa</i>	<i>Modiolus modiolus</i>	<i>Ascidacea</i> (indet.)
<i>Hyas coarctatus</i>	<i>Limaria hians</i>	
<i>Eurynome aspera</i>	<i>Acanthocardia</i> sp.	
<i>Inachus dorsettensis</i>	<i>Spisula subtruncata</i>	
<i>Inachus leptochirus</i>	<i>Mactra stultorum</i>	

TABLE 6: Summary of elasmobranchs tagged and released.

ICES sub-area	VII		IV	
Species/Sex	Female	Male	Female	Male
Spurdog <i>Squalus acanthias</i>	36	16	-	-
Greater spotted dogfish <i>Scyliorhinus stellaris</i>	23	20	-	-
Tope <i>Galeorhinus galeus</i>	5	3	-	-
Starry smoothhound <i>Mustelus asterias</i>	18	20	2	3
Smoothhound <i>Mustelus mustelus</i>	1	2	2	2
Blonde skate <i>Raja brachyura</i>	9	10	-	-
Thornback skate <i>Raja clavata</i>	1	1	-	-
Smalleyed skate <i>Raja microocellata</i>	16	27	-	-
Electric ray <i>Torpedo nobiliana</i>	1	0	-	-
TOTAL	209		9	

TABLE 7: Summary of cetacean sightings made during the cruise.

Date	Time	Station	Prime	Species	Numbers	Comments	Latitude		Longitude			Depth
							Deg	Min	Deg	Min	E/W	
09/11/2006	08:50	-	-	Common dolphin	3-6	Swimming northwards	49	36	4	59.000	W	83 m
09/11/2006	08:50	-	-	Common dolphin	8-12	Swimming away from port quarter, heading east, whilst steaming between G6 and G5	49	36	5	0.000	W	
09/11/2006	09:00	-	-	Common dolphin	1	Swimming alongside vessel	49	36	5	0.000	W	
09/11/2006	12:45	-	-	Common dolphin	>6	Swimming alongside starboard side of vessel whilst steaming	49	32.78	5	50.740	W	-
09/11/2006	13:10	-	-	Common dolphin	12-15	Heading westerly	49	32	5	55.000	W	93 m
09/11/2006	13:25	-	-	Common dolphin	3+	Swimming alongside port side of vessel whilst steaming	49	32.39	6	0.440	W	-
09/11/2006	15:40	13	G11	Common dolphin	3-12	Alongside starboard side whilst hauling trawl	49	30.33	6	26.930	W	111 m
10/11/2006	18:30	-	-	Common dolphin	>20	Following vessel (012 deg)	50	55.77	6	5.720	W	94 m
10/11/2006	18:30	-	-	Common dolphin	8	Swimming alongside starboard side of vessel whilst steaming	50	53.69	6	5.730	W	-
11/11/2006	09:00	-	-	Common dolphin	4	Swimming alongside port side of vessel whilst steaming	52	13.76	5	47.920	W	-
22/11/2006	08:30	-	-	Common dolphin	>20	Alongside portside of vessel	51	45.79	8	0.890	W	55 m
25/11/2006	13:25	72	E2	Common dolphin	2+	On starboard side of the vessel	51	41.83	8	1.650	W	-

TABLE 7 (continued): Summary of cetacean sightings made during the cruise.

Date	Time	Station	Prime	Species	Numbers	Comments	Latitude		Longitude			Depth
							Deg	Min	Deg	Min	E/W	
25/11/2006	19:30	-	-	Common dolphin	6+	Swimming alongside starboard side of vessel whilst steaming	51	33.03	7	39.320	W	-
26/11/2006	10:45	81	F4	Common dolphin	>10	6-7 adults and 4-5 juveniles	51	4.69	8	23.870	W	108 m
26/11/2006	11:10	81	F4	Common dolphin	4	Adults	51	2.86	8	24.690	W	110 m
26/11/2006	11:35	-	-	Common dolphin	3	Adults on starboard side	51	1.77	8	25.870	W	-
26/11/2006	14:30	-	-	Common dolphin	1	Adult on starboard side	50	47.16	7	46.300	W	-
29/11/2006	14:30	-	-	Common dolphin	2	On starboard side	51	45.92	5	52.540	W	-

FIGURE 2: Graphs showing relationships between headline height, wing spread and door spread with depth for the GOV trawl with rockhopper ground gear (filled circles) and standard ground gear (open circles).

