

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR

Survey: CEND 4/20.

STAFF:

Name	Role	Name	Role
Ian Holmes	SIC	Joanne Smith	2IC
Matthew Eade	Deckmaster	Georgina Eastley	Deckmaster
Ross Bullimore	Benthic	Rogan Harmer	Benthic
Sam Barnett	Sampler	Ramon Benedet	Sampler
Nevena Almeida	Sampler	Daniel Clarke	Sampler

DURATION: 14 – 28 June 2020 (14 days at sea)

LOCATION: Western English Channel (ICES Division 7.e) – ECOS survey
(Celtic Sea element of survey not possible due to Covid-19 lockdown effects on the RV schedule)

AIMS:

Primary:

- 1) To carry out a beam trawl survey of the Western 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.
- Biological parameters of selected species.
- Distribution and classification of anthropogenic debris.

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.

Secondary:

- 2) To collect fisheries acoustic data at four operating frequencies (38, 120, 200 and 333 kHz) and multibeam data continuously throughout the survey.
- 3) To collect full salinity, temperature, and depth profiles at each trawl station alongside surface and near-bottom water samples.
- 4) To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'.
- 5) Collect water samples for caesium and tritium analysis under SLA22 (T Bailey – Cefas Lowestoft).
- 6) Collect specimens of common cuttlefish *Sepia officinalis* for use in Cefas cephalopod maturity training courses (V Laptikhovsky – Cefas Lowestoft).
- 7) Collect surface underway chlorophyll samples for SLA25 (N Greenwood – Cefas Lowestoft)
- 8) Collect skeletons of selected gadoid species for reference collection to assist in identification of archaeological vertebrae. (Rachel Blevis, University of Cambridge).

Opportunistic:

- 9) To record details of surface sightings of any marine mammals, sea turtles and large pelagic fish, and record observations on jellyfish aggregations.
- 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) All diadromous species (including allis shad *Alosa alosa*, twaite shad *Alosa fallax* and lampreys (*Petromyzontidae*)) found dead on capture are to be frozen and returned to the lab for analyses, marking samples with the survey, station and date to support DiadES project.
- 13) Collect a vertical ring net sample at the west Gabbard smart buoy, contributing to the Lifeform project (Defra) as part of the UK monitoring network for zooplankton.
- 14) To collect genetic samples from anglerfish *Lophius piscatorius*, black-bellied anglerfish *Lophius budegassa* and hake *Merluccius Merluccius* in support of the GECKA project.

- 15) Collect vertical ring net samples at locations previously known from samples collected on CEND 4/17 and CEND 4/19 for having clusters of European seabass, *Dicentrarchus labrax* eggs and larvae. (H Lloyd-Hartley - Cefas, Lowestoft)

NARRATIVE: (All times are GMT)

Note : This survey was the first to operate on the RV Cefas Endeavour since the suspension of the Cefas RV programme due to the Covid-19 pandemic. The survey was reduced from its planned 27 days in March/April 2020 to just 14 days in June upon resumption of the RV programme. To maintain the time-series of data collected in the western Channel since 2006, these reduced days were to be spent working in this sea area only.

Note : A number of randomly selected stations were fished in each stratum. For the present report, for example, site 5(2) would represent Station 2 in Stratum 5.

Cefas staff arrived at the vessel at 1130hr and all scientists and crew had a COVID-19 test carried out before going into relative isolation until the test results were received. The last of these results all came back on 13 June at 1900hr with all being negative. With completed documentation for safe ways of working on the RV on this fisheries survey being approved by the Cefas regeneration project team, the survey was given the go-ahead to sail.

RV Cefas Endeavour (henceforth referred to as CEND 4/20) sailed at 0330hr 14 March and began the journey to the western Channel. Safety toolbox talks were held on all operations. At 0551hr at a position 6 nm off Southwold (BTS7d survey prime station 104) a 10-minute shake-down tow was conducted to test all ship-board and scientific equipment and this proved to be completely successful. This was followed by a deployment of the ESM2 logger and Niskin sampler. A large quantity of mooring ropes were found floating on the surface and these were recovered and stored aboard as they were a hazard to shipping.

Excellent progress was made to the survey area and work began in Stratum 6 at site 3 close to Portland with an ESM2/Niskin deployment at 0339hr, 15 June. This was followed by a total of seven successful beam trawl deployments over the course of the day located in Stratum 5 and 6 in the north of Lyme Bay. Several of these tows were in close proximity to commercial static gear, but with excellent visibility, these were all carefully negotiated to avoid the gear, but three of the tows were of reduced distance (site 6(3) – 1.49 nm, site 6(5) – 1.89 nm and site 5(3) – 1.01 nm). At Stratum 5; Station 6, the largest catch of plaice, *Pleuronectus platessa* on the entire survey was caught (~36 kg). This location also saw the second largest catch on the survey of undulate ray, *Raja undulata*. The following day, work began again at site 5(9), with a total of seven successful tows completed including the final locations in stratum 5 and further tows in stratum 6 and 7. The tow at site 5(9) was of reduced length as the Transas tow measuring tool was not operating correctly and the tow was hauled at 1.85 nm. Additionally, on this day, six plankton net deployments were made to collect samples for analyses of sea-bass, *Dicentrarchus labrax* eggs.

On 17 June, a further seven stations were successfully fished, with the final locations in Stratum 7 being completed, finishing the day off at Start Point in Stratum 4. The largest catch components on this day were anglerfish, red gurnard, *Chelidonichthys cuculus* and bib, *Trisopterus luscus*. A total of six plankton net deployments were also conducted to collect sea-bass egg samples. The following day, a total of eight successful beam trawl deployments were made, mostly within Stratum 4, finishing the day with one tow in Stratum 3 with a further four plankton deployments made for sea-bass egg samples.

The 19 June saw the survey heading west to work in Stratum 1 around the Isles of Scilly to get ahead of some poorer weather expected in that area in the following days. Over the course of this day, all five sampling locations in this stratum were fished successfully. The tow at Stratum 1 station 4 was of reduced tow length (1.4 nm) to avoid static gear on the tow. In addition, two further stations were successfully fished in Stratum 2, with the tow at site 2(6) being of slightly reduced distance due to the presence of static gear. At the stations to the west and south of the Isles of Scilly, the first sightings of ocean sunfish, *Mola mola* were made with these being the first of ~18 individuals observed over the following days. Most individuals were observed as being juvenile, with an occasional larger specimen seen. These number of sightings was very unusual as only a few sightings are ever made on Cefas surveys. At site 2(6), the largest single catch of sole, *Solea solea* was made (10.2 kg).

The following day was spent in Stratum 2, 8 and 13, south of Lands End. A total of seven valid beam trawl tows were completed with some tow length reductions necessary. The tows at site 2(5) was reduced to 1.5 nm due to static gear, site 2(3) was reduced to 1.18 nm due to strong tide, static gear, cables, and poor ground and site 13(1) was reduced to 1.93 nm due to static gear. At site 13(6), a further five ocean sunfish were observed on the tow. At site 2(5), the largest catch of boarfish, *Capros aper* was observed weighting a total of 15 Kg. Five ocean sunfish were observed at site 13(6). Work in Stratum 2 was completed on this day. On 21 June, a further eight successful beam trawl deployments were made off the southern Cornish coast in Stratum 3, 4, 8 and 13, thus completing all planned work in Stratum 3 and 4. All tows were the full 2 nm distance except the last which was hauled at 1.96 nm and at site 3(1), the tow length was 2.13 nm as hauling was delayed due to bridge VHF comms with another vessel. A further sighting of an ocean sunfish was made at this location. On this day, scientific use of the multi-beam/Olex ceased due to a fault with a sensor. This meant that all following tows had to be carefully selected using the EK80 sounder and chart information meaning that progress was slowed down

The Cefas Endeavour entered French waters early on the morning of the 22 June with the day spent working in the mid-channel stations in Stratum 8, 12 and 13, completing the final locations in both Stratum 8 and 13 during the day. A total of six successful beam trawl deployments were made with the last location at site 12(1) being of reduced tow length (1.81 nm) due to the presence of commercial static gear. The next day was spent close to the French coast working west to east in Stratum 10–12 with a total of seven successful tows completed including the last locations within Stratum 12. The catches during the day were dominated by rocks, sponges *Cliona celata* and *Pachymatisma johnstonia*, edible sea urchin *Echinus esculentus*, football ascidian

Diazona violacea and greater spider crab, *Maia squinado* with few fish observed. At site 10(2), a comber, *Serranus cabrilla*; 18 cm, 80 g; Figure 1) was caught in the port beam. This was only the second recorded catch of this species on any Cefas survey, with the last specimen caught in 1985 on the RV Cirolana survey, CIRO 3/85.



Figure 1: An 18 cm comber, *Serranus cabrilla* caught at station 94.

On 24 June, work in French waters continued south of Jersey and again close to the French coast. Timing of the first two tows of the day was critical to fish those in slack water as the tow locations were close to shallow waters and peak tidal flows were strong. A total of six valid tows were completed, though three were of reduced tow length, due to static gear (site 11(2); site 11(3) and site 11(5), with shallow water and tides additional factors. On this day, the final location in Stratum 11 was completed. The major catch components on the day were greater spider cab, dead-mens fingers, *Alcyonium digitatum* and rocks.

The following day was spent in the mid-Channel area working around the Hurd Deep and west of Guernsey with a total of seven successful valid tows completed. The final locations in Stratum 10 were completed along with four locations in Stratum 9. In addition, a small detour was made to collect a water sample over the Hurd Deep for caesium and tritium analysis under SLA22. At site 10(10) another ocean sunfish was observed. Catches on this day were abundant in the same species composition as the previous day, with the addition of queen scallops *Aequipecten opercularis*. A second specimen of comber (19 cm, 86 g) was caught at site 10(9). The final days fishing on 26 June completed the entire fishing survey with four successful stations worked in Stratum 6, 9 and 11, east of Guernsey, off the Cherbourg Peninsula and in the mid-Channel. The

tow at stratum 11 station 6 was of reduced length at 1.02 nm due to the poor ground. The last survey tow at Stratum 9 station 3 was completed at 1454hr, with the final ESM2 deployment completed at 1518hr.

With the beam trawl survey now complete, RV Cefas Endeavour steamed east heading to Lowestoft. During the steam, the clean down was carried out along with the survey data checks. The vessel made a small detour in the Thames estuary to collect a plankton sample at the west Gabbard smart-buoy at 1238hr on 27 June before docking in Lowestoft at 0200h 28 June. The scientific crew departed the vessel later that day and the gear was de-mobbed the following morning, 29 June.

RESULTS BY AIM:

This western Channel part of the survey routinely takes place in March each year and since 2013, the survey had been extended into the Celtic Sea. The Covid-19 lock-down curtailed survey operations for around three months and this was the first survey on the RV Cefas Endeavour once the programme resumed. However, with the squeeze on the survey schedule, this survey was reduced to just 14 sea days allowing only time to complete the western Channel sea area and maintain the time-series of data collected since 2006. This was based on Cefas scientific advice and had the full approval of the Defra customer. However, it should be noted that this survey took place around three calendar months later than is normally the case, and therefore any conclusions and results gleaned from these collected data should take this into account.

Each survey sampling location was sampled with 2 x 4 m beam trawls. Twice a day, an ESM2 and Niskin water sampler was deployed and this was generally carried out at the beginning and end of each working day. Survey staffing and crewing levels under Covid-19 led to the decision to work daylight hours only but given the timing of this survey, this meant that fishing was possible for around 17 hours each day. This was a minor deviation from previous years but meant that each tow could be fished with good visibility with ease of observing and avoiding commercial static gear.

