



#### RESEARCH VESSEL SURVEY REPORT

#### RV CEFAS ENDEAVOUR Survey: CEND 5/21.

#### STAFF:

Name	Role	Name	Role
lan Holmes	SIC	Ben Hatton	2IC
Charlotte Jennings	Deckmaster	Georgina Eastley	Deckmaster
Tom Woods	Sampler	Matthew Eade	Sampler
Rogan Harmer	Sampler	Rob Forster	Sampler
Gary Thomas	Sampler	Hayden Close	Sampler

**DURATION:** 6 March – 4 April 2021 (22 days at sea)

LOCATION: Western Channel/Celtic Sea (ICES areas 27.7.e-j)

AIMS:

#### PRIMARY:

 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 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.

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

2) To recover the smart-buoy located at the West Gabbard which had moved off site due to weather and place a new smart-buoy as the correct designated location.





#### SECONDARY:

- 3) Collect information on:
  - a. Distribution of macrobenthos
  - b. Distribution and classification of anthropogenic debris.
  - c. Distribution of fish in relation to their environment.
- 4) To collect full depth, conductivity, temperature, and depth profiles at each trawl station alongside surface and near-bottom water samples.
- 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 & tritium analysis under SLA22 (T Bailey Cefas, Lowestoft).
- 8) To tag and release specimens of Plaice, *Pleuronectus platessa* as part of a Cefas plaice tagging project. (S Roslyn Cefas, Lowestoft)
- 9) To collect biological samples and information for Greater weever, *Trachinus draco* as part of a Cefas study on species growth and biology. (S Barnett Cefas, Lowestoft).
- 10) To carry out fieldwork testing of new motion-compensating marine balance(s) provided by Lorrimar Weighing Ltd with a view to purchasing replacements for the current POLS balances.
- 11) Collect samples of selected benthic invertebrate species for analysis of contaminants. (K Dean/A Turner – Cefas, Weymouth).
- 12) To collect genetic samples from anglerfish *Lophius piscatorius*, Black bellied anglerfish *Lophius budegassa* and European hake *Merluccius merluccius* in support of the GECKA project.

#### **OPPORTUNISTIC:**

- 13) To tag and release specimens of various commercially exploited skates (Rajidae) and other select elasmobranchs.
- 14) Collect specimens of selected species for ID purposes as well as length-weight measurements where still required.
- 15) All diadromous species (including allis shad *Alsoa alsoa*, twaite shad *Alsoa 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.

- 16) 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.
- 17) Collect surface underway chlorophyll samples for SLA25 (N Greenwood Cefas Lowestoft)
- 18) Queen scallop Aequipecten opercularis collection.

#### NARRATIVE: (All times are GMT)

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

Cefas scientists arrived at 0830hr, 4 March with two staff arriving the evening before as they had to travel from the south-west. All scientists and crew undertook a COVID-19 test before going into self-isolation until the test results were received. All tests produced a negative result with the last result arriving at 1900hr, 5 March. At this point staff began the process of setting up equipment and labs in readiness to sail and fuel and supplies were received on the morning of 6 March. Sailing was delaying by one tide due to on-going essential harbour maintenance at the Lowestoft bridge. Safety inductions and emergency drills took place during this time.

RV Cefas Endeavour (henceforth referred to as CEND 5/21) sailed at 0106hr 7 March and headed to the west Gabbard smart-buoy location. Upon arrival, work began by taking a plankton sample. Following this, the replacement smart buoy was successfully deployed at 0802hr at the correct location. The wayward smart buoy was then located approximately 0.5nm out of position and was recovered at 0827h. Once this work had been completed, CEND 5/21 began its transit to the western Channel. On route, at a position 12nm off Ramsgate (7DBTS prime station 78), a shakedown ESM2 deployment and a 10-minute beam trawl tow were both successfully completed at 1646hr to test shipboard and scientific equipment. After a smooth passage through the Channel, survey work began at a position south of Portland on 8 March at 0838h at site 6(4). Following this, three further locations were successfully completed in the eastern end of Lyme Bay.

At this point in the survey, operations had to be suspended due to unexpected circumstances and CEND 5/21 began the journey back to Lowestoft on 8 March at 1800hr docking the following evening at 1754hr on 9 March. Cefas staff re-joined the vessel on 14 March at 1000hr and undertook COVID-19 tests before going into self-isolation once again. With a full set of negative results received, CEND 5/21 sailed again at 1006hr on 15 March.

CEND 5/21 survey work recommenced on 16 March at 0713hr south of Portland at site 6(1). With an excellent weather forecast and fine sea condition forecast for the following week, the





decision was taken to concentrate work in the offshore stratum and working in a westerly direction. Over the course of the day, a total of 8 locations were successfully completed without incident and these were within stratum 4-7 inclusive. With weather and sea conditions being excellent and expected to continue, the decision was taken to continue to complete the mid-Channel stations heading generally from east to west. On 17 March, a further 8 offshore sampling locations were completed in stratum 6,7 and 9 with all works being completed in stratum 6 and 7 on this day. The following day a total of 7 successful tows were completed in stratum 9,12 & 13. The tow at site 13(2) had to be fished twice as on the first attempt, the port cod end was holed. After the first tow, a small diversion was made to collect the caesium and tritium water sample over the Hurd Deep. The final tow was completed in stratum 13 on this day. On 19 March, work began in stratum 13 completing another 8 valid tows in stratum 8,13,K and H with stratum 13 being completed during the day.