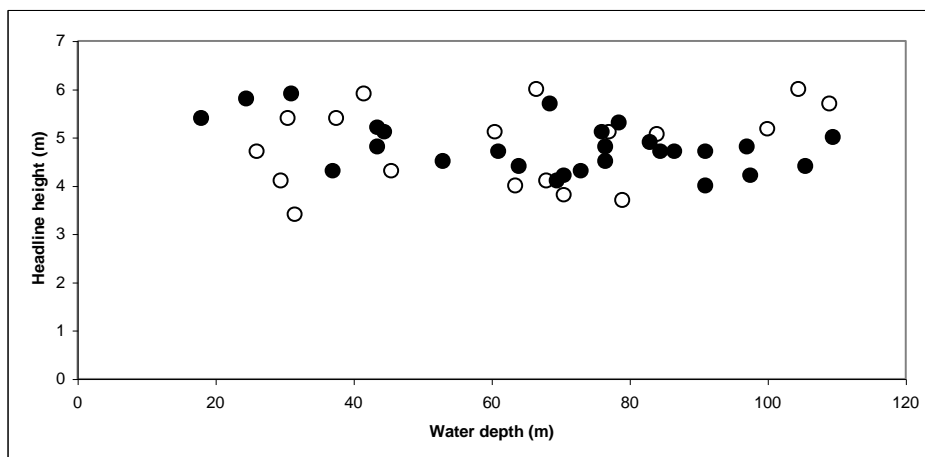
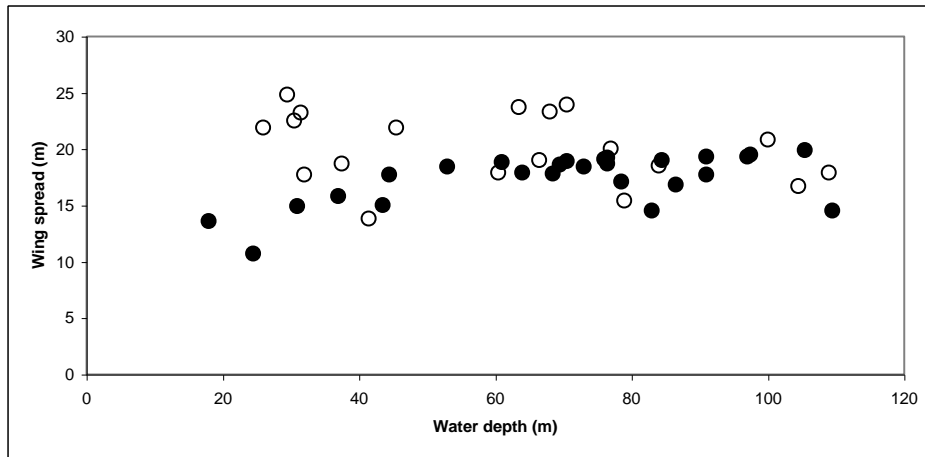
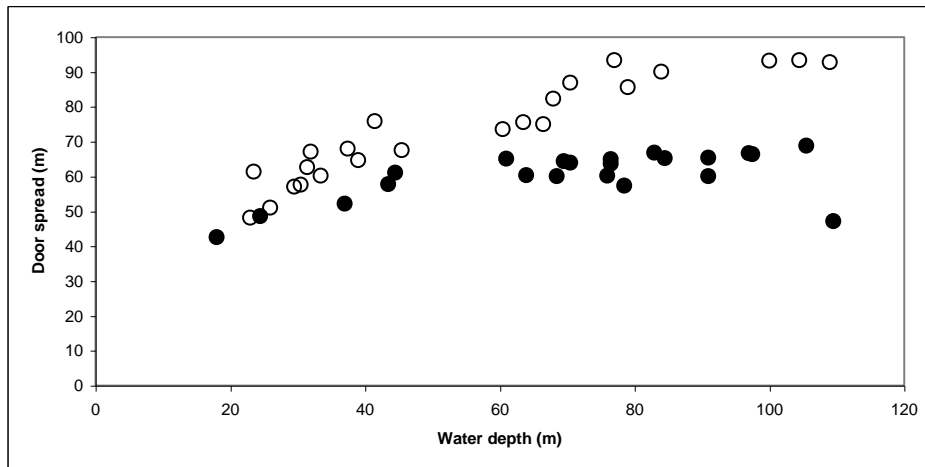


FIGURE 3: Study area indicating sites sampled with mini CTD and niskin bottle (open square), 2m-beam trawl (asterisk), and shippek grab (solid triangle).

