LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK, NR33 OHT

2015 RESEARCH VESSEL PROGRAMME

REPORT: RV CEFAS ENDEAVOUR: SURVEY 4/15

STAFF:

Part One (26 February – 11 March)	Part Two (11 - 23 March)
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DURATION: 26 February – 23 March 2015

LOCATION: Western 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 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. 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 other biological studies.

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

Secondary Aims

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

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

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

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

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

Opportunistic Aims (undertaken only if survey progress and weather allow).

8) To tag and release specimens of various commercially exploited skates (*Rajidae*) and other select elasmobranches.

9) Collect length weight measurements of selected rarely-caught species.

10) Collect frozen specimens of *Sepiolidae*.

11) Collect histological specimens and photographs of gonad states for selected gadoid species for submission to WKMSGAD.

NARRATIVE: (All times GMT)

Part 1.

All staff travelled to Swansea on 25 February to join Cefas Endeavour (CEND) and to set up the Electronic Data Capture (EDC) databases and the fish-room for sampling and to undertake vessel safety inductions. Sailing from Swansea took place at 0040 on 26 February and immediately headed south-west to the first selected survey position in the Celtic Sea (stratum C; Station 5). During the transit to this position, tool-box talks took place with scientists, officers and crew to discuss the survey operations and run-through all health and safety aspects.

The transit to the first station took longer than expected due to the heavy swell and CEND arrived on site at 0933hrs that day. Work began with a CTD/Niskin profile being collected and to obtain a sound velocity profile (SVP) to load into the multibeam/Olex system. A SVP was subsequently taken at most CTD stations carried out on the survey. The first beam trawl tow of the survey followed, which was successfully hauled at 1036hrs. After a long steam of around 60nm, CEND arrived at the next survey station NW of the Isles of Scilly. This was successfully fished but with increasing swell and the onset of darkness, work ceased on safety grounds.

On 27 February work began inshore in Mounts Bay due to expected strong winds and heavy swell offshore. However as the day progressed, it became clear that working stations offshore was possible and plans were changed saving the inshore work for the following days. Over the course of this day, a total of seven stations were successfully fished ending at a position close to the Hurd Deep. In Mounts Bay, catches contained a number of commercial size sole (*Solea solea*) along with many small haddock (*Melanogrammus aeglefinus*). Further offshore, monkfish *(Lophius piscatorius*) also became more evident along with cuttlefish (*Sepia officinalis*). On 28 February, work began offshore in stratum 3 generally heading inshore to avoid the stronger W/SW winds forecast for the afternoon. Over the course of the day, a total of 10 survey stations were successfully fished with all five tows in stratum 5 among them. Catches of monk in this area remained noticeably high and similar to the tows fished on the previous day.

The following day began east of Start Bay and a series of inshore tows in stratum 5 that finished in the eastern end of Lyme Bay were fished. Upon hauling at stratum 5 station 5, the catches were observed to be very small, especially on the port side beam. Both gears were inspected for damage and it was discovered that the several meshes had parted from the fishing line leaving a hole approximately 1m across. This haul was deemed invalid. The starboard gear was undamaged and the catch was processed and entered as an additional tow; the port side catch was entered as invalid with catch observations entered only. By the end of the day, all eight stratum 5 tows had been successfully completed. On 2 March, fishing began at stratum 4 station 3 off Plymouth. This was successfully fished, but plans to continue fishing the offshore tows around Start Point were curtailed by worse than expected westerly gales rendering those tows unworkable at that time. In order to make full use of the day, CEND headed back into Lyme Bay seeking opportunities to fish the remaining tows there. Upon arrival, sea conditions were deemed safe to continue and over the remainder of the day, another three station were successfully fished. With strong westerly wind and a heavy swell expected for 3 March, CEND headed to a position east of Start Point in anticipation of working the area at some point the following day. Fortunately, upon arrival, the sea state proved to be workable and through the day, a total of nine fishing stations were successfully fished. These tows completed the work in both strata 4 and 7.

On 4 March, the day began at stratum 6 station 5 offshore from Portland and CEND re-fished as only little catch was observed in the port beam. The gear was inspected for damage and with none found, the tow was re-fished with additional warp being deployed to counteract the strong tide. The repeated tow still caught very little but the catch indicated the beams had been fishing correctly. An additional tow (stratum 9 station 6) was fished as it was deemed prudent to do so, given the long steam back to this position should one of the other tows within the stratum prove to be unworkable. This proved to be a good decision, given the issues encountered at the following tow. At stratum 9 station 2, CEND encountered a strong tide (~3 knots), coupled with a rocky undulating sea-bed. Upon hauling, it was clear the gear had not fished correctly, and rather than attempt again, the previous tow was regarded as the replacement. At stratum 11 station 2 west of Alderney, several blonde rays (*Raja brachyura*) were caught and were tagged/released.

The following day was spent around Jersey working in a southerly direction ending the day off the French coast. Several of the tows had static gear in the vicinity and the tows were run prior to shooting with the multibeam to ensure they were clear to fish. The tow at stratum 10 station 3 yielded large quantities of common brittle star (*Ophiothrix fragilis*) with approximately 40 baskets observed in the starboard beam and another 25 baskets in the port beam. These are generally expected to be encountered in this vicinity having been seen in this quantity on previous surveys. The 6 March began with two tows to the west of the Bailiwick of Guernsey and were in areas of known static gear. With the full co-operation of officials on the Island, these tows successfully avoided interference. As the survey approached the French coast, CEND began to see rocky ground, making towing the beams more difficult. At stratum 10 station 7, the tow was hauled after 1.66nm (as opposed to the target 2nm), and 0.41nm outside the preferred station radius of 1nm. The very hard ground with jagged rocky spikes approximately 3m high meant that the tow distance had to be reduced. Upon hauling, it was discovered that the gear had taken some damage, with a hole in the batings side of the cod end and the tow was deemed invalid. Given the ground at that location, it was decided not to re-fish that tow, but to fish an alternate station selection.

On 7 March, the survey day began close to the Langoustine Bank, working towards the Hurd Deep and then heading SW towards the coast. At the first tow (stratum 10 station 10), both sets of gear were found to have taken some damage with the port gear having a hole in the cod end approximately $1m^2$ and the starboard gear having a smaller hole in the cod-end and liner. With the tow considered as invalid, and the next available reserve tow being ~30nm east, it was decided to re-fish the tow with reduced duration and warp ratio to avoid the rocks. The repeat tow had to be hauled after 0.7nm due to poor ground. A small detour was taken to collect water samples (for caesium and tritium analysis) at the Hurd Deep. The following tow was fished within the Hurd Deep and saw our first significant observation of marbled electric ray (*Torpedo marmorata*). The following day

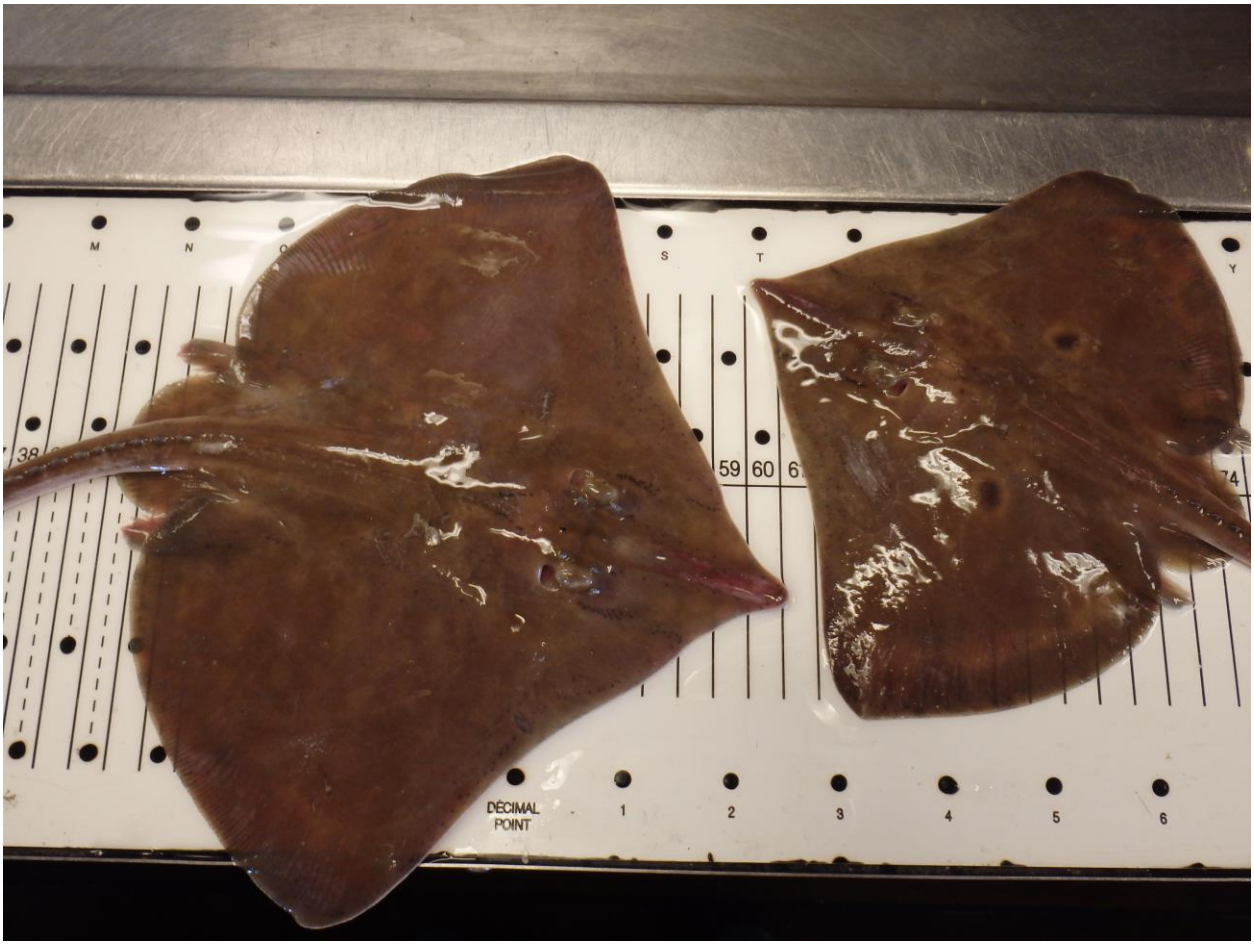
saw the completion of the stations in stratum 12 and ended the day with two tows in the Celtic Sea sector of stratum J and these tows were completed without incident.

On 9 March, survey operations came to a halt with the loss of the entire beam (starboard) after being deployed fully for just 3 minutes. This occurred at stratum J station 6 and on immediate inspection, there appeared to be little obvious reason for the loss. CEND recovery operations began immediately and the area was covered with the multibeam to attempt to locate the beam on the sea-bed. An initial search location was identified and a grapple hook was deployed to try and 'catch' the gear. However upon hauling after the initial 'pass', the grapple hook was retrieved with just the shaft remaining. Recovery operations ceased with plans for a dual camera and grapple hook recovery for the 2nd half being made. A further three tows on similar ground were fished but with increasing swell and limited Olex capability, these were fished for a reduced tow length of 1nm. The last survey day of the first half fished two tows with the third being missed as the deployment of the first two tows took much longer than expected due to strong tides. These final two tows were located one in stratum K and the other in stratum 13.

With part one of the survey completed, CEND steamed directly to Falmouth. Whilst en-route, cleaning, data checking and report writing were all carried out. Docking in Falmouth took place at 1830hrs 10 March.

Part 2.

After a changeover of both scientific and ship's staff and obtaining fresh stores, CEND left Falmouth on 12 March at 0000hrs. The transit overnight brought us on station at stratum 13 station 1 for first light. Following a further tool-box talk and emergency muster drill, a CTD/Niskin profile was conducted to provide a SVP for the multibeam. Content that the gear was fishing well on the ground, with a good catch of monkfish, megrim (*Lepidorhombus whiffiagonis*) and cuttlefish, this station completed stratum 13. The remainder of this day and the morning of the following day, five stations within stratum 8 were fished without incident, and the deeper waters and harder ground saw catches comprising of megrim, monkfish and cuckoo ray (*Leucoraja naevus*). Also, of note were nine small (19-86 cm) common skate (blue skate: *Dipturus* cf. *flossada*).