The fishing gear used on this survey were the (survey) standard 4 m-beam trawls (number 1) with chain mat, flip-up ropes and the net was fitted with a 40 mm cod-end liner and 3m cod-end extension (starboard side), and the same gear (number 2) but without the 40 mm cod-end liner on the port side. All fish, cephalopod and selected commercial shellfish were identified to species, weighed, and measured with large catches of an individual species being sub-sampled. A SAIV mini CTD unit was attached to the headline on the port 4m-beam trawl to record the temperature and salinity depth profile at each station fished. 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 mini CTD unit was used to obtain a sound velocity profile (SVP) for calibration of the multibeam on each plankton net deployment.

All catch details and sample data were entered directly into the fisheries 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. At every haul, the benthic catches were sorted by species and weighed and counted as appropriate. Any benthic species seen in the port gear catch not already seen in the starboard gear catch were added to the starboard catch as observations only to enable these to be identified as being port catch. The exception to this, were the rare sentinel benthic species, which when observed in the port gear, were recorded as such.

PRIMARY AIM:

- 1) *To carry out a beam trawl survey of the Western 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.*

All 81 planned tows in the western Channel survey area were successfully fished. Due to the reduced survey duration, no work was conducted in the Celtic Sea. Table 1 shows the total number of beam trawl deployments by survey area and validity.

Table 1: 4m Beam trawl gear deployments and validity (V = valid; S = shakedown tow) by area

Area	Gear	Validity	Number of Deployments
Western Channel	4m Beam Trawl with blinder	V	81
North Sea	4m Beam Trawl with blinder	S	1
Western Channel	4m Beam Trawl without blinder	V	81
North Sea	4m Beam Trawl without blinder	S	1

The total sampled and non-sampled catches of each species caught on the survey using the 4m beam trawls are shown in Tables 2 and 3. Biological sample collections are shown in Table 4.

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

Common Name	Scientific Name	CEFAS code	Sampled weight (kg)	Catch weight (kg)
Greater spider crab	<i>Maja squinado</i>	SCR	540.123	540.123
Lesser-spotted dogfish	<i>Scyliorhinus canicula</i>	LSD	260.364	260.234
European plaice	<i>Pleuronectes platessa</i>	PLE	222.231	222.231
Anglerfish (monk)	<i>Lophius piscatorius</i>	MON	216.417	216.417
Poor cod	<i>Trisopterus minutus</i>	POD	142.82	144.355
Bib	<i>Trisopterus luscus</i>	BIB	117.332	117.332
Sole (dover sole)	<i>Solea solea</i>	SOL	107.973	107.973
Red gurnard	<i>Aspitrigla (chelidonichthys) cuculus</i>	GUR	104.009	104.009
Megrim	<i>Lepidorhombus whiffiagonis</i>	MEG	73.486	73.486
Edible crab	<i>Cancer pagurus</i>	CRE	72.46	72.99
Common dragonet	<i>Callionymus lyra</i>	CDT	71.031	74.956
Great scallop	<i>Pecten maximus</i>	SCE	65.165	65.165
European conger eel	<i>Conger conger</i>	COE	61.373	61.373
Queen scallop	<i>Aequipecten opercularis</i>	QSC	57.963	369.833
Lemon sole	<i>Microstomus kitt</i>	LEM	52.047	52.047
Thornback ray (roker)	<i>Raja clavata</i>	THR	41.234	41.234
Boar fish	<i>Capros aper</i>	BOF	32.748	45.106
Cuckoo ray	<i>Leucoraja naevus</i>	CUR	32.504	32.504
Whiting	<i>Merlangius merlangus</i>	WHG	31.592	31.592
Common cuttlefish	<i>Sepia officinalis</i>	CTC	30.795	30.795
Streaked gurnard	<i>Trigloporus (chelidonichthys) lastoviza</i>	GUS	27.552	27.552
Thickback sole	<i>Microchirus variegatus</i>	TBS	24.006	26.771
Brill	<i>Scophthalmus rhombus</i>	BLL	23.95	23.95
Spotted ray	<i>Raja montagui</i>	SDR	21.523	21.523
European hake	<i>Merluccius merluccius</i>	HKE	21.103	21.103
Starry smooth-hound	<i>Mustelus asterias</i>	SDS	20.64	20.64
Black-bellied anglerfish	<i>Lophius budegassa</i>	WAF	20.629	20.629
Imperial scaldfish	<i>Arnoglossus imperialis</i>	ISF	19.869	19.869
Ballan wrasse	<i>Labrus bergylta</i>	BNW	18.56	18.56
Grey gurnard	<i>Eutrigla (chelidonichthys) gurnardus</i>	GUG	16.846	16.846
Haddock	<i>Melanogrammus aeglefinus</i>	HAD	15.837	15.837
European lobster	<i>Homarus gammarus</i>	LBE	13.895	13.895
Nurse hound	<i>Scyliorhinus stellaris</i>	DGN	11.93	11.93
Blonde ray	<i>Raja brachyura</i>	BLR	11.557	11.557
John dory	<i>Zeus faber</i>	JOD	11.436	11.436
Blue Jellyfish	<i>Cyanea lamarckii</i>	BLU	11.43	11.477
Undulate ray	<i>Raja undulata</i>	UNR	11.31	11.31
Common spiny lobster	<i>Palinurus elephas</i>	SLO	10.28	10.28
Scald fish	<i>Arnoglossus laterna</i>	SDF	10.054	10.054
Marbled electric ray	<i>Torpedo marmorata</i>	MER	9.301	9.301
Solenette	<i>Buglossidium luteum</i>	SOT	8.633	10.552
Compass jellyfish	<i>Chrysaora hysoscella</i>	COJ	6.791	6.889
Tub gurnard	<i>Trigla (chelidonichthys) lucerna</i>	TUB	6.662	6.662
Dab	<i>Limanda limanda</i>	DAB	6.538	6.538
Cuckoo wrasse	<i>Labrus mixtus (l. Bimaculatus)</i>	CUW	6.268	6.268

Common Name	Scientific Name	CEFAS code	Sampled weight (kg)	Catch weight (kg)
Black seabream	<i>Spondyliosoma cantharus</i>	BKS	6.264	6.264
Moon jellyfish	<i>Aurelia aureta</i>	AUA	4.632	5.387
Goldsinny	<i>Ctenolabrus rupestris</i>	GDY	3.371	3.371
Northern shortfin squid	<i>Illex illecebrosus</i>	SQI	3.173	3.173
Sand sole	<i>Pegusa (solea) lascaris</i>	SOS	3.172	3.172
Blue whiting	<i>Micromesistius poutassou</i>	WHB	3.077	3.077
Velvet swimming crab	<i>Necora puber</i>	MLP	3.072	3.072
Atlantic cod	<i>Gadus morhua</i>	COD	2.775	2.775
Lesser weever fish	<i>Echiichthys (trachinus) vipera</i>	WEL	2.524	2.524
Red mullet	<i>Mullus surmuletus</i>	MUR	2.369	2.369
Three-bearded rockling	<i>Gaidropsarus vulgaris</i>	TBR	2.329	2.329
Cuttle-fish	<i>Sepia elegans</i>	SEE	2.223	2.223
Topknot	<i>Zeugopterus punctatus</i>	TKT	1.872	1.872
Pollack	<i>Pollachius</i>	POL	1.84	1.84
Cry(i)stal jellies	<i>Aequorea</i> spp.	CRI	1.711	2.046
Baillons wrasse	<i>Symphodus (crenilabrus) balloni</i>	BLW	1.35	1.35
European common squid	<i>Loligo (alloteuthis) subulata</i>	ATS	1.24	1.24
Lesser flying squid	<i>Todaropsis eblanae</i>	OME	1.238	1.238
Butterfly blenny	<i>Blennius ocellaris</i>	BBY	1.084	1.084
Common ling	<i>Molva molva</i>	LIN	1.07	1.07
Squid	<i>Loligo vulgaris</i>	LLV	1.038	1.038
Spotted dragonet	<i>Callionymus maculatus</i>	SDT	0.881	0.881
Great sandeel	<i>Hyperoplus lanceolatus</i>	GSE	0.61	0.61
Lions mane jellyfish	<i>Cyanea capillata</i>	LIO	0.47	0.47
Pink cuttlefish	<i>Sepia orbignyana</i>	SEO	0.424	0.424
Pogge (armed bullhead)	<i>Agonus cataphractus</i>	POG	0.36	0.36
Northern squid	<i>Loligo forbesi</i>	NSQ	0.317	0.317
Norwegian topknot	<i>Zeugopterus (phrynorhombus) norvegicus</i>	NKT	0.305	0.305
Norway pout	<i>Trisopterus esmarki</i>	NOP	0.287	0.287
Greater forkbeard	<i>Phycis blennoides</i>	GFB	0.278	0.278
Scale-rayed wrasse	<i>Acantholabrus palloni</i>	SRW	0.183	0.183
Comber	<i>Serranus cabrilla</i>	CMR	0.166	0.166
Greater weever fish	<i>Trachinus draco</i>	WEG	0.16	0.16
Pilchard	<i>Sardina pilchardus</i>	PIL	0.144	0.144
Horse-mackerel (scad)	<i>Trachurus trachurus</i>	HOM	0.14	0.14
Sandeel	<i>Ammodytes tobianus</i>	TSE	0.129	0.129
Gobies	<i>Pomatoschistus</i> spp.	POM	0.126	0.126
American plaice (long-rough dab)	<i>Hippoglossoides platessoides</i>	PLA	0.125	0.125
Red bandfish	<i>Cepola rubescens (c. Macrophthalma)</i>	RPF	0.105	0.105
Ekstroms topknot	<i>Zeugopterus (phrynorhombus) regius</i>	EKT	0.088	0.088
Tompot blenny	<i>Parablennius gattorugine</i>	TBY	0.084	0.084
Steven's goby	<i>Gobius gasteveni</i>	GSV	0.078	0.078
Great pipefish	<i>Syngnathus acus</i>	GPF	0.067	0.067
Yarrel's blenny	<i>Chirolophis ascanii</i>	YBY	0.062	0.062
Reticulate dragonet	<i>Callionymus reticulatus</i>	RDT	0.029	0.029
Smalleyed (painted) ray	<i>Raja microocellata</i>	PTR	0.026	0.026
Sprat	<i>Sprattus sprattus</i>	SPR	0.02	0.02

Common Name	Scientific Name	CEFAS code	Sampled weight (kg)	Catch weight (kg)
Small-mouthed wrasse	<i>Centrolabrus exoletus</i>	SMW	0.017	0.017
Frie's goby	<i>Lesueurigobius friesii</i>	FSG	0.013	0.013
Black goby	<i>Gobius niger</i>	BLG	0.01	0.01
Argentines	<i>Argentinidae</i>	ARG	0.006	0.006
Crystal goby	<i>Crystallogobius linearis</i>	CLG	0.004	0.004
Transparent goby	<i>Aphia minuta</i>	TPG	0.003	0.003
Bullrout	<i>Myoxocephalus scorpius</i>	BRT	0.002	0.002
Sandeels	<i>Ammodytidae</i>	SAX	0.002	0.002
European anchovy	<i>Engraulis encrasicolus</i>	ANE	0.001	0.001
Five-bearded rockling	<i>Ciliata Mustela</i>	FVR	0.001	0.001
Jeffrey's goby	<i>Buenia jeffreysii</i>	JYG	0.001	0.001
Two spotted clingfish	<i>Diplecogaster bimaculata</i>	TSC	0.001	0.001