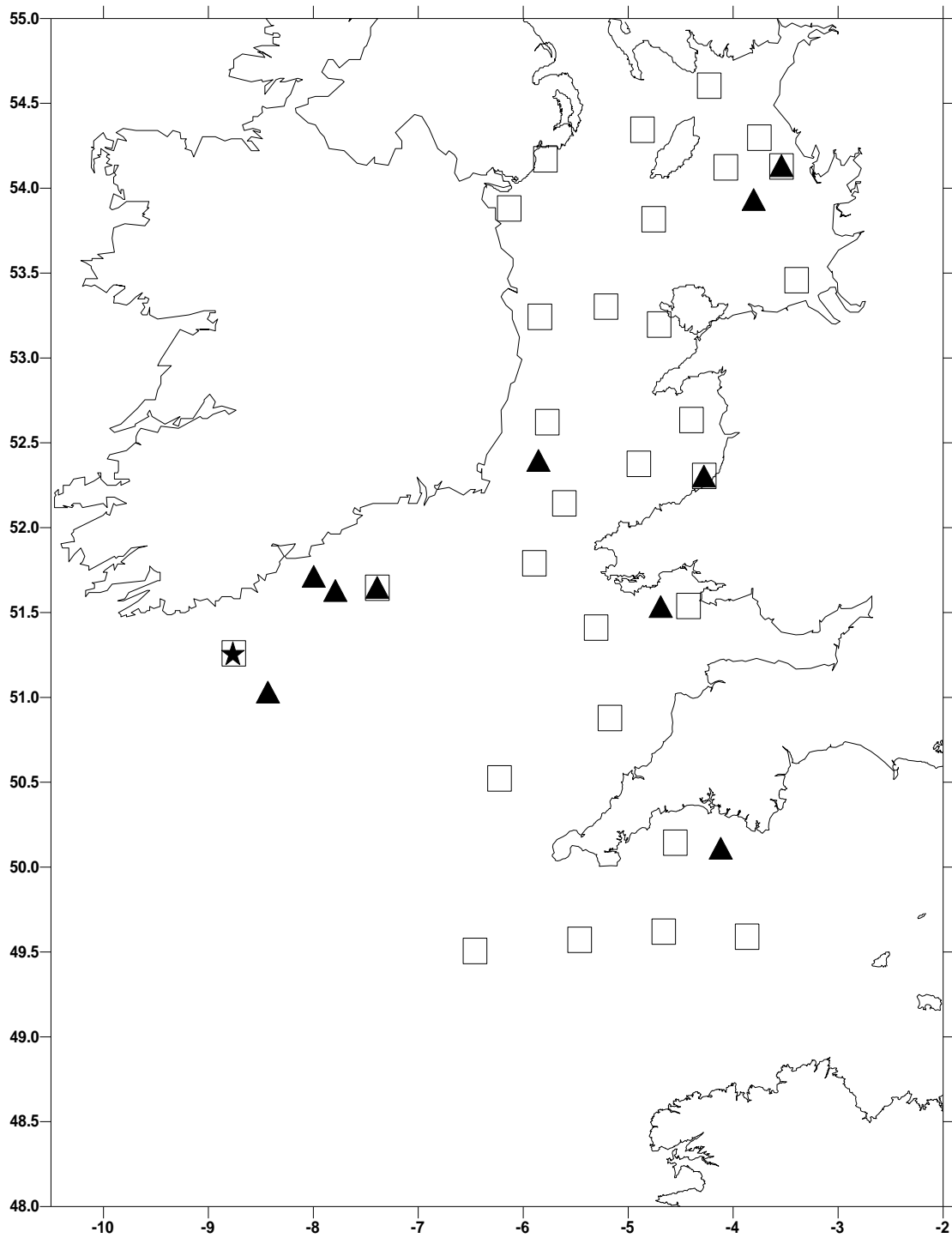


FIGURE 4: Distribution and relative abundance (no. per hour) of cod (COD), haddock (HAD), whiting (WHG) and hake (HKE). Refer to Figure 1 for which ground gear was used.