The following day began again in stratum 8, completing 2 tows before heading into stratum 1 around the Isles of Scilly and completing 4 more before sunset. On 21 March, work began in Mounts Bay in stratum 2. At the first tow of the day at site 2(3), the starboard warp parted, and the beam was lost. Work quickly began to resplice the warp and attach grapple hooks to attempt a recovery of the beam. This took several hours to complete, but thankfully the beam was recovered at the first attempt at 1345hr. The damage to the beam and net was assessed to be relatively minor and repairs were completed in quick time. The survey resumed at 1714h at a different location in stratum 2. A total of 3 locations were fished before the end of the day with 2 in stratum 2 and 1 in stratum 8.

On 22 March, work began in stratum 8, completing the final tow here before moving north to complete the final tow in stratum 1 south of the Isles of Scilly. CEND 5/21 then headed back into stratum 2 and completed the three remaining tows required before moving east into stratum 3 to complete two further stations off Falmouth. The following day began in stratum 3, completing the final three locations here before moving east into stratum 4 where a further 5 tows were completed. The tow at site 3(1) was hauled after 1.68nm due to the presence of commercial static gear but deemed valid but at site 4(9) the tow had to hauled after just 0.36nm due to the presence of static gear and was deemed invalid. This location had to be abandoned as towing options were limited by the further presence of commercial static gear and mMPA to the north.

The 24 March saw the completion of the final sampling tows in both stratum 4 and stratum 5 with a total of 7 successful tows completed working from west of Start Point into the western end of Lyme Bay. With all UK inshore and middle Channel stations completed CEND 5/21 headed into the French EEZ to begin work around the Channel Isles on 25 March. Work here began at 0534hr at site 11(1) which was hauled after 1.5nm due to uncertain grounds and changing water depths. At site 11(6) at a position north-east of Guernsey, a 54cm male sting ray *Dasyatis pastinaca* weighing 1.136Kg was caught. This was quickly weighed and measured before being released alive (Figure 1). At site 11(10), the tow had to be hauled at 1.2nm due to static gear across the tow with the tow deemed as valid. No tow was possible at site 11(8) due to the presence of cables, static gear with a vessel actively setting more pots and other potting vessels close by. This meant that it became necessary to fish site 11(11) and this was visited next and fished successfully. At the final station of the day at site 10(4), a large hole in





the port gear cod-end was discovered upon hauling rendering the tow invalid. In total, 5 locations were fished successfully during the day.



Figure 1: A 54cm male sting ray Dasyatis pastinaca caught at station 11(6).

On 26 March, work began south-east of Jersey, close to the French coast before heading north later in the day, completing 6 valid stations in the process. The tow at site 11(2) had to be abandoned due to limited area suitable to deploy the beams due to shallow waters and Jersey Government whelk potting survey operations in this area. The tow at site 10(7) had to be hauled at 1.03nm due to the presence of static gear. At site 11(7) the tow was hauled early (1.49nm) due to cables and upon hauling a small hole was found in the starboard gear codend and liner where the liner is 'bunched up' within the cod-end. This was deemed valid after careful comparison of the catches from the two gears where the major component was large spider crab *Maja squinado*. At site 10(3), the first attempt to deploy the gear was abandoned after 1 minute due to concerns of the direction of the warps in the water and upon hauling it was discovered that the starboard gear had flipped onto its back but fortunately this caused no gear damage. A second attempt gleaned a valid 1.02nm tow being reduced due to the presence of static gear in the alternative location chosen due to tide changes. The final tow in stratum 11 was completed on this day. At this point of the survey, 24/7 operations commenced.

The following day, 6 valid tows were completed. At site 10(6), a small hole in the starboard cod-end was encountered but again, catch comparison with the port gear catch suggested little or no catch had been lost. At site 13(3), both gear's cod ends were badly damaged, and the tow was invalid. Repairs took several hours and when work recommenced, daylight had been lost so an attempt to fish the inshore tow at site 10(10) was abandoned and site 13(3) was then re-fished in a different location and only for a valid distance of 1.03nm. On 28 March, the day began at site 12(1) where upon hauling, the port gear cod-end was found to be badly





damaged rendering the tow invalid. With no alternative tow possible due to cables and poor ground, this location was abandoned. At site J(1), the tow was hauled at 1.48nm due to excess weight observed on the warp tension monitor, but upon hauling the catch was small and no damage had been sustained.

At site 12(2), the starboard warp parted, and the beam was lost at 1.43nm into the tow. Upon hauling the port gear, the cod-end was found to be badly damaged too. After several unsuccessful attempted to recover the gear using grapple hooks, the gear was abandoned with the location recorded for a future recovery and the French authorities were informed. With no spare gear and limited net supplies left on the vessel, the decision was taken at this point to abandon further inshore tows on rough ground and head into the Celtic Sea.

Work recommenced the following day at site N(5) at 0041h. Over the course of the day, a total of 6 successful locations were fished. At site K(5), the tow was hauled at 1.27nm due to high tension on the warp monitor, but again upon hauling, the catches were small, and no damage had been sustained to the gear. The following day a total of 5 successful tows were completed with large transiting distances between them. The day also saw the end to work in the French EEZ. At site N(3) south-west of the Canyons MCZ, a 43cm, 1.61kg male common electric ray *Torpedo nobiliana* was caught (Figure 2). This was quickly weighed and measured and released alive. On 31 March, CEND 5/21 moved into the Republic of Ireland EEZ and work began at site G(3) with a total of 6 successful tows completed in both stratum G and stratum E. At site E(1), the tow was hauled at a valid 1.14nm due to a 2m high wall of rock observed on the Olex.

Figure 2: A 43cm common electric ray, Torpedo nobiliana caught at station N(3).



On the final survey day of the survey, a further 6 sampling locations were successfully completed, finishing off stratum G and stations also in stratum B and F. At three locations in stratum B, a shorter 1.4nm tow was completed to save time to ensure that all locations in the Republic of Ireland EEZ were completed before the vessel had to end survey operations. At site E(3) at a position north-west of the Greater Haig Fras MCZ a total of 5 blue-mouth redfish





*Helicolenus dactylopterus* were caught, the first specimens observed in the entire time series (Figure 3a). At site G(1), a single pearlfish *Echiodon drummondi* (21cm; 0.005kg) was caught and retained for ID confirmation with this being only the second such specimen caught on the entire survey series (Figure 3b).