The afternoon of 13 March was spent fishing four stations around the Isles of Scilly (stratum 1). The catches contained more benthos (starfish and urchins), but the fish composition remained similar to the previous stratum, consisting mainly of megrim, monkfish and several skate species (including common (blue) skate, and shagreen ray (*Leucoraja fullonica*). On 14 March, the remaining four stations off Land's End (stratum 2), were completed. This concluded all stations making up the western English Channel part of the survey. From here, the afternoon's operations continued southwards to complete the final two stations in stratum K. The following day, one station (number 8) was fished in the morning in stratum J, yielding bib (*Trisopterus luscus*), poor cod (*Trisopterus minutus*), lesser-spotted dogfish (*Scyliorhinus canicula*) and monkfish, before steaming southwards to locate the position of the lost beam trawl from Part 1 of the survey. The beam was located within three hours using the multibeam tracks and a drop camera. It subsequently took a further three hours to safely recover the beam using a grapple. The recovery operation was conducted professionally efficiently and safely and we thank and congratulate the crew for their efforts. The damage to the net was minimal, and was repaired the following morning. On 16/17^{h} March, CEND steamed westwards to the deeper water of the Celtic shelf, and fished the southernmost part of the survey (stratum I and H). Ten stations were fished over these two days, with catches comprising

mainly of megrim and monkfish, with cuckoo rays and an occasional shagreen ray observed. Working northwards along the western part of the grid, stratum G and E were completed over the following two days, with relatively small catches. On the afternoon of 19 March, fishing began inshore off the south coast of Ireland in stratum A, with three stations fished. The catches were much richer in diversity, and comprised of a lot more juvenile commercial species, such as lemon sole (*Microstomus kitt*), grey gurnard (*Eutrigla gurnardus*), plaice (*Pleuronectes platessa*) and megrim. The ground at station two, was extremely hard and a long time was spent searching for a suitable tow. In the end, a 1.3nm tow was all that was possible safely. On the morning of 20 March the decision was made to split the scientific staff into two teams to allow 24-hour fishing as this would give us the best chance of completing the whole survey. Consequently on this day, nine stations were fished finishing stratum G and E, along with three stations in F, two in D and one in B. The catches were varied, but increased in size in Strata F, B and D, with more commercial species seen, including monkfish, megrim, plaice and sole (*Solea solea*), as well as further skate, including common, small-eyed (*Raja microocellata*) and spotted (*Raja montagui*). At station D1, a common skate egg case was found within the benthos. The outer case had been damaged but was found to contain an embryo still inside. This was cut open to reveal a near full-term male common skate of 17cm, with a tiny yolk sac still attached. This specimen was allowed to recuperate in the tank for a few hours after which time it was released successfully.

In the early hours of 21 March, CEND had to make an unscheduled detour to St. Ives from the Celtic Deep to put a crew member ashore. On our way back to position, the opportunity was taken to pick up a station in the outer Bristol Channel, and then the remainder of the day was spent working across stratum B and finishing off stratum D. This positioned CEND well for completion of the inshore stations off the south-eastern Irish coast (stratum A) at first light the following morning. The grounds were very hard and jagged, making finding a suitable place to tow, very difficult. A lot of time was spent multibeaming tracks to find suitable ground. Finally the remaining two stations within this stratum were completed, and CEND then headed off to complete stratum B. Unfortunately upon arrival at station B1, the banks, shellfish boxes, static gear and extremely hard jagged grounds, made towing anywhere in the vicinity impossible, and the tow had to be abandoned. CEND completed stratum B overnight, and entered into the final stations within Welsh waters on the morning of 23 March. Again static gear in the area made finding suitable towing positions difficult, but all final three stations were successfully fished. The catches comprised of a lot of skate (blonde, thornback (*Raja clavata*) and small-eyed), along with plaice and a few sole. Cefas Endeavour docked alongside in Swansea at 1918hrs that day.

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 1) but without the 40mm con-end liner on the port side. Upon losing the starboard gear (number 3), this was replaced with beam number 2. 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 starboard 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.

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, Southwest 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 135 successful tows were completed out of a total of 136 planned. This comprised of all 81 planned tows in the western English Channel and a further 54 tows in the Celtic Seas (55 planned). 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. Annex 1 gives the station details of each survey station including date/time, shooting and hauling coordinates and various weather/sea-state observational data.

2. To collect fisheries acoustic data at three operating frequencies (38, 120 & 200 kHz) and multi-beam data continuously throughout the survey. Not completed.

Table 1: Gear deployments and validity by area

Area	Gear	Validity	Number of Deployments
Celtic Sea	4m Beam Trawl with blinder	I	2
Celtic Sea	4m Beam Trawl with blinder	V	54
Celtic Sea	4m Beam Trawl no blinder	I	2
Celtic Sea	4m Beam Trawl no blinder	V	54
Celtic Sea	ESM2 logger with Niskin	V	16
Western Channel	4m Beam Trawl with blinder	A	4
Western Channel	4m Beam Trawl with blinder	I	3
Western Channel	4m Beam Trawl with blinder	V	79
Western Channel	4m Beam Trawl no blinder	A	2
Western Channel	4m Beam Trawl no blinder	I	4
Western Channel	4m Beam Trawl no blinder	V	80
Western Channel	ESM2 logger with Niskin	V	25

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

SCIENTIFIC NAME	Sampled Catch	Total Catch	CEFAS CODE
Scyliorhinus canicula	922.912	922.912	LSD
Lophius piscatorius	656.266	656.266	MON
Trisopterus minutus	336.61	407.336	POD
Pecten maximus	273.195	273.195	SCR
Pleuronectes platessa	251.27	251.27	PLE
Lepidorhombus whiffiagonis	226.694	226.694	MEG
Sepia officinalis	194.234	194.234	CTC
Melanogrammus aeglefinus	193.181	193.181	HAD
Trisopterus luscus	170.588	170.588	BIB
Aspitrigla (chelidonichthys) cuculus	126.233	126.233	GUR
Mustelus asterias	118.315	118.315	SDS
Merluccius merluccius	117.074	117.074	HKE
Merlangius merlangus	114.292	114.292	WHG
Leucoraja naevus	110.515	110.515	CUR
Solea solea	103.355	103.355	SOL
Lophius budegassa	97.491	97.491	WAF
Pecten maximus	95.729	95.729	SCE
Callionymus lyra	75.076	75.076	CDT
Microstomus kitt	72.604	72.604	LEM
Cancer pagurus	70.502	70.502	CRE
Raja montagui	55.86	55.86	SDR
Conger conger	54.955	54.955	COE
Raja brachyura	49.885	49.885	BLR
Sepia orbignyana	46.509	46.509	SEO
Trigla (chelidonichthys) lucerna	39.769	39.769	TUB
Raja clavata	39.625	39.625	THR
Gadus morhua	39.422	39.422	COD
Lithodes maja	0.131	35.131	LDM
Scophthalmus rhombus	32.295	32.295	BLL
Glyptocephalus cynoglossus	31.944	31.944	WIT
Trigloporus (chelidonichthys) lastoviza	31.667	31.667	GUS
Limanda limanda	30.628	30.628	DAB
Scyliorhinus stellaris	26.632	26.632	DGN
Eutrigla (chelidonicthys) gurnardus	26.114	26.114	GUG
Raja undulata	26.013	26.013	UNR
Torpedo marmorata	21.794	21.794	MER
Microchirus variegatus	20.651	20.651	TBS
Dipturus (raja) batis	20.15	20.15	SKT
Mullus surmuletus	18.465	18.465	MUR
Labrus bergylta	17.52	17.52	BNW

SCIENTIFIC NAME	Sampled Catch	Total Catch	CEFAS CODE
Platichthys flesus	16.394	16.394	FLE
Spondyliosoma cantharus	16.192	16.192	BKS
Buglossidium luteum	13.135	15.659	SOT
Zeus faber	15.142	15.142	JOD
Arnoglossus imperialis	14.811	14.811	ISF
Pollachius	14.77	14.77	POL
Capros aper	14.503	14.503	BOF
Trisopterus esmarki	12.981	12.981	NOP
Scophthalmus maximus (psetta maxima)	12.62	12.62	TUR
Pegusa (solea) lascaris	12.205	12.205	SOS
Raja microocellata	11.256	11.256	PTR
Necora puber	10.788	10.851	MLP
Loligo vulgaris	9.498	9.498	LLV
Hippoglossoides platessoides	8.474	8.474	PLA
Gaidropsarus vulgaris	7.447	7.447	TBR
Labrus mixtus (l. bimaculatus)	7.276	7.276	CUW
Arnoglossus laterna	7.041	7.041	SDF
Molva molva	6.518	6.518	LIN
Pollachius virens	6.14	6.14	POK
Dicentrarchus labrax	5.665	5.665	ESB
Nephrops norvegicus	5.635	5.635	NEP
Trachurus trachurus	4.342	4.342	HOM
Leucoraja fullonica	3.973	3.973	SHR
Argentinidae	3.817	3.817	ARG
Zeugopterus punctatus	3.668	3.668	TKT
Micromesistius poutassou	3.406	3.406	WHB
Homarus gammarus	3.221	3.221	LBE
Loligo forbesi	2.588	2.588	NSQ
Todaropsis eblanae	2.521	2.521	OME
Phycis blennoides	2.117	2.117	GFB
Scomber scombrus	2.037	2.037	MAC
Ctenolabrus rupestris	1.674	1.674	GDY
Squalus acanthias	1.4	1.4	DGS
Lepidorhombus boscii	1.255	1.255	LBI
Palinurus elephas	1.148	1.148	SLO
Sprattus sprattus	0.923	0.923	SPR
Clupea harengus	0.751	0.751	HER
Symphodus (crenilabrus) balloni	0.745	0.745	BLW
Dicentrarchus spp	0.72	0.72	BSE
Echiichthys (trachinus) vipera	0.526	0.526	WEL
Aspitrigla (chelidonichthys) obscura	0.501	0.501	GUL
Agonus cataphractus	0.486	0.486	POG

SCIENTIFIC NAME	**Sampled Catch**	**Total Catch**	**CEFAS CODE**
Loliginidae	0.467	0.467	SQZ
Zeugopterus (phrynorhombus) norvegius	0.402	0.402	NKT
Zeugopterus (phrynorhombus) regius	0.387	0.387	EKT
Syngnathus acus	0.315	0.315	GPF
Trachinus draco	0.315	0.315	WEG
Blennius ocellaris	0.312	0.312	BBY
Enchelyopus cimbrius	0.278	0.278	FRR
Callionymus maculatus	0.268	0.268	SDT
Loligo (alloteuthis) subulata	0.262	0.262	ATS
Sardina pilchardus	0.139	0.139	PIL
Hyperoplus lanceolatus	0.133	0.133	GSE
Ammodytes spp	0.117	0.117	SAN
Engraulis encrasicolus	0.094	0.094	ANE
Gobius gasteveni	0.086	0.086	GSV
Sparus auratus	0.083	0.083	SBG
Ciliata septentrionalis	0.076	0.076	NNR
Sepia elegans	0.065	0.075	SEE
Centrolabrus exoletus	0.07	0.07	SMW
Symphodus (crenilabrus) melops	0.059	0.059	CWG
Raniceps raninus	0.035	0.035	LFB
Liparis montagui	0.028	0.028	MSS
Pomatoschistus spp	0.027	0.027	POM
Hippocampus ramulosus (h. guttulatus)	0.025	0.025	SHE
Parablennius gattorugine	0.021	0.021	TBY
Gadiculus argenteus	0.014	0.014	SYP
Gobius paganellus	0.013	0.013	RKG
Hyperoplus immaculatus	0.01	0.01	ISE
Chirolophis ascanii	0.01	0.01	YBY
Lesueurigobius friesii	0.007	0.007	FSG
Ciliata mustela	0.004	0.004	FVR
Crystallogobius linearis	0.002	0.002	CLG
Micrenophrys (taurulus) lilljeborgi	0.002	0.002	NVB
Taurulus bubalis	0.002	0.002	SSN
Diplecogaster bimaculata	0.001	0.001	TSC