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

Common Name	Scientific Name	Cefas code	Catch weight (kg)
Epibenthic mix unidentified	<i>Epibenthic mixture</i>	BEN	3745.881
Rocks	<i>Assorted rocks</i>	ROK	2596.356
Edible sea urchin	<i>Echinus esculentus</i>	URS	300.309
-	<i>Diazona violacea</i>	DIV	107.018
Yellow boring sponge	<i>Cliona celata</i>	CLI	328.802
Sponges	<i>Porifera</i>	PFZ	337.524
Spiny starfish	<i>Marthasterias glacialis</i>	MAG	490.669
-	<i>Pachymatisma johnstonia</i>	PMJ	54.632
Dead-mens fingers	<i>Alcyonium digitatum</i>	DMF	153.081
Common starfish	<i>Asterias rubens</i>	STH	253.975
Sea squirts	<i>Ascidacea</i>	SSX	10.065
Bryozoan	<i>Pentapora foliacea</i>	PET	44.542
Shell	<i>Broken shell</i>	BSL	90.713
Common brittle star	<i>Ophiothrix fragilis</i>	OPF	86.972
Curled octopus	<i>Eledone cirrhosa</i>	EDC	75.377
Hornwrack	<i>Flustra foliacea</i>	FAF	71.142
Breadcrumb sponge	<i>Halichondria panicea</i>	BCS	69.007
-	<i>Nemertesia antennina</i>	NEA	67.89
Curly weed	<i>Alcyonidium diaphanum</i>	ALG	63.412
-	<i>Raspailia spp.</i>	RAS	52.406
-	<i>Luidia ciliaris</i>	LDC	44.994
Parchment worm tubes	<i>Chaetopterus tubes</i>	CVT	43.383
Hydroids	<i>Hydroida (order)</i>	HYD	42.189
-	<i>Luidia sarsi</i>	LUS	30.161
Hermit in adamsia	<i>Eupagurus / pagurus in adamsia</i>	HIA	27.289
Bryozoan	<i>Cellariidae</i>	CEL	23.018
Common sunstar	<i>Crossaster papposus</i>	CTP	21.673
-	<i>Polymastiidae</i>	PMX	19.795
Red cushion star	<i>Porania pulvillus</i>	PPV	13.203
Scorpion spider crab	<i>Inachus dorsettensis</i>	IND	11.53
Kelp	<i>Laminaria spp.</i>	LMX	11.137
Green seaweeds	<i>Chlorophyceae</i>	CHZ	10.303
Sand star	<i>Astropecten irregularis</i>	API	9.961

Common Name	Scientific Name	Cefas code	Catch weight (kg)
-	<i>Nemertesia ramosa</i>	NER	9.603
Swimming crab	<i>Liocarcinus depurator</i>	LMD	8.502
Star ascidian	<i>Botryllus schlosseri</i>	BIS	8.254
Sea mouse	<i>Aphrodite aculeata</i>	AAC	7.987
-	<i>Axinella infundibuliformis</i>	AXI	7.666
Japweed	<i>Sargassum muticum</i>	SAM	6.481
-	<i>Dysidea fragilis</i>	DYS	6.463
Goose-foot star	<i>Anseropoda placenta</i>	PLM	5.841
-	<i>Stichastrella rosea</i>	SLR	5.715
-	<i>Henricia oculata</i>	HEO	5.526
Circular crab	<i>Atelycyclus rotundatus</i>	ALR	5.5
Red dead mens finger	<i>Alcyonium glomeratum</i>	AYG	5.435
-	<i>Tethya aurantia</i>	TAA	5.256
Dahlia anemone	<i>Urticina (tealia) felina</i>	DHA	5.081
-	<i>Ascidia virginea</i>	ASV	4.609
Bladder wrack	<i>Fucus vesiculosus</i>	WRB	4.428
Cotton spinner	<i>Holothuria forskali</i>	COT	4.137
-	<i>Echinus acutus</i>	URA	4.087
-	<i>Philine aperta</i>	PHP	3.964
Slender spider crab	<i>Macropodia tenuirostris</i>	MCT	3.751
Slender-leg spider crab	<i>Inachus leptochirus</i>	INL	3.715
-	<i>Ascidia conchilega</i>	ASD	3.51
American slipper limpet	<i>Crepidula fornicata</i>	ASL	3.375
Sickle hydroid	<i>Hydrallmania falcata</i>	HYH	3.232
	<i>Psammechinus miliaris</i>	PMM	3.029
	<i>Ophiura</i>	OHT	2.952
Sponge	<i>Suberites</i> spp.	SUB	2.819
Common swimming crab	<i>Polybius (liocarcinus) holsatus</i>	LMH	2.765
Wracks	<i>Fucus</i> spp.	FUX	2.707
-	<i>Bolocera tuediae</i>	BCT	2.68
-	<i>Ophiocolina nigra</i>	OPN	2.663
Sponge crab	<i>Dromia personata</i>	DRP	2.364
Red seaweeds (nei)	<i>Rhodophyceae</i>	SWR	2.274
Sea lemon	<i>Archidoris pseudoargus</i>	ADP	2.273
Stalk ascidian	<i>Styela clava</i>	SAA	2.197
-	<i>Pagurus prideaux</i>	PEX	2.142
-	<i>Echinaster sepositus</i>	ECS	2.122
Star ascidian	<i>Botrylloides leachi</i>	BOT	2.058
-	<i>Scaphander lignarius</i>	SDL	2.05
-	<i>Sagartia</i> spp.	SAG	2.02
Common whelk	<i>Buccinum undatum</i>	WHE	1.803
	<i>Hyalinoecia tubicola</i>	HYT	1.615
Gibbs sea spider	<i>Pisa armata</i>	PAA	1.536
Knotted wrack	<i>Ascophyllum nodosum</i>	ANO	1.392
Sea slugs	<i>Nudibranchia</i>	NBX	1.392
-	<i>Diphasia nigra</i>	DIN	1.378
Hermit in whelk	<i>Eupagurus / pagurus in buccinum</i>	HIW	1.32
Opisthobranch indet	<i>Opisthobranch indet</i>	OPI	1.183
-	<i>Rossia macrosoma</i>	ROM	1.162
Hermit crab	<i>Pagurus bernhardus</i>	PEB	1.138
Purple heart urchin	<i>Spatangus purpureus</i>	SPG	1.118
-	<i>Ascidella scabra</i>	ASS	1.11
-	<i>Henricia sanguinolenta</i>	HNS	0.972

Common Name	Scientific Name	Cefas code	Catch weight (kg)
Rough crab	<i>Eurynome aspersa</i>	EUA	0.954
Dogfish egg case	<i>Dogfish egg cases</i>	DEG	0.947
Hermit in suberites	<i>Eupagurus / pagurus in suberites</i>	HIS	0.902
-	<i>Molgulidae</i>	MGX	0.895
Brown seaweeds (nei)	<i>Phaeophyceae</i>	SWB	0.873
-	<i>Limaria hians</i>	LIM	0.809
-	<i>Pleurobranchus membranaceus</i>	PBM	0.734
Bivalves	<i>Mollusca-bivalvia</i>	BIV	0.732
Scaleworm	<i>Laetmonice (hermione) histrix</i>	HMH	0.675
Cloak anemone	<i>Adamsia carciniopados</i>	AMP	0.668
-	<i>Calliactis parasitica</i>	CAR	0.645
Sea cucumbers	<i>Holothuroidea</i>	HTZ	0.643
Variiegated scallop	<i>Chlamys varia</i>	CHV	0.638
-	<i>Cucumariidae</i>	CMX	0.619
-	<i>Scalpellum</i>	SCA	0.578
Contracted crab	<i>Hyas coarctatus</i>	HYC	0.563
Cuttle eggs	<i>Cuttle eggs</i>	CEG	0.559
Squat lobsters	<i>Galathea spp.</i>	GLX	0.557
-	<i>Phakellia ventilabrum</i>	PHA	0.547
Pheasant tail hydroid	<i>Lytocarpia myriophyllum</i>	HYL	0.494
-	<i>Tritonia hombergi</i>	TNH	0.393
-	<i>Echinocardium spp.</i>	ECV	0.357
Feather star	<i>Antedon bifida</i>	ADB	0.352
Sea lettuce	<i>Ulva lactuca</i>	ULL	0.346
Plumose anemone	<i>Metridium senile</i>	PMA	0.34
Xanthidae	<i>Xanthid crab</i>	XAN	0.307
-	<i>Macropodia linaresi</i>	MCL	0.283
Calcereous sponges	<i>Calcarea</i>	CCZ	0.272
Great spider crab	<i>Hyas araneus</i>	HYA	0.26
Bryozoan	<i>Bugula spp.</i>	BUG	0.251
Marbled swimming crab	<i>Liocarcinus marmoreus</i>	LMM	0.229
Angular crab	<i>Goneplax rhomboides</i>	GOR	0.226
-	<i>Acanthodoris pilosa</i>	ACP	0.221
Squid eggs	<i>Squid eggs</i>	SQS	0.221
Pink seafan	<i>Eunicella verrucosa</i>	EUV	0.197
Squat lobster	<i>Munida rugosa</i>	MNR	0.191
Sponge	<i>Haliclona oculata</i>	HAO	0.186
Sea hare	<i>Aplysia punctata</i>	AYP	0.176
-	<i>Bathynectes longipes</i>	BAL	0.159
Dog cockle	<i>Glycymeris</i>	GLG	0.154
Bristle worms	<i>Polychaeta</i>	BWX	0.139
Sea mats	<i>Bryozoa</i>	EPZ	0.124
Anemone unidentified	<i>Anemone unidentified</i>	AMU	0.116
Dwarf-swimming crab	<i>Liocarcinus pusillus</i>	LPU	0.114
Auger shell	<i>Turritella communis</i>	TUC	0.113
Swimming crab	<i>Macropipus tuberculatus</i>	MPT	0.113
Keyhole limpet	<i>Diodora graeca</i>	KYL	0.108
Gastropod eggs	<i>Gastropod eggs</i>	GAE	0.1
Barnacles	<i>Cirrepedia</i>	CIZ	0.095
Goose barnacles	<i>Lepadidae</i>	GOZ	0.095
Red snapping shrimp	<i>Alpheus glaber</i>	ALP	0.064
-	<i>Sepiolidae</i>	SPY	0.062
-	<i>Actinauge richardi</i>	ACR	0.06

