LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK, NR33 OHT

2016 RESEARCH VESSEL PROGRAMME

REPORT: RV CEFAS ENDEAVOUR: SURVEY 5/16

STAFF:

Part One	Part Two
I Holmes (SIC)	S McCully Phillips (SIC)
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J Pettigrew	K Duggan
C Jennings	R Brittain
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P Gardiner (3-6 March)	N Hampton
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DURATION: 3 – 27 March 2016

LOCATION: Western English Channel/Celtic Sea (ICES areas VIIe, VIIf, VIIg, VIIh, VIIj)

SURVEY AIMS:

PRIMARY AIMS:

1) To carry out a beam trawl survey of the Celtic Sea, South-Western Approaches and Western English Channel. Deploying standardised 4m beam trawls (x2) and water column profiler. Station selection will be based on a fully random stratified approach with gears deployed at each station where appropriate.

   Catches from the trawls will be processed to obtain information on:

   - Distribution, size composition and relative abundance of fish, cephalopods, and benthic invertebrates.
   - Age-length distribution of selected fish species.
   - Biological parameters of selected species.

The data obtained from processing the trawl catches is collected in support of the EU Data Collection Framework (DCF) and will be submitted to ICES working groups and will also support other Cefas biological studies.

2) To fully test updated Electronic Data Capture (EDC) software functionality using two fishing gears at a single sampling location (P Gardiner – Cefas, Lowestoft).

SECONDARY AIMS:

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

4) Collect information on:
    a. Distribution of macro-benthos
    b. Distribution and classification of anthropogenic debris.
    c. Distribution of fish in relation to their environment.

5) To collect full depth, conductivity, temperature and depth profiles at each trawl station alongside surface and near-bottom water samples using a Niskin bottle with ESM2 logger.

6) To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'.

7) To record details of surface sightings of any marine mammals, sea turtles and large pelagic fish, and record observations of jellyfish aggregations.

8) Collect water samples for caesium & tritium analysis under SLA22 (T Bailey – Cefas).

9) To collect water alkalinity and dissolved inorganic carbon (DIC) and nutrient samples at selected stations. (N Greenwood - Cefas).

OPPORTUNISTIC AIMS:

10) To tag and release specimens of various commercially exploited skates (Rajidae) and other select elasmobranchs.

11) Collect specimens of selected species for ID purposes as well as length-weight measurements where still required.

12) Recover/replace Cefas wave-rider near the Scilly Isles (D Pearce – Cefas Lowestoft).

13) To collect length and weight measurements of jellyfish caught and in addition, collect jellyfish 'flesh' samples to allow baseline isotopic signature to be determined in order to compare these with the isotopic signatures of higher trophic level species (K St. John Glew – Southampton University).

NARRATIVE: (All times GMT)

Part 1.

Scientific staff joined the RV Cefas Endeavour in Lowestoft at 2100hrs on 2 March in readiness for sailing early the following day, leaving port at 0206hrs 3 March.

En-route to the survey area, chlorophyll and suspended particle matter (SPM) samples were collected at the West Gabbard smart-buoy location for Cefas colleagues. These samples were collected at 0529hrs 3 March. The remainder of the morning was occupied by survey operations, health and safety toolbox talks and a muster drill. At 1448hrs, 3 March, a 'shakedown' ESM/CTD dip followed by the deployment of both beams was carried out at a location off Dungeness (BTS7d survey prime station 74). Both operations were successful. Upon completion, the journey to the survey area was recommenced.

Cefas Endeavour arrived at the first fishing station in the Western English Channel at stratum 6; station 3 at 0603hrs 4 March. Work began with an ESM/CTD dip followed by the beams deployment. Four minutes into the beam deployment, concerns over the direction/angle of the port warp led to a partial haul during which the issue resolved itself. This led to an extended tow period, but still covering the required 2nm on the ground. During this first survey day, a total of seven successful tows were completed without incident working mostly offshore to take advantage on the fine sea conditions. Catches in this area consisted of medium sized plaice (*Pleuronectus platessa*; many spent females) but only a few sole (*Solea solea*). At stratum 6, station 4, the port gear caught a large by-catch of sand, gravel and brittle stars (*Ophiuroidea*), but the starboard gear caught little. As a result, the starboard gear was inspected for potential damage but none was found.

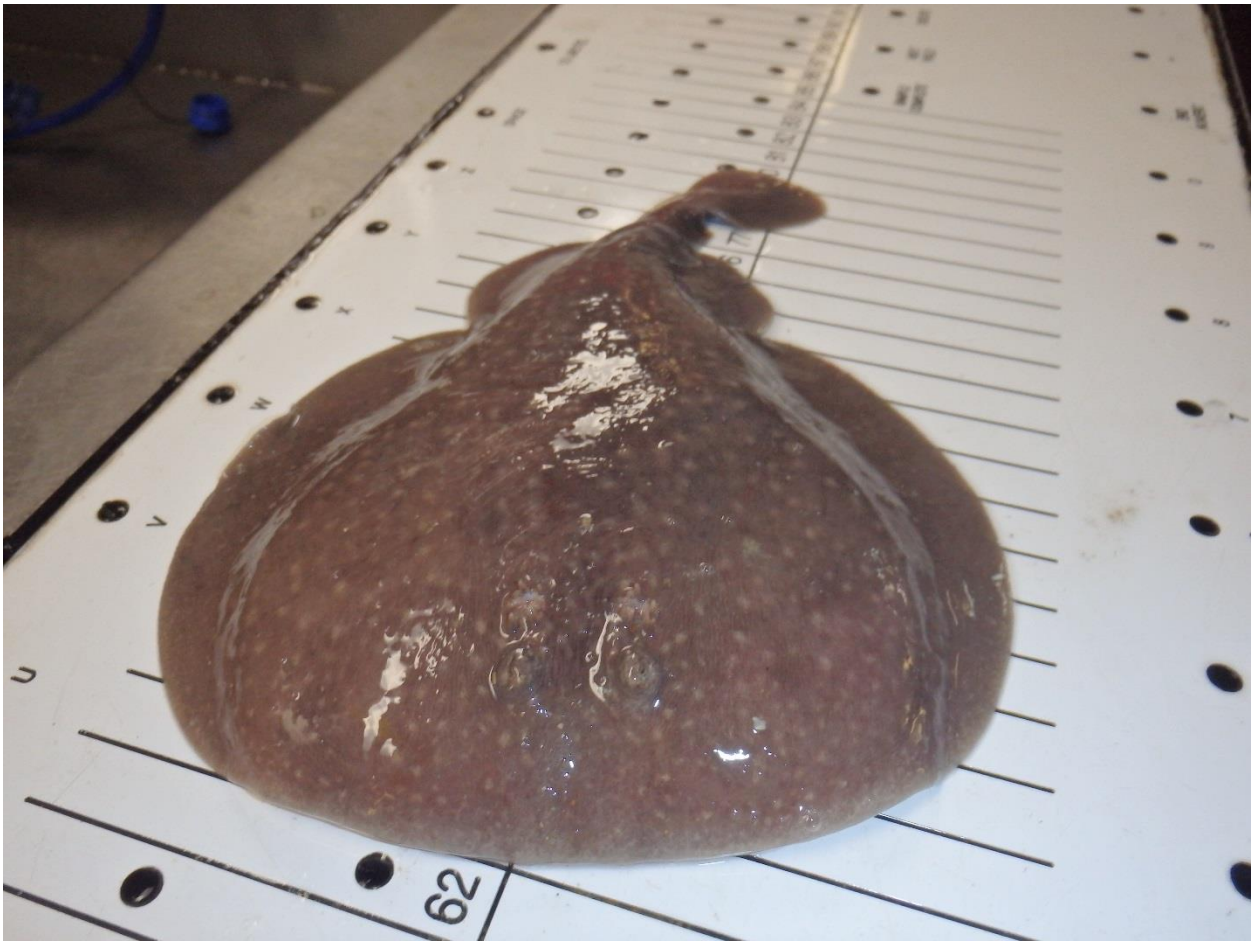
On 5 March, work began in stratum 7 completing a series of offshore tows within that stratum before heading inshore to complete four tows in stratum 4 SW of Start Point. A total of eight successful tows were completed during the day. The day saw a significant increase in the numbers of plaice being caught. Other major catch components were cuttlefish (*Sepia officinalis*), gurnards (*Triglidae*) and lesser spotted dogfish (*Scyliorhinus canicula*). On 6 March, a series of tows within stratum 5 in Lyme Bay were fished with all catches being light, but comprising mostly of small flatfish. At 1557hrs at Torquay, one scientist was disembarked as per survey plan, with another taking their place. At the end of this working day, the opportunity was taken to collect larval samples using the ring net.

The following day was spent within French waters and around the Channel Islands. Close co-operation with the Guernsey fisheries department meant we were able to work around the local vessels and their deployed static fishing gear. On the sixth tow of the day (stratum 10; station 4) both cod-ends were found to be holed and the tow deemed invalid for both gears. This unfortunately curtailed operations for the day whilst repairs were made. A total of 5 successful tows had been completed during the day. On 8 March, the day was spent fishing a series of mid-Channel stations including three close to the Hurd Deep with a total of seven stations being fished with minimal incident. Catches of monk increased during the day. With winds due to strengthen and turn N/NW, Cefas Endeavour headed back to the UK coast in order to continue working in the lee of the Devon/Cornwall coast the following day. This day began with five tows <3nm off the land, and were completed successfully in relative comfort with catches of small flatfish prevalent. Upon completion of these stations, some stations located further offshore were visited to see if conditions allowed them also to be fished. A further two stations were fished on this day.

On 10 March, survey operation began close to Falmouth and on the first tow, the starboard gear ‘came fast’ after 1.27nm on a pinnacle that showed up on the sounder but not on the multibeam viewer (Olex). With great skill and experience, the crew were able to recover the gear with little damage and the tow was deemed valid upon gear inspection. A further 6 valid survey stations were fished during the day. At prime station stratum 4, station 13, a total of 11 active fishing vessels were observed working within an 8 nm radius of our location. Overnight, Cefas Endeavour steamed south again to work the stations in French waters in stratum 11 and 10. En-route, a brief stop over the Hurd Deep was made allowing for a fish larvae sample using a ring net to be taken. This was carried out at 2210hrs. The 11 March was spent completing stratum 11 with three inshore stations being fished. In addition, two stations were completed in stratum 10. Station 6 within stratum 10 could not be fished due to boats working static gear in the vicinity and not having the light to see the gear. There were also several cables and rocky outcrops limiting any tow. On 12 March, the day began south-west of Guernsey at stratum 10; station 1. Upon hauling it was found that the port beam cod-end was holed and the station had to be re-fished. Once repairs had been made, the tow was re-fished for a reduced tow distance of 1nm. The remainder of stratum 10 stations were completed this day with one further tow completed in stratum 12. The tow at stratum 12 station 4 off Pointe de Beg-Pol was abandoned as no suitable tow could be located.

Overnight Cefas Endeavour streamed south-west to complete stations in eastern stratum I and stations in stratum J with suitable tow locations being successfully fished at five

locations. Stratum J continues to be problematic with most tows requiring a significant period of time searching for suitable ground prior to deployment of the gear, with most tows still being reduced in length to 1nm. On 14 March, the remaining four stratum 12 stations were successfully fished. The second tow of the day had to be re-fished as the port gear cod-end was holed at the first attempt and was re-fished with a reduced tow length. Catches consisted of sponges, urchins and the first marbled electric rays (*Torpedo marmorata*; see photo below) of this years' survey. Due to an increasing swell and with the onset of darkness, fishing operations ceased with one planned tow left unfished.

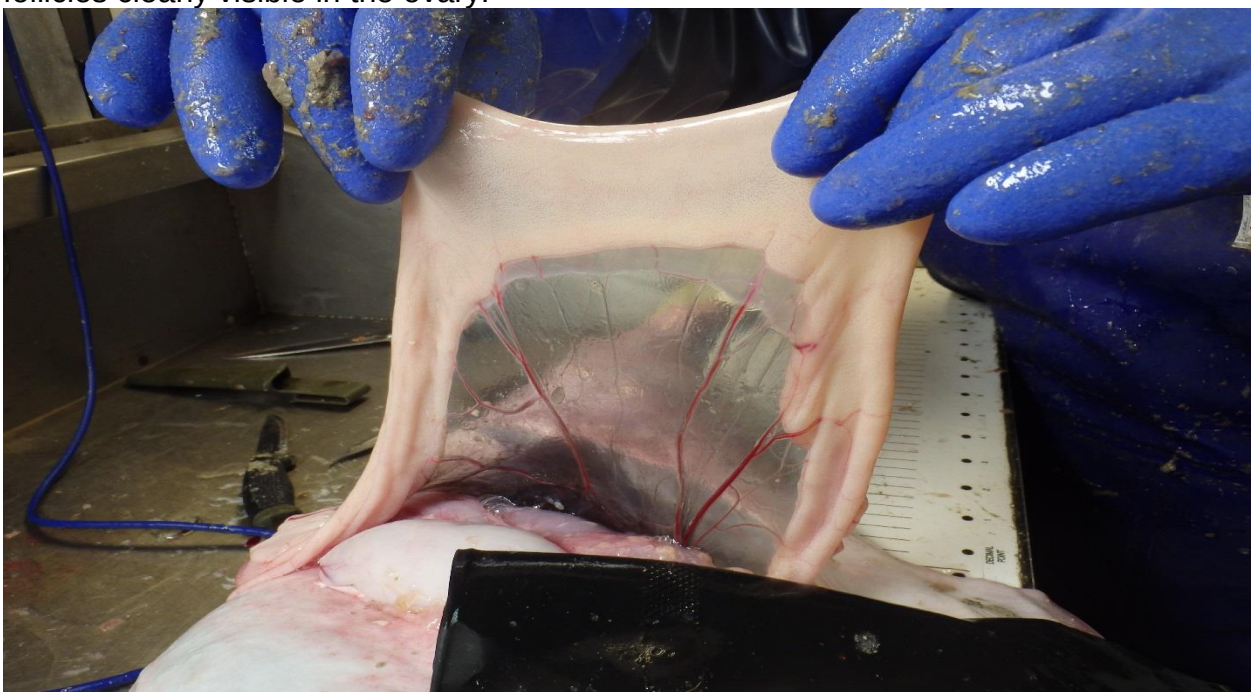


At first light, an attempt was made to recover and replace a Cefas wave-rider buoy located west of the Isles of Scilly. Unfortunately, sea conditions prevented this operation from occurring and the fishing survey recommenced in stratum 8, south-west of the Isles of Scilly. A series of seven tows in and around the Scillies including all tows in stratum 1 were completed on 15 March. The final survey day of part one was spent working six stations in Mounts Bay off the Cornish coast before the clean-up prior to docking began. Cefas Endeavour docked in Falmouth at 1830hrs 16 March.