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

SCIENTIFIC NAME	Total Catch	CEFAS CODE	SCIENTIFIC NAME	Total Catch	CEFAS CODE
Epibenthic mixture	5477.574	BEN	*Ciona intestinalis*	2.373	CNI
Assorted rocks	3792.975	ROK	*Buccinum undatum*	2.231	WHE
Marthasterias glacialis	128.826	MAG	*Urticina (tealia) felina*	2.033	DHA
Rhizostoma octopus	117.185	BAR	*Ophiothrix fragilis*	1.901	OPF
Pentapora foliacea	67.278	PET	*Scaphander lignarius*	1.881	SDL
Eledone cirrhosa	60.278	EDC	*Adamsia carciniopados*	1.822	AMP
Echinus esculentus	36.744	URS	*Eunicella verrucosa*	1.595	EUV
Luidia sarsi	35.412	LUS	*Ophiura ophiura*	1.346	OHT
Echinus acutus	29.571	URA	*Macropipus tuberculatus*	1.309	MPT
Luidia ciliaris	18.117	LDC	*Aequorea spp*	1.261	CRI
Metridium senile	11.097	PMA	*Atrina fragilis*	1.234	AFR
Eupagurus / pagurus in adamsia	10.865	HIA	*Halichondria panicea*	1.052	BCS
Aphrodite aculeata	10.575	AAC	*Stichastrella rosea*	1.025	SLR
Polymastiidae	10.157	PMX	*Suberites spp*	0.83	SUB
Holothuroidea	9.884	HTZ	*Polybius (liocarcinus) holsatus*	0.795	LMH
Polyclinidae	9.758	PCZ	*Munida rugosa*	0.754	MNR
Asterias rubens	9.417	STH	*Pteraster militaris*	0.742	PTM
Astropecten irregularis	8.893	API	*Dromia personata*	0.694	DRP
Alcyonium digitatum	8.118	DMF	*Pagurus bernhardus*	0.681	PEB
Porania pulvillus	8.074	PPV	*Crossaster papposus*	0.656	CTP
Nemertesia spp	7.546	NEM	*Haliclona oculata*	0.65	HAO
Spatangus purpureus	7.092	SPG	*Rossia macrosoma*	0.632	ROM
Henricia oculata	6.445	HEO	*Bolocera tuediae*	0.621	BCT
Anseropoda placenta	5.801	PLM	*Octopus vulgaris*	0.615	OCV
Cliona celata	5.772	CLI	*Liocarcinus marmoreus*	0.498	LMM
Axinella infundibuliformis	5.171	AXI	*Cellariidae*	0.465	CEL
Porifera	3.418	PFZ	*Pandalus montagui*	0.438	PRM
Actinauge richardi	2.572	ACR	*Arctica islandica*	0.376	CLQ

SCIENTIFIC NAME	Total Catch	CEFAS CODE	SCIENTIFIC NAME	Total Catch	CEFAS CODE
Atelycyclus rotundatus	0.367	ALR	*Inachus dorsettensis*	0.08	IND
Pagurus prideaux	0.314	PEX	*Brissopsis lyrifera*	0.067	BRL
Filograna implexa	0.284	FII	*Lytocarpia myriophyllum*	0.064	HYL
Corystes cassivelaunus	0.257	CCV	*Processa canaliculata*	0.045	PCC
Bryozoa	0.184	EPZ	*Calliostoma granulatum (=c. papillosum)*	0.038	PTQ
Hydrallmania falcata	0.173	HYH	*Psammechinus miliaris*	0.035	PMM
Diphasia spp	0.17	DIP	*Antedon bifida*	0.032	ADB
Crangon allmanni	0.167	CGA	*Ascidia virginea*	0.029	ASV
Eupagurus / pagurus in suberites	0.162	HIS	*Atelecylus undecimdentatus*	0.029	ATU
Hyas araneus	0.155	HYA	*Laetmatonice filicornis*	0.028	LAF
Hyalinoecia tubicola	0.153	HYT	*Astarte sulcata*	0.027	AES
Tritonia hombergi	0.152	TNH	*Crangonidae*	0.026	CRN
Inachus leptochirus	0.151	INL	*Nemertesia ramosa*	0.023	NER
Eupagurus / pagurus in buccinum	0.148	HIW	*Archidoris pseudoargus*	0.022	ADP
Goneplax rhomboides	0.146	GOR	*Echinocardium spp*	0.022	ECV
Abietinaria abietina	0.143	ABI	*Anomia ephippium*	0.021	AEP
Liocarcinus depurator	0.14	LMD	*Chaetopterus tubes*	0.02	CVT
Buccinidae	0.138	WHZ	*Ophiura affinis*	0.02	OHF
Ascidiidae	0.124	ASY	*Pandalina brevirostris*	0.02	PDW
Alcyonidium diaphanum	0.12	ALG	*Scalpellum*	0.02	SCA
Alcyonium glomeratum	0.12	AYG	*Anapagurus in epizoanthus*	0.018	HIE
Echinocardium cordatum	0.109	ECC	*Limaria hians*	0.016	LIM
Sepiola atlantica	0.103	SPA	*Sagartia spp*	0.016	SAG
Anemone unidentified	0.095	AMU	*Alpheus glaber*	0.015	ALP
Palaemon serratus	0.094	CPR	*Munida sarsi*	0.014	MAS
Macropodia tenuirostris	0.088	MCT	*Aequipecten opercularis*	0.014	QSC
Epizoanthus encrustans	0.087	EZI	*Colus gracilis*	0.013	CSG
Flustra foliacea	0.08	FAF	*Neptunea antiqua*	0.012	RWK

SCIENTIFIC NAME	Total Catch	CEFAS CODE	SCIENTIFIC NAME	Total Catch	CEFAS CODE
Sertularia cupressina	0.012	WHW	*Capulus ungaricus*	0.003	CAU
Hyas coarctatus	0.011	HYC	*Ctenophora*	0.003	CTA
Euspira (polinices) eggs	0.011	NAE	*Epizoanthus incrustatus*	0.003	EPS
Polychaeta	0.01	BWX	*Raspailia spp*	0.003	RAS
Pisa armata	0.01	PAA	*Caryophyllia smithii*	0.002	DCC
Pasiphaea spp	0.01	PAS	*Liocarcinus corrugatus*	0.002	LIC
Ascidiacea	0.01	SSX	*Pontophilus spinosus*	0.002	PPS
Xantho incisus	0.01	XAI	*Spirontocaris lilljeborgii*	0.002	SPL
Dendronotus frondosus	0.006	DDF	*Xantho pilipes*	0.002	XAP
Dosinia exoleta	0.006	DSE	*Abra spp*	0.001	ABR
Penaeoidea	0.006	PEZ	*Eurydice pulchra*	0.001	EDP
Henricia sanguinolenta	0.005	HNS	*Galatheidae*	0.001	GAL
Nudibranchia	0.005	NBX	*Galathea spp*	0.001	GLX
Sabellidae	0.005	PWX	*Hydroida (order)*	0.001	HYD
Thyone fusus	0.005	THH	*Hydrozoa*	0.001	HZX
Cancer pagurus (cock)	0.004	CRC	*Macropodia linaresi*	0.001	MCL
Echinidae	0.004	EEX	*Nucula nucleus*	0.001	NNU
Ophiura sarsi	0.004	OPS	*Chamelea gallina*	0.001	VST

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

Species	Celtic Sea	Western Channel
Aspitrigla (chelidonichthys) cuculus F	99	186
Aspitrigla (chelidonichthys) cuculus M	98	134
Aspitrigla (chelidonichthys) cuculus U	0	6
Aspitrigla (chelidonichthys) obscura F	0	1
Aspitrigla (chelidonichthys) obscura M	0	3
Conger conger U	12	14
Dicentrarchus labrax F	0	2
Dicentrarchus labrax M	0	2
Dipturus (raja) batis F	6	4
Dipturus (raja) batis M	7	6
Eutrigla (chelidonicthys) gurnardus F	143	56
Eutrigla (chelidonicthys) gurnardus M	91	29
Eutrigla (chelidonicthys) gurnardus U	30	10
Gadus morhua F	9	9
Gadus morhua M	6	5
Glyptocephalus cynoglossus F	86	1
Glyptocephalus cynoglossus M	73	3
Glyptocephalus cynoglossus U	1	0
Lepidorhombus whiffiagonis F	450	113
Lepidorhombus whiffiagonis M	267	20
Leucoraja fullonica F	3	1
Leucoraja fullonica M	3	0
Leucoraja naevus F	37	44
Leucoraja naevus M	27	53
Lophius budegassa F	70	19
Lophius budegassa M	68	16
Lophius budegassa U	13	1
Lophius piscatorius F	120	179
Lophius piscatorius M	128	154
Lophius piscatorius U	6	0
Melanogrammus aeglefinus F	143	57
Melanogrammus aeglefinus M	114	24
Merlangius merlangus F	116	110
Merlangius merlangus M	93	93
Merlangius merlangus U	2	0
Merluccius merluccius F	73	6
Merluccius merluccius M	71	6
Merluccius merluccius U	5	1
Microstomus kitt F	60	82
Microstomus kitt M	43	84
Molva molva F	1	0
Molva molva M	2	0
Molva molva U	1	2
Mullus surmuletus F	12	46
Mullus surmuletus M	12	36
Mullus surmuletus U	0	5
Mustelus asterias F	11	45

Species	Celtic Sea	Western Channel
Mustelus asterias M	10	39
Pleuronectes platessa F	199	284
Pleuronectes platessa M	141	192
Raja brachyura F	9	12
Raja brachyura M	7	12
Raja clavata F	1	20
Raja clavata M	8	28
Raja microocellata F	1	2
Raja microocellata M	3	0
Raja montagui F	21	34
Raja montagui M	30	28
Raja undulata F	0	4
Raja undulata M	0	10
Scophthalmus maximus (psetta maxima) F	2	1
Scophthalmus maximus (psetta maxima) M	1	1
Scophthalmus rhombus F	4	8
Scophthalmus rhombus M	3	10
Scyliorhinus stellaris F	0	4
Scyliorhinus stellaris M	4	3
Solea solea F	35	107
Solea solea M	40	74
Solea solea U	0	1
Squalus acanthias F	0	1
Squalus acanthias M	0	1
Trigla (chelidonichthys) lucerna F	2	61
Trigla (chelidonichthys) lucerna M	4	56
Trigloporus (chelidonichthys) lastoviza F	5	59
Trigloporus (chelidonichthys) lastoviza M	1	49
Trigloporus (chelidonichthys) lastoviza U	1	4
Zeus faber F	10	18
Zeus faber M	6	15
Zeus faber U	0	2

Secondary Aims

3. Collect information on;
    a. Distribution of macro-benthos
    b. Distribution and classification of anthropogenic debris.
    c. Distribution of fish in relation to their environment.
    Completed

4. 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

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

6. To record details of surface sightings of any marine mammals, sea turtles and large pelagic fish, and record observations on jellyfish aggregations. Completed – just three group sightings of common dolphin (*Delphinus delphis*). Details to be sent to the Sea Watch Foundation.

7. 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.

Opportunistic Aims

8. To tag and release specimens of various commercially exploited skates (*Rajidae*) and other select elasmobranchs. Over the course of the survey a total of 65 specimen were tagged and released. These comprised 22 starry smooth-hounds (*Mustelus asterias*), six nursehounds (*Scyliorhinus stellaris*), nine undulate ray (*Raja undulata*), 17 cuckoo ray (*Leucoraja naevus*), seven blonde ray, 1 shagreen ray and two common skate.

9. Collect length weight measurements of selected rarely-caught species. A total of 55 individual length weight measurements of rarely caught species were collected. These comprised:

Marbled electric ray	*Torpedo marmorata*	26
Lesser forkbeard	*Raniceps raninus*	2
Rock goby	*Gobius paganellus*	1
Tompot blenny	*Parablennius*	3
Montague's seasnail	*Liparis montagui*	4
Northern rockling	*Ciliata*	1
Ling-finned gurnard	*Aspitrigla*	4
Ekstrom's topknot	*Zeugopterus*	1
Two-spot clingfish	*Diplecogaster*	1
Norway bullhead	*Micrenophrys*	1
Steven's goby	*Gobius gasteveni*	3
Starry smoothhound	*Mustelus asterias*	1
Conger eel	*Conger conger*	2
Yarrell's blenny	*Chirolophis ascanii*	1
Greater pipefish	*Syngnathus acus*	1
Ballan wrasse	*Labrus bergylta*	3

10. Collect frozen specimens of *Sepiolidae*. None collected

11. Collect histological specimens and photographs of gonad states for selected gadoid species for submission to WKMSGAD. Not completed

12. Additional sample collections:

    a) A total of 109 samples of benthic and fish species requiring confirmation of species identification were frozen for J Ellis – Cefas.
    b) Records of beam trawl damage to shellfish species were collected by R McIntyre – Cefas.
    c) At one fishing station, samples of whelk (*Buccinum undatum)* hermit crabs (*Eupagurus bernhardus)* and empty whelk shells were collected for analysis as part of an on-going Cefas project. V Laptikhovsky (Cefas Lowestoft)

Litter by-catch information.

Details of the bycatch of litter caught at all fishing stations were recorded. In total, 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. Figure 7 shows the breakdown of litter items caught by classification type for each gear.