**Figure 3a and 3b:** A 12cm blue-mouth redfish *Helicolenus dactylopterus* caught at station E(3) and a 21 cm pearlfish *Echiodon drummondi* caught at station G(1).



The final tow of the survey was completed at 2329h on 1 April with a final CTD profile collected before the beams were recovered on board, checked over and stowed away.

With the beam trawl survey now complete, RV Cefas Endeavour began it journey back to Lowestoft at 0010h, 2 April. During the steam, the clean down was carried out along with the survey data checks and report writing. CEND 5/21 docked in Lowestoft at 0020h 4 April. The scientific crew departed the vessel later that day and the gear was de-mobbed later that morning on 4 April.

#### **RESULTS BY AIM:**

This western Channel part of the survey routinely takes place in March each year and since 2013, the survey has been extended into the Celtic Sea. 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. Covid-19 mitigations in place meant that no mid-survey break was planned so the survey was staffed throughout with 10 staff, initially operating as two cross-over shifts working a long working day, switching to 24/7 working part way into the survey to cater for the longer steams between stations. Inshore stations were scheduled to be worked in daylight hours so that commercial static gear could be seen and avoided.

The fishing gear used on this survey were the (survey) standard 4 m-beam trawls (number 3) with chain mat, flip-up ropes and the net was fitted with a 40 mm cod-end liner and 3m codend extension (starboard side), and the same gear (number 1) but without the 40 mm codend liner on the port side. Beam number 2 was used as a replacement for beam number 3 when this was lost on 28 March. 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 when required.

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.

#### **PRIMARY AIMS:**

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.

A Total of 78 out of 81 planned tows in the western Channel survey area were successfully fished along with 28 out of a planned 50 tows in the Celtic Sea. A reduced survey duration due to having to return to port for ~6 days led to the loss of 22 tows in the Celtic sea. The stations left were either UK waters or the French EEZ and were mostly concentrated in the Bristol Channel and outer waters for ease should further survey days be allocated later in the calendar year. The locations not worked in the western Channel were in stratum 10 (1 station missed) and stratum 12 (2 stations missed). These were due to the major gear damage and loss encountered within those stratum. One extra station was completed in stratum 4 on the English coast. Table 1 shows the total number of beam trawl deployments by survey area and validity.

Area	Gear	Validity	Number of Deployments
Western Channel	4m Beam Trawl with blinder	V	82
Western Channel	4m Beam Trawl with blinder	I	5
Celtic Sea	4m Beam Trawl with blinder	V	28
North Sea	4m Beam Trawl with blinder	S	1
Western Channel	4m Beam Trawl without blinder	V	79
Western Channel	4m Beam Trawl without blinder	I	8
Celtic Sea	4m Beam Trawl without blinder	V	28
North Sea	4m Beam Trawl without blinder	S	1

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

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. The numbers of 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)
Lesser spotted dogfish	Scyliorhinus canicula	LSD	443.578	443.578
Greater spider crab	Maia squinado	SCR	394.347	394.347
Anglerfish (monk)	Lophius piscatorius	MON	269.212	269.212
European plaice	Pleuronectes platessa	PLE	241.316	241.316
Poor cod	Trisopterus minutus	POD	232.195	247.703
Common cuttlefish	Sepia officinalis	СТС	187.844	187.844
Megrim	Lepidorhombus whiffiagonis	MEG	170.694	170.694
Whiting-pout (bib)	Trisopterus luscus	BIB	158.265	158.265
Black-bellied anglerfish	Lophius budegassa	WAF	136.928	136.928
Haddock	Melanogrammus aeglefinus	HAD	134.646	134.646
Sole (dover sole)	Solea solea	SOL	128.045	128.045
Red gurnard	Aspitrigla (chelidonichthys) cuculus	GUR	116.237	116.237
European hake	Merluccius merluccius	НКЕ	112.403	112.403
Thornback ray (roker)	Raja clavata	THR	106.295	106.295
Undulate ray	Raja undulata	UNR	88.326	88.326
Common dragonet	Callionymus lyra	CDT	79.867	82.723
Great scallop	Pecten maximus	SCE	78.225	78.225
European conger eel	Conger conger	COE	70.261	70.261
Blue whiting	Micromesistius poutassou	WHB	70.086	70.086
Cuckoo ray	Leucoraja naevus	CUR	69.179	69.179
Lemon sole	Microstomus kitt	LEM	53.755	53.755
Starry smooth hound	Mustelus asterias	SDS	49.047	49.047
Whiting	Merlangius merlangus	WHG	41.744	41.744
Grey gurnard	Eutrigla (chelidonicthys) gurnardus	GUG	41.536	41.536
Boar fish	Capros aper	BOF	40.221	46.536
Queen scallop	Aequipecten opercularis	QSC	39.543	133.318
Edible crab unsexed	Cancer pagurus	CRE	34.150	34.150
Thickback sole	Microchirus variegatus	TBS	31.159	31.159
Tub gurnard	Trigla (chelidonichthys) lucerna	TUB	30.265	30.265
Blue skate (Grey skate)	Dipturus batis	SKG	25.363	25.363
Spotted ray	Raja montagui	SDR	24.991	24.991
Imperial scaldfish	Arnoglossus imperialis	ISF	23.848	23.848
Brill	Scophthalmus rhombus	BLL	22.702	22.702
Black seabream	Spondyliosoma cantharus	BKS	22.646	22.646
Witch	Glyptocephalus cynoglossus	WIT	20.476	20.476
Red mullet	Mullus surmuletus	MUR	18.024	18.024
John dory	Zeus faber	JOD	16.956	16.956
Dab	Limanda limanda	DAB	16.951	16.951
Marbled electric ray	Torpedo marmorata	MER	14.507	14.507
Atlantic cod	Gadus morhua	COD	13.539	13.539
Streaked gurnard	Trigloporus (chelidonichthys) lastoviza	GUS	13.432	13.432
Nurse hound	Scyliorhinus stellaris	DGN	13.140	13.140
Blonde ray	Raja brachyura	BLR	12.999	12.999
Common spiny lobster	Palinurus elephas	SLO	9.780	9.780
Solenette	Buglossidium luteum	SOT	9.675	11.505
Scald fish	Arnoglossus laterna	SDF	8.529	8.529
Horse-mackerel (scad)	Trachurus trachurus	HOM	8.231	8.231