Part 2.

After a changeover of scientific staff and obtaining fresh stores, Cefas Endeavour left Falmouth on 17 March at 2318hrs with safety inductions for arriving staff and a full toolbox talk having taken place prior to sailing. The transit overnight brought us on station at stratum 13, station 1, for first light. Following a further health and safety toolbox talk with the arriving staff, a CTD/Niskin profile was conducted to provide a sound-velocity profile (SVP) for the multibeam system followed by a 'shakedown' tow in order to ensure all arriving staff were fully briefed in sampling methods and use of the revised EDC software. Following this, the scientific complement split into two 12-hour shifts to allow for 24-hour survey operations. Over the course of the day, a total of 5 successful tows were completed in stratum 13, J and K.

On 19 March, fishing took place in stratum H, K and 8, completing a total of 10 successful tows and finishing stratum 8. The day saw good catches of monkfish (*Lophius piscatorius and Lophius budegassa)*, megrim (*Lepidorhombus whiffiagonis*) and cuttlefish. This completed the western Channel set of stations. The following day, just 6 tows were fished due largely to the longer steams between the tows. The remaining 4 tows in stratum I were completed along with an 'extra' tow in stratum IV that had been fished recently by our colleagues from the Marine Institute (ROI) on a recent RV Celtic Explorer survey. Catches throughout the day were light consisting mainly of monkfish, megrim, haddock (*Melanogrammus aeglefinus)* and hake (*Merluccius merluccius*). This was followed by a day working a 'loop' around the Haig Fras Marine Protected Area (MPA) working in stratum E, F and G completing seven stations during the day ending up at the western edge of the survey grid at stratum G, station 2. Several mature monkfish (both sub-species) were caught allowing us a rare opportunity to observe the mature stages of the species. The photograph below is of a mature monk (*Lophius budegassa*) with egg follicles clearly visible in the ovary.



On 22 March, Cefas Endeavour continued to benefit from fine weather and calm seas and worked the most exposed stations in the west of the survey grid in stratum E and G, completing a total of 6 successful tows. Catches were dominated by monkfish (mostly *Lophius budegassa*), haddock, megrim and lesser spotted dogfish. The following day, work began at stratum B, station 1, close to the Irish coast. The second planned tow of the day was abandoned due to the unavailability of a suitable tow as a result of shallow waters and power cables. The alternative tow of stratum B, station 7 was successfully fished in lieu of this tow. At stratum D, station 5, eight nursehounds (*Scyliorhinus stellaris*) were caught between the two gears, all were in excess of 80cm long and were tagged and released. The last tow of the day (stratum C, station 7) yielded good numbers of ray species (small-eyed - *Raja microocellata;* blonde - *Raja brachyura* and spotted - *Raja montagui*) and many were tagged and released. A total of 9 tows were successfully completed including all 5 within stratum D.

On 24 March, the day began with an aborted attempt to fish stratum C, station 8, with the tow curtailed at 0.64nm due to bad ground. The gear was inspected for damage and it was discovered that the starboard 'flip-up' warp had parted, along with two shackles and one necklace chain. The port gear was undamaged. Following repairs, work recommenced at stratum C, station 9 which yielded very small catches of mostly lesser spotted dogfish. The remainder of the day was spent completing stratum C with a total of seven tows completed. The final tow of the day at stratum C, station 3 off St Ives was abandoned at 0.4nm due to bad ground. Both sets of gear were inspected and found to be missing a few shackles and necklace chains but were otherwise undamaged. No alternative tow could be located in the vicinity and the location was abandoned. On 25 March, the tow at stratum B, station 6 had to be postponed as it was located within a traffic separation scheme (TSS) and the tidal conditions at the time of arrival meant that the tow would have needed to be fished against the traffic flow. The final four survey stations were successfully fished over the course of the morning including the tow located within the TSS. The final tow of the survey (stratum B, station 4) had to be fished three times as on the first two attempts, the port gear cod-end was damaged by rocks rendering the tow invalid. The third attempt was fished with both a reduced tow length of 1nm and with a shortened warp ratio of 3-to-1 thus ensuring a valid tow was achieved.

With the entire survey grid completed, Cefas Endeavour headed to a position south-west of the Isles of Scilly to make a second attempt at recovering and replacing the wave-rider buoy located there. With deteriorating weather and sea conditions, time was short but the buoy was successfully recovered at 1822hrs with the replacement fully deployed at 1911hrs, 25 March.

Following this, the decision was taken to attempt to fish some additional survey tows within the Western English Channel survey grid, operating close inshore to avoid the incoming inclement weather, beginning in stratum 2 close to Mounts Bay. Fishing resumed at stratum 2, station 9 at 2232hrs that day and continued until 0237hrs the following morning with a total of three additional tows being successfully fished within this stratum. En-route to the next selected additional tow in stratum 13, the decision was taken to cease survey operations completely and begin the journey back to Lowestoft.

The forecast bad weather predicted strong to gale-force southwesterly winds veering southerly meaning that getting back to Lowestoft and then into port would be difficult unless survey operations ceased at that time. During the journey back, all laboratories were cleaned and gear packed away in readiness for off-loading.

Cefas Endeavour docked in Lowestoft at 1248hrs on 27 March.

RESULTS BY AIM:

The survey gears used on this survey were the (survey) standard 4m-beam trawls (number 3) with chain mat, flip-up ropes and the net was fitted with a 40mm cod-end liner and 3m cod-end extension (starboard side), and the same gear (number 2) but without the 40mm con-end liner on the port side. All fish and selected commercial shellfish were identified to species, weighed and measured with large catches of an individual species being sub-sampled.

A SAIV Micro CTD unit was attached to the headline on the port 4m-beam trawl in order to record the temperature and salinity depth profile at each station fished. In addition, at two locations each day, a surface salinity sample was taken simultaneously with a Niskin bottom water sample and an ESM2 logger profile. Additionally, a SAIV Micro CTD unit was used to obtain a SVP for calibration of the multibeam.

All catch details and sample data were entered directly into the Electronic Data Capture (EDC) system and uploaded directly into the Fishing Survey System (FSS). Station details were manually entered into the FSS using information collected from the Transas bridge logging system and bridge logbook. Benthic observations were made from the starboard catch, with any observations from the port side catch not already seen in the starboard catch being added as additional starboard observations.

Primary aims

1) *To carry out a beam trawl survey of the Celtic Sea, South-West Approaches and Western English Channel. Deploying standardised 4m beam trawls (x2), and water column profiler. Station selection will be based on a fully random stratified approach with the gears deployed at each station where appropriate.*

A total of 131 successful tows were completed out of a total of 131 planned for the survey. This comprised of all 81 planned tows in the western English Channel and all 50 planned tows in the Celtic Seas. The gear deployments by survey area and validity are show in Table 1 below with lists of both the sampled and non-sampled species caught on the survey in Tables 2 & 3 with each species showing the associated catch and sample weights. Biological sample collections are shown in Table 4.

Figure 1 shows the positions of all beam trawl fishing stations, with Figure 2 showing the survey track each day with the relevant tow validities. Species composition pie plots for the entire survey is shown on Figure 3 with western Channel pie plot show every tow since 2006 show in Figure 4. The distribution of six major commercial species for the survey are shown in Figure 5 along with the length distributions of the same species along with total catch numbers for the two different gears at Figure 6. Appendix 1 gives the station details of each survey station including date/time, shooting and hauling coordinates and various weather/sea-state observational data.

The largest catches of sole were observed in the Western English Channel close to Start Point and off the north Cornwall coast, with one station west of Guernsey also yielding large numbers. Few sole were caught in the outer Celtic Sea. This is as observed in previous surveys. Plaice were also predominantly caught in western end of Lyme Bay and off the north Cornwall coast, with few being caught in French waters or in the Celtic sea. Anglerfish (*Lophius piscatorius)* were observed in greatest abundance in the Western English Channel and in the Celtic Seas southeast of Ireland. Catch numbers were much less than observed in 2015, but were generally observed as being larger fish. White anglerfish (*Lophius budegassa*) were caught in greater numbers in the Celtic Sea with few individuals caught in the western Channel. Lemon sole were predominantly caught off the north Cornwall coast and south-east of Ireland with fewer individuals caught in UK inshore waters in the Western English Channel. Few individuals were observed off the northern French coast. Common cuttlefish catches were mostly seen in the Western English Channel with the largest catches taken offshore from Start Point and northwest of Brittany. Few cuttlefish were caught in the Celtic Sea.

Table 1: Gear deployments and validity by area

Area	Gear	Validity	Number of Deployments
Celtic Sea	4m Beam Trawl with blinder	A	3
Celtic Sea	4m Beam Trawl with blinder	I	1
Celtic Sea	4m Beam Trawl with blinder	V	53
Celtic Sea	4m Beam Trawl no blinder	A	1
Celtic Sea	4m Beam Trawl no blinder	I	3
Celtic Sea	4m Beam Trawl no blinder	V	53
Celtic Sea	ESM2 logger, CTD and Niskin	V	15
Western Channel	4m Beam Trawl with blinder	A	2
Western Channel	4m Beam Trawl with blinder	I	1
Western Channel	4m Beam Trawl with blinder	V	84
Western Channel	4m Beam Trawl no blinder	A	0
Western Channel	4m Beam Trawl no blinder	I	3
Western Channel	4m Beam Trawl no blinder	V	84
Western Channel	ESM2 logger, CTD and Niskin	V	25
Western Channel	ESM2 logger, CTD and Niskin	I	2
Western Channel	Ring Net	V	3
Western Channel	Continuous Automated Litter/ Plankton Sampler (CALPS)	V	13
Western Channel	Caesium/Tritium water sample	V	11

Table 2: Total catch of sampled species, ordered by size of total catch

COMMON NAME	SCIENTIFIC NAME	Cefas Code	Sampled Catch	Total Catch
Lesser spotted dogfish	*Scyliorhinus canicula*	LSD	717.223	731.613
Monkfish	*Lophius piscatorius*	MON	471.66	472.525
Plaice	*Pleuronectes platessa*	PLE	374.741	376.345
Poor cod	*Trisopterus minutus*	POD	347.947	408.593
Greater spider crab	*Maja squinado*	SCR	248.862	252.497
Haddock	*Melanogrammus aeglefinus*	HAD	226.799	227.617
Megrim	*Lepidorhombus whiffiagonis*	MEG	221.455	223.075
Common cuttlefish	*Sepia officinalis*	CTC	207.55	207.55
White bellied anglerfish	*Lophius budegassa*	WAF	166.323	166.323
Pout whiting	*Trisopterus luscus*	BIB	165.534	166.028
Whiting	*Merlangius merlangus*	WHG	142.22	143.277
Sole	*Solea solea*	SOL	141.893	144.687
Hake	*Merluccius merluccius*	HKE	106.72	106.72
Lemon sole	*Microstomus kitt*	LEM	89.279	90.008
Cod	*Gadus morhua*	COD	87.63	88.087
Red gurnard	*Aspitrigla (chelidonichthys) cuculus*	GUR	86.631	86.866
Conger ell	*Conger conger*	COE	80.865	80.865
Edible crab	*Cancer pagurus*	CRE	77.247	77.543
Scallop	*Pecten maximus*	SCE	72.775	72.775
Cuckoo ray	*Leucoraja naevus*	CUR	70.851	70.851
Common dragonet	*Callionymus lyra*	CDT	68.134	68.387
Blonde ray	*Raja brachyura*	BLR	63.423	63.423
Starry smooth-hound	*Mustelus asterias*	SDS	59.515	59.515
Thornback ray	*Raja clavata*	THR	56.66	56.66
Brill	*Scophthalmus rhombus*	BLL	53.411	53.411
Spotted ray	*Raja montagui*	SDR	49.309	49.309
Undulate ray	*Raja undulata*	UNR	43.766	43.766
Nursehound	*Scyliorhinus stellaris*	DGN	41.539	41.539
Thick-back sole	*Microchirus variegatus*	TBS	36.112	36.412
Dab	*Limanda limanda*	DAB	35.349	64.032
Witch	*Glyptocephalus cynoglossus*	WIT	35.012	35.012
Tub gurnard	*Trigla (chelidonichthys) lucerna*	TUB	32.797	32.797
Pink cuttlefish	*Sepia orbignyana*	SEO	32.444	32.444
Pollack	*Pollachius pollachius*	POL	29.375	32.365
Grey gurnard	*Eutrigla (chelidonicthys) gurnardus*	GUG	29.228	29.556
Black sea-bream	*Spondyliosoma cantharus*	BKS	28.94	28.94
Norwegian lobster	*Nephrops norvegicus*	NEP	27.786	27.786
Turbot	*Scophthalmus maximus (psetta maxima)*	TUR	25.435	25.435
Norway pout	*Trisopterus esmarki*	NOP	24.499	24.499
Imperial scaldfish	*Arnoglossus imperialis*	ISF	21.354	21.354
Marbled electric ray	*Torpedo marmorata*	MER	19.855	19.855
Flounder	*Platichthys flesus*	FLE	18.76	19.761
Boarfish	*Capros aper*	BOF	18.328	18.43
European sea-bass	*Dicentrarchus labrax*	ESB	16.26	16.26
Ballan wrasse	*Labrus bergylta*	BNW	16.142	18.975
Streaked gurnard	*Trigloporus (chelidonichthys) lastoviza*	GUS	15.254	15.649
Small-eyed ray	*Raja microocellata*	PTR	14.587	14.587
Long-rough dab	*Hippoglossoides platessoides*	PLA	13.605	13.605
Three-bearded rockling	*Gaidropsarus vulgaris*	TBR	13.402	13.649
Herring	*Clupea harengus*	HER	13.167	13.167
Common skate complex	*Dipturus* cf. *flossada*	SKT	12.668	12.668