Water alkalinity, dissolved inorganic carbon (DIC) and nutrient sample collection

A total of 11 samples were taken for dissolved inorganic carbon, nutrients and alkalinity analysis and samples were collected using the standard operating procedures provided. All samples taken were surface water taken from the surface (4m) sea-water supply via the ferry-box system.

Micro CTD

The SAIV Micro CTD unit number 427 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. However, this unit was lost along with the beam trawl. A second unit (number 488) was used on the subsequent days. A total of 127 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 (number 120) and an ESM2 logger (No 3). 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 41 surface and 43 bottom salinity samples were collected. At each CTD station, a sound velocity profile (SVP) was taken using a Saiv mini CTD unit (S/N 1151) to calibrate the multibeam system.

Our thanks 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. Of particular note, we would like to thank all staff (both Cefas and P&O) who were involved in the successful location and recovery of the lost 4m beam trawl. This task took great skill and determination and the whole operation was conducted in a calm, professional and safe manner.

Ian Holmes & Sophy McCully Phillips
26 March 2015

INITIALLED: S Kupschus
SEEN IN DRAFT: T Byrne (Master)

DISTRIBUTION:

I Holmes
J Smith
J Silva
G Burt
R McIntyre
M Whybrow
J Pettigrew
C Jennings
C Derbyshire (Irish Observer)
S McCully Phillips
R Ayers
P Dolder
L Cox
S Lozach
J Ashworth
G Thomas
R Faulkner

Additional:
S Kupschus
T Bailey
N Greenwood
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

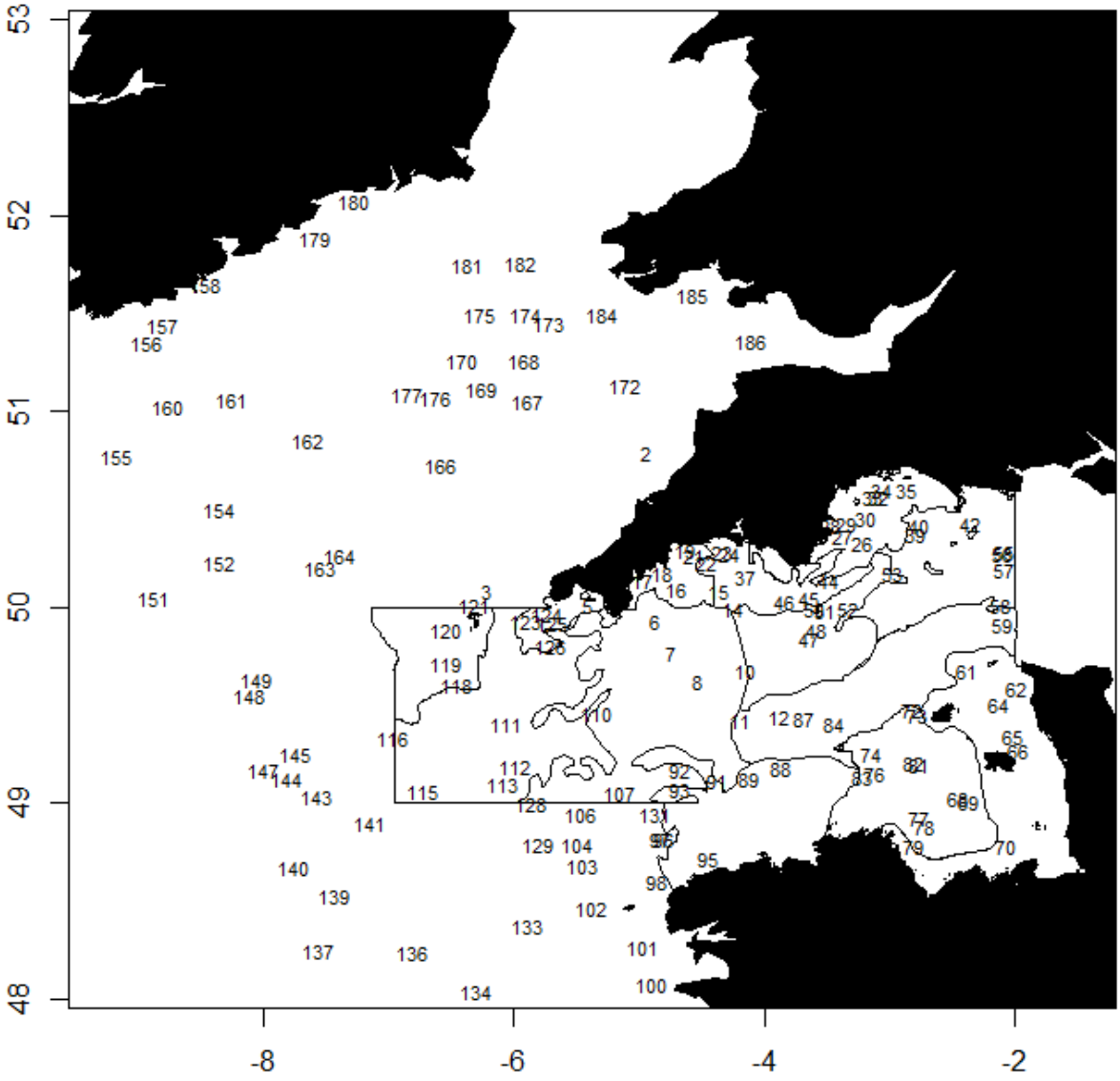


Figure 1: Chart of survey station numbers for CEND 4/15 (beam trawl stations only).

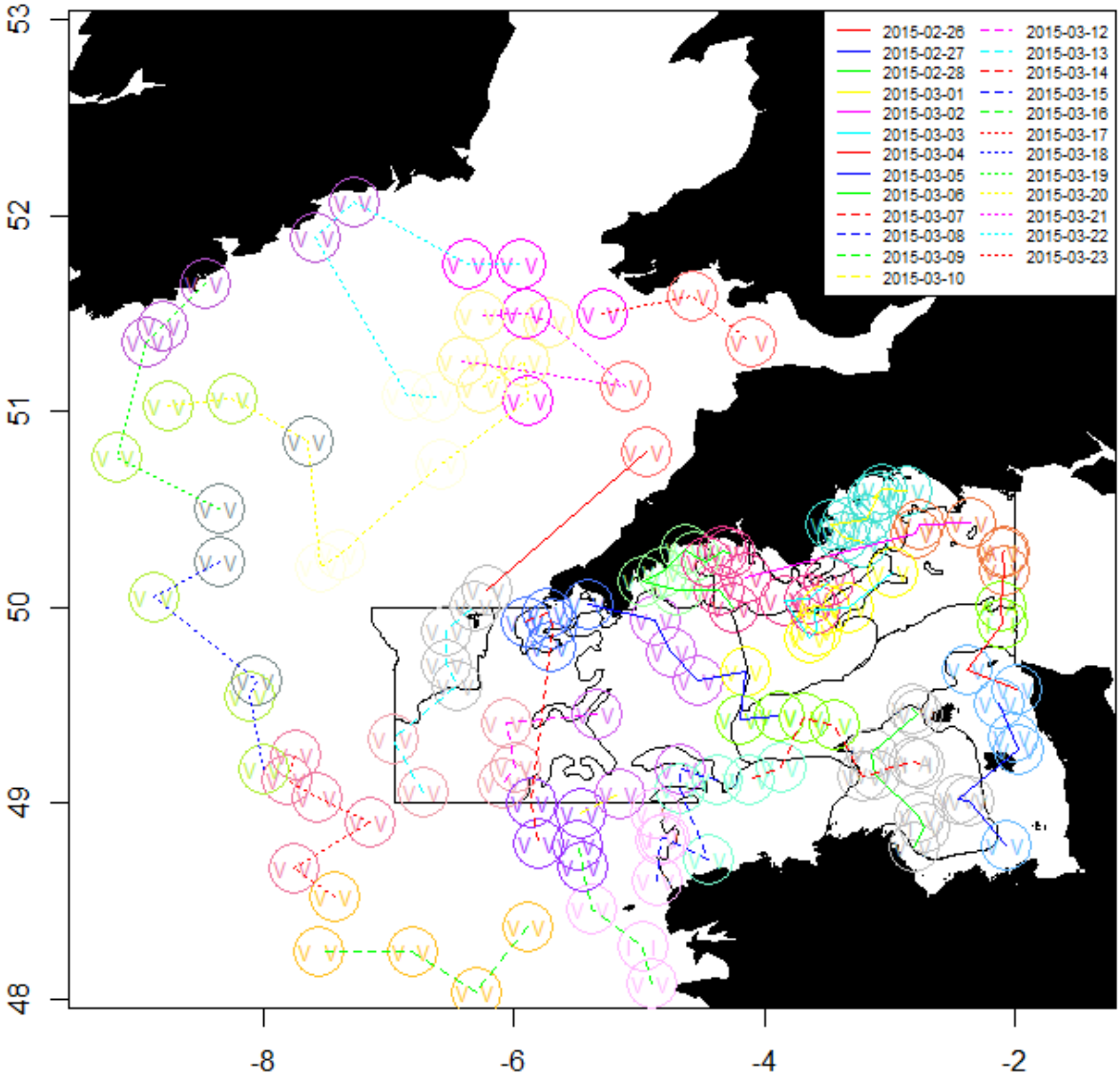


Figure 2: Survey Track showing beam trawl stations and validity codes by day.

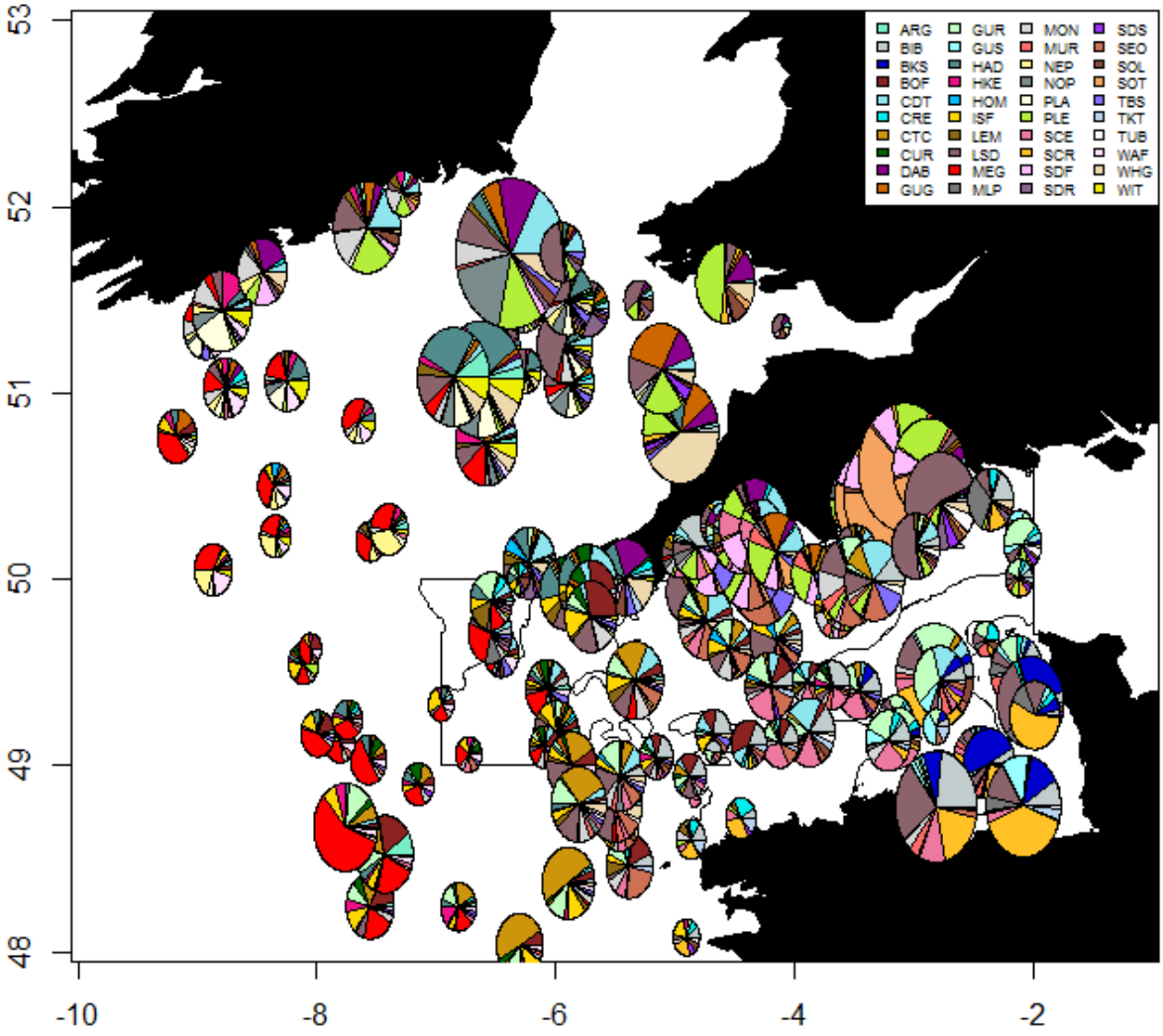


Figure 3: Species composition pie plots for Cend 4/15. Size of circles represents the size of the overall catch in numbers of the 40 most abundant species at a station with the size of the slice representing the relative proportion of each species encountered. For Cefas species codes see Table 2.