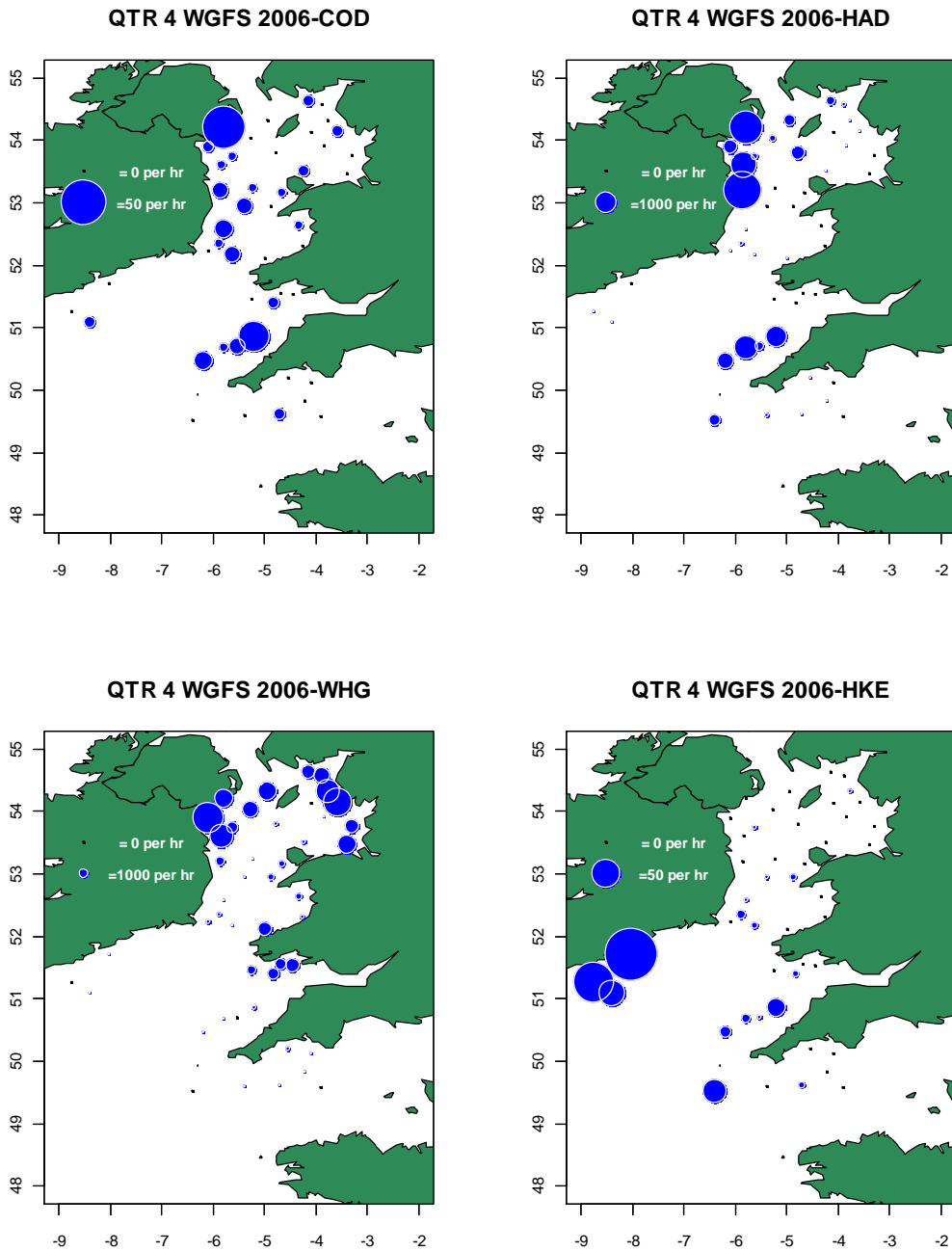


FIGURE 5: Distribution and relative abundance (no. per hour) of anglerfish (MON), lemon sole (LEM), megrim (MEG) and plaice (PLE). Refer to Figure 1 for which ground gear was used.