COMMON NAME	SCIENTIFIC NAME	Cefas Code	Sampled Catch	Total Catch
(Blue skate)				
Red mullet	*Mullus surmuletus*	MUR	12.598	12.812
Blue whiting	*Micromesistius poutassou*	WHB	12.307	12.307
Horse mackerel	*Trachurus trachurus*	HOM	11.911	11.911
Ling	*Molva molva*	LIN	11.445	11.445
Sand sole	*Pegusa (solea) lascaris*	SOS	10.342	10.942
Solinette	*Buglossidium luteum*	SOT	10.107	10.107
Velvet swimming crab	*Necora puber*	MLP	10.046	10.965
John dory	*Zeus faber*	JOD	8.637	8.637
European lobster	*Homarus gammarus*	LBE	8.321	8.321
Scaldfish	*Arnoglossus laterna*	SDF	6.569	6.569
Cuckoo wrasse	*Labrus mixtus (l. bimaculatus)*	CUW	6.194	6.373
Mackerel	*Scomber scombrus*	MAC	3.637	3.637
Common topknot	*Zeugopterus punctatus*	TKT	2.691	2.904
Common electric ray	*Torpedo nobiliana*	ECR	2.385	2.385
Goldsinny	*Ctenolabrus rupestris*	GDY	1.723	1.755
Argentine	*Argentinidae*	ARG	1.561	1.561
Greater forkbeard	*Phycis blennoides*	GFB	1.454	1.454
Shagreen ray	*Leucoraja fullonica*	SHR	1.425	1.425
Baillons wrasse	*Symphodus (crenilabrus) balloni*	BLW	1.112	1.112
Couch's seabream	*Pagrus pagrus*	SBC	1.076	1.076
Long-finned squid	*Loligo vulgaris*	LLV	1.059	1.059
Slipper lobster	*Scyllarus arctus*	ARC	0.856	0.856
Elegant cuttlefish	*Sepia elegans*	SEE	0.812	0.812
Spurdog	*Squalus acanthias*	DGS	0.79	0.79
Sting ray	*Dasyatis pastinaca*	SGR	0.68	0.68
Lesser weever	*Echiichthys (trachinus) vipera*	WEL	0.624	0.624
Norwegian topknot	*Zeugopterus (phrynorhombus) norvegius*	NKT	0.465	0.465
Spotted dragonet	*Callionymus maculatus*	SDT	0.464	0.464
Sprat	*Sprattus sprattus*	SPR	0.373	0.373
Ekstrom's topknot	*Zeugopterus (phrynorhombus) regius*	EKT	0.36	0.36
Long-finned gurnard	*Aspitrigla (chelidonichthys) obscura*	GUL	0.323	0.323
Tompot blenny	*Parablennius gattorugine*	TBY	0.301	0.367
Allis shad	*Alosa alosa*	AAS	0.265	0.265
Lesser flying squid	*Todaropsis eblanae*	OME	0.261	0.261
Pogge	*Agonus cataphractus*	POG	0.259	0.259
Butterfly blenny	*Blennius ocellaris*	BBY	0.259	0.259
Northern squid	*Loligo forbesi*	NSQ	0.231	0.231
Greater sandeel	*Hyperoplus lanceolatus*	GSE	0.205	0.285
Pilchard	*Sardina pilchardus*	PIL	0.195	0.195
Steven's goby	*Gobius gasteveni*	GSV	0.183	0.183
European common squid	*Loligo (alloteuthis) subulata*	ATS	0.164	0.164
Immaculate sandeel	*Hyperoplus immaculatus*	ISE	0.135	0.135
Anchovy	*Engraulis encrasicolus*	ANE	0.124	0.124
Greater pipefish	*Syngnathus acus*	GPF	0.122	0.122
Common spiny lobster	*Palinurus elephas*	SLO	0.113	0.113
Four-bearded rockling	*Enchelyopus cimbrius*	FRR	0.11	0.11
Red bandfish	*Cepola rubescens (c. macrophthalma)*	RPF	0.109	0.109
Common Squid	*Loligo spp*	SQC	0.068	0.068
Small-mouthed wrasse	*Centrolabrus exoletus*	SMW	0.065	0.065
Northern rockling	*Ciliata septentrionalis*	NNR	0.055	0.055
Five-bearded rockling	*Ciliata mustela*	FVR	0.05	0.055
Lesser sandeel	*Ammodytes tobianus*	TSE	0.048	0.048

COMMON NAME	SCIENTIFIC NAME	Cefas Code	Sampled Catch	Total Catch
Garfish	*Belone belone*	GAR	0.045	0.045
Sea scorpion	*Taurulus bubalis*	SSN	0.042	0.394
Greater weever	*Trachinus draco*	WEG	0.035	0.244
Bullrout	*Myoxocephalus scorpius*	BRT	0.026	0.026
Sand goby	*Pomatoschistus spp*	POM	0.017	0.017
Norway bullhead	*Micrenophrys (taurulus) lilljeborgi*	NVB	0.014	0.014
Frie's goby	*Lesueurigobius friesii*	FSG	0.012	0.012
Black goby	*Gobius niger*	BLG	0.009	0.009
Silvery pout	*Gadiculus argenteus*	SYP	0.007	0.007
Rock goby	*Gobius paganellus*	RKG	0.007	0.007
Blue-mouthed redfish	*Helicolenus dactylopterus*	RBM	0.003	0.003
Raitt's sandeel	*Ammodytes marinus*	MSE	0.002	0.002
Yarrell's blenny	*Chirolophis ascanii*	YBY	0.001	0.001

Table 3: Total catches of non-sampled species, ordered by size of total catch

Common Name	Scientific Name	Cefas Code	Weight (if taken)
Epibenthic mixture	N/A	BEN	6977.389
Assorted rocks	N/A	ROK	2779.896
Queen scallop	*Aequipecten opercularis*	QSC	88.907
Curled octopus	*Eledone cirrhosa*	EDC	83.981
Ross coral	*Pentapora foliacea*	PET	44.030
Barrel jellyfish	*Rhizostoma octopus*	BAR	20.845
Sponge crab	*Dromia personata*	DRP	2.105
Pink seafan	*Eunicella verrucosa*	EUV	1.953
Fan mussel	*Atrina fragilis*	AFR	0.998
Little cuttlefish	*Sepiola atlantica*	SPA	0.205
Bobtail squid	*Rossia macrosoma*	ROM	0.166
Sea mouse	*Aphrodite aculeata*	AAC	-
Cranchs spider crab	*Achaeus cranchii*	ACI	-
	Actinauge richardi	ACR	-
Feather star	*Antedon bifida*	ADB	-
Sea lemon	*Archidoris pseudoargus*	ADP	-
Astarte montagui	*Astarte montagui*	AEM	-
Common saddle oyster	*Anomia ephippium*	AEP	-
	Astarte sulcata	AES	-
Curly weed	*Alcyonidium diaphanum*	ALG	-
Broad clawed burrowing shrimp	*Alpheus macrocheles*	ALM	-
Red snapping shrimp	*Alpheus glaber*	ALP	-
Circular crab	*Atelycyclus rotundatus*	ALR	-
	Alcyonidiidae	ALX	-
Cloak anemone	*Adamsia carciniopados*	AMP	-
Anemone unidentified	*Anemone unidentified*	AMU	-
Knotted wrack	*Ascophyllum nodosum*	ANO	-
Sand star	*Astropecten irregularis*	API	-
Common pelicans foot	*Aporrhais pespelicani*	APP	-
	Ascidia conchilega	ASD	-
American slipper limpet	*Crepidula fornicata*	ASL	-
	Ascidiidae	ASY	-
Cushion star	*Asterina gibbosa*	ATG	-
	Axinella infundibuliformis	AXI	-
Red dead man's finger	*Alcyonium glomeratum*	AYG	-
	Bathynectes longipes	BAL	-

Common Name	Scientific Name	Cefas Code	Weight (if taken)
Breadcrumb sponge	*Halichondria panicea*	BCS	-
	Bolocera tuediae	BCT	-
Epibenthic mix unidentified	*Epibenthic mixture*	BEN	-
Star ascidian	*Botryllus schlosseri*	BIS	-
Bivalves	*Mollusca-bivalvia*	BIV	-
Shell	*Broken shell*	BSL	-
Brittle-stars	*Ophiuroidea*	BSY	-
	Calliactis parasitica	CAR	-
Masked crab	*Corystes cassivelaunus*	CCV	-
Bryozoan	*Cellariidae*	CEL	-
	Crangon allmanni	CGA	-
Variegated scallop	*Chlamys varia*	CHV	-
Green seaweeds	*Chlorophyceae*	CHZ	-
	Circomphalus casina	CIA	-
Barnacles	*Cirrepedia*	CIZ	-
Yellow boring sponge	*Cliona celata*	CLI	-
Ghost shrimp	*Caprella linearis*	CLL	-
	Crinoidea	CNZ	-
Common prawn	*Palaemon serratus*	CPR	-
Prickly cockle	*Acanthocardia echinata*	CPY	-
	Colus gracilis	CSG	-
Common(brown)shrimp	*Crangon crangon*	CSH	-
Common sunstar	*Crossaster papposus*	CTP	-
Parchment worm tubes	*Chaetopterus tubes*	CVT	-
Devonshire cup-coral	*Caryophyllia smithii*	DCC	-
	Dendronotus frondosus	DDF	-
Dogfish egg case	*Dogfish egg cases*	DEG	-
Dahlia anemone	*Urticina (tealia) felina*	DHA	-
	Diphasia nigra	DIN	-
Dead-mens fingers	*Alcyonium digitatum*	DMF	-
Nut crab	*Ebalia spp*	EBA	-
Pennants nut-crab	*Ebalia tuberosa*	EBT	-
Sea potato	*Echinocardium cordatum*	ECC	-
	Echinaster sepositus	ECS	-
	Echinocardium spp	ECV	-
Rough crab	*Eurynome aspersa*	EUA	-
Hornwrack	*Flustra foliacea*	FAF	-
Hornwrack	*Securiflustra securifrons*	FAS	-
	Filograna implexa	FII	-
Wracks	*Fucus spp*	FUX	-
	Gastropoda	GAS	-
	Goniasteridae	GAX	-
Faroe sunset-shell	*Gari fervensis*	GIF	-
Dog cockle	*Glycymeris glycymeris*	GLG	-
Squat lobsters	*Galathea spp*	GLX	-
Angular crab	*Goneplax rhomboides*	GOR	-
Goose barnacles	*Lepadidae*	GOZ	-
Sponge	*Haliclona oculata*	HAO	-
	Henricia oculata	HEO	-
Hermit in adamsia	*Eupagurus / pagurus in adamsia*	HIA	-
Hermit crab in epizoanthus	*Anapagurus in epizoanthus*	HIE	-
Hermit in suberites	*Eupagurus / pagurus in suberites*	HIS	-
Hermit in whelk	*Eupagurus / pagurus in buccinum*	HIW	-

Common Name	Scientific Name	Cefas Code	Weight (if taken)
Scaleworm	*Laetmonice (hermione) histrix*	HMH	-
	Henricia sanguinolenta	HNS	-
Sea cucumbers	*Holothuroidea*	HTZ	-
Great spider crab	*Hyas araneus*	HYA	-
Contracted crab	*Hyas coarctatus*	HYC	-
Hydroids	*Hydroida (order)*	HYD	-
Sickle hydroid	*Hydrallmania falcata*	HYH	-
Pheasant tail hydroid	*Lytocarpia myriophyllum*	HYL	-
	Hyalinoecia tubicola	HYT	
Scorpion spider crab	*Inachus dorsettensis*	IND	
Slender-leg spider crab	*Inachus leptochirus*	INL	
Inachus spp	*Inachus spp*	INX	-
Kelps-tangles-oarweeds	*Phaeophyceae-laminariales*	KEL	-
Norway cockle	*Laevicardium crassum*	LCC	-
	Luidia ciliaris	LDC	-
Corrugated swimming crab	*Liocarcinus corrugatus*	LIC	-
File shells	*Limidae*	LIZ	-
Arch-front swimming crab	*Liocarcinus arcuatus*	LMA	-
Swimming crab	*Liocarcinus depurator*	LMD	-
Common swimming crab	*Polybius (liocarcinus) holsatus*	LMH	-
Marbled swimming crab	*Liocarcinus marmoreus*	LMM	-
Kelp	*Laminaria spp*	LMX	-
Dwarf-swimming crab	*Liocarcinus pusillus*	LPU	-
	Luidia sarsi	LUS	-
Spiny starfish	*Marthasterias glacialis*	MAG	-
Long-leg spider crab	*Macropodia rostrata*	MCR	-
Slender spider crab	*Macropodia tenuirostris*	MCT	-
Macropodia spp	*Macropodia spp*	MCX	-
Squat lobster	*Munida rugosa*	MNR	-
Swimming crab	*Macropipus tuberculatus*	MPT	-
Edible mussel	*Mytilus edulis*	MUS	-
Polinices eggs	*Euspira (polinices) eggs*	NAE	-
Sea slugs	*Nudibranchia*	NBX	-
	Nemertesia antennina	NEA	-
Hydroid	*Nemertesia spp*	NEM	-
Ragworms	*Nereis spp*	NEX	-
Nut shells	*Nuculidae*	NNX	-
Netted dogwhelk	*Hinia (nassarius) reticulatua*	NSR	-
European sting winkle (drill)	*Ocenebra erinacea*	OCE	-
	Ophiura albida	OHA	-
	Ophiura ophiura	OHT	-
Common brittle star	*Ophiothrix fragilis*	OPF	-
	Ophiocomina nigra	OPN	-
Gibbs sea spider	*Pisa armata*	PAA	-
Pink shrimps (nei)	*Pandalus spp*	PAN	-
Hermit crabs	*Paguridae*	PAY	-
	Porella compressa	PCO	-
	Processidae	PCY	-
	Polyclinidae	PCZ	-
	Dichelopandalus bonnieri	PDB	-
	Pandalus propinquus	PDP	-
Hermit crab	*Pagurus bernhardus*	PEB	-
	Penaeoidea	PEZ	-