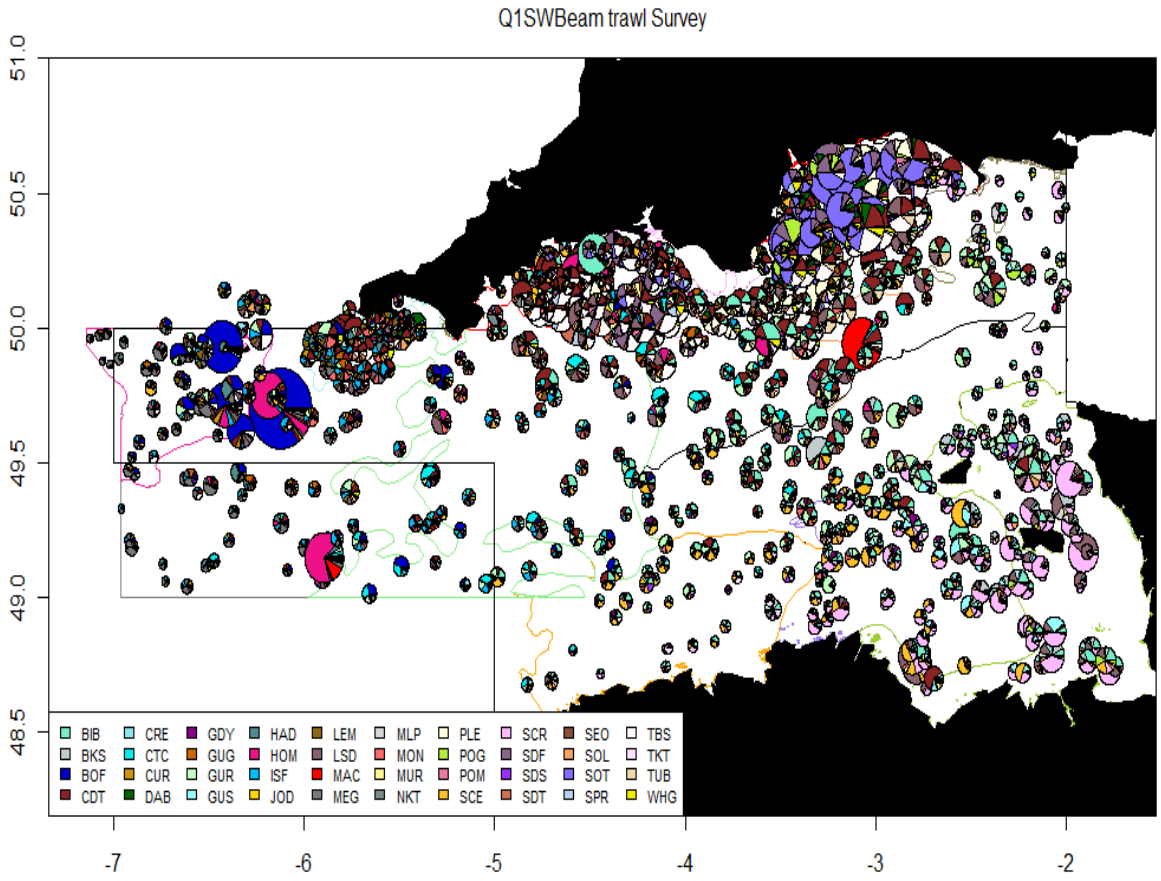


Figure 4: Species composition pie plots for the entire time-series (2006 – 2015) of the western English Channel part of the Q1SWECOS survey. Size of circles represents the size of the overall catch in numbers of the 40 most abundant species at a station with the size of the slice representing the relative proportion of each species encountered illustrating the general appropriateness of the stratum design although small improvements should be considered.

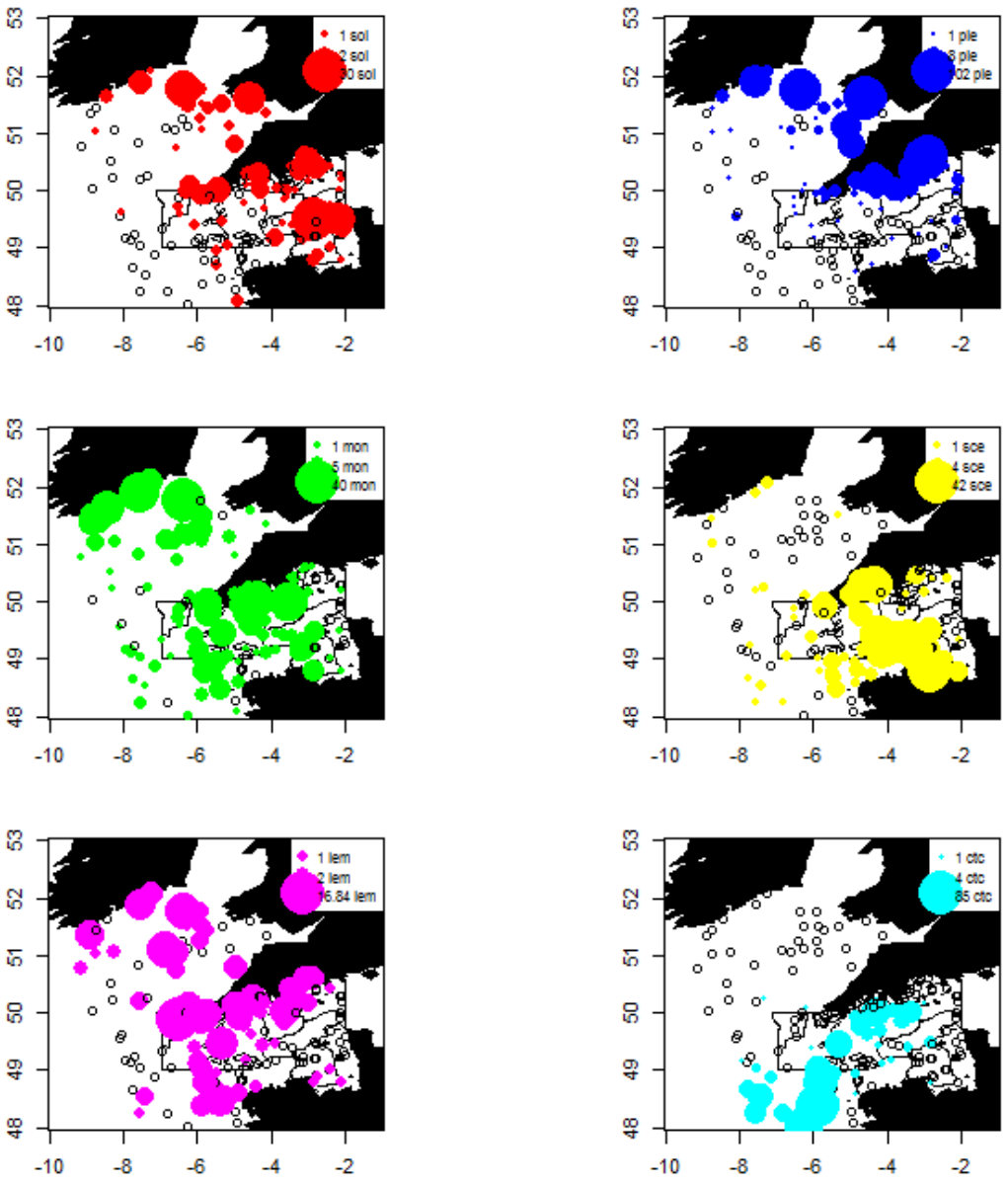


Figure 5: Distribution and numbers of major commercial species by station.

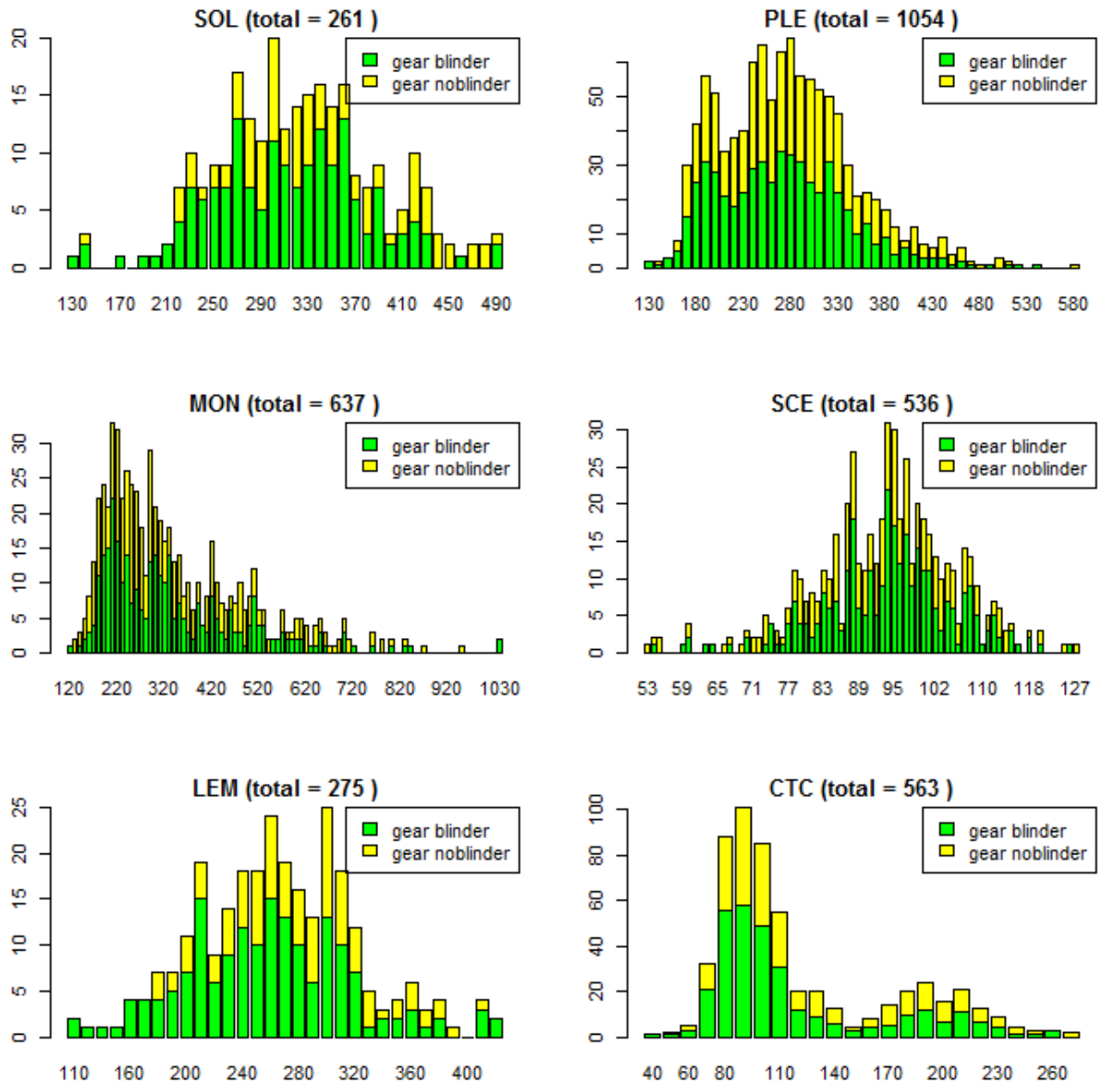
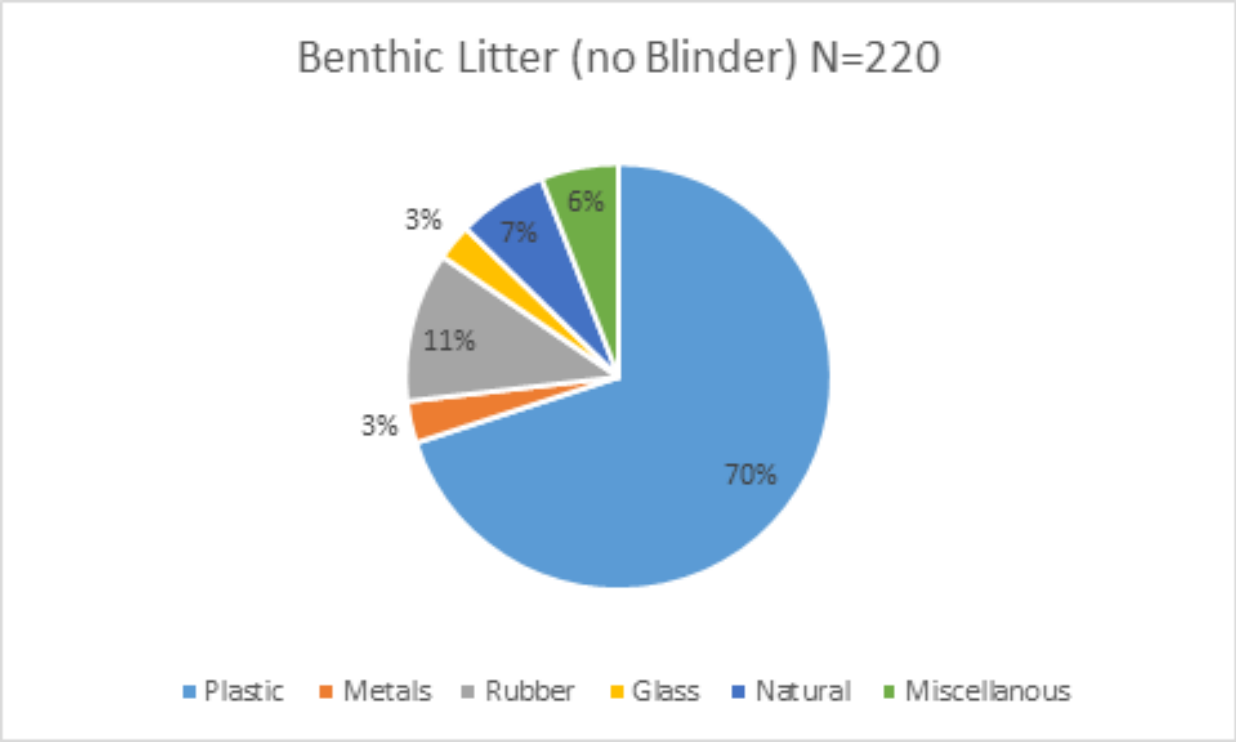