Common Name	Scientific Name	CEFAS code	Sampled weight (kg)	Catch weight (kg)
Ballan wrasse	Labrus bergylta	BNW	7.540	7.540
Turbot	Scophthalmus maximus (psetta maxima)	TUR	6.225	6.225
American plaice (long-rough dab)	Hippoglossoides platessoides	PLA	5.921	5.921
Smalleyed (painted) ray	Raja microocellata	PTR	5.815	5.815
Norway lobster	Nephrops norvegicus	NEP	5.709	5.709
European seabass	Dicentrarchus labrax	ESB	5.008	5.008
Three-bearded rockling	Gaidropsarus vulgaris	TBR	4.840	4.840
Norway pout	Trisopterus esmarki	NOP	4.765	4.765
Spurdog	Squalus acanthias	DGS	4.665	4.665
Velvet swimming crab	Necora puber	MLP	4.403	4.403
European lobster	Homarus gammarus	LBE	4.119	4.119
Sand sole	Pegusa (solea) lascaris	SOS	4.098	4.098
Cuckoo wrasse	Labrus mixtus (l. bimaculatus)	CUW	3.716	3.716
Sting ray	Dasyatis pastinaca	SGR	3.572	3.572
Common ling	Molva molva	LIN	3.540	3.540
Four spot megrim	Lepidorhombus boscii	LBI	3.265	3.265
Topknot	Zeugopterus punctatus	ткт	2.544	2.544
Argentines	Argentinidae	ARG	2.387	2.387
Baillons wrasse	Symphodus (crenilabrus) balloni	BLW	2.358	2.358
Goldsinny	Ctenolabrus rupestris	GDY	2.183	2.183
Barrel jellyfish	Rhizostoma octopus	BAR	2.150	2.150
Flounder (European)	Platichthys flesus	FLE	1.910	1.910
(European) mackerel	Scomber scombrus	MAC	1.633	1.633
Common electric ray	Torpedo nobiliana	ECR	1.610	1.610
Butterfly blenny	Blennius ocellaris	BBY	1.565	1.565
Sprat	Sprattus sprattus	SPR	1.440	1.440
Shagreen ray	Leucoraja fullonica	SHR	1.343	1.343
Lesser weever fish	Echiichthys (trachinus) vipera	WEL	1.298	1.298
Cuttlefish	Sepia elegans	SEE	0.969	0.969
Greater forkbeard	Phycis blennoides	GFB	0.838	0.838
Spotted dragonet	Callionymus maculatus	SDT	0.832	0.832
European Squid	Loligo vulgaris	LLV	0.692	0.692
Norwegian topknot	Zeugopterus (phrynorhombus) norvegius	NKT	0.569	0.569
Pilchard	Sardina pilchardus	PIL	0.506	0.506
Couch's seabream	Pagrus pagrus	SBC	0.445	0.445
European common squid	Loligo (alloteuthis) subulata	ATS	0.425	0.425
Ekstroms topknot	Zeugopterus (phrynorhombus) regius	EKT	0.415	0.415
Northern shortfin squid	Illex illecebrosus	SQI	0.332	0.332
Immaculate sandeel	Hyperoplus immaculatus	ISE	0.254	0.254
Steven's goby	Gobius gasteveni	GSV	0.253	0.253
Herring	Clupea harengus	HER	0.250	0.250
Lesser flying squid	Todaropsis eblanae	OME	0.241	0.241
Great sandeel	, Hyperoplus lanceolatus	GSE	0.203	0.203
Pink cuttlefish	Sepia orbianyana	SEO	0.194	0.194
Flapper skate	Dipturus intermedius	SKF	0.184	0.184
Great ninefish	Synanathus acus	GPF	0 159	0 159
Blue-mouth redfich	Helicolenus dactulonterus	RRM	0.153	0.157
Northern squid	I olian forhesi	NSO	0.1/1	0.132
Crv/i)stal iellies	Δραμοrea con	190	0.136	0.171
Furonean anchowy	Engraulis encrasicolus		0.130	0.170
European anchovy	Engradins encrusicolus	AINE	0.127	0.127