Common Name	Scientific Name	Cefas Code	Weight (if taken)
Sponges	*Porifera*	PFZ	-
Sea spider	*Pycnogonum littorale*	PGL	-
	Philine aperta	PHP	-
Long clawed porcelain crab	*Pisidia longgicornis*	PIS	-
	Pisa tetraodon	PIT	-
Goose-foot star	*Anseropoda placenta*	PLM	-
Plumose anemone	*Metridium senile*	PMA	-
	Pachymatisma johnstonia	PMJ	-
	Psammechinus miliaris	PMM	-
	Polymastiidae	PMX	-
Necklace shell	*Euspira (polinices) catena*	PNC	-
Hairy crab	*Pilumnus hirtellus*	PNH	
	Pontophilus spinosus	PPS	
Red cushion star	*Porania pulvillus*	PPV	
Northern pink shrimp	*Pandalus borealis*	PRA	
Pink shrimp	*Pandalus montagui*	PRM	
Pandalid shrimps	*Pandalidae (family)*	PSH	
Painted top shell	*Calliostoma zizyphinum*	PTS	
	Portunidae	PUZ	
	Raspailia spp	RAS	
Ray egg cases	*Raja egg cases*	RES	
	Rossia macrosoma	ROM	
Stalk ascidian	*Styela clava*	SAA	
	Serpula vermicularis	SAV	
	Scaphander lignarius	SDL	
	Simnia patula	SIM	
	Stichastrella rosea	SLR	
Atlantic mud shrimp	*Solenocera membranacea*	SOA	
Purple heart urchin	*Spatangus purpureus*	SPG	
	Spirontocaris lilljeborgii	SPL	
Squid eggs	*Squid eggs*	SQS	
	Eostichopus regalis	SSR	
Sea squirts	*Ascidiacea*	SSX	
Common starfish	*Asterias rubens*	STH	
Sponge	*Suberites spp*	SUB	
Brown seaweeds (nei)	*Phaeophyceae*	SWB	
Red seaweeds (nei)	*Rhodophyceae*	SWR	
	Tethya aurantia	TAA	
	Tritonia hombergi	TNH	
Auger shell	*Turritella communis*	TUC	
Hydroid	*Tubularia spp*	TUI	
Sea lettuce	*Ulva lactuca*	ULL	
	Upogebia spp	UPX	
	Echinus acutus	URA	
Edible sea urchin	*Echinus esculentus*	URS	
Sea urchins	*Echinoidea*	URX	
Whelk eggs	*Whelk eggs*	WES	
Common whelk	*Buccinum undatum*	WHE	
	Buccinum humphreysianum	WHH	
Bladder wrack	*Fucus vesiculosus*	WRB	
Toothed wrack	*Fucus serratus*	WRS	
Xanthidae	*Xanthid crab*	XAN	

Table 4: Biological samples collected by sex and area, in alphabetical order

Common Name	Scientific Name	Sex	Celtic Sea	Western Channel
Red gurnard	*Aspitrigla (chelidonichthys) cuculus*	F	78	115
Red gurnard	*Aspitrigla (chelidonichthys) cuculus*	M	115	90
Red gurnard	*Aspitrigla (chelidonichthys) cuculus*	U	4	17
Lon-finned gurnard	*Aspitrigla (chelidonichthys) obscura*	F	0	2
Lon-finned gurnard	*Aspitrigla (chelidonichthys) obscura*	M	0	1
Conger eel	*Conger conger*	U	8	30
Common stingray	*Dasyatis pastinaca*	M	0	1
European Seabass	*Dicentrarchus labrax*	F	1	3
European Seabass	*Dicentrarchus labrax*	M	3	9
Common Skate complex (Blue skate)	*Dipturus* cf. *flossada*	F	10	2
Common Skate complex (Blue skate)	*Dipturus* cf. *flossada*	M	5	1
Grey Gurnard	*Eutrigla (chelidonicthys) gurnardus*	F	132	91
Grey Gurnard	*Eutrigla (chelidonicthys) gurnardus*	M	89	44
Grey Gurnard	*Eutrigla (chelidonicthys) gurnardus*	U	5	19
Cod	*Gadus morhua*	F	12	5
Cod	*Gadus morhua*	M	11	3
Witch	*Glyptocephalus cynoglossus*	F	113	2
Witch	*Glyptocephalus cynoglossus*	M	46	0
Witch	*Glyptocephalus cynoglossus*	U	1	0
Megrim	*Lepidorhombus whiffiagonis*	F	525	137
Megrim	*Lepidorhombus whiffiagonis*	M	288	24
Megrim	*Lepidorhombus whiffiagonis*	U	0	1
Shagreen Ray	*Leucoraja fullonica*	M	1	0
Cuckoo Ray	*Leucoraja naevus*	F	17	27
Cuckoo Ray	*Leucoraja naevus*	M	24	51
Black bellied Anglerfish	*Lophius budegassa*	F	81	20
Black bellied Anglerfish	*Lophius budegassa*	M	72	14
Black bellied Anglerfish	*Lophius budegassa*	U	1	0
Anglerfish	*Lophius piscatorius*	F	113	94
Anglerfish	*Lophius piscatorius*	M	99	72
Anglerfish	*Lophius piscatorius*	U	1	3
Haddock	*Melanogrammus aeglefinus*	F	191	72
Haddock	*Melanogrammus aeglefinus*	M	186	49
Haddock	*Melanogrammus aeglefinus*	U	8	4
Whiting	*Merlangius merlangus*	F	189	87
Whiting	*Merlangius merlangus*	M	145	83
Whiting	*Merlangius merlangus*	U	2	1
Hake	*Merluccius merluccius*	F	71	17
Hake	*Merluccius merluccius*	M	63	23
Hake	*Merluccius merluccius*	U	13	6
Lemon Sole	*Microstomus kitt*	F	120	73
Lemon Sole	*Microstomus kitt*	M	101	84
Lemon Sole	*Microstomus kitt*	U	0	1
Ling	*Molva molva*	F	1	0
Ling	*Molva molva*	M	0	1
Ling	*Molva molva*	U	1	3
Red Mullet	*Mullus surmuletus*	F	11	36
Red Mullet	*Mullus surmuletus*	M	14	16
Red Mullet	*Mullus surmuletus*	U	0	1
Starry Smooth-hound	*Mustelus asterias*	F	7	18

Common Name	Scientific Name	Sex	Celtic Sea	Western Channel
Starry Smooth-hound	*Mustelus asterias*	M	5	17
Plaice	*Pleuronectes platessa*	F	170	345
Plaice	*Pleuronectes platessa*	M	129	240
Blonde Ray	*Raja brachyura*	F	9	9
Blonde Ray	*Raja brachyura*	M	9	3
Thornback Ray	*Raja clavata*	F	11	31
Thornback Ray	*Raja clavata*	M	8	30
Small-eyed Ray	*Raja microocellata*	F	8	1
Small-eyed Ray	*Raja microocellata*	M	5	2
Spotted Ray	*Raja montagui*	F	20	17
Spotted Ray	*Raja montagui*	M	35	20
Undulate Ray	*Raja undulata*	F	0	10
Undulate Ray	*Raja undulata*	M	0	14
Turbot	*Scophthalmus maximus (psetta maxima)*	F	2	9
Turbot	*Scophthalmus maximus (psetta maxima)*	M	1	6
Brill	*Scophthalmus rhombus*	F	4	13
Brill	*Scophthalmus rhombus*	M	4	14
Nursehound	*Scyliorhinus stellaris*	F	6	2
Nursehound	*Scyliorhinus stellaris*	M	6	4
Sole	*Solea solea*	F	78	142
Sole	*Solea solea*	M	53	128
Sole	*Solea solea*	U	0	2
Spurdog	*Squalus acanthias*	M	0	1
Marbled Electric Ray	*Torpedo marmorata*	F	2	3
Marbled Electric Ray	*Torpedo marmorata*	M	4	7
Electric Ray	*Torpedo nobiliana*	F	1	0
Electric Ray	*Torpedo nobiliana*	M	1	0
Tub Gurnard	*Trigla (chelidonichthys) lucerna*	F	9	35
Tub Gurnard	*Trigla (chelidonichthys) lucerna*	M	11	26
Streaked Gurnard	*Trigloporus (chelidonichthys) lastoviza*	F	9	22
Streaked Gurnard	*Trigloporus (chelidonichthys) lastoviza*	M	7	41

2) To fully test 'new' Electronic Data Capture (EDC) software functionality using two fishing gears at a single sampling location (P Gardiner – Cefas, Lowestoft)

The new EDC software developer (Paul Gardiner) spent the first four days on the survey observing the live use of the EDC software when fishing with two gears at a fishing station. This functionality had not been previously tested in the field. Minor issues only were encountered with otolith targeting with the pre-set percentage collection limits being by-passed and once identified, the issue was quickly resolved. Other minor software tweaks and enhancements in response to user suggestions were also made or logged with implementation carried out at a later date.

Secondary Aims

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

Not routinely carried out, but recording at 38kHz frequency were taken on occasions when shoals of fish were evident on the EK60 sounder and Jeroen Van Der Kooij (Cefas - Lowestoft) was informed post-survey.

4) Collect information on;

- *d. Distribution of macro-benthos.*
- *e. Distribution and classification of anthropogenic debris.*
- *f. Distribution of fish in relation to their environment.*

Observations of all macro-benthic by-catch were identified to species at each valid haul and were taken from the starboard gear, with additional species found in the port gear by-catch being added. All litter by-catch was classified to type, weighed and photographed. Fish and shellfish species in the catches were identified to species at each haul.

5) To collect full depth conductivity, temperature and depth profiles at selected trawl stations alongside surface and near-bottom water samples using a Niskin with ESM2 logger.

Completed. At two locations on each fishing survey day, CTD profiles and associated salinity water samples were collected.

6) To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'.

Completed. Ferrybox was running and collecting these data whilst the vessel was at sea.

7) To record details of surface sightings of any marine mammals, sea turtles and large pelagic fish, and record observations on jellyfish aggregations.

Completed – Just one confirmed sighting of a Minke whale (*Balaenoptera acutorostrata*) Other dolphin sightings were made but could not be confirmed.

8) *Collect water samples for caesium and tritium analysis under SLA22 (Trevor Bailey - Cefas Lowestoft).*

A total of 11 samples were collected including the sample at the Hurd Deep. Each sample consisted of 2 x 25 litre carboys and a 1 litre plastic bottle.

9) To collect water alkalinity and dissolved inorganic carbon (DIC) and nutrient samples at selected stations (N Greenwood - Cefas).

Not completed – advised prior to survey that these samples were no longer required.

Opportunistic Aims

10) To tag and release specimens of various commercially exploited skates (Rajidae) and other selected elasmobranchs.

Over the course of the survey a total of 84 specimens were tagged and released. These comprised:

Common Name	Scientific name	Number tagged/released
Starry smooth-hound	*Mustelus asterias*	21
Blonde Ray	*Raja brachyura*	17
Undulate Ray	*Raja undulata*	14
Nursehound	*Scyliorhinus stellaris*	13
Spotted ray	*Raja montagui*	10
Small-eyed ray	*Raja microocellata*	5
Common (Blue) skate	*Dipturus* cf. *flossada*	2
Shagreen ray	*Leucoraja fullonica*	1
Sting ray	*Dasyatis pastinaca*	1
	Total	84

11) Collect specimens of selected species for ID purposes as well as length weight measurements where still required.

A total of 86 individual length weight measurements of rarely caught species were collected.

These comprised:

Common Name	Scientific name	Number measured
Norwegian topknot	*Zeugopterus norvegius*	20
Steven's goby	*Gobius gasteveni*	16
Northern rockling	*Ciliata septentrionalis*	13
Ekstrom's topknot	*Zeugopterus regius*	8
Ballan wrasse	*Labrus bergylta*	8
Couch's sea-bream	*Pagrus pagrus*	6
Greater fork-beard	*Phycis blennoides*	3
Sea scorpion	*Taurulus bubalis*	3
Frie's goby	*Lesueurigobius friesii*	3
Rock goby	*Gobius paganellus*	1
Tompot blenny	*Parablennius*	1
Norway bullhead	*Micrenophrys*	1
Black goby	*Gobius niger*	1
Baillon's wrasse	*Symphodus balloni*	1
Yarrell's blenny	*Chirolophis ascanii*	1
	Total	**86**

12) Recover/replace Cefas wave-rider near the Scilly Isles (D Pearce – Cefas Lowestoft).

This work was carried out on 25 March. Details of the time that the recovered wave-rider buoy was 'on deck' and when the replacement buoy's clump was deployed were passed to D Pearce.

13) To collect length and weight measurements of jellyfish caught and in addition, collect jellyfish 'flesh' samples to allow baseline isotopic signature to be determined in order to compare these with the isotopic signatures of higher trophic level species (K St John Glew – Southampton University).

Five jellyfish measurements and 'flesh' samples were collected. In addition, seven other flesh samples were retained.

Additional sample collections

a) Two specimens of dead allis shad (*Alosa alosa)* were frozen (A Walker - Cefas, Lowestoft).

b) Specimens of cuttlefish and squid were retained for the purpose of testing the new EDC measuring board (M Challiss - Cefas Lowestoft).

c) All lesser weever (*Echiichthys (trachinus) vipera)* caught were retained for biological studies as part of PhD works (L Gorman – Newcastle University).

d) Two samples of mixed whelks (*Buccinum undatum)* and hermit crab in whelk (*Eupagurus bernhardus)* shells were retained as part on on-going shellfish projects (V Laptivhovsky – Cefas Lowestoft).

e) Eleven whole squid samples were retained for demonstrations of cephalopod ageing techniques (V Laptivhovsky – Cefas Lowestoft).

f) Five samples of Alloteuthis squid were retained for genetics and morphology studies (V Laptivhovsky – Cefas Lowestoft).

g) Six empty king scallop shells (complete) were retained for ageing and shell decay studies (V Laptivhovsky – Cefas Lowestoft).

h) Six samples of various gobies were retained (Suffolk wildlife Trust).

i) Ten specimens of moribund starry smooth-hound (*Mustelus asterias*) and one specimen of blonde ray found to be dead upon hauling were retained for on-going elasmobranch biological studies (S McCully Phillips – Cefas Lowestoft).

j) Two samples of anchovy (*Engraulis encrasicolus*) were retained for genetic studies (J Van Der Kooij – Cefas Lowestoft).

k) A total of 149 samples of benthic and fish species requiring confirmation of species identification were retained (J Ellis – Cefas Lowestoft).

l) Three ‘empty’ ray egg cases were retained (The Shark Trust).

m) Fifteen samples (whole fish or heads) of sole were retained for the B-FishConnect project looking to trace the spawning grounds of juvenile sole using DNA and otoliths (S Delerue-Ricard University of Leuven, Belgium).

n) A total of 3 samples were taken using a ring net with 270-micron mesh, deployed off the starboard gantry for use in fish larvae training workshop (D Johns – SAHFOS).

o) Thirteen trial plankton samples were collected from the Continuous Automated Litter and Plankton Sampler (CALPS) with an 80-micron mesh. These samples were taken to aid the development of future sampling/monitoring programmes (J Pettigrew – Cefas Lowestoft).