Common Name	Scientific Name	Cefas code	Catch weight (kg)
Edible mussel	<i>Mytilus edulis</i>	MUS	0.06
-	<i>Laetmatonice filicornis</i>	LAF	0.056
Anemone	<i>Paraphellia expansa</i>	PAE	0.053
-	<i>Filograna implexa</i>	FII	0.052
Ctenophores	<i>Ctenophora</i>	CTA	0.049
Common basket shell	<i>Corbula gibba</i>	CGB	0.047
Long clawed porcelain crab	<i>Pisidia longgicornis</i>	PIS	0.047
-	<i>Chartella</i> spp.	CHA	0.043
-	<i>Crangon allmanni</i>	CGA	0.039
Whelk eggs	<i>Whelk</i> eggs	WES	0.037
Common(brown)shrimp	<i>Crangon crangon</i>	CSH	0.036
Bryers nut-crab	<i>Ebalia tumefacta</i>	EBM	0.033
-	<i>Processidae</i>	PCY	0.03
-	<i>Pontophilus spinosus</i>	PPS	0.026
Leachs spider crab	<i>Inachus phalangium</i>	INP	0.026
Long-leg spider crab	<i>Macropodia rostrata</i>	MCR	0.021
Goose barnacles	<i>Lepas</i> spp.	GOO	0.019
-	<i>Upogebia</i> spp.	UPX	0.019
Oyster drill	<i>Urosalpinx cinerea</i>	UXC	0.018
Broad clawed burrowing shrimp	<i>Alpheus macracheles</i>	ALM	0.016
Jellyfish indet	<i>Scyphozoa</i>	JEL	0.016
Pennants nut-crab	<i>Ebalia tuberosa</i>	EBT	0.015
Xanthid crab	<i>Monodaeus couchi</i>	EPM	0.015
-	<i>Armina loveni</i>	AAL	0.014
-	<i>Simnia patula</i>	SIM	0.013
Masked crab	<i>Corystes cassivelaunus</i>	CCV	0.013
Norway cockle	<i>Laevicardium crassum</i>	LCC	0.011
-	<i>Epizoanthus encrustans</i>	EZI	0.008
Hornwrack	<i>Securiflustra securifrons</i>	FAS	0.008
-	<i>Henricia</i> spp.	HEX	0.007
Striped venus	<i>Chamelea gallina</i>	VST	0.006
Sea grass	<i>Zostera</i> spp.	ZOX	0.006
Polinices eggs	<i>Euspira (polinices) eggs</i>	NAE	0.005
Hermit crab	<i>Anapagurus laevis</i>	APL	0.004
Tusk shells	<i>Scaphopoda</i>	SPZ	0.003
Nut crab	<i>Ebalia</i> spp.	EBA	0.003
-	<i>Ophiura albida</i>	OHA	0.003
Nudibranch	<i>Doris sticta</i>	DOR	0.003
Devonshire cup-coral	<i>Caryophyllia smithii</i>	DCC	0.002
Sand mason	<i>Lanice conchilega</i>	LCE	0.002
-	<i>Epimeria cornigera</i>	EPI	0.002
Common prawn	<i>Palaemon serratus</i>	CPR	0.002
Hermit crab in epizoanthus	<i>Anapagurus in epizoanthus</i>	HIE	0.002
Cushion star	<i>Asterina gibbosa</i>	ATG	0.002
Peacock worm	<i>Sabellidae</i>	PWX	0.001
Razor clams	<i>Solenidae</i>	RAY	0.001
-	<i>Eurydice</i> spp.	EDX	0.001
-	<i>Golfingiidae</i>	GFX	0.001
-	<i>Pontobdella muricata</i>	PDM	0.001

Table 4: Biological information and samples collected by sex - alphabetical order

Common Name	Scientific Name	Sex	Western Channel
Scale-rayed wrasse	<i>Acantholabrus palloni</i>	M	1
Red gurnard	<i>Aspitrigla (Chelidonichthys) cuculus</i>	F	228
Red gurnard	<i>Aspitrigla (Chelidonichthys) cuculus</i>	M	170
Red gurnard	<i>Aspitrigla (Chelidonichthys) cuculus</i>	U	9
Small-mouthed wrasse	<i>Centrolabrus exoletus</i>	M	1
Conger eel	<i>Conger conger</i>	F	2
Conger eel	<i>Conger conger</i>	M	3
Conger eel	<i>Conger conger</i>	U	42
Goldsinny	<i>Ctenolabrus rupestris</i>	F	25
Goldsinny	<i>Ctenolabrus rupestris</i>	M	28
Goldsinny	<i>Ctenolabrus rupestris</i>	U	4
Grey Gurnard	<i>Eutrigla gurnardus</i>	F	89
Grey Gurnard	<i>Eutrigla gurnardus</i>	M	55
Grey Gurnard	<i>Eutrigla gurnardus</i>	U	4
Cod	<i>Gadus morhua</i>	F	1
Ballan wrasse	<i>Labrus bergylta</i>	F	26
Ballan wrasse	<i>Labrus bergylta</i>	M	4
Cuckoo wrasse	<i>Labrus mixtus (l. bimaculatus)</i>	F	20
Cuckoo wrasse	<i>Labrus mixtus (l. bimaculatus)</i>	M	10
Megrim	<i>Lepidorhombus whiffiagonis</i>	F	276
Megrim	<i>Lepidorhombus whiffiagonis</i>	M	46
Cuckoo Ray	<i>Leucoraja naevus</i>	F	22
Cuckoo Ray	<i>Leucoraja naevus</i>	M	19
Black bellied Anglerfish	<i>Lophius budegassa</i>	F	35
Black bellied Anglerfish	<i>Lophius budegassa</i>	M	7
Black bellied Anglerfish	<i>Lophius budegassa</i>	U	1
Anglerfish	<i>Lophius piscatorius</i>	F	123
Anglerfish	<i>Lophius piscatorius</i>	M	114
Anglerfish	<i>Lophius piscatorius</i>	U	11
Haddock	<i>Melanogrammus aeglefinus</i>	F	31
Haddock	<i>Melanogrammus aeglefinus</i>	M	14
Haddock	<i>Melanogrammus aeglefinus</i>	U	2
Whiting	<i>Merlangius merlangus</i>	F	91
Whiting	<i>Merlangius merlangus</i>	M	43
Whiting	<i>Merlangius merlangus</i>	U	22
Hake	<i>Merluccius merluccius</i>	F	48
Hake	<i>Merluccius merluccius</i>	M	17
Hake	<i>Merluccius merluccius</i>	U	3
Lemon Sole	<i>Microstomus kitt</i>	F	102
Lemon Sole	<i>Microstomus kitt</i>	M	85
Lemon Sole	<i>Microstomus kitt</i>	U	3
Ling	<i>Molva molva</i>	U	1
Red Mullet	<i>Mullus surmuletus</i>	F	8
Red Mullet	<i>Mullus surmuletus</i>	M	3
Starry Smooth-hound	<i>Mustelus asterias</i>	F	8
Starry Smooth-hound	<i>Mustelus asterias</i>	M	4
Plaice	<i>Pleuronectes platessa</i>	F	265
Plaice	<i>Pleuronectes platessa</i>	M	108
Blonde Ray	<i>Raja brachyura</i>	F	6
Blonde Ray	<i>Raja brachyura</i>	M	2
Thornback Ray	<i>Raja clavata</i>	F	11
Thornback Ray	<i>Raja clavata</i>	M	16

Common Name	Scientific Name	Sex	Western Channel
Small-eyed Ray	<i>Raja microocellata</i>	F	1
Spotted Ray	<i>Raja montagui</i>	F	16
Spotted Ray	<i>Raja montagui</i>	M	15
Undulate Ray	<i>Raja undulata</i>	F	2
Undulate Ray	<i>Raja undulata</i>	M	1
Brill	<i>Scophthalmus rhombus</i>	F	10
Brill	<i>Scophthalmus rhombus</i>	M	7
Nursehound	<i>Scyliorhinus stellaris</i>	F	2
Nursehound	<i>Scyliorhinus stellaris</i>	M	4
Common cuttlefish	<i>Sepia officinalis</i>	F	3
Common cuttlefish	<i>Sepia officinalis</i>	M	3
Common cuttlefish	<i>Sepia officinalis</i>	U	167
Sole	<i>Solea solea</i>	F	209
Sole	<i>Solea solea</i>	M	212
Black Seabream	<i>Spondyliosoma cantharus</i>	F	37
Black Seabream	<i>Spondyliosoma cantharus</i>	M	8
Black Seabream	<i>Spondyliosoma cantharus</i>	U	3
Baillons wrasse	<i>Symphodus (crenilabrus) balloni</i>	F	9
Baillons wrasse	<i>Symphodus (crenilabrus) balloni</i>	M	11
Marbled Electric Ray	<i>Torpedo marmorata</i>	F	6
Marbled Electric Ray	<i>Torpedo marmorata</i>	M	12
Tub Gurnard	<i>Trigla (Chelidonichthys) lucerna</i>	F	15
Tub Gurnard	<i>Trigla (Chelidonichthys) lucerna</i>	M	7
Streaked Gurnard	<i>Trigloporus (Chelidonichthys) lastoviza</i>	F	77
Streaked Gurnard	<i>Trigloporus (Chelidonichthys) lastoviza</i>	M	57
John dory	<i>Zeus faber</i>	F	18
John dory	<i>Zeus faber</i>	M	3

Figure 2 shows the positions of all 4m beam trawl fishing stations, with Figure 3 showing the survey track each day with the relevant tow validities of these 4 m beam trawl deployments. Species composition pie charts for the entire survey are shown on 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 shown in 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. Appendix 2 shows the planned priority sampling locations not fished with the reasons why this was not possible, along with the alternative sampling locations fished where appropriate.

Observations on the catches made are given below, although it should be noted that the changes noted from the 2019 survey should also be viewed in the context of a change in the survey timing (March in 2019, June in 2020) and the reduction in night time fishing operations.

Target species observations

The largest catches of sole were observed south-west of Lands-end, and south-east of Start Point. In addition, large catches were observed west of the Isles of Scilly, the western end of Lyme Bay and around the Eddystone lighthouse. Smaller numbers of sole were caught around the Channel Islands and off the northern French coast. In total, sole catch numbers were 12% greater than those observed in 2019 at the western Channel stations. The catch weight of sole was 3% less than observed in 2019 at the same stations. Plaice was caught predominantly in Lyme Bay and around Start Point. As observed in previous years, few plaice were caught in French waters. In total, 10% more plaice was caught compared to the 2019 with the catch weight of plaice increasing by 24% compared to the 2019 survey.

Anglerfish was observed in greatest abundance in the western English Channel between Lands End and Eddystone Rock. Catch numbers were 13% greater than those observed in 2019 and the weight caught in 2020 was 16 greater than observed in 2019. Black-bellied anglerfish were mostly caught at the western end of the western Channel with similar total numbers and weight observed in the 2019 survey. Lemon sole was caught predominantly off the Cornish and south Devon coast, with smaller catches observed in the mid-Channel areas. Overall, catches of lemon sole in 2020 increased from those observed in 2019 with catch numbers and catch weights increasing by 65% and 51% respectively. Common cuttlefish (*Sepia officinalis*) catches were almost all caught in French waters south of the Channel Islands, with fewer numbers caught in Lyme Bay and south of Start Point. Both catch numbers and catch weight decreased compared to the 2019 survey with decreases of 51% and 72% respectively.

Other species observations

Most ray species catch weights decreased in 2020 compared to 2019 with small-eyed ray, *Raja microocellata* decreasing almost 100%, undulate ray by ~80%, blonde ray *Raja brachyura* by 33% and spotted ray *Raja montagui* by 18%. These decreases may be a direct result of either the survey taking place at a different time of year or the limited amount of night-time fishing. Increases were observed in thornback ray, *Raja clavata* (22%) and cuckoo ray, *Leucoraja naevus* (17%). All shark species catches decreased in 2020, with decreases in weight caught of greater-spotted dogfish, *Scyliorhinus stellaris* - nursehound of 49%, lesser-spotted dogfish, *Scyliorhinus canicular* of 20% and starry smooth-hound, *Mustelus asterias* of 81%.

No specimens of European seabass were caught in 2020 compared with the 56 caught in 2019, but these numbers were unprecedented with just 1 caught in 2018 and 5 in 2017. Black sea-bream *Spondyliosoma cantharus* catch weight in 2020 was around 90% less than observed in 2019 with 49 specimens caught compared to 492 the previous year. Other species where catch weights in 2020 increased on the 2019 survey included brill *Scophthalmus rhombus* (up 87%), megrim, *Lepidorhombus whiffiagonis* (up 168%), European lobster *Homarus gammarus*; (up 135%), common spiny lobster, *Palinurus elephas* (up 151%) and edible crab, *Cancer pagurus*; (up 65%). Notable decreases in observed catches were seen in turbot, *Scophthalmus maximus*; (down

100% to zero caught), tub gurnard, *Trigla (Chelidonichthys) lucerna* (down 72%), red mullet, *Mullus surmuletus* (down 80%) and whiting, *Merlangius merlangus*; (down 55%).

A total of 103 species were caught on the survey in 2020, five more than observed in 2019 in the western Channel. Of note were two comber caught on this survey time series for the first time with only one specimen being caught previously on any Cefas survey in 1985.

Details of marine litter by-catch caught at all fishing stations were recorded separately by gear. Litter by-catch was categorized by 'type', weighed, photographed, and categorized by size at every fishing station with, details of any attached organisms being recorded. Most litter items caught were classified as plastic in line with previous surveys.