Common Name	Scientific Name	CEFAS code	Sampled weight (kg)	Catch weight (kg)
Comber	Serranus cabrilla	CMR	0.125	0.125
Gobies	Pomatoschistus spp.	POM	0.118	0.118
Four-bearded rockling	Enchelyopus cimbrius	FRR	0.115	0.115
Pogge (armed bullhead)	Agonus cataphractus	POG	0.110	0.110
Greater weever fish	Trachinus draco	WEG	0.090	0.090
Silvery pout	Gadiculus argenteus	SYP	0.071	0.071
Tompot blenny	Parablennius gattorugine	ТВҮ	0.068	0.068
Reticulate dragonet	Callionymus reticulatus	RDT	0.049	0.049
Sandeel	Ammodytes tobianus	TSE	0.042	0.042
Black goby	Gobius niger	BLG	0.041	0.041
Flying squid	Todarodes saggittatus	SQE	0.028	0.028
Red bandfish	Cepola rubescens (c. macrophthalma)	RPF	0.027	0.027
Yarrel's blenny	Chirolophis ascanii	YBY	0.026	0.026
Northern rockling	Ciliata septentrionalis	NNR	0.023	0.023
Moon jellyfish	Aurelia aurita	AUA	0.023	0.023
Five-bearded rockling	Ciliata mustela	FVR	0.013	0.013
Shore rockling	Gaidropsarus mediterraneus	SRR	0.010	0.010
Smooth sandeel	Gymnammodytes semisquamatus	SMS	0.008	0.008
Pearlfish	Echiodon drummondi	PRL	0.005	0.005
Two spotted clingfish	Diplecogaster bimaculata	TSC	0.002	0.002
Crystal goby	Crystallogobius linearis	CLG	0.002	0.002
Transparent goby	Aphia minuta	TPG	0.001	0.001
Jeffrey's goby	Buenia jeffreysii	JYG	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)
Rocks	Assorted rocks	ROK	3672.364
Epibenthic mix unidentified	Epibenthic mixture	BEN	3488.448
Common brittle star	Onhiothrix fraailis	OPF	1354 696
Yellow boring sponge	Cliona celata	CI1	589 520
Edible sea urchin	Echinus esculentus	LIBS	442.062
Spiny starfish	Marthasterias alacialis	MAG	356 992
Breadcrumb sponge	Halichondria panicea	BCS	261 482
Easthall assidian		DIV	190 229
			109.230
Horriwraek	Flustra joliacea	FAF	182.900
common starrish	Asterias Tuberis	318	182.831
sponges	Polijera	PFZ	130.393
Dead-men's fingers	Aicyonium digitatum	DMF	114.561
Shell	Broken snell	BSL	101.912
Kelp	Laminaria spp	LMX	99.618
Curled octopus	Eledone cirrhosa	EDC	/3.132
Purple heart urchin	Spatangus purpureus	SPG	70.847
Starfish	Luidia sarsi	LUS	65.491
Seven-armed starfish	Luidia ciliaris	LDC	62.412
Elephant ear sponge	Pachymatisma johnstonia	PMJ	61.002
Parchment worm tubes	Chaetopterus tubes	CVT	60.984
Black brittlestar	Ophiocomina nigra	OPN	53.006
Sponge	Raspailia spp	RAS	38.864
Hydroids	Hydroida (order)	HYD	35.177
Sea squirts	Ascidiacea	SSX	34.360
Antenna hydroid	Nemertesia antennina	NEA	33.655
Sea urchin	Echinus acutus	URA	29.481
Wracks	Fucus spp	FUX	29.083
Bryozoan	Pentapora foliacea	PET	28.720
Sea anemone	Actinauge richardi	ACR	27.692
Sponge	Polymastiidae	PMX	24.000
Sea mouse	Aphrodite aculeata	AAC	23.291
Hermit in adamsia	Eupagurus / pagurus in adamsia	HIA	22.197
Sand star	Astropecten irregularis	API	21.282
Sea slug	Tritonia hombergi	TNH	18.712
Whelk eggs	Whelk eaas	WES	18.284
Bryozoan	Cellariidae	CEL	15.829
Goosebump sponge	Dvsidea fragilis	DYS	15 278
Brown seaweeds (nei)	Dhaennhureae	S/W/R	12 50/
Common sunstar	Crossaster nannsus	СТР	10 985
Bed cushion star	Porania nulvillus	PPV	10.383
	Motridium conilo	DMA	0.600
Piumose anemone	Mollusca biveluia	PIVIA	9.099
Divalves	Stickestrolle resea	BIV	8.554
KOSY Stariish		SLR	8.104
Hydroid		NER	7.991
North Atlantic cup sponge	Axinella infundibuliformis	AXI	6.700
Ked dead man's finger	Aicyonium giomeratum	AYG	5./73
Scorpion spider crab	Inachus dorsettensis	IND	5.567
Goose-foot star	Anseropoda placenta	PLM	5.068
Gannet	Morus bassanus	GAN	5.025
Green sea urchin	Psammechinus miliaris	PMM	4.982
Stalk ascidian	Styela clava	SAA	4.819
Golfball sponge	Tethya aurantia	TAA	4.644
Opisthobranch	Scaphander lignarius	SDL	4.582