Litter by-catch information.

Details of the bycatch of litter caught at all fishing stations were recorded. Litter bycatch was categorized by 'type', weighed, photographed and categorized by size at every fishing station. In addition, details of any attached organisms were recorded. Photographs of all litter items were taken.

Micro CTD

The SAIV Micro CTD unit number 1151 was attached to the 4m-beam trawl in order to record the temperature, salinity and depth profile at each station fished and this was successful in recording data on all fishing days. A total of 137 successful CTD data collections were made.

Surface/bottom salinity samples

The starboard gantry with the 'hydrographic' wire was used in the collection of bottom water samples using a Niskin sampler and an ESM2 logger. The sample was routinely taken at around 2-3m off the seabed. In addition, at each CTD station, a surface salinity sample was taken from the ferrybox water supply. A total of 43 surface and 41 bottom salinity samples were collected. At each CTD station, a SVP was taken using a SAIV mini CTD unit (S/N 533) to calibrate the multibeam system.

Our thanks once again go to the officers and crew of RV Cefas Endeavour for their help, support and advice given during this survey and it is largely due to their skill and co-operation that all survey aims were achieved again this year.

Ian Holmes & Sophy McCully Phillips
29 March 2016

INITIALLED: S Kupschus
SEEN IN DRAFT: N/A

DISTRIBUTION:

I Holmes
J Smith
J Silva
G Burt
J Pettigrew
C Jennings
G Greenhalgh
S Smith
P Gardiner
S McCully Phillips
L Cox
M Whybrow
D Stokes (Marine Institute, Ireland)
K Duggan
R Brittain
N Hampton
C Derbyshire (Irish Observer)
K Maltby (Exeter University)

Additional:

S Kupschus
T Bailey
Cefas Fisheries Survey's SICs/2ICs
Cefas Trim
J Maitland (P&O)
B Salter (P&O)
Master (Cefas Endeavour)
FCO (for France)
Marine Management Organisation (MMO)
Welsh Government (WG)
Devon & Severn IFCA
Cornwall IFCA
Isles of Scilly IFCA
Southern IFCA
A Knights (Natural England)
Crown Estate
States of Jersey
Bailiwick of Guernsey

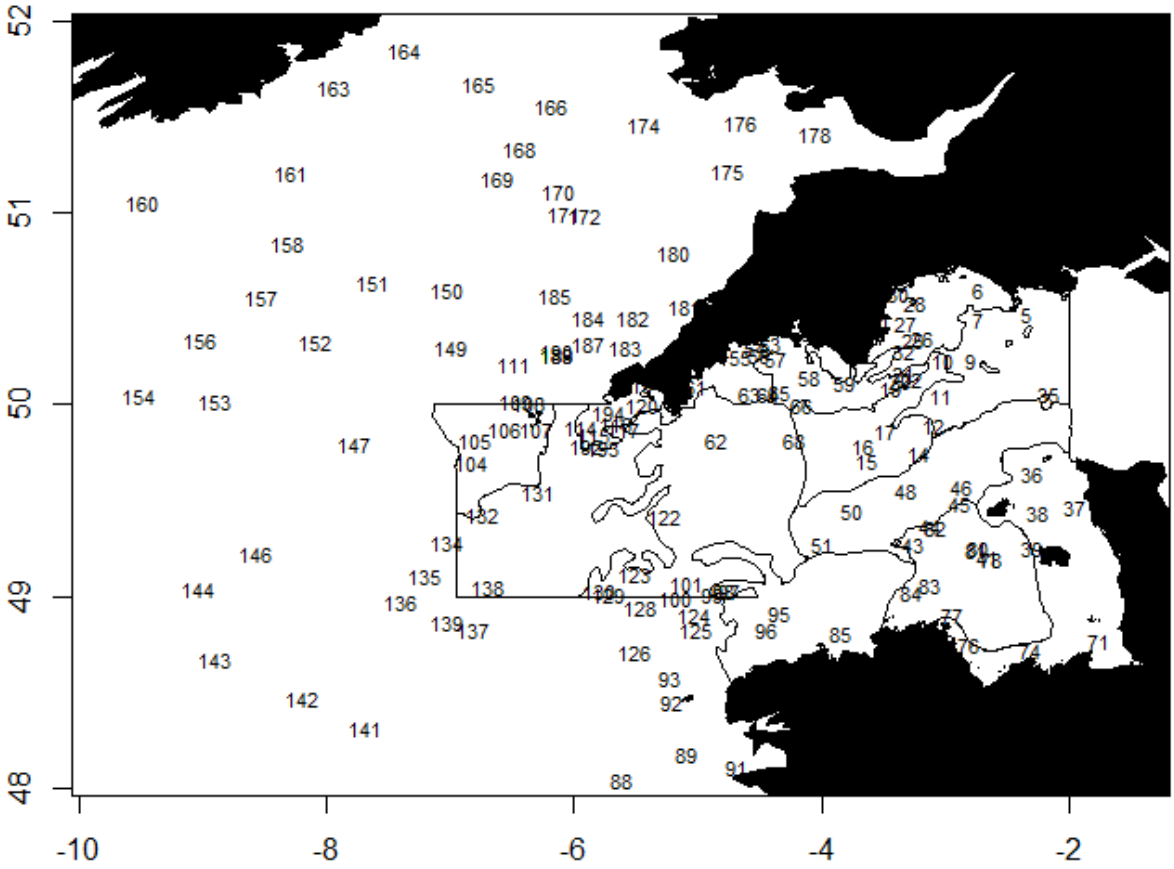


Figure 1: Chart of survey station numbers for CEND 5/16 (beam trawl stations only).

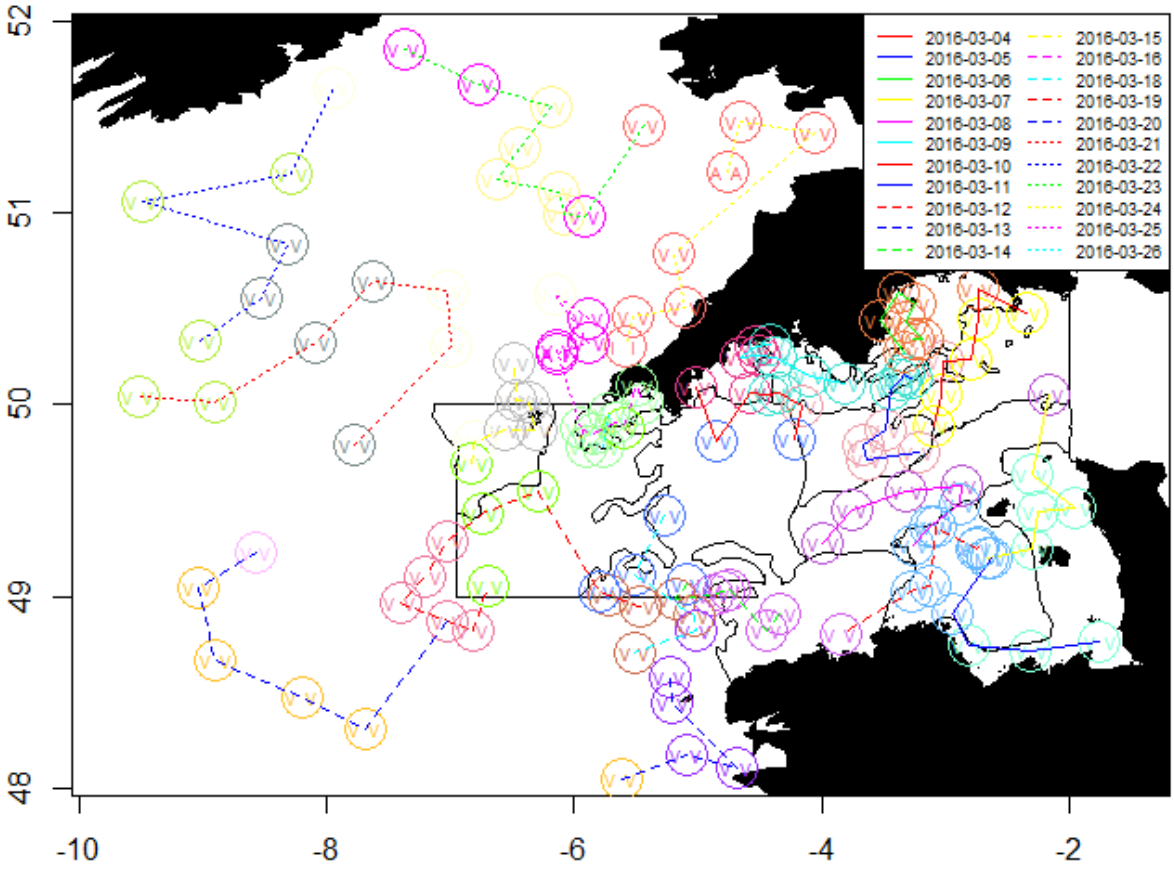


Figure 2: Survey Track showing beam trawl stations and validity codes (V = valid; A = additional, I = invalid) by day.

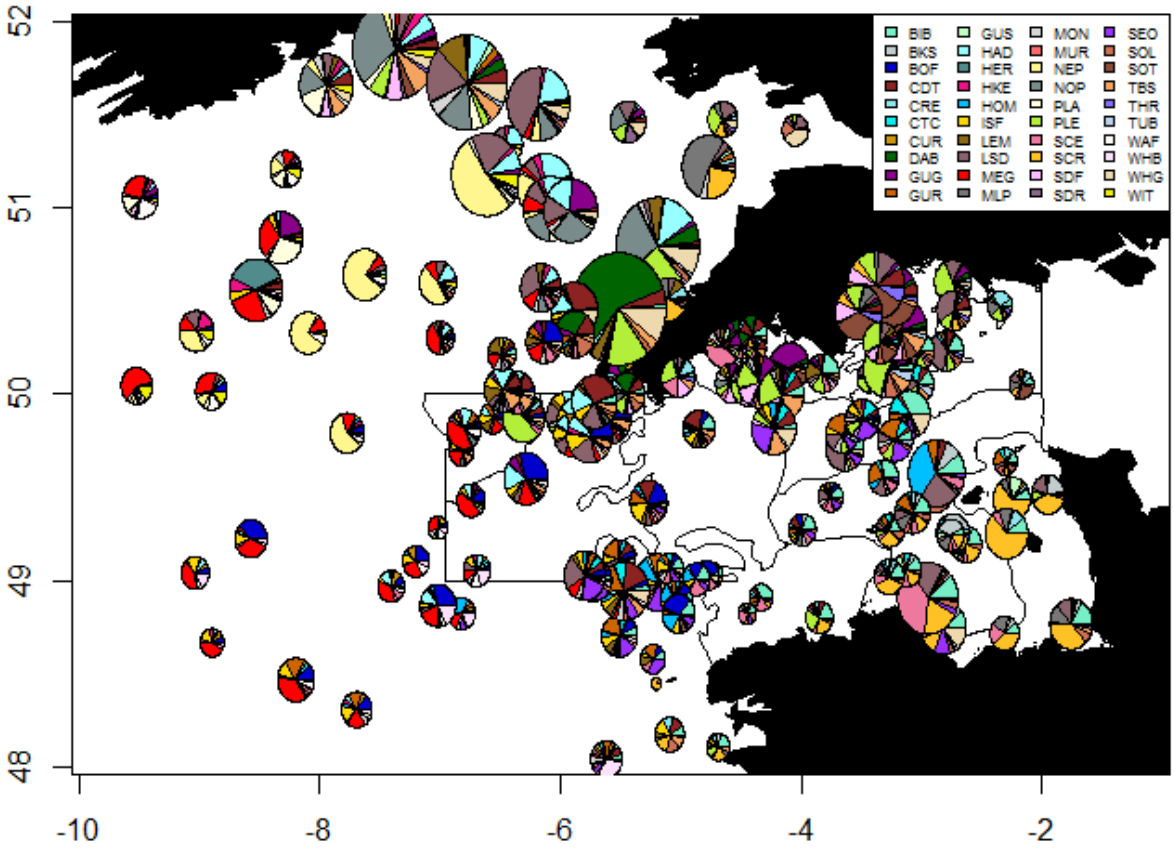


Figure 3: Species composition pie plots for Cend 5/16. Size of circles represents the size of the overall catch in numbers of the 40 most abundant species at a station with the size of the slice representing the relative proportion of each species encountered. For Cefas species codes see Table 2.

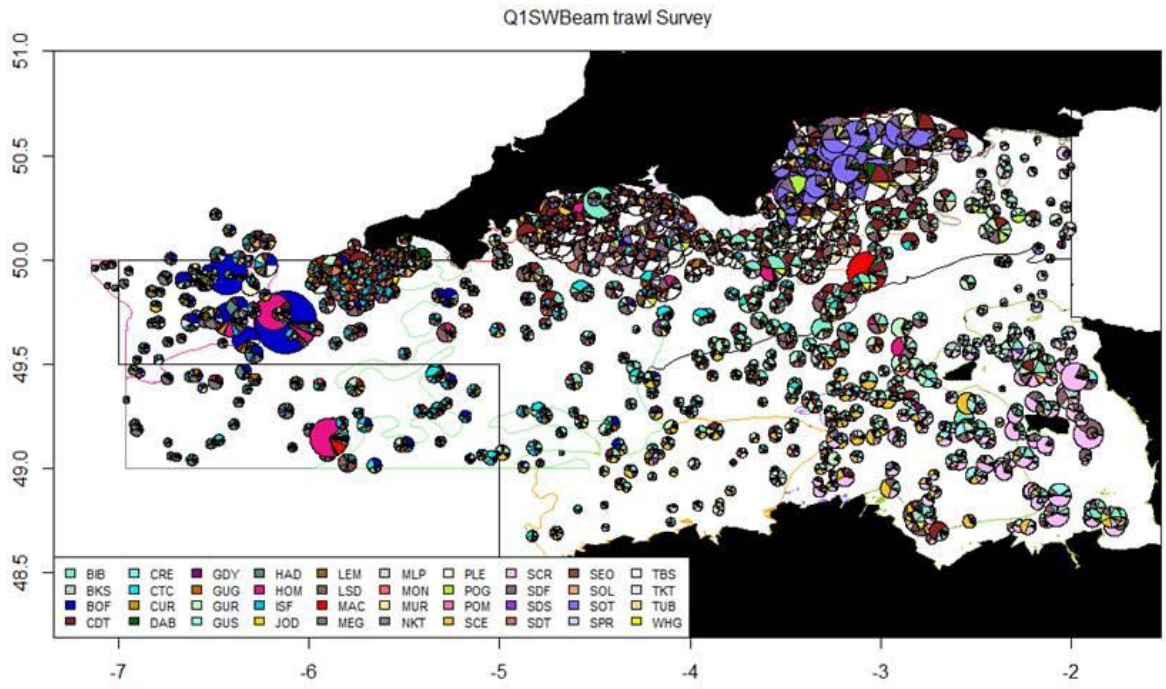


Figure 4: Species composition pie plots for the entire time-series (2006 – 2016) of the western English Channel part of the Q1SWECOS survey. Size of circles represent the size of the overall catch in numbers of the 40 most abundant species at a station with the size of the slice representing the relative proportion of each species encountered illustrating the general appropriateness of the stratum design although small refinements could be considered.