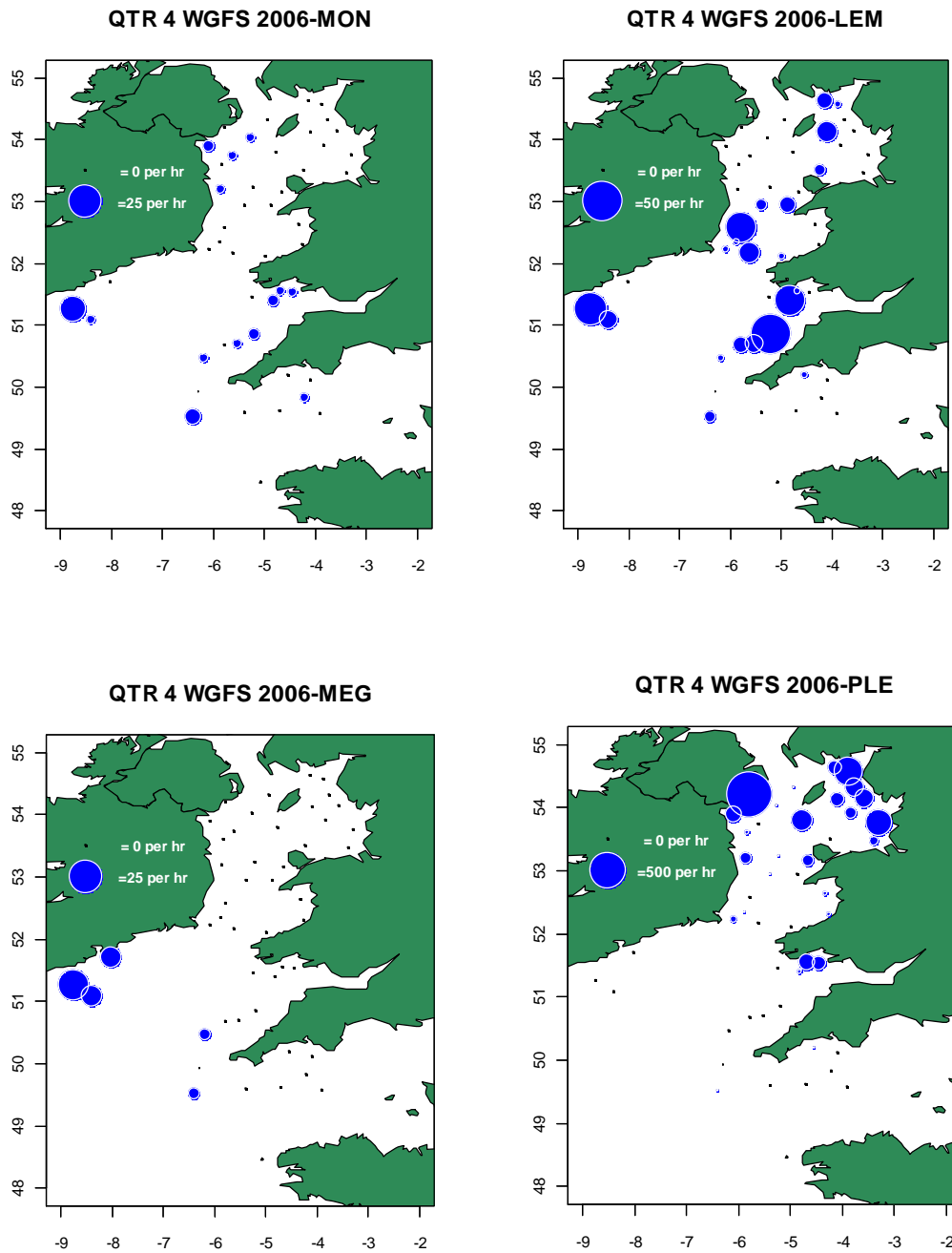


FIGURE 6: Distribution and relative abundance (no. per hour) of herring (HER), mackerel (MAC), anchovy (ANE) and pilchard (PIL). Refer to Figure 1 for which ground gear was used.