Common Name	Scientific Name	Cefas code	Catch weight (kg)
Sponge crab	Dromia personata	DRP	4.545
Serpent star	Ophiura ophiura	OHT	4.489
Sickle hydroid	Hydrallmania falcata	НҮН	4.405
Hermit in whelk	Eupagurus / pagurus in buccinum	HIW	4.291
Swimming crab	Liocarcinus depurator	LMD	4.061
Swimming crab	Macropipus tuberculatus	MPT	3.312
Sea lemon	Archidoris pseudoargus	ADP	3.265
Bloody Henry starfish	Henricia oculata	HEO	3.116
Gaping fileclam	Limaria hians	LIM	2.977
Slender-leg spider crab	Inachus leptochirus	INL	2.862
Squid eggs	Squid eggs	SQS	2.659
Gibb's sea spider	Pisa armata	PAA	2.605
Red seaweeds (nei)	Rhodophyceae	SWR	2.587
Slender spider crab	Macropodia tenuirostris	MCT	2.544
Variegated scallop	Chlamys varia	CHV	2.421
Circular crab	Atelycyclus rotundatus	ALR	2.409
Sponge	Suberites spp.	SUB	2.217
Hairy sea-squirt	Ascidiella scabra	ASS	2.035
Common swimming crab	Polybius (liocarcinus) holsatus	LMH	1.982
Atlantic mud shrimp	Solenocera membranacea	SOA	1.842
Sea cucumber	Cucumariidae	CMX	1.755
Dahlia anemone	Urticina (tealia) felina	DHA	1.728
Cotton spinner	Holothuria forskali	СОТ	1.727
Green seaweeds	Chlorophyceae	CHZ	1.646
Norway cockle	Laevicardium crassum	LCC	1.625
Xanthidae	Xanthid crab	XAN	1.576
Curly weed	Alcyonidium diaphanum	ALG	1.553
Common whelk	Buccinum undatum	WHE	1.439
Sea cucumber	Parastichopus tremulus	STT	1.357
Opisthobranch indet	Opisthobranchia	OPI	1.312
Squat lobster	Munida rugosa	MNR	1.309
Sea potato	Echinocardium spp	ECV	1.262
Bladder wrack	Fucus vesiculosus	WRB	1.222
Opisthobranch	Philine aperta	PHP	1.112
Dog cockle	Glycymeris glycymeris	GLG	1.091
Bristle worm	Hyalinoecia tubicola	HYT	1.052
Great spider crab	Hyas araneus	HYA	1.029
Deeplet sea anemone	Bolocera tuediae	BCT	0.979
Scaleworm	Laetmonice (hermione) histrix	НМН	0.963
Star ascidian	Botryllus schlosseri	BIS	0.948
Contracted crab	Hyas coarctatus	HYC	0.924
Feather star	Antedon bifida	ADB	0.922
Brown shrimp	Crangon allmanni	CGA	0.916
Ascidian	Molgulidae	MGX	0.880
Stout bobtail squid	Rossia macrosoma	ROM	0.693
Sea slug	Pleurobranchus membranaceus	PBM	0.665
Hermit anemone	Calliactis parasitica	CAR	0.601
Bobtail squid	Sepiolidae	SPY	0.588
Bushy-backed sea slug	Dendronotus frondosus	DDF	0.528
Sugar kelp	Laminaria saccharina	LMS	0.527
Peacock worm	Sabellidae	PWX	0.490
Ascidian	Ascidia virginea	ASV	0.473
Hermit in suberites	Eupagurus / pagurus in suberites	HIS	0.466
Angular crab	Goneplax rhomboides	GOR	0.454
Fan mussel	Atrina fragilis	AFR	0.404
Common prawn	Palaemon serratus	CPR	0.378



Common Name	Scientific Name	Cefas code	Catch weight (kg)
Leachs spider crab	Inachus phalangium	INP	0.366
Star ascidian	Botrylloides leachi	BOT	0.336
Masked crab	Corystes cassivelaunus	CCV	0.335
Spiny shrimp	Pontophilus spinosus	PPS	0.322
Processa shrimp	Processidae	PCY	0.320
Pheasant tail hydroid	Lytocarpia myriophyllum	HYL	0.312
Spider crab	Macropodia linaresi	MCL	0.285
Sea slugs	Nudibranchia	NBX	0.272
Red starfish	Echinaster sepositus	ECS	0.260
Pink seafan	Eunicella verrucosa	EUV	0.254
Anemone unidentified	Anemone unidentified	AMU	0.253
Dogfish egg case	Dogfish egg cases	DEG	0.237
Swimming crab	Bathynectes longipes	BAL	0.216
Nudibranch	Doris sticta	DOR	0.207
Polinices eggs	Euspira (polinices) eggs	NAE	0.200
Squat lobsters	Galathea spp.	GLX	0.199
Dwarf-swimming crab	Liocarcinus pusillus	LPU	0.195
Pink shrimp	Pandalus propinqvus	PDP	0.190
Icelandic cyprina	Arctica islandica	CLQ	0.183
Rough crab	Eurynome aspersa	EUA	0.180
Marbled swimming crab	Liocarcinus marmoreus	LMM	0.173
Hydroid	Tubularia spp	TUI	0.157
Pink shrimp	Pandalus montagui	PRM	0.139
Long clawed porcelain crab	Pisidia longgicornis	PIS	0.131
Pink shrimp	Scalpellum scalpellum	SCA	0.124
Lacy tubeworm	Filograna implexa	FII	0.104
Auger shell	Turritella communis	TUC	0.100
Red snapping shrimp	Alpheus glaber	ALP	0.097
Spiny cockie indet	Acantnocardia spp	ACY	0.092
Whip shrimp	Dichelopandalus bonnieri	PDB	0.088
Sponge	Haliciona oculata	HAU	0.078
Broad clawed burrowing shrimp	Alpheus macrocheles	ALM	0.068
Venus casina (ciam)		CIA	0.065
Nut crab	Ebalia spp.	EBA	0.065
Kaybala limpat	Ebalia tuberosa	EBI	0.061
Mud shrimp			0.056
Common(brown)shrimp	Crangon crangon		0.054
	Macronodia rostrata	MCB	0.054
Common basket shell	Corbula aibba	ССВ	0.053
Devonshire cun-coral	Carvonhullia smithii		0.032
Painted top shell	Calliostoma zizvohinum	PTS	0.044
American slipper limpet	Crenidula fornicata	ASI	0.040
Goose barnacles	Lenadidae	607	0.037
Hermit crabs	Paquridae	PAY	0.037
Serpent's table brittle star	Onhiura albida	OHA	0.036
Hermit crab in epizoanthus	Ananaaurus in enizoanthus	HIF	0.032
Nerklare shell	Eusnira (nalinices) catena	PNC	0.032
Hermit crah	Paaurus hernhardus	PFR	0.031
Flustra bryzoan	Chartella snn	CHA	0.029
Sea spider	Pvcnoaonum littorale	PGI	0.028
Ovster drill	Urosalpinx cinerea	UXC	0.026
Anemone	Paranhellia exnansa	PAF	0.022
Sand mason	Lanice conchileaa	LCF	0.019
Pandalid shrimps	Pandalidae (family)	PSH	0.018
Polvchaete worm	Glvcera tridactvla	GLC	0.016
,	2.,22.2.1.10000,10		