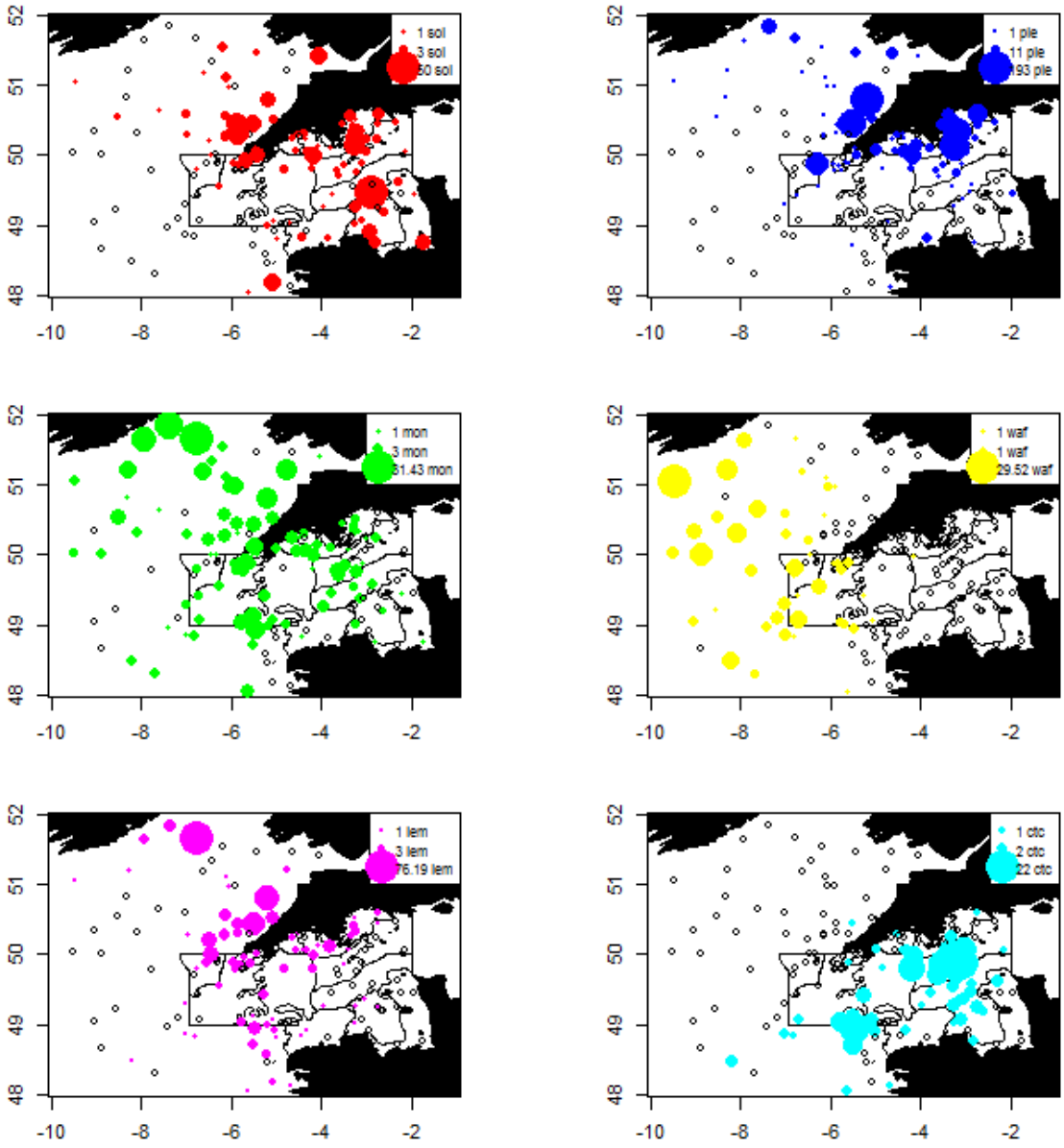


Figure 5: Distribution and numbers of major commercial species by station (see Table 2, for species codes).

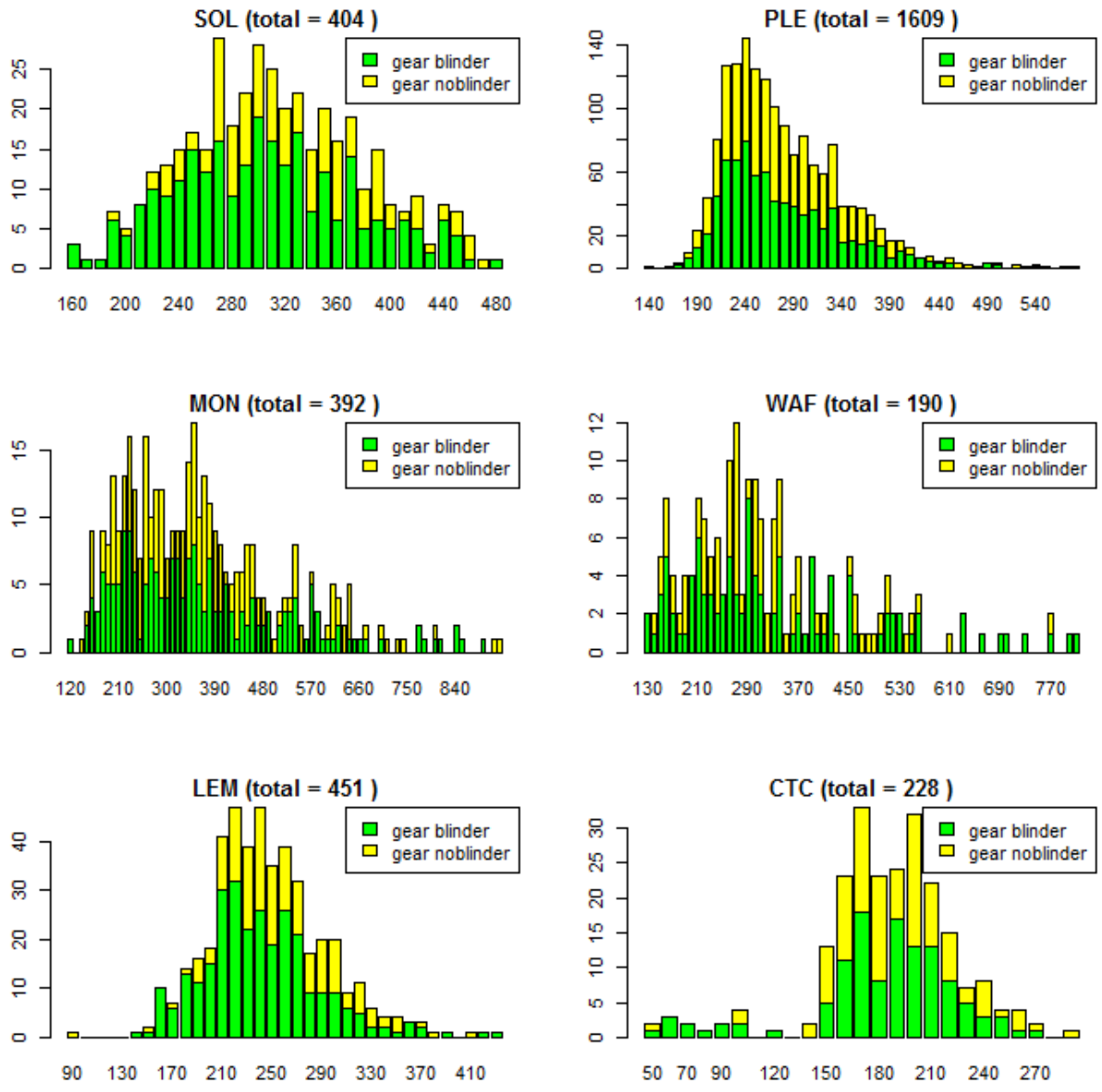


Figure 6: Length distributions (mm) for the major commercial species with total catch numbers by the two different gear types.

Appendix 1: Station Log information

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
4	04/03/2016 06:03	11	50.474833	-2.346333	50.474833	-2.346333	0	251.8	251.8	37	37	250	300	0.5	24	0.2	14	987	2	Profiler
5	04/03/2016 06:27	11	50.475666	-2.353666	50.472166	-2.412333	2.3	268.8	271.1	40	45	245	300	0.5	24	0.8	14	987	2	Beams
6	04/03/2016 08:45	10	50.604	-2.744	50.583166	-2.7025	2	287.4	289.4	33	34	300	260	0.5	1	0.5	12	986	250	Beams
7	04/03/2016 10:40	11	50.45	-2.738166	50.426333	2.701366	2	299.6	301.6	51	52	314	260	0.5	1	1	10	986	260	Beams
8	04/03/2016 12:57	11	50.242	-2.8185	50.242	-2.8185	0	314.5	314.5	57	57		270	0.5	1	0.3	19	986.5	260	Profiler
9	04/03/2016 14:06	11	50.234	-2.799	50.212833	-2.839166	2	316.4	318.4	61	62	68	280	0.5	1	0.5	15	986	1	Beams
10	04/03/2016 16:00	12	50.230666	-3.023	50.23	-3.074833	2	325.9	327.9	61	62	57	260	0.5	1	0.5	9	985.5	260	Beams
11	04/03/2016 17:39	11	50.052	-3.033333	50.019833	-3.047166	1.9	339.7	341.6	68	67	47	220	0.5	1	0.3	10	985.5	220	Beams
12	04/03/2016 19:08	11	49.892333	-3.102666	49.861	-3.120333	2	349.6	351.6	70	71	237	230	0.5	1	0.1	9	985.5	220	Beams
13	05/03/2016 06:17	12	49.745833	-3.225666	49.745833	-3.225666	0	396.5	396.5	73	73	329	350	0.5	2	0.2	22	991	340	Profiler
14	05/03/2016 07:00	12	49.752333	-3.225166	49.785833	-3.232333	2	398	400	72	71	293	350	0.5	2	0.3	23	991	340	Beams
15	05/03/2016 09:42	12	49.71	-3.640166	49.722333	-3.5935	2	419.6	421.6	76	76	243	30	0.5	1.5	0.6	30	995		Beams
16	05/03/2016 11:17	12	49.7895	-3.664166	49.801666	-3.616166	2	428.5	430.5	76	75	252	20	0.5	1.5	0.1	30	996	10	Beams
17	05/03/2016 12:58	12	49.866833	-3.494666	49.889666	-3.457166	2.1	436.7	438.8	74	73	245	20	0.5	1.5	0.1	19	997	10	Beams
18	05/03/2016 14:58	9	50.091	-3.444	50.091	-3.444		451.8		69		39	20	0.5	1	0.4	14	998	10	Profiler
19	05/03/2016 15:49	9	50.086166	-3.441166	50.084	-3.493166	2.1	453.1	455.2	70	70	51	20	0.5	1	0.8	14	998	10	Beams
20	05/03/2016 17:08	9	50.1295	-3.3675	50.113166	-3.411833	1.9	462.1	464	66	67	49	20	0.5	1	0.8	15	999	10	Beams
21	05/03/2016 18:22	9	50.161833	-3.345166	50.1435	-3.388333	2	469.8	471.8	65	65	47	350	0.5	1	0.6	14	999	0	Beams
22	05/03/2016 19:34	9	50.137666	-3.281666	50.186166	-3.238166	2	477.4	479.4	65	63	205	355	0.5	0.7	0	15	1000	0	Beams
23	05/03/2016 20:55	9	50.233666	-3.239833	50.233666	-3.239833				61	61									Profiler
24	06/03/2016 06:07	10	50.345833	-3.255166	50.345833	-3.255166	0	504.9	504.9	56	56	61	350	0.5		0.4	19	1002.5		Profiler
25	06/03/2016 06:32	10	50.3405	-3.2595	50.325666	-3.306333	2.1	506	508.1	56	57	62	350	0.5		0.4	17	1003		Beams
26	06/03/2016 08:01	10	50.349333	-3.182	50.357833	-3.131666	2	514.2	516.2	55	56	164	350	0.5		0	15	1003		Beams
27	06/03/2016 09:49	10	50.429333	-3.318833	50.46	-3.297666	2.1	525.9	528	44	40	218	350	0.5		0.5	15	1002		Beams
28	06/03/2016 11:17	10	50.531833	-3.255166	50.553166	-3.2145	2	533	535	30	30	232	330	0.5		0.2	20	1002		Beams
29	06/03/2016 13:04	10	50.582666	-3.365166	50.582666	-3.365166		542.2		17		80	300	0.5		0.2	10	1001		Profiler
30	06/03/2016 13:21	10	50.5865	-3.382333	50.57	-3.4275	2	543.1	545.1	17	18	79	300	0.5		0.2	10	1001		Beams
31	06/03/2016 16:13	10	50.439666	-3.5265	50.4255	-3.489833	1.7	556.4	558.1	15	15	11	290	0.5		0.1	12	999.5		Beams