SECONDARY AIMS

- 2) *To collect fisheries acoustic data at four operating frequencies (38, 120, 200 and 333 kHz) and multibeam data continuously throughout the survey.*

This aim was successfully completed with acoustic data recorded for the 4 frequencies for the duration of the survey. In addition, multibeam echo sounder (MBES) data was continuously recorded throughout the survey until there was a failure in the system. (S Kupschus - Cefas, Lowestoft).

- 3) *To collect full salinity, temperature, and depth profiles at each trawl station alongside surface and near-bottom water samples.*

The port side 4 m beam was deployed with a SAIV mini CTD unit attached to the headline to collect a full salinity, temperature, and depth profile at each tow. This was successful at every tow and the salinity and temperatures at the surface and bottom were added to the FSS station logs. In addition, at 25 sampling locations in the western Channel, a CTD profile using an ESM2 logger along with a Niskin water sampler were deployed using the starboard gantry with the 'hydrographic' wire. Salinity samples from the 'bottom' were collected at each location from the Niskin along with a surface seawater samples collected using the 'feed' from the Ferrybox.

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

The Ferrybox was running for most of the survey sending live data remotely back to Cefas. Unfortunately for the first 2-3 working days the Ferrybox was not operational.

- 5) *Collect water samples for caesium & tritium analysis under SLA22 (T Bailey – Cefas Lowestoft).*

All eleven samples targeted were successfully collected at the nearest survey sampling location to the water collection site. At each location, 3 x 25 litre carboys and a 1 litre bottle were filled with surface seawater.

- 6) *Collect specimens of common cuttlefish *Sepia officinalis* for use in Cefas cephalopod maturity training courses (V Laptikhovsky – Cefas Lowestoft).*

No samples were collected on this survey.

- 7) *Collect surface underway chlorophyll samples for SLA25 (N Greenwood – Cefas Lowestoft)*

A total of 11 chlorophyll samples were collected for this project and were frozen in the -80°C freezer for analysis in Lowestoft.

- 8) *Collect skeletons of selected gadoid species for reference collection to assist in identification of archaeological vertebrae. (Rachel Blevis, University of Cambridge).*

No samples were collected on this survey.

OPPORTUNISTIC:

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

No dedicated observer was present on this survey and therefore no sightings of marine mammals, sea turtles, large pelagic fish and jellyfish aggregations were made. Notes on the presence of ocean sunfish are provided in the narrative.

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

No tagging was possible on this survey.

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

A total of 25 samples were frozen for ID confirmation including several squid species, sandeel, small dragonet, wrasse, blenny, and a comber. In addition, several specimens of foraminifera were frozen for ID confirmation.

12) All diadromous species (including allis shad *Alosa alosa*, twaite shad *Alosa fallax* and lampreys (*Petromyzontidae*)) found dead on capture are to be frozen and returned to the lab for analyses, marking samples with the survey, station and date to support DiadES project.

No samples were collected on this survey.

13) Collect a vertical ring net sample at the west Gabbard smart buoy, contributing to the Lifeform project (Defra) as part of the UK monitoring network for zooplankton.

This plankton sample was collected at the end of the survey prior to docking in Lowestoft.

14) To collect genetic samples from anglerfish *Lophius piscatorius*, black-bellied anglerfish *Lophius budegassa* and hake *Merluccius merluccius* in support of the GECKA project.

No samples were collected on this survey.

15) Collect vertical ring net samples at locations previously known from samples collected on CEND 4/17 and CEND 4/19 for having clusters of seabass eggs and larvae. (H Lloyd-Hartley - Cefas, Lowestoft)

A total of 13 successful vertical ring net plankton samples were collected for this project using a single 1 m diameter ring net with a 1 mm mesh net. At each location, a SAIV mini CTD unit was deployed with the net to record the temperature and salinity profile.

Acknowledgements

My thanks go to all the officers and crew of RV Cefas Endeavour for their invaluable help, support and advice given during this survey, without which the survey would not have been successful. Additionally, my thanks also go to the shore-based AWSM staff who ensured that the equipment needed for the survey all arrived fully to specification.

Finally, my thanks go to the Cefas scientists who delivered the survey aims. Your commitment, dedication and hard work is really appreciated, and without such a committed group, the survey aims would not have been achieved. This was the first post-Covid-19 lockdown survey to take place. The health and safety mitigations and on-board safety measures ensured the work could continue whilst keeping us all safe. Special thanks to all aboard for maintaining the Covid-19 safe working practices throughout the survey.

Ian Holmes
Scientist in Charge
8 September 2020

DISTRIBUTION:

Survey personnel +	Crown Estate
P Falconer (PL)	States of Jersey
D Pettengell (PM)	Bailiwick of Guernsey
Cefas Fisheries/MPA Survey SICs/2ICs	FCO (for France)
G Burt (Data Steward)	Marine Management Organisation (MMO)
S Kupschus	AW Ship Management
T Bailey	Master/First Officer (Cefas Endeavour)
Southern IFCA	BODC
Devon and Severn IFCA	
Isles of Scilly IFCA	
Cornwall IFCA	

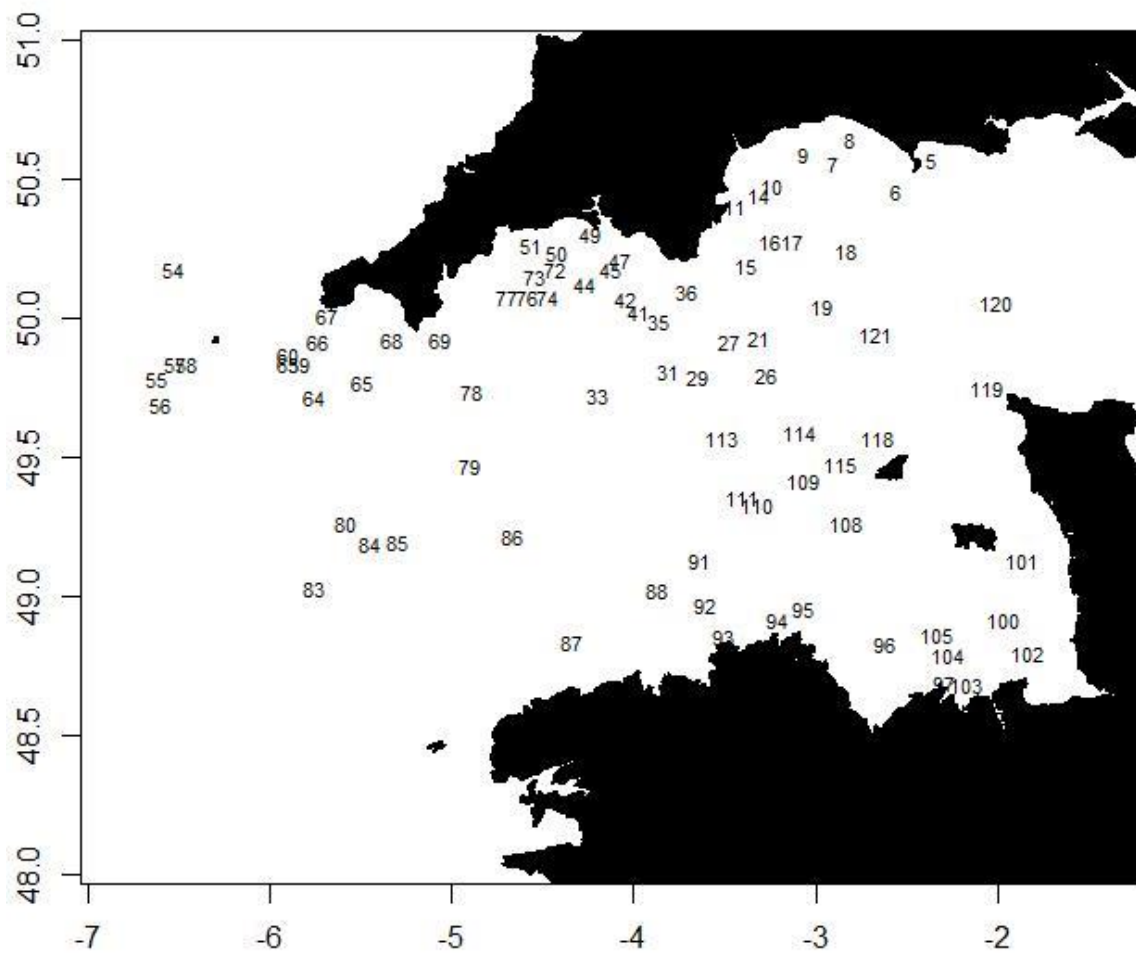


Figure 2: Chart of survey station numbers for CEND 4/20 (4m beam trawl stations only).

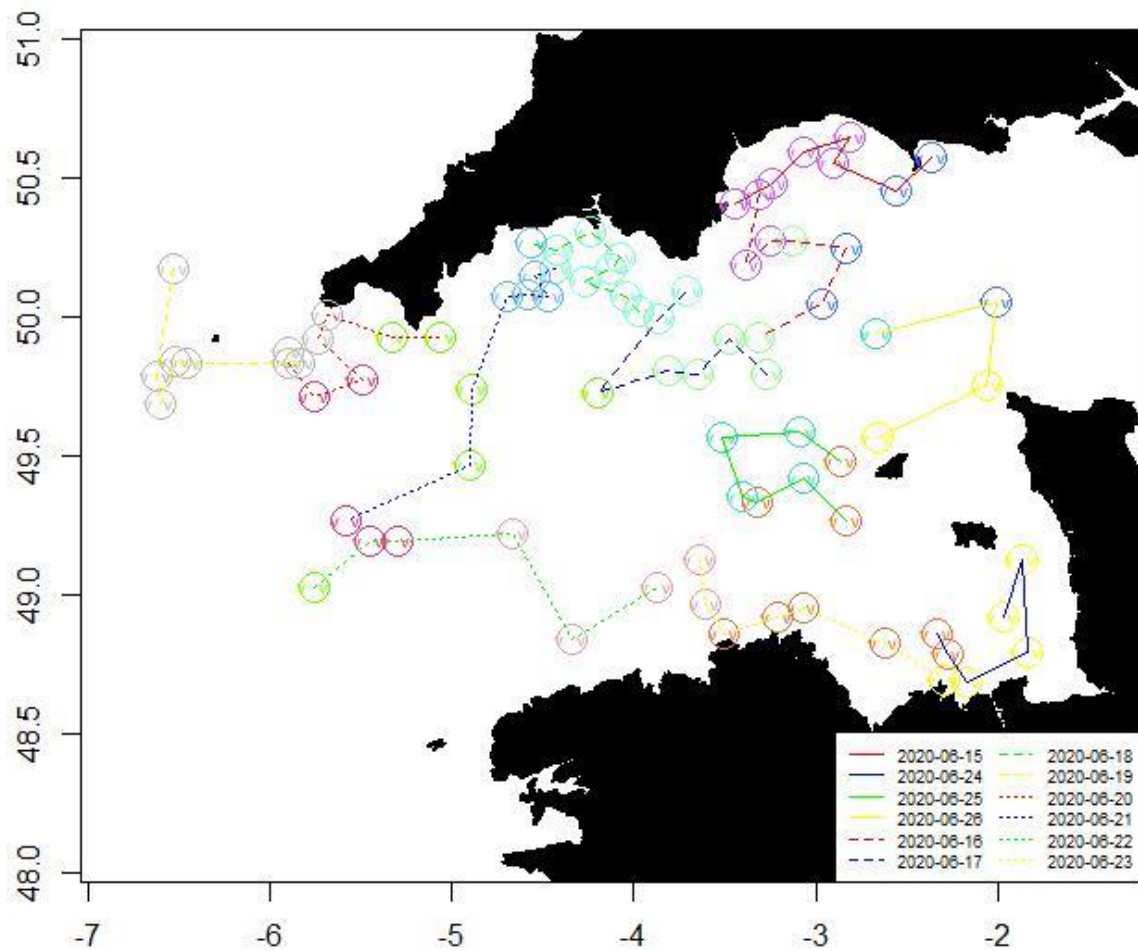


Figure 3: Survey track showing 4 m beam trawl stations and deployment validity codes (V = valid) by day.