Figure 6: Length distributions (mm) for the major commercial species with total catch numbers by the two different gear types.



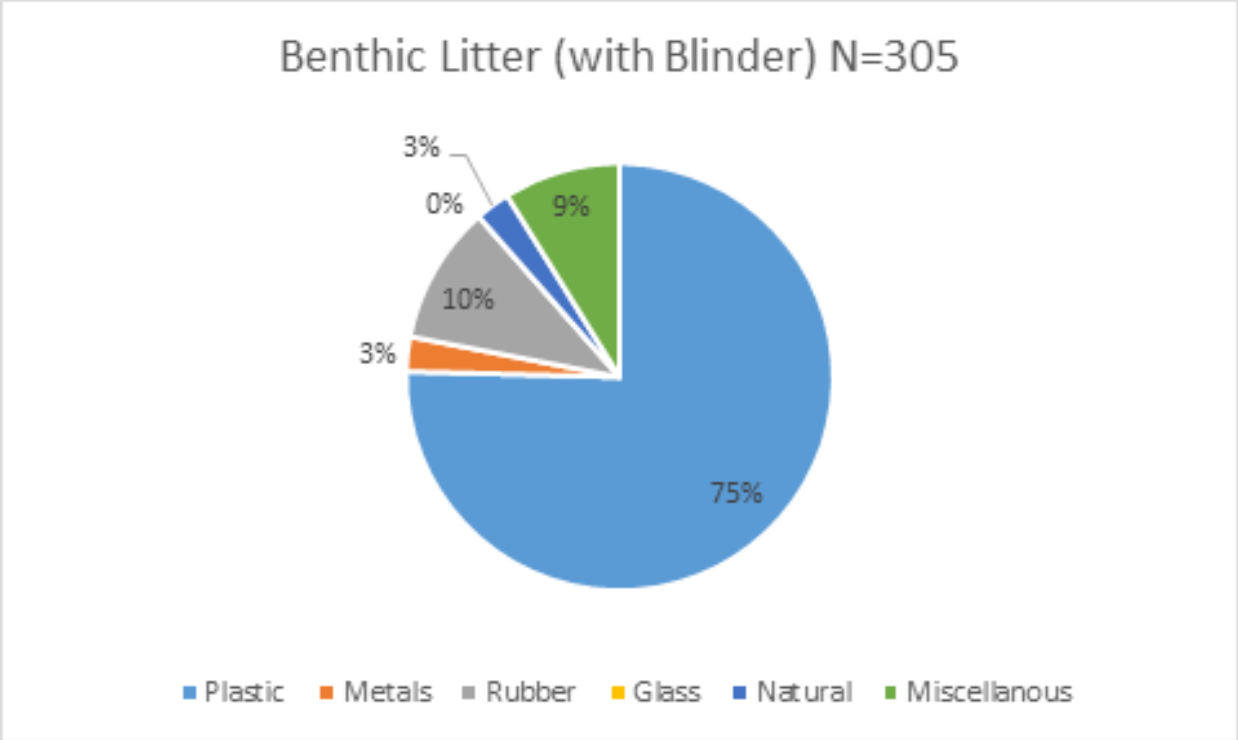


Figure 7 – Breakdown of litter by-catch by classification type.

Appendix 1: Station Log information

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
1	26/02/2015 09:33	50.793	-4.940	50.793	-4.940	0	0	0	55	55	79	280	1.5	2.5	0.2	29	1025	250	Profiler
2	26/02/2015 10:06	50.793	-4.951	50.790	-5.003	2	0	2	55	58	79	280	1.5	2.5	0.2	29	1025	250	Beams
3	26/02/2015 18:32	50.087	-6.219	50.096	-6.268	2	0	2	81	86	300	320	1.5	3	0.2	25	1031	310	Beams
4	27/02/2015 06:00	50.016	-5.424	50.016	-5.424	0	0	0	52		277	320	0.5	2	0.4	11	1034	260	Profiler
5	27/02/2015 06:20	50.011	-5.410	49.986	-5.377	2	196.8	198.8	51	50	126	320	0.5	2	0.2	11	1034	260	Beams
6	27/02/2015 09:41	49.933	-4.869	49.924	-4.820	2	227.3	229.3	85	85	13	270	0.5	2	0.2	15	1035	260	Beams
7	27/02/2015 11:22	49.771	-4.741	49.743	-4.714	1.9	239.5	241.4	87	89	65	270	1	2	0.5	15	1034.5	250	Beams
8	27/02/2015 13:02	49.625	-4.538	49.602	-4.500	2	251.6	253.6	88	89	67	250	1	2	0.4	15	1034.5	260	Beams
9	27/02/2015 15:02	49.671	-4.180	49.671	-4.180	0	0	0	85	85	249	260	1	1.5	0.6	13	1033.5	260	Profiler
10	27/02/2015 15:36	49.675	-4.151	49.676	-4.100	2	268.3	270.3	85	85	249	260	1	2	0.6	16	1033	260	Beams
11	27/02/2015 17:50	49.425	-4.202	49.424	-4.151	2.1	287.6	289.7	90	89	244	260	1	2.3	0.8	24	1033	260	Beams
12	27/02/2015 19:28	49.444	-3.885	49.450	-3.835	2	300.2	302.2	86	86	251	260	1	2	0.6	22	1033	260	Beams
13	28/02/2015 06:07	49.982	-4.244	49.982	-4.244	0	353.9	353.9	76	76	260	240	0.5	2	0.4	11	1023	260	Profiler
14	28/02/2015 06:39	49.996	-4.258	49.983	-4.306	2	356	358	74	74	268	240	0.5	2	0.3	11	1023	240	Beams
15	28/02/2015 08:07	50.085	-4.370	50.103	-4.328	2	366	368	72	71	258	270	0.5	2	4.1	17	1023	260	Beams
16	28/02/2015 10:43	50.091	-4.700	50.086	-4.751	1.9	383.9	385.8	74	73	285	260	0.5	3.5	0	16	1021.5	260	Beams
17	28/02/2015 12:54	50.136	-4.968	50.139	-4.930	1.4	396.2	397.6	34	44	62	250	0.5	1.5	1	20	1019.5	210	Beams
18	28/02/2015 13:56	50.175	-4.820	50.193	-4.776	2	402.4	404.4	58	59	39	240	0.5	1.5	0.1	19	1019.5	210	Beams
19	28/02/2015 15:44	50.295	-4.631	50.276	-4.589	2	413.3	415.3	34	40	107	240	1	2	0.1	26	1015.5	210	Beams
20	28/02/2015 16:35	50.273	-4.583	50.273	-4.583	0	0	0	53	53	126	240	1	2	0	27	1014.5	220	Profiler
21	28/02/2015 17:05	50.264	-4.568	50.237	-4.597	2.1	418.3	420.4	51	56	130	240	1	2	0	27	1014.5	220	Beams
22	28/02/2015 18:15	50.232	-4.457	50.261	-4.432	2	426.6	428.6	58	55	234	240	1.5	2	0.1	30	1013.5	220	Beams
23	28/02/2015 19:28	50.286	-4.333	50.304	-4.290	1.9	433.1	435	50	44	242	240	1.5	2	0.2	28	1013.5	220	Beams
24	28/02/2015 20:22	50.277	-4.277	50.244	-4.269	2.1	437.4	439.5	51	54	248	260	1.5	2	0.2	28	1013	220	Beams
25	01/03/2015 06:05	50.333	-3.209	50.333	-3.209	0	492.1	492.1	55	55	70	270	1	2	0.2	23	1016	260	Profiler
26	01/03/2015 06:24	50.331	-3.223	50.315	-3.269	2.1	493.1	495.2	55	55	71	270	1	2	0.2	23	1016	260	Beams
27	01/03/2015 08:15	50.360	-3.375	50.351	-3.425	1.9	502.5	504.4	52	52	219	265	0.5	1.5	0.3	25	1017	260	Beams
28	01/03/2015 09:49	50.423	-3.478	50.407	-3.432	1.9	510.8	512.7	17	35	223	240	0.5	0.5	0.2	21	1017	280	Beams
29	01/03/2015 11:10	50.431	-3.354	50.459	-3.326	1.9	516.9	518.8	42	39	213	265	0.5	1	0.4	22	1017	230	Beams
30	01/03/2015 13:36	50.454	-3.186	50.648	-3.156	2	530.6	532.6	28	28	41	260	1	2	0.1	25	1014	230	Beams