Common Name	Scientific Name	Cefas code	Catch weight (kg)
Nudibranch	Armina loveni	AAL	0.016
Bryozoan	Bugula spp	BUG	0.014
Little cuttlefish	Sepiola atlantica	SPA	0.013
Pink shrimp	Pandalina brevirostris	PDW	0.013
Horn tusk worm	Ditrupa arientina	DTA	0.009
Flat wrack	Fucus spiralis	WRE	0.008
Open simnia	Simnia patula	SIM	0.007
Isopod	Astacilla longicornis	ALC	0.007
Isopod	Idoteidae	IOZ	0.007
Bristle worms	Polychaeta	BWX	0.006
Friendly bladed shrimp	Spirontocaris lilljeborgii	SPL	0.006
Sea lettuce	Ulva lactuca	ULL	0.006
Pod razor shell	Ensis siliqua	ESS	0.005
Hermit crab	Anapagurus laevis	APL	0.005
Mantis shrimp	Rissoides (meiosquilla) desmaresti	MED	0.005
Oval venus	Timoclea ovata	VEO	0.004
Hornwrack	Securiflustra securifrons	FAS	0.004
Parthenopid crab	1. Distolambrus maltzami	DIM	0.004
Netted dogwhelk	Hinia (nassarius) reticulatua	NSR	0.003
Sea spider	Pycnogonida	PYG	0.003
Lancet	Branchiostoma (amphioxus) lanceolatum	LCT	0.003
Cirolana crabs	Cirolana spp	CIR	0.003
Toothed wrack	Fucus serratus	WRS	0.002
Chitons	Polyplacophora	PLX	0.002
Sulcate astarte	Astarte sulcata	AES	0.002
Nut shells	Nuculidae	NNX	0.001
Tiger scallop	Palliolum tigerinum	CYT	0.001
Tusk shells	Scaphopoda	SPZ	0.001



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

Common Name	Scientific Name	Sex	Western Channel	Celtic Sea
Red gurnard	Aspitrigla (Chelidonichthys) cuculus	F	176	61
Red gurnard	Aspitrigla (Chelidonichthys) cuculus	М	132	65
Red gurnard	Aspitrigla (Chelidonichthys) cuculus	U	37	0
Conger eel	Conger conger	F	1	0
Conger eel	Conger conger	U	57	10
Goldsinny	Ctenolabrus rupestris	F	24	0
Goldsinny	Ctenolabrus rupestris	М	19	0
Goldsinny	Ctenolabrus rupestris	U	6	0
Sting ray	Dasyatis pastinaca	F	1	0
Sting ray	Dasyatis pastinaca	М	1	0
European seabass	Dicentrarchus labrax	F	2	0
European seabass	Dicentrarchus labrax	М	3	0
Blue skate (Grey skate)	Dipturus batis	F	5	4
Blue skate (Grey skate)	Dipturus batis	М	4	6
Flapper skate	Dipturus intermedius	М	0	1
Grey Gurnard	Eutrigla gurnardus	F	103	76
Grey Gurnard	Eutrigla gurnardus	М	46	63
Grey Gurnard	Eutrigla gurnardus	U	41	10
Cod	Gadus morhua	F	2	0
Cod	Gadus morhua	М	0	4
Witch	Glyptocephalus cynoglossus	F	6	58
Witch	Glyptocephalus cynoglossus	М	0	40
Ballan wrasse	Labrus bergylta	F	10	0
Ballan wrasse	Labrus bergylta	М	4	0
Cuckoo wrasse	Labrus mixtus (l. bimaculatus)	F	14	0
Cuckoo wrasse	Labrus mixtus (l. bimaculatus)	М	7	0
4-spot megrim	Lepidorhombus boscii	F	0	4
4-spot megrim	Lepidorhombus boscii	М	0	4
Megrim	Lepidorhombus whiffiagonis	F	146	595
Megrim	Lepidorhombus whiffiagonis	М	29	316
Shagreen ray	Leucoraja fullonica	F	1	2
Shagreen ray	Leucoraja fullonica	М	0	1
Cuckoo Ray	Leucoraja naevus	F	61	20
Cuckoo Ray	Leucoraja naevus	М	54	29
Black bellied Anglerfish	Lophius budegassa	F	27	66
Black bellied Anglerfish	Lophius budegassa	М	31	61
Black bellied Anglerfish	Lophius budegassa	U	18	21
Anglerfish	Lophius piscatorius	F	106	27
Anglerfish	Lophius piscatorius	М	98	27
Anglerfish	Lophius piscatorius	U	6	1
Haddock	Melanogrammus aeglefinus	F	19	77
Haddock	Melanogrammus aeglefinus	М	9	70
Haddock	Melanogrammus aeglefinus	U	0	2
Whiting	Merlangius merlangus	F	85	32
Whiting	Merlangius merlangus	М	65	33
Whiting	Merlangius merlangus	U	1	0
Hake	Merluccius merluccius	F	15	37
Hake	Merluccius merluccius	М	16	53
Hake	Merluccius merluccius	U	6	26
Lemon Sole	Microstomus kitt	F	78	40
Lemon Sole	Microstomus kitt	М	55	39
Ling	Molva molva	F	0	1
Red Mullet	Mullus surmuletus	F	37	6
Red Mullet	Mullus surmuletus	M	33	5
Red Mullet	Mullus surmuletus	U	8	0