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
32	06/03/2016 17:47	10	50.2775	-3.342	50.253	-3.377333	2	569.3	571.3	61	62	60		0.5		0.7		999		Beams
34	07/03/2016 06:09	14	50.060166	-2.1665	50.060166	-2.1665	0	631.7	631.7	67	67	85	10	1	1.5	2.5	21	1001	0	Profiler
35	07/03/2016 06:22	14	50.053833	-2.174666	50.039166	-2.221333	2	632.4	634.4	67	66	85	10	1	1.5	2.5	21	1001	0	Beams
36	07/03/2016 10:07	4	49.639166	-2.307166	49.668666	-2.283333	2	665.8	667.8	53	50	244	10	0.5	1	2.3	24	1005	5	Beams
37	07/03/2016 12:32	4	49.462166	-1.9545	49.485666	-1.918	2.1	687.1	689.2	23	22	180	350	0.5	0.5	1.6	21	1004.5	0	Beams
38	07/03/2016 14:59	4	49.437833	-2.256166	49.411166	-2.286333	2	707.9	709.9	54	54	30	350	0.5	0.5	0.6	19	1005	0	Beams
39	07/03/2016 16:29	4	49.252166	-2.2975	49.24	-2.3235	1.2	719.8	721	46	44	53	350	0.5	1.5	1.2	20	1006	0	Beams
40	07/03/2016 18:16	3	49.201166	-2.634666	49.201166	-2.634666		733.9		64		9	350	0.5	1.5	0.5	22	1006	0	Profiler
41	07/03/2016 18:51	3	49.199833	-2.657166	49.194	-2.607166	2	736.1	738.1	63	61	335	260	0.5	1.5	0.6	15	1006	0	Beams
42	08/03/2016 06:07	3	49.2745	-3.268333	49.2745	-3.268333		782		75		60		0.5	1	1		1009.5	0	Profiler
43	08/03/2016 06:34	3	49.271	-3.265	49.2725	-3.315833	2.1	784.1	786.2	76	67	50		0.5	0.5	0.7		1009.5	300	Beams
44	08/03/2016 08:31	3	49.369166	-3.129166	49.341	-3.102	2.1	797.8	799.9	74	72	348		0.5	0.5	1.6		1011	300	Beams
45	08/03/2016 10:33	3	49.481666	-2.893	49.469333	-2.8455	2	812.9	814.9	68	68	275		0.5	0.5	1.2		1010	300	Beams
46	08/03/2016 12:32	14	49.576666	-2.879	49.599833	-2.842166	1.9	823.5	825.4	70	70	220		0.5	0.5	2.9		1010	300	Beams
47	08/03/2016 15:28	14	49.5585	-3.303833	49.5585	-3.303833	0	845.6	845.6	97	97	121	240	0.5	0.2	0.3	25	1007	250	Profiler
48	08/03/2016 15:45	14	49.552833	-3.3205	49.540166	-3.367833	2	846.5	848.5	97	98	78	240	1	2	0.8	27	1006	250	Beams
50	08/03/2016 18:12	14	49.448666	-3.759666	49.441	-3.8095	2.1	864.8	866.9	88	88	73	240	1	2.5	1.1	22	1005	250	Beams
51	08/03/2016 20:09	14	49.273166	-3.994166	49.247666	-4.0265	2	879.4	881.4	89	89	247	230	1	2	0.2	20	1004	250	Beams
52	09/03/2016 06:07	9	50.314333	-4.385833	50.314333	-4.385833	0	967.6	967.6	41	41	94	320	1.5	2	2.7	49	987	280	Profiler
53	09/03/2016 06:47	9	50.319333	-4.419166	50.2885	-4.439166	2	970.2	972.2	30	52	82	320	1.5	2	0.9	49	987	280	Beams
54	09/03/2016 08:13	8	50.3035	-4.532833	50.3095	-4.5835	2	976.5	978.5	50	37	110	310	1	1	0.5	46	991	280	Beams
55	09/03/2016 09:37	8	50.250666	-4.652833	50.281833	-4.632	2	984.3	986.3	53	38	239	320	1	1	0.2	51	993	320	Beams
56	09/03/2016 11:33	8	50.261333	-4.501666	50.275333	-4.4545	2.1	994.1	996.2	51	49	248	320	1	1.5	0.6	42	995	320	Beams
57	09/03/2016 12:56	9	50.245333	-4.378666	50.251166	-4.3275	2	1000.4	1002.4	51	54	260	340	1	1.5	0.7	30	997.5	320	Beams
58	09/03/2016 14:53	9	50.148833	-4.101166	50.122833	-4.067	2.1	1013.5	1015.6	66	68	303	340	1	2	0.6	44	997	320	Beams
59	09/03/2016 16:27	9	50.113666	-3.825166	50.145333	-3.841333	2	1026.2	1028.2	73	70	90	340	1.5	3	0.5	41	999	330	Beams
60	10/03/2016 06:07	8	50.089	-5.025833	50.089	-5.025833		1091.6		48		35	340	0.5	1	1	19	1011.5	330	Profiler
61	10/03/2016 06:29	8	50.0935	-5.0245	50.073666	-5.035333	1.3	1093.2	1094.5	40	52	30	335	0.5	1	1	15	1012	330	Beams
62	10/03/2016 09:29	6	49.814333	-4.852	49.781666	-4.841333	2.1	1112.4	1114.5	86	85	231	5	0.5	1	0.2	15	1014	5	Beams
63	10/03/2016 12:26	8	50.06	-4.576	50.0875	-4.5465	2.1	1135.5	1137.6	71	71	252	20	0.5	1	0.5	8	1016	10	Beams

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
64	10/03/2016 13:50	9	50.0545	-4.4275	50.056333	-4.376	2	1143.1	1145.1	72	73	260	10	0.5	1	0.5	12	1015.5	10	Beams
65	10/03/2016 14:46	9	50.066833	-4.348	50.069666	-4.2965	2.1	1146.5	1148.6	73	74	270	0	0.5	1	0.3	10	1016	10	Beams
66	10/03/2016 16:15	12	49.999833	-4.169	49.981	-4.126166	2	1155.6	1157.6	76	77	321	0	0.5	1	0.1	10	1016	10	Beams
67	10/03/2016 17:55	6	49.818666	-4.229833	49.818666	-4.229833	0	1168.8	1168.8	81	81	77		0.5	1	1.2		1016	10	Profiler
68	10/03/2016 18:24	6	49.816666	-4.230666	49.810166	-4.281166	2	1169.9	1171.9	82	82	79		0.5	1	1.2		1016	10	Beams
70	11/03/2016 06:25	4	48.761	-1.739666	48.761	-1.739666	0	1297.4	1297.4	25	25	55		0.5		0.9		1019		Profiler
71	11/03/2016 06:48	4	48.766666	-1.761	48.77	-1.811333	2	1298.9	1300.9	29	31	55		0.5		0.9		1019		Beams
72	11/03/2016 11:38	4	48.712833	-2.2995	48.712833	-2.2995	0	1338.6	1338.6	30	30	290		0.5		1.4		1021		Profiler
73	11/03/2016 12:08	4	48.719833	-2.3345	48.719833	-2.3345	0	1340.1	1340.1	32	32	295		0.5		2.2		1021		Profiler
74	11/03/2016 12:30	4	48.716833	-2.315333	48.7105	-2.2905	1	1341.5	1342.5	30	29	283		0	0	1.2		1021		Beams
76	11/03/2016 14:46	4	48.7465	-2.821166	48.714	-2.811	2	1365.7	1367.7	27	26	65				0.1		1021		Beams
77	11/03/2016 17:56	3	48.904666	-2.952666	48.904833	-2.978166	1	1389.3	1390.3	52	52	108				4.3		1021		Beams
78	11/03/2016 21:02	3	49.1945	-2.633166	49.177666	-2.661333	1.4	1419.5	1420.9	64	64	19	20			0.7	5	1021		Beams
79	12/03/2016 06:07	3	49.250666	-2.7455	49.250666	-2.7455		1460.5		66		108				3.4		1022		Profiler
80	12/03/2016 06:32	3	49.254333	-2.744	49.261333	-2.793666	2	1462.2	1464.2	68	70	102			0.5	3.3		1022	260	Beams
81	12/03/2016 08:21	3	49.245166	-2.760166	49.248333	-2.785166	1.1	1473.6	1474.7	70	72	78				1.9		1022		Beams
82	12/03/2016 10:21	3	49.362666	-3.078666	49.329666	-3.0835	2	1489.7	1491.7	72	72	344				1.8		1023		Beams
83	12/03/2016 13:08	3	49.057	-3.126166	49.0505	-3.076666	2.1	1512.9	1515	67	66	264		0.5		3.2		1023.5		Beams
84	12/03/2016 14:55	3	49.020333	-3.274166	49.031166	-3.2265	2	1524.6	1526.6	68	68	257		0.5		1.9		1023.5		Beams
85	12/03/2016 18:34	5	48.801666	-3.852166	48.793833	-3.901166	1.9	1557	1558.9	64	74	71	30			2.4	11	1023		Beams
86	12/03/2016 21:04	5	48.715833	-4.273166	48.715833	-4.273166		1575.4		44		327	30	1		0.2	10	1024		Profiler
87	13/03/2016 06:02	22	48.109833	-5.582833	48.109833	-5.582833	0	1663.7	1663.7	126	126	19	60	0.5	1.5	1.7	15	1023	270	Profiler
88	13/03/2016 06:57	22	48.041333	-5.620333	48.009166	-5.6315	2	1668.8	1670.8	128	130	27	60	0.5	1.5	1	15	1023	270	Beams
89	13/03/2016 10:41	24	48.173	-5.095333	48.186833	-5.081333	1.1	1700.9	1702	95	92	179	100	0.5	1.5	1.3	15	1024	270	Beams
90	13/03/2016 12:54	24	48.097666	-4.721	48.097666	-4.721		1719		47		45			0.2	0.8		1023	270	Profiler
91	13/03/2016 13:43	24	48.105833	-4.691833	48.079	-4.721333	2	1722.7	1724.7	47	44	50		1	0.2	0.3		1022.5	270	Beams
92	13/03/2016 18:22	24	48.444166	-5.2065	48.411	-5.2015	2.1	1765.9	1768	106	106	45	60	1.5	2	0.9	25	1021	270	Beams
93	13/03/2016 20:58	24	48.578	-5.234833	48.565833	-5.252	1	1787.7	1788.7	114	115	69	50	1.5	2	0.7	30	1021	270	Beams
94	14/03/2016 06:16	5	48.924166	-4.298166	48.924166	-4.298166		1184.3		97		83	80	1	2	0.9	24	1021	70	Profiler
95	14/03/2016 06:38	5	48.911	-4.336	48.895666	-4.380833	2	1836	1838	98	100	84	80	1	2	1.1	22	1021	70	Beams

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
96	14/03/2016 08:10	5	48.823833	-4.450666	48.8145	-4.499166	2	1846	1848	100	101	74	80	1	2	1.6	17	1020.5	70	Beams
97	14/03/2016 10:54	5	49.029833	-4.747833	49.023333	-4.7975	2	1866.1	1868.1	97	102	137	80	1.5	2.5	0.3	30	1020	80	Beams
98	14/03/2016 13:06	5	49.025666	-4.788833	49.028166	-4.763833	1	1874.6	1875.6	100	99	240	80	1.5	2.5	1.2	29	1019.5	80	Beams
99	14/03/2016 14:22	5	49.0065	-4.875666	49.0155	-4.826833	1.9	1882.4	1884.3	103	100	248	80	1.5	2.5	1.5	25	1019	80	Beams
100	14/03/2016 16:22	25	48.988666	-5.187166	48.983833	-5.237666	2.1	1899.6	1901.7	107	109	284	80	1.5	3	0.6	29	1018.5	80	Beams
101	14/03/2016 18:05	6	49.0655	-5.093166	49.071	-5.043166	2	1910.1	1912.1	106	106	54	80	1.5	3	0.9	29	1018.5	80	Beams
102	15/03/2016 07:11	13	49.709666	-6.811666	49.709666	-6.811666	0	2017.4	2017.4	106	106	20	90	1.5	2.5	0.9	26	1019	90	Profiler
103	15/03/2016 07:32	13	49.716166	-6.817833	49.716166	-6.817833	0	2017.9	2017.9	106	106	20	90	1.5	2.5	0.9	26	1019	90	Profiler
104	15/03/2016 07:54	13	49.695166	-6.825	49.678166	-6.8695	2	2019.7	2021.7	106	110	52	90	1.5	2	0.6	15	1019	90	Beams
105	15/03/2016 09:43	19	49.814833	-6.802333	49.795666	-6.844833	2	2032.8	2034.8	109	110	65	80	1.5	2	0.8	22	1021	90	Beams
106	15/03/2016 11:54	2	49.873	-6.563	49.884333	-6.582166	1.1	2048.8	2049.9	94	96	170	60	1.5	2	0.8	20	1021	90	Beams
107	15/03/2016 13:41	2	49.873833	-6.308	49.889666	-6.263	2	2062.7	2064.7	64	72	272	90	1	2	1	21	1021	90	Beams
108	15/03/2016 15:42	2	50.010166	-6.3675	50.016833	-6.317166	2	2078.9	2080.9	83	81	274	50	0.5	1.5	0.6	19	1021	90	Beams
109	15/03/2016 17:10	2	50.023833	-6.4785	50.034833	-6.43	2	2089	2091	88	90	311	50	0.5	1.5	0.4	18	1021	90	Beams
110	15/03/2016 18:50	2	50.198333	-6.488333	50.198333	-6.488333		2101.5		98		16	30	0.5	1	0.4	13	1021	90	Profiler
111	15/03/2016 19:15	2	50.2175	-6.489166	50.190666	-6.458666	2.1	2103.8	2105.9	98	96	17	30	0.5	1	0.4	13	1021	90	Beams
113	16/03/2016 06:09	7	49.870666	-5.939333	49.870666	-5.939333	0	2153.8	2153.8	80	80	350	70	0.5	1	0.5	14	1021	90	Profiler
114	16/03/2016 06:34	7	49.880833	-5.9465	49.848166	-5.936666	2	2155.6	2157.6	79	84	345	70	0.5	1	0.5	15	1021	80	Beams
115	16/03/2016 07:40	7	49.848666	-5.847833	49.822	-5.816833	2	2161.7	2163.7	86	88	13	70	0.5	1	0.6	16	1021	185	Beams
116	16/03/2016 09:06	7	49.903	-5.663333	49.936166	-5.657	2	2171.9	2173.9	80	76	9	40	0.5	1	0.3	15	1021	80	Beams
117	16/03/2016 10:23	13	49.875833	-5.608166	49.851166	-5.643333	1.9	2180	2181.9	81	84	75	40	0.5	1	0.2	13	1021	80	Beams
118	16/03/2016 12:44	7	50.098333	-5.49	50.098333	-5.49		2199		27		114	40	0.5	1	0.2	17	1021	40	Profiler
119	16/03/2016 13:19	7	50.1035	-5.493333	50.0705	-5.5	2	2200.7	2202.7	23	41	125	60	0.5	0.5	0.1	12	1021.5	50	Beams
120	16/03/2016 14:31	7	50.004	-5.448333	54.976	-5.426	2	2207.3	2209.3	57	57	210	90	0.5	0.5	0.2	13	1020	70	Beams
121	18/03/2016 08:07	6	49.4105	-5.283	49.4105	-5.283	0	2292.2	2292.2	102	102	281	90	0.5	1	0.2	15	1019	80	Profiler
122	18/03/2016 08:38	6	49.418166	-5.269333	49.445666	-5.240333	2	2292.6	2294.6	102	103	308	90	0.5	1	0.2	15	1019	80	Beams
123	18/03/2016 11:55	6	49.113	-5.515833	49.089	-5.552	2	2318.4	2320.4	112	113	41	90	0.5	1	0.7	15	1018	90	Beams
124	18/03/2016 15:00	25	48.901833	-5.04	48.8875	-5.086	2	2345.8	2347.8	110	109	99	90	0.5	1	0.2	19	1016.5	90	Beams
125	18/03/2016 16:16	24	48.821333	-5.021333	48.807666	-5.067166	2	2354.1	2356.1	105	107	229	90	1	1.5	0.5	22	1016	90	Beams
126	18/03/2016 18:28	25	48.704666	-5.511166	48.731833	-5.482	2	2376.3	2378.3	113	116	230	90	1	1.5	0.7	22	1016.5	90	Beams