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
31	01/03/2015 15:12	50.568	-3.098	50.568	-3.098	0	538.7	538.7	34		67	230	1	2	0.3	25	1012	230	Profiler
32	01/03/2015 15:31	50.564	-3.087	50.541	-3.124	2.2	539.6	541.8	32	35	66	230	1	2	0.3	25	1012	230	Beams
33	01/03/2015 17:26	50.561	-3.130	50.546	-3.084	2	548.1	550.1	32	35	76	270	1	2	0.3	21	1012.5	230	Beams
34	01/03/2015 18:26	50.602	-3.069	50.600	-3.017	2	554.5	556.5	32	32	85	270	0.5	1.5	0.2	11	1013	240	Beams
35	01/03/2015 19:36	50.598	-2.869	50.596	-2.782	2	562.2	564.2	33	32	119	270	0.5	1.5	0.2	15	1014	240	Beams
36	02/03/2015 06:04	50.152	-4.168	50.152	-4.168	0	633	633	66	66	138	290	1.5	2.5	0.2	28	1019	260	Profiler
37	02/03/2015 06:35	50.152	-4.155	50.150	-4.104	2	634.3	636.3	65	65	166	290	1.5	2.5	0	28	1019	260	Beams
39	02/03/2015 13:24	50.376	-2.791	50.389	-2.744	2	697.2	699.2	56	55	268	300	1.5	2.5	0.2	31	1025.5	280	Beams
40	02/03/2015 14:38	50.421	-2.773	50.446	-2.723	2.1	703.3	705.4	54	54	303	310	1.5	2.5	0.3	13	1026	280	Beams
41	02/03/2015 16:21	50.427	-2.377	50.427	-2.377	0	718.7	718.7	49	49	77	310	1.5	2.5	1.3	22	1026.5	290	Profiler
42	02/03/2015 16:33	50.428	-2.354	50.427	-2.301	2	719.6	721.6	49	49	75	310	1.5	2.5	1.5	22	1026.5	290	Beams
43	03/03/2015 06:05	50.139	-3.488	50.139	-3.488	0	786.7	786.7	68		63	260	1	2	0.9	21	1026	260	Profiler
44	03/03/2015 06:23	50.135	-3.487	50.110	-3.521	2	787.5	789.5	67	67	54	260	1	2	0.9	21	1026	260	Beams
45	03/03/2015 08:07	50.046	-3.637	50.031	-3.683	2.1	795.5	797.6	68	70	82	265	1	2	0.2	24	1027.5	260	Beams
46	03/03/2015 09:30	50.030	-3.836	50.016	-3.883	1.9	803.7	805.6	70	72	273	265	1	2	0.5	26	1029.5	260	Beams
47	03/03/2015 11:38	49.839	-3.648	49.826	-3.601	2	821	823	72	74	257	280	1.5	2	0.6	22	1031.5	270	Beams
48	03/03/2015 12:53	49.884	-3.583	49.910	-3.616	2.1	827.4	829.5	71	71	239	290	1	2	0.7	25	1031	270	Beams
49	03/03/2015 14:26	49.990	-3.632	49.990	-3.632	0	835.3	835.3	74	74	185	300	1	2	0.1	21	1032	270	Profiler
50	03/03/2015 14:46	49.989	-3.606	49.988	-3.554	2	836.4	838.4	74	74	185	300	1	2	0.1	21	1032	270	Beams
51	03/03/2015 15:30	49.988	-3.524	49.991	-3.472	2	839.5	841.5	74	72	51	300	1	2	0.2	21	1032	270	Beams
52	03/03/2015 16:33	49.995	-3.327	50.000	-3.275	2	847.2	849.2	73	73	38	300	1	2	0.6	19	1033	270	Beams
53	03/03/2015 18:51	50.177	-2.979	50.153	-3.013	2.2	866.8	869	64	65	58	270	1	2	1	25	1035	270	Beams
54	04/03/2015 06:06	50.284	-2.081	50.284	-2.081	0	912.9	912.9	57	57	81	290	1	2	1.9	22	1038	270	Profiler
55	04/03/2015 06:33	50.283	-2.090	50.276	-2.140	2	914.1	916.1	57.1	58	82	290	1	2	2.2	22	1038.5	270	Beams
56	04/03/2015 07:37	50.277	-2.109	50.274	-2.160	2	919	921	57	58	89	290	1	2	2	22	1041	270	Beams
57	04/03/2015 09:02	50.191	-2.083	50.180	-2.131	1.9	928.3	930.2	58.5	58.8	95	290	1	2	1	22	1041	270	Beams
58	04/03/2015 11:00	50.007	-2.113	50.000	-2.163	2.1	943.4	945.5	65	65	246	290	1.5	2	1.3	24	1044	270	Beams
59	04/03/2015 12:48	49.916	-2.103	49.924	-2.053	2	955.2	957.2	79	82	259	340	1.5	2	3.1	19	1045	270	Beams
60	04/03/2015 15:25	49.676	-2.400	49.676	-2.400	0	979.1	979.1	52	52	136	290	1	2	0.9	23	1046	270	Profiler
61	04/03/2015 15:49	49.679	-2.389	49.712	-2.397	2	980.3	982.3	46	51	115	300	1	2	0.8	20	1047	270	Beams
62	04/03/2015 18:56	49.583	-1.988	49.552	-1.970	2	1006.6	1008.6	34	29	353	300	0.5	1.5	1.6	15	1048	270	Beams
63	05/03/2015 06:01	49.510	-2.120	49.510	-2.120	0	1034.2	1034.2	40	40	22		0.5		1.4		1051.5		Profiler

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
64	05/03/2015 06:19	49.506	-2.134	49.484	-2.172	1.9	1035.3	1037.2	40	45	23		0.5		1.5		1051.5		Beams
65	05/03/2015 08:33	49.340	-2.018	49.338	-1.968	2	1052.5	1054.5	30	26	326		0.5		1.3		1052		Beams
66	05/03/2015 10:35	49.270	-1.983	49.255	-1.940	2.1	1066.4	1068.5	28	27	306				1.2		1053.5		Beams
67	05/03/2015 14:14	49.015	-2.454	49.015	-2.454	0	1104.6	1104.6	44	44	146				0.9		1052		Profiler
68	05/03/2015 14:34	49.020	-2.451	49.053	-2.449	2	1105.3	1107.3	45	46	144		0.5		1.3		1052		Beams
69	05/03/2015 16:21	49.009	-2.365	49.032	-2.401	2	1114.2	1116.2	46	48	130		0.5		2.3		1053		Beams
70	05/03/2015 18:47	48.781	-2.078	48.785	-2.128	1.9	1140.1	1142	42	39	270				0.5		1053		Beams
71	06/03/2015 06:05	49.472	-2.832	49.472	-2.832	0	1195.1	1195.1	73.6	73.6	62	200	0.5	1.5	1.5	11	1048.5	240	Profiler
72	06/03/2015 07:02	49.478	-2.823	49.471	-2.852	1.2	1197	1198.2	74.6	70	33	200	0.5	1.5	2	15	1048	240	Beams
73	06/03/2015 08:58	49.454	-2.782	49.467	-2.829	2.1	1207.2	1209.3	70	70	5	200	0.5	1.5	1.9	15	1048	250	Beams
74	06/03/2015 11:25	49.251	-3.151	49.231	-3.192	2	1227.9	1229.9	69	69	278	200	0.5	1.5	2.4	15	1047.5	260	Beams
75	06/03/2015 12:58	49.147	-3.125	49.147	-3.125	0	1236.7	1236.7	68	68	272	190	0.5	1.5	1.5	12	1045	260	Profiler
76	06/03/2015 13:21	49.148	-3.125	49.134	-3.074	2	1237.7	1239.7	69	66	263	160	0.5	1.5	0.8	8	1045	260	Beams
77	06/03/2015 15:42	48.927	-2.767	48.935	-2.803	1.5	1259.4	1260.9	46	47	134	150	0.5	1.5	2.3	11	1044	260	Beams
78	06/03/2015 17:04	48.878	-2.726	48.892	-2.757	1.6	1267.8	1269.4	48	52	129	150	0.5	1	2.3	12	1043	260	Beams
79	06/03/2015 18:22	48.780	-2.809	48.794	-2.854	2	1277.6	1279.6	42	37	129	150	0.5	0.5	1.1	13	1042.5	260	Beams
80	07/03/2015 06:04	49.196	-2.760	49.196	-2.760	0	1319.7	1319.7	68	68	94	200	0.5	1	1.8	15	1040	290	Profiler
81	07/03/2015 06:25	49.199	-2.769	49.210	-2.817	2	1320.9	1322.9	68	70	94	200	0.5	1	1.8	15	1040	290	Beams
82	07/03/2015 08:42	49.210	-2.810	49.219	-2.822	0.7	1331.9	1332.6	68	70	10	200	0.5	1	0.7	13	1040	260	Beams
83	07/03/2015 10:49	49.134	-3.214	49.133	-3.163	2	1350.3	1352.3	72	71	270	200	0.5	1	2.8	12	1040	260	Beams
84	07/03/2015 13:27	49.400	-3.452	49.419	-3.426	2	1373.5	1375.5	77	77	236	300	0.5	1	1.2	10	1039	280	Beams
86	07/03/2015 15:33	49.440	-3.664	49.440	-3.664	0	1389	1389	118	118	56	270	0.5	1	0.3	14	1038	280	Profiler
87	07/03/2015 15:56	49.432	-3.680	49.416	-3.725	2	1390.1	1392.1	111	110	62	270	0.5	1	0.4	13	1037.5	280	Beams
88	07/03/2015 18:08	49.179	-3.871	49.162	-3.915	2	1407.9	1409.9	93.1	93.9	75	270	0.5	1	1.9	15	1037	280	Beams
89	07/03/2015 19:58	49.121	-4.118	49.108	-4.164	2	1418.3	1420.3	94	94	86	265	0.5	1.5	0.6	17	1037	280	Beams
90	08/03/2015 06:00	49.114	-4.388	49.114	-4.388	0	1451	1451	98	98	86	240	0.5	1.5	1.7	14	1035	260	Profiler
91	08/03/2015 06:37	49.116	-4.379	49.112	-4.430	2.1	1452.9	1455	99.4	98.2	87	240	0.5	1.5	1.6	14	1035	260	Beams
92	08/03/2015 08:37	49.172	-4.675	49.179	-4.725	2	1465	1467	102	102	121	240	0.5	2.2	0.4	18	1035	260	Beams
93	08/03/2015 10:31	49.072	-4.675	49.088	-4.630	2	1477.8	1479.8	97	95	240	250	0.5	2.5	0.9	20	1036.5	260	Beams
94	08/03/2015 14:06	48.714	-4.440	48.714	-4.440	0	1505.8	1505.8	65	65	59	250	0.5	2.5	0.5	15	1038	250	Profiler
95	08/03/2015 14:25	48.716	-4.445	48.722	-4.473	1.3	1506.3	1507.6	65	78	56	250	0.5	2.5	0.8	15	1038	250	Beams
96	08/03/2015 16:24	48.817	-4.798	48.812	-4.848	2	1521.7	1523.7	106	108	54		0.5	2.5	2.2		1037.5	260	Beams

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
97	08/03/2015 18:37	48.814	-4.832	48.810	-4.856	1	1530.3	1531.3	110	110	63		0.5	2	0.9		1039	260	Beams
98	08/03/2015 20:17	48.603	-4.864	48.570	-4.870	2	1544.4	1546.4	97	94	232		0.5	2	0.3		1039	260	Beams
99	09/03/2015 08:26	48.077	-4.896	48.077	-4.896	0	1617.2	1617.2	75	75	170	180	0.5	2	1.2	15	1037	300	Profiler
100	09/03/2015 08:48	48.078	-4.901	48.078	-4.941	1.6	1618.4	1620	73	70	171	180	0.5	2	0.9	15	1037.5	300	Beams
101	09/03/2015 10:43	48.264	-4.976	48.265	-4.982	0.3	1632.4	1632.7	65	65	192	180	0.5	2	0.3	15	1037.5	300	Beams
102	09/03/2015 15:50	48.459	-5.380	48.443	-5.387	1	1659.8	1660.8	116	117	353	260	0.5	1.5	1.4	12	1036	260	Beams
103	09/03/2015 17:59	48.679	-5.460	48.662	-5.461	1	1679	1680	114	114.3	44	230	0.5	1.5	1.6	18	1036	240	Beams
104	09/03/2015 19:33	48.788	-5.500	48.802	-5.486	1	1690.4	1691.4	115	114	70	230	0.5	1.5	1.2	10	1036	240	Beams
105	10/03/2015 06:12	48.951	-5.445	48.951	-5.445	0	1742.3	1742.3	112	112	57	350	0.1	1.5	1.7	14	1041	270	Profiler
106	10/03/2015 06:40	48.945	-5.462	48.927	-5.505	2	1743.4	1745.4	114	114	61	20	2	2	1.7	14	1041	270	Beams
107	10/03/2015 09:12	49.047	-5.154	49.031	-5.199	2	1764.4	1766.4	108	108	113	30	0.5	2.5	0.6	14	1042	270	Beams
109	12/03/2015 09:07	49.423	-5.365	49.423	-5.365	0	1888.7	1888.7	104	104	94	180	1.5	1.5	0.7	17	1033	200	Profiler
110	12/03/2015 10:16	49.456	-5.336	49.425	-5.353	1.9	1893.8	1895.7	104	104	156	180	1.5	1.5	0.2	23	1033	200	Beams
111	12/03/2015 14:21	49.408	-6.067	49.382	-6.092	1.9	1930.4	1932.3	110	110	263	180	1.5	1.5	0.7	20	1031	204	Beams
112	12/03/2015 16:23	49.184	-5.993	49.153	-5.980	1.9	1945.9	1947.8	115	116	292	320	1.5	1.5	0.6	15	1029	240	Beams
113	12/03/2015 17:47	49.100	-6.087	49.084	-6.129	2	1953.6	1955.6	118	119	66	320	1.5	2	0.7	21	1032	240	Beams
114	13/03/2015 06:02	49.062	-6.707	49.062	-6.707	0	1989.7	1989.7	126	126	52	330	2	2.5	0.5	28	1037	260	Profiler
115	13/03/2015 06:33	49.059	-6.727	49.057	-6.777	2	1990.9	1992.9	125	129	73	330	2	2.5	0.6	28	1037	260	Beams
116	13/03/2015 09:32	49.328	-6.958	49.319	-6.916	1.8	2013.4	2015.2	120	116	142	340	2	3.5	0.4	34	1040	260	Beams
117	13/03/2015 12:48	49.603	-6.463	49.603	-6.463	0	2042	2042	108	108	225	340	2	3	0.6	36	1039.5	270	Profiler
118	13/03/2015 13:36	49.600	-6.453	49.607	-6.501	1.9	2044.4	2046.3	105	106	247	340	2	3	0.6	36	1039.5	270	Beams
119	13/03/2015 15:14	49.709	-6.546	49.719	-6.596	2	2054.1	2056.1	98	100	257	350	4	6.5	0.4	22	1041	310	Beams
120	13/03/2015 17:05	49.884	-6.539	49.913	-6.519	1.9	2066.8	2068.7	88	88	60	0	2	3	0.6	24	1041	310	Beams
121	13/03/2015 18:59	50.007	-6.310	49.995	-6.357	2	2080.6	2082.6	81	71	53	0	4	6	0.8	21	1041	310	Beams
122	14/03/2015 06:03	49.934	-5.916	49.934	-5.916	0	2118.5	2118.5	70	70									Profiler
123	14/03/2015 06:37	49.926	-5.905	49.894	-5.878	2.2	2119.7	2121.9	70	76	346	10	3	3.5	0.5	17	1042	310	Beams
124	14/03/2015 08:28	49.970	-5.729	49.944	-5.769	2.1	2130.8	2132.9	70	72	252	10	1	1	0.9	15	1044	310	Beams
125	14/03/2015 09:59	49.920	-5.700	49.923	-5.750	2	2138.9	2140.9	75	76	98		0.5	1	0.5		1042.5	310	Beams
126	14/03/2015 11:29	49.799	-5.702	49.767	-5.689	2	2149.5	2151.5	89	90	120		1	1	0.5		1042.5	330	Beams
127	14/03/2015 16:16	48.964	-5.904	48.964	-5.904	0	2200.8	2200.8	117	117	240	70	1	1.5	0.9	16	1042	280	Profiler
128	14/03/2015 17:22	48.999	-5.864	48.973	-5.896	2	2206	2208	118	119	259	50	1	1.5	0.6	22	1042	280	Beams
129	14/03/2015 19:30	48.791	-5.804	48.763	-5.830	2	2223	2225	117	118	25	50	1	1	0.6	12	1042	280	Beams