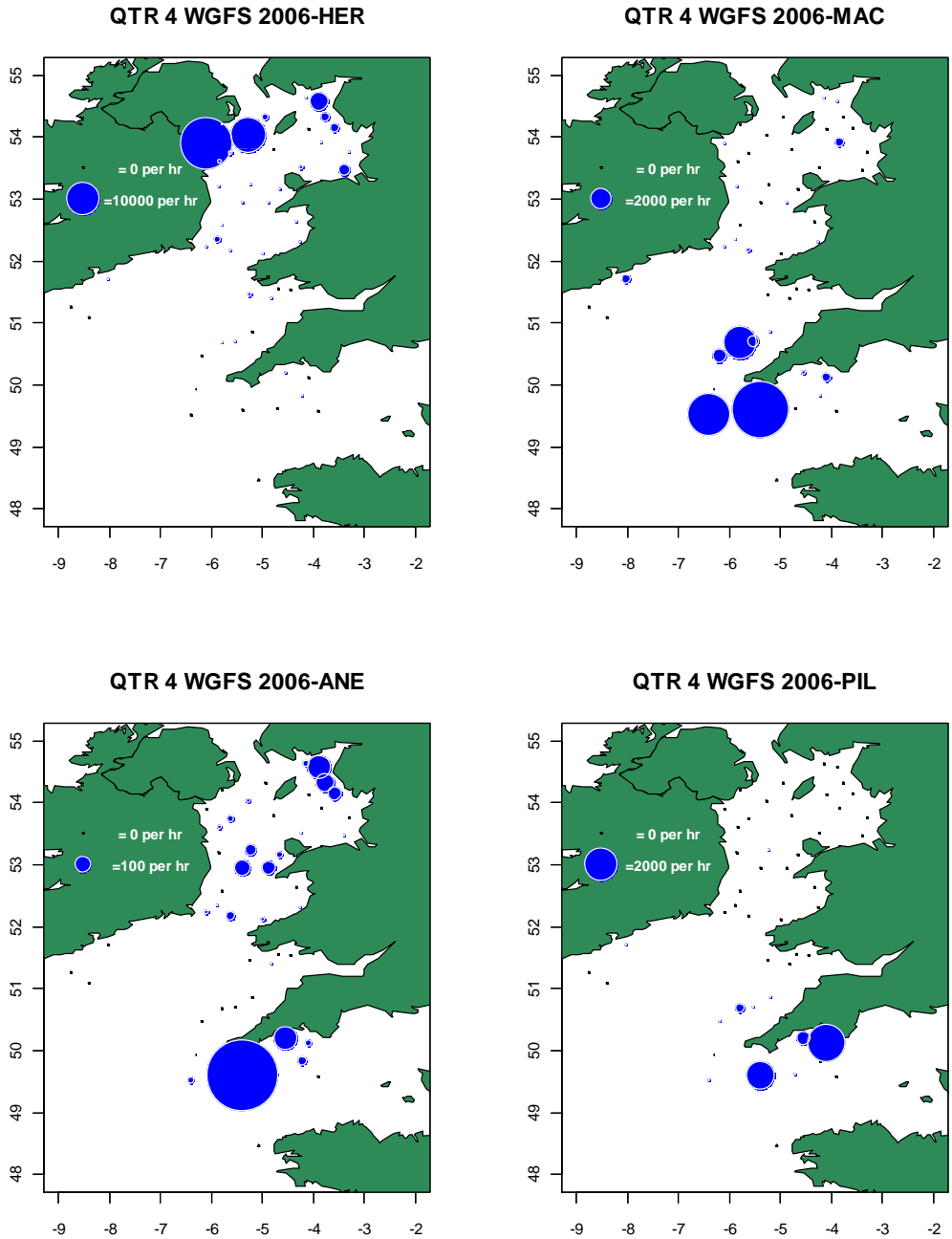


FIGURE 7: Distribution and relative abundance (no. per hour) of spurdog (DGS), thornback skate (THR), *Nephrops* (NEP), and northern squid (NSQ). Refer to Figure 1 for which ground gear was used.