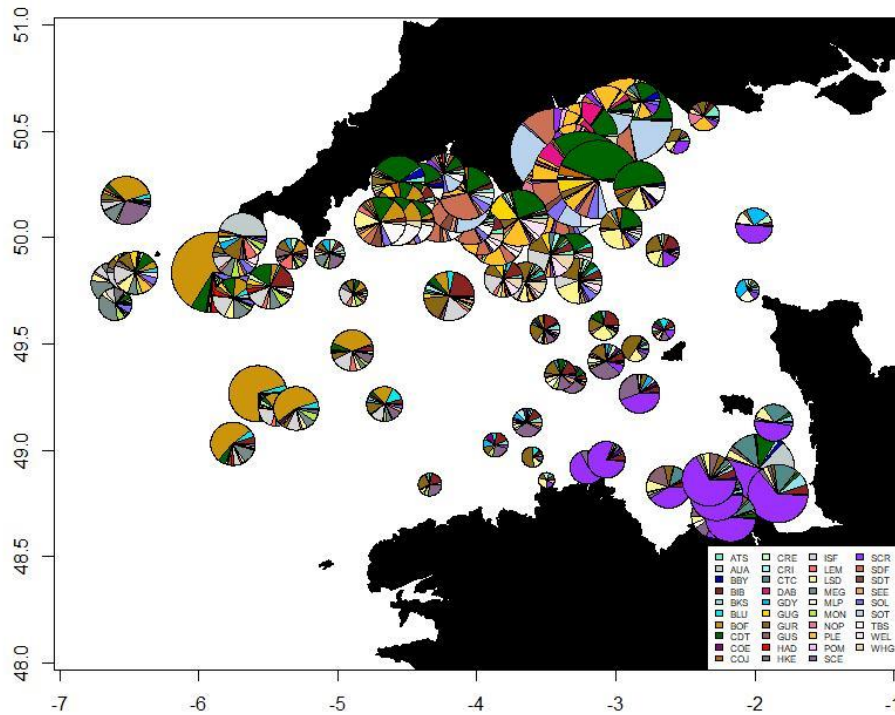


Figure 4: Species composition pie plots for Cend 4/20. Size of circles represents the size of the overall catch in numbers of the 40 most abundant species at a station with the size of the slice representing the relative proportion of each species encountered. For Cefas species codes see Table 2.

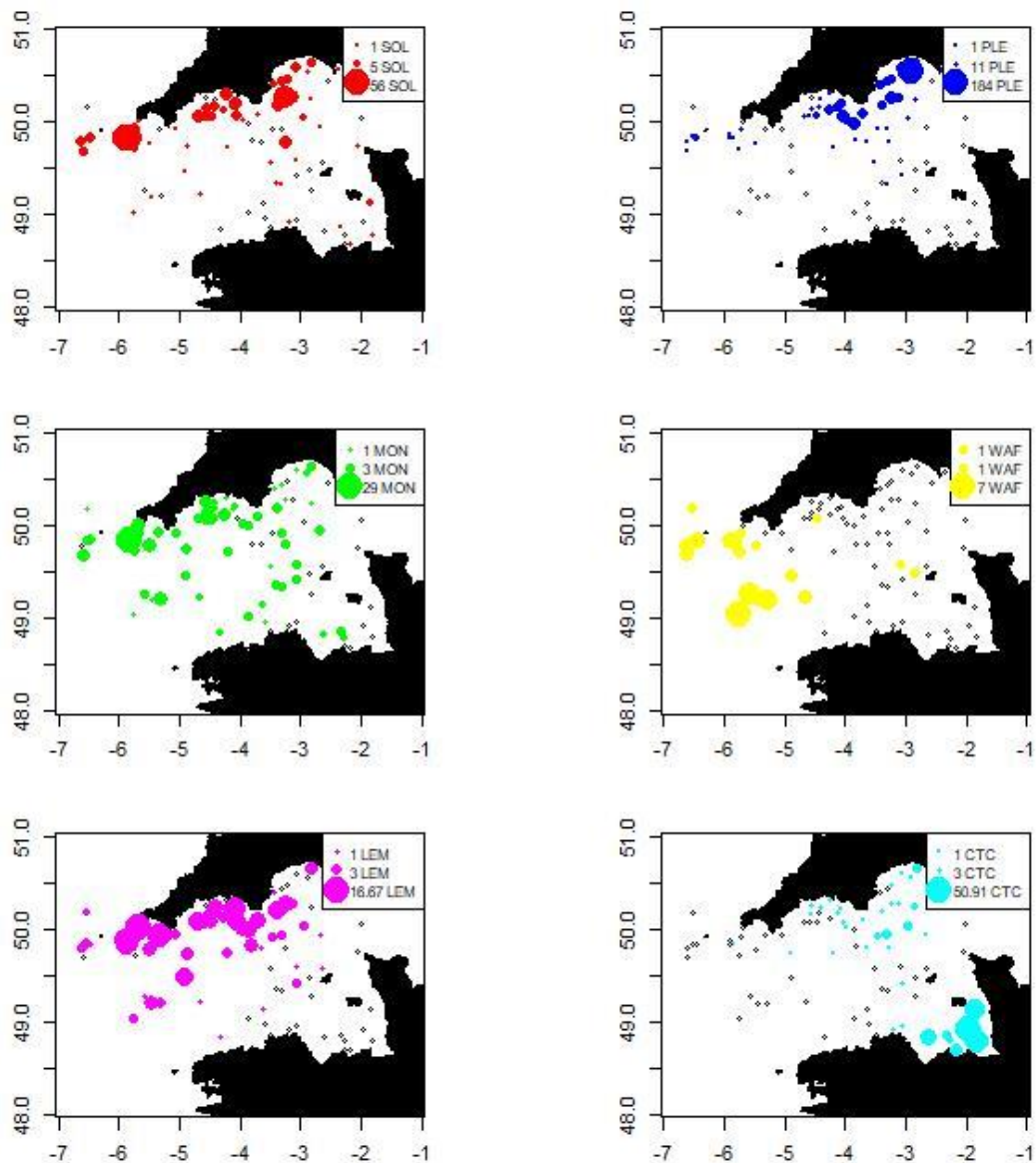


Figure 5: Distribution and total numbers of major commercial species by station (see Table 2, for species codes).

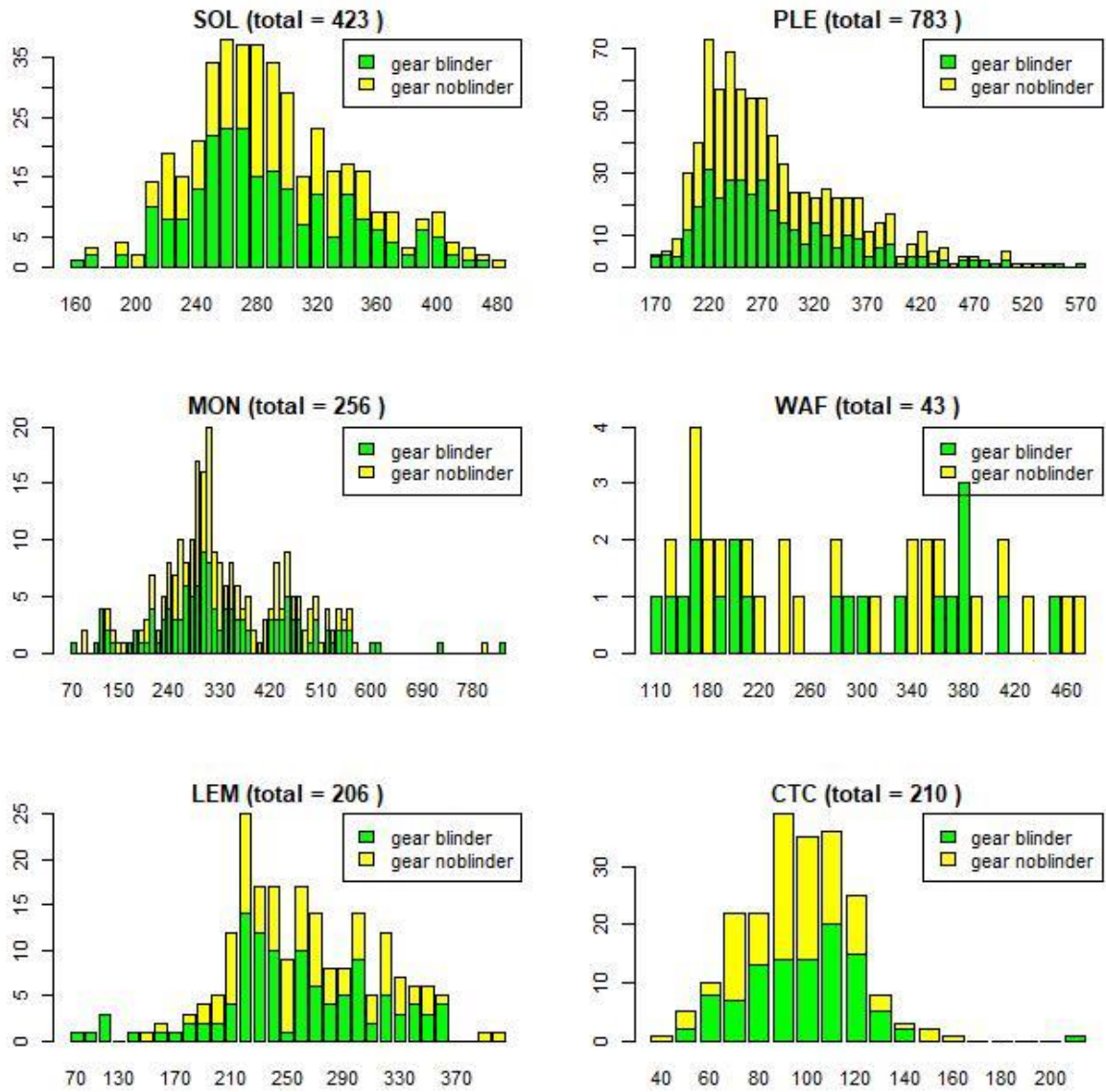


Figure 6: Length distributions (mm) for the major commercial species with total catch numbers by the two different gear types.