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
130	15/03/2015 06:06	48.944	-4.888	48.944	-4.888	0	2272.5	2272.5	104	104	250	60	1.5	1.5	0.7	18	1039	280	Profiler
131	15/03/2015 06:32	48.945	-4.874	48.957	-4.827	2	2273.6	2275.6	104	103	263	60	1.5	1.5	0.2	20	1039	280	Beams
132	16/03/2015 06:32	48.367	-5.870	48.367	-5.870	0	2385.7	2385.7	121	121	224				0.6				Profiler
133	16/03/2015 07:06	48.368	-5.890	48.371	-5.939	2	2387.3	2389.3	120	123	244	0	1.5	3	0.5	1	1032	280	Beams
134	16/03/2015 10:22	48.034	-6.298	48.045	-6.252	2	2417.3	2419.3	145	141	23		0.5	1.5	0.4		1032	280	Beams
135	16/03/2015 14:06	48.232	-6.815	48.232	-6.815	0	2451.8	2451.8	158	158	106		0.5	1.5	0.4		1031	280	Profiler
136	16/03/2015 14:52	48.240	-6.811	48.270	-6.791	2.1	2452.8	2454.9	158	158	167		0.5	1.5	0.5		1031	280	Beams
137	16/03/2015 18:53	48.245	-7.552	48.216	-7.553	1.8	2492.1	2493.9	170	177	112		0.5	2	0.1		1030	280	Beams
138	17/03/2015 06:00	48.510	-7.449	48.510	-7.449	0	2529.4	2529.4	161	161	112	180	0.5	1	0.1	15	1030	280	Profiler
139	17/03/2015 06:41	48.524	-7.431	48.549	-7.401	2	2530.9	2532.9	160	160	112	170	0.5	1	0.1	12	1031	280	Beams
140	17/03/2015 09:00	48.668	-7.758	48.656	-7.802	2	2550.1	2552.1	138	155	289	0	1	2.5	0.4	0	1032	280	Beams
141	17/03/2015 12:42	48.899	-7.149	48.881	-7.191	1.9	2585.4	2587.3	140	143	91	140	1	2.5	0.8	2	1033.5	280	Beams
142	17/03/2015 14:59	49.030	-7.522	49.030	-7.522	0	2604.2	2604.2	145	145	170	90	0.5	1	0.2	8	1034	300	Profiler
143	17/03/2015 15:40	49.031	-7.566	49.029	-7.617	2	2606	2608	145	144	197	90	1.5	2.5	0.3	8	1034	300	Beams
144	17/03/2015 17:30	49.124	-7.806	49.145	-7.767	2	2618.9	2620.9	142	139	219	0	1	2.5	0.4	0	1036	300	Beams
145	17/03/2015 18:54	49.246	-7.741	49.280	-7.736	2	2627.1	2629.1	136	136	232	40	1.5	2.5	0.5	10	1038	300	Beams
146	18/03/2015 06:04	49.151	-8.009	49.151	-8.009	0	2651.1	2651.1	147	147	221				0.4				Profiler
147	18/03/2015 06:46	49.171	-7.992	49.200	-7.968	2	2653.3	2655.3	145	142	228	80	2	2.5	0.5	10	1041	270	Beams
148	18/03/2015 09:31	49.547	-8.111	49.580	-8.116	2.1	2677	2679.1	112	108	262	50	1	1	0.5	30	1043	270	Beams
149	18/03/2015 10:42	49.627	-8.054	49.661	-8.053	2	2683.5	2685.5	117	126	327	50	1	1	0.5	25	1044	270	Beams
150	18/03/2015 14:56	50.046	-8.882	50.046	-8.882	0	2725.8	2725.8	134	134	52	80	1.5	1	0.6	19	1044.5	270	Profiler
151	18/03/2015 15:38	50.051	-8.867	50.063	-8.813	2.2	2726.9	2729.1	135	125	86	70	1.5	1	0.4	19	1044	270	Beams
152	18/03/2015 18:21	50.231	-8.347	50.248	-8.302	2	2749.7	2751.7	120	119	201	60	1.5	1	0.7	21	1044	270	Beams
153	19/03/2015 05:59	50.508	-8.319	50.508	-8.319	0	2776.8	2776.8	86	86	157	50	0.5	1	0.3	16	1045	270	Profiler
154	19/03/2015 06:29	50.501	-8.354	50.483	-8.398	2	2778.3	2780.3	90	96	209	50	0.5	1	0.5	12	1046	270	Beams
155	19/03/2015 10:15	50.768	-9.173	50.794	-9.139	2	2816.7	2818.7	120	120	49	50	0.5	1	1	15	1046	270	Beams
156	19/03/2015 14:00	51.351	-8.925	51.377	-8.890	2	2853.8	2855.8	100	96	59	60	0.5		1	10	1046		Beams
157	19/03/2015 15:10	51.441	-8.798	51.465	-8.752	2	2855.7	2857.7	90	92	75	60	0.5		0.8	10	1046		Beams
158	19/03/2015 19:19	51.652	-8.457	51.644	-8.483	1.3	2898.3	2899.6	38	35	221		0.5		0.4		1046		Beams
159	20/03/2015 00:10	51.044	-8.766	51.044	-8.766	0	2937.7	2937.7	110	110	331				0.1				Profiler
160	20/03/2015 00:46	51.027	-8.765	50.995	-8.754	2	2938.7	2940.7	112	113	15	50	1.5	0	0.3	10	1045	0	Beams
161	20/03/2015 03:13	51.064	-8.251	51.068	-8.198	2	2960.8	2962.8	110	107	58	30	1.5	0	0.6	8	1044	0	Beams

Station	Date/Time	LatS	LongS	LatH	LongH	Distance	LogS	LogH	DepthS	DepthH	Tdir	Wdir	SeaH	SwlH	Tspeed	Wspeed	Barom	SwlDir	Gear
162	20/03/2015 06:02	50.849	-7.647	50.817	-7.639	2	2988.1	2990.1	110	108	77	30	1.5	0	0.2	10	1044	0	Beams
163	20/03/2015 10:00	50.204	-7.549	50.223	-7.507	2	3028.7	3030.7	105	105	249	40	15	0	1.3	18	1042.5	0	Beams
164	20/03/2015 11:17	50.268	-7.394	50.282	-7.347	2	3035.9	3037.9	107	107	222	40	0.5		0.6	22	1042.5		Beams
165	20/03/2015 15:18	50.721	-6.600	50.721	-6.600	0	3076.9	3076.9	100	100	57	40	1	1.5	0.8	12	1039.5	270	Profiler
166	20/03/2015 15:50	50.730	-6.580	50.751	-6.538	2	3077.9	3079.9	100	102	54	40	1	1.5	1	10	1039	270	Beams
167	20/03/2015 19:05	51.053	-5.884	51.073	-5.842	2	3110.6	3112.6	93	90	319		0.5	1	0.7		1038	270	Beams
168	20/03/2015 20:58	51.258	-5.921	51.257	-5.973	2	3125.2	3127.2	93	94	279		0.5		0.7		1038		Beams
169	20/03/2015 23:05	51.120	-6.254	51.090	-6.276	2	3140.9	3142.9	103	110	208		0.5		0.7		1038.5		Beams
170	21/03/2015 01:04	51.258	-6.420	51.258	-6.474	2.1	3156.8	3158.9	106	124	207	10	2	0	1.1	10	1038	0	Beams
171	21/03/2015 14:25	51.113	-5.118	51.113	-5.118	0	3292.5	3292.5	70	70	89	10	1		0.6	12	1039		Profiler
172	21/03/2015 15:08	51.130	-5.111	51.163	-5.108	2	3293.8	3295.8	70	70	66	0	1		1.3	16	1039		Beams
173	21/03/2015 18:34	51.453	-5.725	51.464	-5.760	1.5	3325.2	3326.7	85	88	7	0	1.5	1	0.6	18	1039.5	20	Beams
174	21/03/2015 19:48	51.500	-5.899	51.476	-5.934	2	3332.8	3334.8	104	104	321	0	1	1	0.8	12	1040	20	Beams
175	21/03/2015 21:45	51.496	-6.277	51.467	-6.299	2	3348.4	3350.4	106	111	352	20	1	1	0.5	14	1041	20	Beams
176	22/03/2015 00:51	51.075	-6.621	51.054	-6.664	2	3377.4	3379.4	95	95	236	20	2	2	0.6	12	1041	20	Beams
177	22/03/2015 02:16	51.087	-6.854	51.106	-6.897	2	3387.4	3389.4	95	95	56	20	3	2	0.3	12	1040.5	20	Beams
178	22/03/2015 07:56	51.853	-7.747	51.853	-7.747	0	3444.7	3444.7	39	39	101				0.5				Profiler
179	22/03/2015 10:59	51.890	-7.581	51.907	-7.546	1.7	3468.2	3469.9	54	52	135	0	1	0	0.6	0	1039.5	0	Beams
180	22/03/2015 13:49	52.073	-7.274	52.107	-7.269	2	3492.5	3494.5	40	30	1		0.5		0.1		1038		Beams
181	22/03/2015 21:11	51.750	-6.375	51.718	-6.390	2	3563.6	3565.6	75	73	32	200	0.5		0.9	16	1033		Beams
182	23/03/2015 23:30	51.756	-5.943	51.724	-5.953	2	3584	3586	113	112	293	200	0.5		0.1	18	1032		Beams
183	23/03/2015 03:19	51.527	-5.309	51.527	-5.309		3615.8		58		135				2.5				Profiler
184	23/03/2015 04:08	51.498	-5.301	51.528	-5.281	2	3620.7	3622.7	63	60	122	220	2.5	0	2.3	20	1030	0	Beams
185	23/03/2015 07:22	51.593	-4.576	51.605	-4.594	1	3653.2	3654.2	41	39	63	180	1.5	0	0.7	16	1029	0	Beams
186	23/03/2015 10:18	51.358	-4.108	51.357	-4.162	2	3680.9	3682.9	49	43	254	220	0.5		1	12	1029		Beams