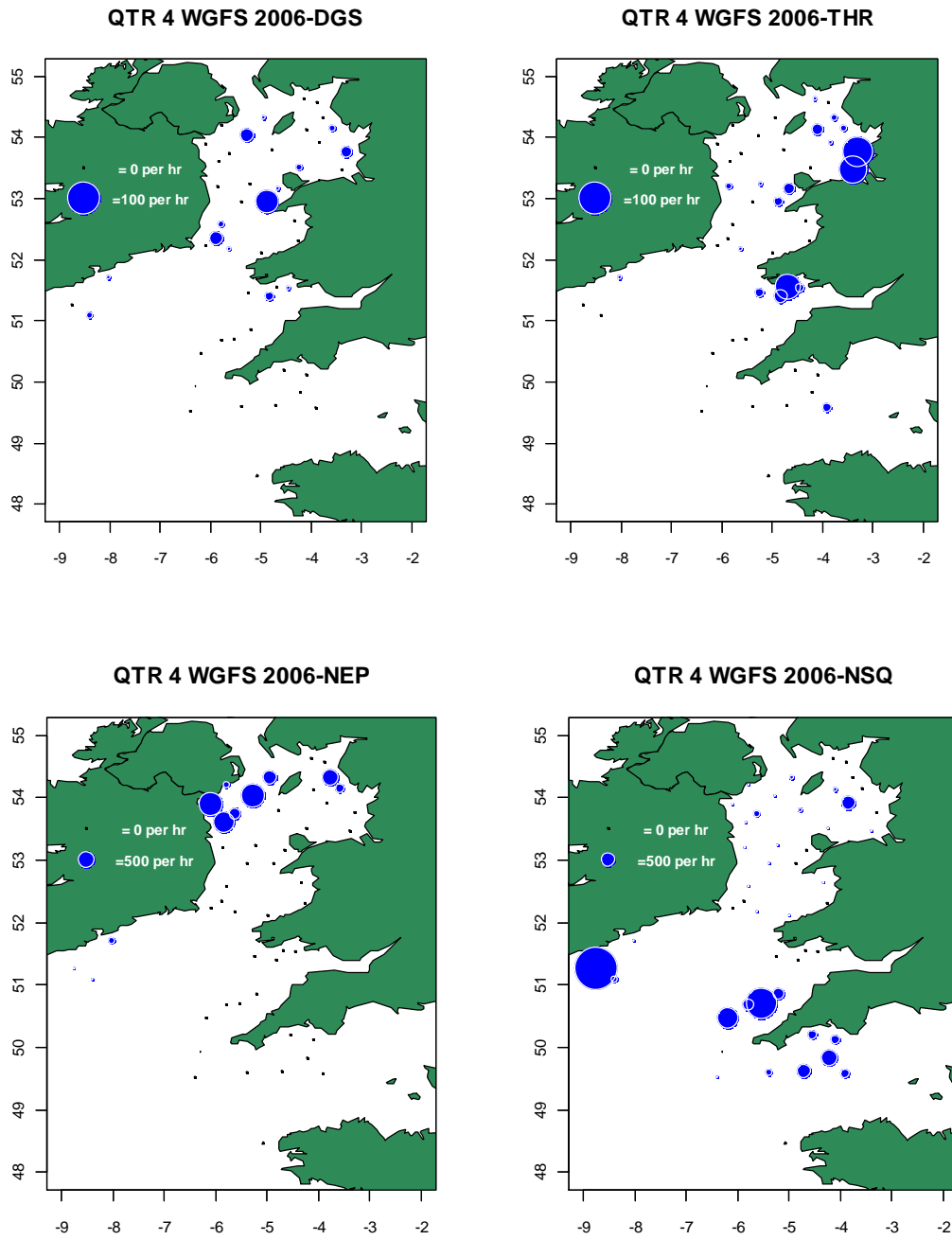


FIGURE 8: Relationships between total weight and mantle length in four species of squid (*Alloteuthis subulata* ATS; *Loligo forbesi* NSQ; *Todaropsis eblanae* OME; and *Illex* spp. SQI).