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
127	19/03/2016 00:16	25	48.955	-5.460666	48.955	-5.460666		2403.5		113		54	80	1	1.5	0.9	25	1017	90	Profiler
128	19/03/2016 00:46	25	48.942666	-5.472833	48.913166	-5.4965	2	2404.4	2406.4	114	116	59	80	1	1.5	0.9	24	1016	90	Beams
129	19/03/2016 03:20	25	49.005333	-5.728666	48.984666	-5.768333	2	2421.9	2423.9	117	118	88	80	1	1.5	0.5	22	1016	90	Beams
130	19/03/2016 04:30	6	49.026833	-5.798	49.0585	-5.782166	2	2427.9	2429.9	117	115	124	80	1	1.5	0.5	23	1016	90	Beams
131	19/03/2016 08:19	13	49.548333	-6.287333	49.5645	-6.242333	1.9	2466.7	2468.6	107	106	265	80	1	2	0.4	23	1016.5	80	Beams
132	19/03/2016 11:11	13	49.430166	-6.744333	49.402	-6.771666	2	2491	2493	115	118	33	60	1	2	0.4	23	1017	80	Beams
133	19/03/2016 12:56	21	49.294333	-7.002	49.294333	-7.002	0	2504.4	2504.4	124	124	60	50	1	2	0.4	22	1016.5	60	Profiler
134	19/03/2016 13:28	21	49.284833	-7.020166	49.260833	-7.0555	2	2505.3	2507.3	125	128	73	50	1	2	0.3	22	1016.5	60	Beams
135	19/03/2016 15:16	21	49.1025	-7.200833	49.089166	-7.247333	2	2518.5	2520.5	135	135	126	80	1	2	0.3	19	1016	70	Beams
136	19/03/2016 17:18	21	48.9695	-7.408333	48.982166	-7.361333	2.1	2531.5	2533.6	143	137	215	80	1	2.5	0.2	23	1016.5	70	Beams
137	19/03/2016 21:15	21	48.822333	-6.822666	48.817666	-6.773333	2.1	2557.4	2559.5	142	136	282	80	1	2.5	0.3	28	1016	70	Beams
138	19/03/2016 23:41	13	49.053666	-6.695333	49.031666	-6.733833	2	2576.5	2578.5	127	131	58	40	1	2.5	0.4	30	1016	40	Beams
139	20/03/2016 01:58	21	48.866	-7.0195	48.849833	-7.0645	2	2593.7	2595.7	141	144	91	70	1	2	0.6	21	1016	60	Beams
140	20/03/2016 06:22	22	48.318166	-7.663333	48.318166	-7.663333		2635.8		175		112	70	1	2	0.1	21	1015	60	Profiler
141	20/03/2016 07:00	22	48.307	-7.692166	48.288166	-7.733666	2	2638	2640	183	179	112	70	1	2.5	0.1	23	1015	60	Beams
142	20/03/2016 09:51	22	48.466833	-8.198833	48.483333	-8.155	2	2663.7	2665.7	173	168	254	50	1	2.5	0.4	22	1017	60	Beams
143	20/03/2016 13:26	22	48.666666	-8.895166	48.647833	-8.936666	2	2699.2	2701.2	166	172	31	30	1	2	0.4	21	1017	50	Beams
144	20/03/2016 17:06	22	49.041	-9.035166	49.059166	-8.992833	2	2727.9	2729.9	155	155	137	30	1	2.2	0.3	22	1017.5	50	Beams
145	20/03/2016 20:17	23	49.2265	-8.572833	49.2265	-8.572833	0	2749.7	2749.7	150	150	243	50	1	1.5	0.4	18	1019	50	Profiler
146	20/03/2016 20:54	23	49.225166	-8.572166	49.2325	-8.522666	2	2751.7	2753.7	151	139	259	50	1	1.5	0.3	18	1019	50	Beams
147	21/03/2016 01:35	18	49.792166	-7.770833	49.766833	-7.8045	2	2799.8	2801.8	129	134	30	50	1	1.5	0.5	16	1019	50	Beams
148	21/03/2016 06:22	19	50.291333	-7.002	50.291333	-7.002		2848		110		158			1	0		1019		Profiler
149	21/03/2016 06:43	19	50.305166	-7	50.338166	-6.992166	2	2849	2851	109	109	186				0		1020		Beams
150	21/03/2016 09:23	19	50.601166	-7.0205	50.621833	-6.9795	2	2867.8	2869.8	106	105	218				0.5		1020		Beams
151	21/03/2016 12:37	18	50.6425	-7.625833	50.645	-7.677833	2	2895.9	2897.9	110	116	17		0.5		0.1		1019.5		Beams
152	21/03/2016 15:33	18	50.3295	-8.098	50.310666	-8.143166	2.1	2923	2925.1	136	136	70		0.5		0.3		1018		Beams
153	21/03/2016 19:03	20	50.017833	-8.900333	50.001	-8.945	2	2959.2	2961.2	127	133	190		0.5		0.5		1018		Beams
154	21/03/2016 21:47	20	50.046	-9.520666	50.029	-9.565333	2	2984.3	2986.3	144	143	40		0.5		0.1		1017		Beams
155	22/03/2016 01:13	20	50.346166	-9.0155	50.346166	-9.0155		3016.2		133		38		0.5		0.3		1014.5		Profiler
156	22/03/2016 01:40	20	50.339666	-9.0255	50.317333	-9.064333	1.9	3017	3018.9	131	136	49		0.5		0.4		1015		Beams

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
157	22/03/2016 04:48	18	50.560166	-8.5285	50.551166	-8.578833	2	3048.1	3050.1	103	107	81		0.5		0.4		1013		Beams
158	22/03/2016 07:13	18	50.840833	-8.323	50.863166	-8.283833	2	3070.9	3072.9	98	91	218		0.5		0.3		1012.5		Beams
159	22/03/2016 12:36	20	51.054166	-9.492	51.054166	-9.492	0	3121	3121	123	123	334		0.5		0.2		1012		Profiler
160	22/03/2016 13:10	20	51.058	-9.488	51.024833	-9.486666	2.1	3122.5	3124.6	123	123	24		0.5		0.2		1011		Beams
161	22/03/2016 17:44	20	51.209	-8.282	51.238	-8.257333	2	3173.1	3175.1	105	104	94		0.5		0.2		1010		Beams
162	22/03/2016 21:05	19	51.6535	-7.956666	51.6535	-7.956666	0	3202.8	3202.8	81	81	233		0.5		0.2		1010.5		Profiler
163	22/03/2016 21:21	19	51.658333	-7.946666	51.678666	-7.902666	2	3203.4	3205.4	81	80	234		0.5		0.2		1010.5		Beams
164	23/03/2016 00:03	15	51.854	-7.374833	51.8655	-7.324333	1.9	3227.8	3229.7	74	73	273		0.5		0.2		1011		Beams
165	23/03/2016 02:51	15	51.674333	-6.778166	51.672166	-6.723833	2.1	3253.7	3255.8	75	74	237		0.5		0.3		1010.5		Beams
166	23/03/2016 05:46	17	51.559	-6.184833	51.5285	-6.206833	2	3277.8	3279.8	120	120	35		0.5		0.7		1010.5		Beams
167	23/03/2016 09:18	17	51.3455	-6.441166	51.3455	-6.441166		3297.5		124		352		0.5		0.4		1011		Profiler
168	23/03/2016 09:52	17	51.343333	-6.442166	51.310666	-6.431166	2	3299	3301	129	128	338		0.5		0.2		1011		Beams
169	23/03/2016 11:43	17	51.179666	-6.615833	51.201166	-6.575166	1.9	3313.3	3315.2	109	112	216		0.5		0.5		1011		Beams
170	23/03/2016 14:25	17	51.112333	-6.125333	51.1275	-6.1725	2	3335.2	3337.2	99	104	120	180	0.5		0.4	11	1012		Beams
171	23/03/2016 16:08	17	50.9975	-6.085166	50.972833	-6.120833	2	3347.1	3349.1	100	102	79	230	0.5	1	0.5	14	1011	220	Beams
172	23/03/2016 17:40	15	50.987333	-5.9175	50.964666	-5.956	2	3358.3	3360.3	95	97	45	240	0.5	1	0.6	15	1011	220	Beams
173	23/03/2016 21:44	16	51.462666	-5.448666	51.462666	-5.448666	0	3397	3397	70	70	303	240	0.5	1	1.1	12	1010	220	Profiler
174	23/03/2016 22:05	16	51.463333	-5.441166	51.449333	-5.393	2	3397.8	3399.8	70	69	296	240	0.5	1	0.8	12	1010	220	Beams
175	24/03/2016 01:18	16	51.221	-4.770166	51.2315	-4.774833	0.6	3428.4	3429	50	50	136	200	0.5	1	0.2	16	1010	220	Beams
176	24/03/2016 04:16	16	51.476666	-4.653833	51.467833	-4.705166	2	3445.6	3447.6	50	54	74	220	0.5	1	0.9	11	1007	220	Beams
177	24/03/2016 06:50	16	51.409333	-4.037333	51.409333	-4.037333		3473.4		43		207	220	0.5	1	0.1	10	1006.5	220	Profiler
178	24/03/2016 07:08	16	51.418166	-4.051833	51.394833	-4.089833	2.1	3474.8	3476.9	42	41	260	230	0.5	1	0.3	20	1006	220	Beams
179	24/03/2016 12:35	16	50.787166	-5.2125	50.787166	-5.2125	0	3533	3533	66	66	234	220	1	1.5	0.5	27	1006	220	Profiler
180	24/03/2016 12:57	16	50.794833	-5.1935	50.814166	-5.150833	2	3533.9	3535.9	66	66	191	220	1	2	0.2	23	1007	220	Beams
181	24/03/2016 17:47	16	50.512333	-5.102	50.492333	-5.143333	2	3572.5	3574.5	41	44	62	230	1	3	0.1	24	1004.5	220	Beams
182	24/03/2016 20:50	16	50.459333	-5.5205	50.466166	-5.469166	2	3592.5	3594.5	65	60	227	260	1	3	0.9	18	1004	220	Beams
183	24/03/2016 23:38	16	50.3045	-5.590833	50.3045	-5.578833	0.4	3612	3612.4	35	30	235	310	1	2	0.7	14	1005	300	Beams
184	25/03/2016 03:22	15	50.454	-5.888	50.427333	-5.919166	2	3638.5	3640.5	78	77	39	330	1	2	0.9	19	1008	300	Beams
185	25/03/2016 05:18	19	50.573	-6.163333	50.5495	-6.205	2.1	3654.3	3656.4	94	97	47	330	1	2.5	1.2	21	1009	300	Beams
186	25/03/2016 08:03	15	50.333	-5.872666	50.333	-5.872666		3575.6		75		187	300	0.5	1.5	0.7	3	1009.5	280	Profiler

Station	Date & Time	Stratum	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
187	25/03/2016 08:35	15	50.322666	-5.881	50.3415	-5.923833	2	3678.1	3680.1	70	74	191	260	0.5	1.5	0.7	8	1010.5	290	Beams
188	25/03/2016 10:40	15	50.264	-6.142	50.2885	-6.106666	2	3693.5	3695.5	81	81	216	220	0.5	2	1.3	8	1011	280	Beams
189	25/03/2016 11:53	15	50.265666	-6.138	50.2895	-6.1015	2	3699.9	3701.9	80	78	224	200	0.5	2	1.4	10	1011	280	Beams
190	25/03/2016 13:09	15	50.2825	-6.136	50.292	-6.113333	1	3705.1	3706.1	80	80	251	220	0.5	2	0.6	16	1010.5	280	Beams
191	25/03/2016 22:10	7	49.771833	-5.916	49.771833	-5.916	0	3767.6	3767.6	93	93	211	210	1	2	0.8	26	1005	240	Profiler
192	25/03/2016 22:32	7	49.781833	-5.906	49.809666	-5.878	2	3768.3	3770.3	91	88	234	210	1	2	0.8	26	1005	240	Beams
193	26/03/2016 00:11	7	49.777	-5.7615	49.801833	-5.727166	2.1	3776.5	3778.6	89	87	263	200	1	2	0.8	24	1003	210	Beams
194	26/03/2016 02:17	7	49.96	-5.719333	49.9345	-5.686833	2	3789.7	3791.7	71	75	323	180	1	2	1.9	27	999	200	Beams