Appendix 1: Station Log information

Station	Date/Time	Lat Shot	Long Shot	Lat Haul	Long Haul	Distance	Depth Shot	Depth Haul	Tide dir	Tide speed	Wind dir	Wind speed	Sea Height	Swell Dir	Swell Hgt	Barom	Gear
1	14/06/2020 05:51	52.2465	1.813833	52.2565	1.823	0.7	30	26	188	0.2			0.5			1023	4m Beam
2	14/06/2020 08:05	52.16783	1.7975	52.16783	1.7975		32		16	1			0.5			1023	ESM2 and Niskin
3	15/06/2020 03:39	50.57617	-2.378	50.57617	-2.378		27		225	0.4			0.5			1026	ESM2 and Niskin
4	15/06/2020 04:16	50.572	-2.37133	50.572	-2.37133		27		224	0.4			0.5			1026	Nutrients or SVP
5	15/06/2020 04:42	50.57117	-2.366	50.57467	-2.32717	1.5	28	26	265	0.6			0.5			1026	4m Beam
6	15/06/2020 07:06	50.4525	-2.562	50.45567	-2.51267	1.9	47	46	271	0.9			0.5			1026	4m Beam
7	15/06/2020 10:03	50.55317	-2.90583	50.55333	-2.85233	2	37	36	280	0.4	180	4	0.5			1027	4m Beam
7	15/06/2020 10:03	50.55317	-2.90583	50.55333	-2.85233	2	37	36	280	0.4	180	4	0.5			1027	Caesium and Tritium
8	15/06/2020 12:12	50.64433	-2.81583	50.651	-2.84017	1	30	30	204	0			0.5			1027	4m Beam
9	15/06/2020 14:02	50.59117	-3.07067	50.59583	-3.01867	2	32	32	68	0.2			0.5			1027	4m Beam
10	15/06/2020 16:15	50.47567	-3.23917	50.4865	-3.1895	2	40	40	56	30			0.5			1027	4m Beam
11	15/06/2020 18:19	50.40333	-3.438	50.4325	-3.413	2.1	37	36	152	0.2			0.5			1026	4m Beam
11	15/06/2020 18:19	50.40333	-3.438	50.4325	-3.413	2.1	37	36	152	0.2			0.5			1026	Caesium and Tritium
12	15/06/2020 19:40	50.404	-3.42467	50.404	-3.42467	0	40	40					0.5			1026	ESM2 and Niskin
13	16/06/2020 03:39	50.446	-3.2975	50.446	-3.2975		43		49	0.3						1024	ESM2 and Niskin
13	16/06/2020 03:39	50.446	-3.2975	50.446	-3.2975		43		49	0.3						1024	Nutrients or SVP
14	16/06/2020 03:58	50.43983	-3.30783	50.4205	-3.34567	1.9	43	44	49	0.3	100	10				1024	4m Beam
15	16/06/2020 06:16	50.18783	-3.38633	50.1655	-3.42567	2	62	63	55	0.1	90	12	0.5			1025	4m Beam
16	16/06/2020 08:30	50.2735	-3.249	50.2925	-3.20617	2	60	59	227	0.5	120	7	0.5			1024	4m Beam
17	16/06/2020 11:06	50.273	-3.1275	50.28117	-3.07717	2	60	60	238	0.4			0.5			1024	4m Beam
17	16/06/2020 11:06	50.273	-3.1275	50.28117	-3.07717	2	60	60	238	0.4			0.5			1024	Caesium and Tritium
18	16/06/2020 13:21	50.2425	-2.83133	50.2755	-2.82317	2.1	60	60	309	0.2			0.5			1024	4m Beam
19	16/06/2020 15:58	50.043	-2.96317	50.02483	-3.0065	2	68	68	56	0.8			0.5			1024	4m Beam
20	16/06/2020 17:01	50.02717	-2.98117	50.02717	-2.98117		68		50	0.6			0.5			1023	Ring nets
21	16/06/2020 19:31	49.92917	-3.31167	49.90783	-3.27217	2	69	68	136	0.1			0.5			1023	4m Beam
22	16/06/2020 20:26	49.89567	-3.25333	49.89567	-3.25333		69						0.5			1023	Ring nets
23	16/06/2020 20:38	49.89567	-3.25583	49.89567	-3.25583		69						0.5			1023	ESM2 and Niskin
24	17/06/2020 03:41	49.79717	-3.2565	49.79717	-3.2565		72		64	0.7			0.5			1023	ESM2 and Niskin
24	17/06/2020 03:41	49.79717	-3.2565	49.79717	-3.2565		72		64	0.7			0.5			1023	Nutrients or SVP
25	17/06/2020 04:09	49.80117	-3.24467	49.80117	-3.24467		72		64	0.7			0.5			1023	Ring nets
26	17/06/2020 04:23	49.79617	-3.27	49.78667	-3.3195	2	72	73	48	0.7			0.5			1023	4m Beam
27	17/06/2020 06:17	49.91867	-3.46883	49.90183	-3.51333	2	73	72	48	0.3			0.5			1023	4m Beam
27	17/06/2020 06:17	49.91867	-3.46883	49.90183	-3.51333	2	73	72	48	0.3			0.5			1023	Caesium and Tritium
28	17/06/2020 07:10	49.8925	-3.53133	49.8925	-3.53133		72		48	0.3			0.5			1023	Ring nets
29	17/06/2020 08:31	49.7915	-3.64783	49.79833	-3.59733	2	74	72	257	0.5			0.5			1023	4m Beam

Station	Date/Time	Lat Shot	Long Shot	Lat Haul	Long Haul	Distance	Depth Shot	Depth Haul	Tide dir	Tide speed	Wind dir	Wind speed	Sea Height	Swell Dir	Swell Hgt	Barom	Gear
30	17/06/2020 09:27	49.80767	-3.5855	49.80767	-3.5855		72		257	0.5			0.5			1023	Ring nets
31	17/06/2020 10:46	49.80783	-3.80983	49.8185	-3.761	2.1	74	75	255	0.3			0.5			1023	4m Beam
32	17/06/2020 11:42	49.7695	-3.74417	49.7695	-3.74417		75		254	0.1			0.5			1023	Ring nets
33	17/06/2020 12:35	49.725	-4.20033	49.71417	-4.249	1.9	81	81	77	0.6			0.5			1023	4m Beam
33	17/06/2020 12:35	49.725	-4.20033	49.71417	-4.249	1.9	81	81	77	0.6			0.5			1023	Caesium and Tritium
34	17/06/2020 12:27	49.71283	-4.26367	49.71283	-4.26367	0	82	82	77	0.6			0.5			1023	Ring nets
35	17/06/2020 16:50	49.99083	-3.85783	49.99717	-3.80733	1.9	73	73	102	0.4			0.5			1023	4m Beam
36	17/06/2020 18:23	50.09267	-3.70283	50.07883	-3.75067	2	70	71	72	0.2			0.5			1022	4m Beam
36	17/06/2020 18:23	50.09267	-3.70283	50.07883	-3.75067	2	70	71	72	0.2			0.5			1022	Caesium and Tritium
37	17/06/2020 19:31	50.0895	-3.73717	50.0895	-3.73717		71				250	12	0.5			1022	Caesium and Tritium
37	17/06/2020 19:31	50.0895	-3.73717	50.0895	-3.73717		71				250	12	0.5			1022	Ring nets
38	17/06/2020 19:39	50.08983	-3.73583	50.08983	-3.73583		71				270	11	0.5			1022	ESM2 and Niskin
39	18/06/2020 03:40	50.0195	-3.95367	50.0195	-3.95367		74		97	0.7	300	8	0.5			1021	ESM2 and Niskin
39	18/06/2020 03:40	50.0195	-3.95367	50.0195	-3.95367		74		97	0.7	300	8	0.5			1021	Nutrients or SVP
40	18/06/2020 03:47	50.01917	-3.95133	50.01917	-3.95133		75		98	0.7	300	8	0.5			1021	Ring nets
41	18/06/2020 04:03	50.01933	-3.96817	50.02267	-4.0195	2	75	74	100	0.7	300	8	0.5			1021	4m Beam
42	18/06/2020 05:10	50.0715	-4.04583	50.0825	-4.09433	2	72	73	104	0.5	300	12	0.5			1021	4m Beam
43	18/06/2020 06:02	50.08567	-4.1085	50.08567	-4.1085		72				300	10	0.5			1021	Ring nets
44	18/06/2020 07:04	50.123	-4.26617	50.117	-4.21517	2	70	70	253	0	300	8	0.5			1021	4m Beam
45	18/06/2020 09:00	50.17433	-4.1295	50.1785	-4.07783	2	62	61	266	0.4	270	5	0.5			1021	4m Beam
46	18/06/2020 09:56	50.1815	-4.04767	50.1815	-4.04767		62		266	0.4	270	5	0.5			1021	Ring nets
47	18/06/2020 11:09	50.2095	-4.07567	50.20417	-4.0245	2	57	57	286	0.4	260	10	0.5			1021	4m Beam
48	18/06/2020 12:08	50.20433	-4.01217	50.20433	-4.01217		57				260	9	0.5			1021	Ring nets
49	18/06/2020 13:49	50.30367	-4.23733	50.30383	-4.28933	2	38	43	41	0.4	260	12	0.5			1020	4m Beam
50	18/06/2020 15:31	50.237	-4.4205	50.22317	-4.46783	2	58	59	69	0.4	260	14	0.5			1020	4m Beam
51	18/06/2020 17:30	50.26267	-4.56467	50.25783	-4.51333	2	53	54	90	0.2	290	16	1			1020	4m Beam
52	18/06/2020 18:23	50.25767	-4.489	50.25767	-4.489	0	53	53			290	18	0.8			1020	ESM2 and Niskin
53	19/06/2020 04:06	50.1725	-6.54433	50.1725	-6.54433		95		70	0.6	280	16	1.5	270	1.5	1023	ESM2 and Niskin
53	19/06/2020 04:06	50.1725	-6.54433	50.1725	-6.54433		95		70	0.6	280	16	1.5	270	1.5	1023	Nutrients or SVP
54	19/06/2020 04:37	50.17517	-6.52467	50.17467	-6.56033	1.4	96	98	78	0.6	280	16	1.5	270	1.5	1023	4m Beam
55	19/06/2020 07:50	49.786	-6.621	49.8105	-6.58567	2	96	94	199	0.9	260	12	1.5	260	1	1024	4m Beam
55	19/06/2020 07:50	49.786	-6.621	49.8105	-6.58567	2	96	94	199	0.9	260	12	1.5	260	1	1024	Caesium and Tritium
56	19/06/2020 09:35	49.687	-6.60283	49.66633	-6.56317	2	101	104	319	0.3	270	13	1.5	270	1	1025	4m Beam
57	19/06/2020 11:40	49.83917	-6.517	49.813	-6.485	2	92	95	336	0.5	270	13	1.5	270	1	1025	4m Beam
58	19/06/2020 12:55	49.83383	-6.4545	49.802	-6.43867	2	84	92	8	0.6	240	12	1.5	270	1	1025	4m Beam
59	19/06/2020 16:27	49.83567	-5.83783	49.84933	-5.88467	2	88	88	126	0.6	220	14	1	280	1	1026	4m Beam
60	19/06/2020 17:25	49.8695	-5.90117	49.89317	-5.9345	1.9	81	81	151	0.7	240	12	1.5	270	1	1025	4m Beam
61	19/06/2020 18:15	49.8945	-5.94783	49.8945	-5.94783	0	77	77	172	0.7	220	12	1	280	1	1026	ESM2 and Niskin

Station	Date/Time	Lat Shot	Long Shot	Lat Haul	Long Haul	Distance	Depth Shot	Depth Haul	Tide dir	Tide speed	Wind dir	Wind speed	Sea Height	Swell Dir	Swell Hgt	Barom	Gear
62	20/06/2020 03:38	49.83733	-5.88	49.83733	-5.88		88		95	0.6	220	6	1	270	1	1026	ESM2 and Niskin
62	20/06/2020 03:38	49.83733	-5.88	49.83733	-5.88		88		95	0.6	220	6	1	270	1	1026	Nutrients or SVP
63	20/06/2020 03:59	49.83583	-5.89767	49.83017	-5.93533	1.5	88	88	95	0.6	250	8	1	270	1	1026	4m Beam
64	20/06/2020 05:53	49.71567	-5.74917	49.73983	-5.78467	2.1	94	92	124	0.8			0.7	270	1	1027	4m Beam
65	20/06/2020 08:05	49.7715	-5.48867	49.77033	-5.43717	2	88	86.5	209	0.6	220	6	0.5	260	1	1028	4m Beam
65	20/06/2020 08:05	49.7715	-5.48867	49.77033	-5.43717	2	88	86.5	209	0.6	220	6	0.5	260	1	1028	Caesium and Tritium
66	20/06/2020 10:48	49.9185	-5.73467	49.93383	-5.68883	2	74	73	281	0.9	220	8	1	270	1	1028	4m Beam
67	20/06/2020 12:05	50.00667	-5.686	50.02033	-5.66417	1.2	62	46	322	1.6	220	8	1	270	1	1028	4m Beam
68	20/06/2020 14:55	49.925	-5.33083	49.902	-5.36567	2	64	64	51	0.4	190	20	1.5	270	1	1028	4m Beam
69	20/06/2020 17:14	49.92367	-5.06017	49.90517	-5.1025	2	83	83	62	1.4	190	20	1.5	270	1	1028	4m Beam
70	20/06/2020 18:20	49.9235	-5.06083	49.9235	-5.06083		83				190	22	1.2	270	1	1029	ESM2 and Niskin
71	21/06/2020 03:37	50.1755	-4.41983	50.1755	-4.41983		66		83	0.2	270	18	1.5	190	1.5	1023	ESM2 and Niskin
71	21/06/2020 03:37	50.1755	-4.41983	50.1755	-4.41983		66		83	0.2	270	18	1.5	190	1.5	1023	Nutrients or SVP
72	21/06/2020 04:00	50.17283	-4.43367	50.16317	-4.48333	2	66	67	83	0.2	270	18	1.5	190	1.5	1023	4m Beam
72	21/06/2020 04:00	50.17283	-4.43367	50.16317	-4.48333	2	66	67	83	0.2	270	18	1.5	190	1.5	1023	Caesium and Tritium
73	21/06/2020 05:05	50.14733	-4.54683	50.13467	-4.59483	1.9	69	70	77	0.3	270	14	1.2	220	1.5	1025	4m Beam
74	21/06/2020 06:39	50.07283	-4.47267	50.05967	-4.52017	2	75	75	68	0.1	270	12	1	220	1.5	1025	4m Beam
75	21/06/2020 07:37	50.04783	-4.54133	50.04783	-4.54133		75				250	14	1	220	1.5	1025.5	Nutrients or SVP
76	21/06/2020 08:19	50.07667	-4.57867	50.06033	-4.62767	2.1	75	75	194	0	250	17	1	230	1.5	1026	4m Beam
77	21/06/2020 09:33	50.07517	-4.69517	50.071	-4.74667	2	72	72	218	0.1	250	16	1	230	1.5	1027	4m Beam
78	21/06/2020 13:05	49.73833	-4.8895	49.747	-4.83967	2.1	85	85	265	0.4	250	18	1.5	220	1.7	1030	4m Beam
79	21/06/2020 16:02	49.46967	-4.896	49.45083	-4.93817	2.1	97	98	62	1.5	260	18	1.5	250	2	1032	4m Beam
80	21/06/2020 20:09	49.266	-5.57633	49.27933	-5.622	2	108	108	149	0.7	250	14	1.5	250	2	1034	4m Beam
81	21/06/2020 21:32	49.2655	-5.68517	49.2655	-5.68517		108				250	12	1.5	250	2	1034	ESM2 and Niskin
82	22/06/2020 03:42	49.03483	-5.742	49.03483	-5.742		116		36	1.2	210	14	1.3	250	1.5	1034	ESM2 and Niskin
82	22/06/2020 03:42	49.03483	-5.742	49.03483	-5.742		116		36	1.2	210	14	1.3	250	1.5	1034	Nutrients or SVP
83	22/06/2020 04:09	49.0305	-5.75517	49.00983	-5.79617	2	117	118	46	1.2	210	14	1.2	250	1.5	1034	4m Beam
84	22/06/2020 06:47	49.192	-5.44667	49.18167	-5.495	2.1	109	110	93	1.1	210	16	1	250	1.5	1034	4m Beam
85	22/06/2020 08:53	49.19667	-5.29983	49.22883	-5.28617	2	107	105	182	0.7	200	14	1	250	1.5	1034	4m Beam
86	22/06/2020 12:15	49.21767	-4.66467	49.22817	-4.61667	2	93	94	253	1.2	190	15	1.2	250	2	1035	4m Beam
87	22/06/2020 16:40	48.83867	-4.33833	48.828	-4.3865	2.1	96	96	78	1.7			1	240	1.5	1034	4m Beam
88	22/06/2020 19:38	49.02633	-3.8675	49.0245	-3.9135	1.8	87	87	89	0.3			1	240	1.5	1033	4m Beam
89	22/06/2020 21:16	49.01433	-3.91033	49.01433	-3.91033		86						1	270	1.5	1034	ESM2 and Niskin
90	23/06/2020 03:37	49.13333	-3.61583	49.13333	-3.61583		83		66	0.6	120	10	1	270	1	1033	ESM2 and Niskin
90	23/06/2020 03:37	49.13333	-3.61583	49.13333	-3.61583		83		66	0.6	120	10	1	270	1	1033	Nutrients or SVP
91	23/06/2020 04:02	49.1305	-3.63867	49.11967	-3.68667	2	83	84	66	0.7	120	8	1	270	1	1033	4m Beam
92	23/06/2020 06:33	48.96833	-3.6015	48.96267	-3.6515	2	81	83	73	1.2			0.7	270	1	1033	4m Beam
93	23/06/2020 09:16	48.85933	-3.5	48.8705	-3.45233	2	50	49	278	1.1			0.5	270	1	1032	4m Beam

Station	Date/Time	Lat Shot	Long Shot	Lat Haul	Long Haul	Distance	Depth Shot	Depth Haul	Tide dir	Tide speed	Wind dir	Wind speed	Sea Height	Swell Dir	Swell Hgt	Barom	Gear
94	23/06/2020 12:25	48.92033	-3.20617	48.92917	-3.1575	2	51	50	3	26	80	10	0.5	270	0.5	1032	4m Beam
95	23/06/2020 14:16	48.95567	-3.07117	48.9615	-3.02133	1.9	55	55	255	1	80	16	0.5	270	1	1031	4m Beam
96	23/06/2020 16:30	48.8285	-2.62267	48.846	-2.66567	1.9	40	45	129	2.3	80	14	1	270	1	1030	4m Beam
97	23/06/2020 18:48	48.6935	-2.28933	48.709	-2.334	2	32	36	88	0.4	60	14	1			1029	4m Beam
98	23/06/2020 19:40	48.716	-2.34533	48.716	-2.34533		36				40	12	0.7			1028	ESM2 and Niskin
99	24/06/2020 03:57	48.93417	-1.96	48.93417	-1.96		22		130	1.4	70	12	0.5			1028	ESM2 and Niskin
99	24/06/2020 03:57	48.93417	-1.96	48.93417	-1.96		22		130	1.4	70	12	0.5			1028	Nutrients or SVP
100	24/06/2020 04:17	48.91767	-1.96817	48.9325	-1.95433	1.1	22	20	130	1.4	70	12	0.5			1028	4m Beam
101	24/06/2020 06:19	49.1295	-1.8665	49.15033	-1.89567	1.7	19.5	20	104	1.5	40	10	0.5			1027	4m Beam
102	24/06/2020 10:24	48.79633	-1.83583	48.782	-1.79033	2	29	27	241	1.1	40	8	0.5			1026	4m Beam
103	24/06/2020 14:46	48.68533	-2.1745	48.69567	-2.14033	1.5	23	23	318	0.5	10	12	0.5			1026	4m Beam
104	24/06/2020 16:50	48.78967	-2.27667	48.80767	-2.31933	2	35	38	119	1.9	30	12	0.5			1026	4m Beam
105	24/06/2020 18:21	48.862	-2.33017	48.88217	-2.3705	1.9	43	48	129	2.8	30	12	0.5			1025	4m Beam
106	24/06/2020 20:11	48.87583	-2.36467	48.87583	-2.36467		50				40	16	0.5	300	0.5	1025	ESM2 and Niskin
107	25/06/2020 03:38	49.25917	-2.84	49.25917	-2.84		65		218	0.9			0.5	300	0.5	1025	ESM2 and Niskin
107	25/06/2020 03:38	49.25917	-2.84	49.25917	-2.84		65		218	0.9			0.5	300	0.5	1025	Nutrients or SVP
108	25/06/2020 04:23	49.26683	-2.83083	49.28117	-2.78467	2	65	64	170	0.9			0.5	300	0.5	1024	4m Beam
109	25/06/2020 07:09	49.41733	-3.07067	49.42917	-3.11967	2.1	71	77	116	0.7	40	6	0.5	280	0.5	1025	4m Beam
110	25/06/2020 10:01	49.333	-3.31583	49.31167	-3.35517	2	77	77	47	1.3			0.5	260	0.5	1023	4m Beam
111	25/06/2020 12:51	49.356	-3.40117	49.36067	-3.35067	2	77	77	289	0.6			0.5	260	0.5	1023	4m Beam
112	25/06/2020 14:43	49.49783	-3.46183	49.49783	-3.46183		116	116	234	1.1							Caesium and Tritium
113	25/06/2020 15:19	49.5685	-3.5115	49.5825	-3.46483	2	77	74	230	1.1			0.5			1023	4m Beam
114	25/06/2020 17:42	49.58683	-3.08867	49.60017	-3.04183	2	77	79	208	0.7			0.5			1023	4m Beam
115	25/06/2020 19:46	49.47917	-2.86033	49.48117	-2.91133	1.9	73	73	91	0.8			0.5			1022	4m Beam
116	25/06/2020 21:18	49.486	-2.86567	49.486	-2.86567		73						0.5			1022	ESM2 and Niskin
117	26/06/2020 03:39	49.53	-2.70983	49.53	-2.70983		67		227	2.8	260	18	0.7			1021	ESM2 and Niskin
117	26/06/2020 03:39	49.53	-2.70983	49.53	-2.70983		67		227	2.8	260	18	0.7			1021	Nutrients or SVP
118	26/06/2020 04:46	49.56717	-2.65833	49.59383	-2.6275	2	69	68	217	1.8	260	16	0.7			1021	4m Beam
119	26/06/2020 08:04	49.7525	-2.05433	49.74217	-2.07517	1	59	59	91	0.5	30	10	0.5			1021	4m Beam
120	26/06/2020 10:39	50.05517	-2.00633	50.047	-2.0565	2	66	65	81	2.3	240	12	1			1021	4m Beam
121	26/06/2020 14:24	49.93967	-2.665	49.932	-2.71533	2	65	65	341	0.1	240	12	1			1021	4m Beam
122	26/06/2020 15:18	49.92167	-2.74333	49.92167	-2.74333		65		245	1.1	240	12	0.7			1021	ESM2 and Niskin
123	26/06/2020 15:28	49.92083	-2.74533	49.92083	-2.74533		65		246	1.1	240	12	0.7			1021	Ring nets
124	27/06/2020 12:38	51.95167	-2.1205	51.95167	-2.1205		41		215	1.6	200	25	1.2	180	0.7	1017	Ring nets

Appendix 2: Survey priority stations not worked on CEND 4/20

Stratum	Priority number	P Reference number	Reason for not working	Alternative priority station worked
2	2	P20990	Permission denied by Cornwall IFCA – (sea grasses)	Str 2 Stn 6
3	5	P24355	Tow in Fal and Helford SAC	Str 3 Stn 6
4	4	P24509	Permission denied by Devon and Severn IFCA – Area of no towed gear.	Str 4 Stn 11
4	5	P26919	Permission denied by Devon and Severn IFCA – Area of no towed gear.	Str 4 Stn 12
4	9	P26974	Permission denied by Devon and Severn IFCA – Area of no towed gear.	Str 4 Stn 13
5	8	P29603	Permission denied by Southern IFCA -	Str 5 Stn 9
10	1	P27614	Tow in fisheries protection zone	Str 10 Stn 10
10	5	P28311	Permission denied by Bailiwick of Guernsey – static gear present.	Str 10 Stn 11