Common Name	Scientific Name	Sex	Western Channel	Celtic Sea
Starry Smooth-hound	Mustelus asterias	F	11	4
Starry Smooth-hound	Mustelus asterias	М	18	2
Plaice	Pleuronectes platessa	F	260	60
Plaice	Pleuronectes platessa	М	173	79
Blonde Ray	Raja brachyura	F	2	0
Blonde Ray	Raja brachyura	М	3	0
Thornback Ray	Raja clavata	F	45	1
Thornback Ray	Raja clavata	Μ	44	1
Small-eyed Ray	Raja microocellata	F	2	0
Spotted Ray	Raja montagui	F	23	5
Spotted Ray	Raja montagui	Μ	17	9
Undulate Ray	Raja undulata	F	20	0
Undulate Ray	Raja undulata	М	26	0
Turbot	Scophthalmus maximus (psetta maxima)	F	4	1
Brill	Scophthalmus rhombus	F	7	1
Brill	Scophthalmus rhombus	М	6	1
Nursehound	Scyliorhinus stellaris	М	7	0
Common cuttlefish	Sepia officinalis	U	416	65
Sole	Solea solea	F	204	23
Sole	Solea solea	М	168	21
Sole	Solea solea	U	1	0
Black Seabream	Spondyliosoma cantharus	F	52	0
Black Seabream	Spondyliosoma cantharus	Μ	43	0
Black Seabream	Spondyliosoma cantharus	U	22	0
Spurdog	Squalus acanthias	F	2	0
Spurdog	Squalus acanthias	М	1	0
Baillons wrasse	Symphodus (crenilabrus) balloni	F	15	0
Baillons wrasse	Symphodus (crenilabrus) balloni	Μ	12	0
Marbled Electric Ray	Torpedo marmorata	F	2	0
Marbled Electric Ray	Torpedo marmorata	М	13	1
Common electric ray	Torpedo nobiliana	М	0	1
Tub Gurnard	Trigla (Chelidonichthys) lucerna	F	54	3
Tub Gurnard	Trigla (Chelidonichthys) lucerna	Μ	34	2
Tub Gurnard	Trigla (Chelidonichthys) lucerna	U	1	0
Streaked Gurnard	Trigloporus (Chelidonichthys) lastoviza	F	41	0
Streaked Gurnard	Trigloporus (Chelidonichthys) lastoviza	Μ	41	0
Streaked Gurnard	Trigloporus (Chelidonichthys) lastoviza	U	14	0
John dory	Zeus faber	F	37	3
John dory	Zeus faber	Μ	14	5
John dory	Zeus faber	U	7	2

Figure 7 shows the positions of all 4m beam trawl fishing stations, with Figure 8 showing the survey track each day with the relevant tow validities of these 4m beam trawl deployments. Species composition pie charts for the entire survey are shown on Figure 9. The distribution of six major commercial species for the survey are shown in Figure 10 along with the length distributions of the same species, along with total catch numbers for the two different gears shown in Figure 11.

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 are from the 2020 survey (western Channel) and from the 2019 survey (Celtic Sea). This should also be viewed in the context of a change in the survey timing in the western Channel - March in 2021; June in 2020 and in the Celtic Sea, only 28 out of 50 locations were fished.

#### Target species observations

Sole:

In the western Channel, the largest catches of sole were observed south-west of Lands-End, in Mounts Bay, south-east of Start Point and in Lyme Bay. In addition, large catches were observed to the east of the Channel Islands, and in mid-Channel areas around the Hurd Deep. Smaller numbers of sole were caught around the Eddystone lighthouse and off the northern French coast. In the Celtic Sea, the largest catches were observed to the south-east of Republic of Ireland with smaller catches observed north of the Isles of Scilly. Areas of usual high catch numbers in stratum B-D were not fished on this survey.

In the western Channel, sole catch numbers (376) were similar to those observed in 2019 (374) when the western Channel survey was last conducted in March, but with less individuals caught in the smaller lengths (18-25cm inclusive), but more individuals caught in the length range of 26-28cm inclusive. Catch numbers were 11% less than those observed in 2020 survey (423) conducted in June but showed. The catch weight of sole (113.8kg) was just 1.7% higher than observed in 2019 (111.8kg) and 5.4% higher than that observed in the 2020 survey (108.0kg). In the Celtic Sea with only 28 stations completed and many of the tows where sole would have been caught not being fished, comparison of the catch weight and numbers was not possible.

#### Plaice:

In the western Channel, plaice was caught predominantly in Lyme Bay and around Start Point. As observed in previous years, few plaice were caught in French waters. In the Celtic Sea, the largest catches were observed to the south-east of Republic of Ireland.

In the western Channel, a total of 1314 plaice were caught, this being 86% higher than observed in March 2019 and 68% higher that observed in 2020 in June. The length distributions for these years showed that in 2021 more fish were caught in at the smaller length groups (18-28cm inclusive) but less in the larger sizes (31-39cm inclusive). This had the effect of reducing the L50 length from 26cm in both 2019/2020 to just 23cm in 2021. Catch weights of plaice in the western Channel were 199.5kg and were 11% less than observed in 2020 in June (222.3kg) and 11% higher than observed in the 2019 survey in March.

In the Celtic Sea only 28 out of 50 locations were completed in 2021, but the major stratum where plaice are routinely caught were fished. A total of 655 fish were caught in 2021 (28





stations) compared to 315 fish in 2019 (49 stations) with the additional fish mostly observed in the length range 19-23cm inclusive. Plaice catches in the Celtic Sea in 2021 (40.2kg) were 20% less than that observed in 2019 (50.3kg) from the reduced locations fished.

#### Monk: (Lophius piscatorius)

*Lophius piscatorius* were observed in greatest abundance in the western English Channel between the Isles of Scilly and Eddystone Rock, mid Channel to the west and north of the Hurd Deep and off the French coast south west of the Channel Islands. In the Celtic Sea, the greatest abundance was observed south-east of the Republic of Ireland.

In the western Channel, a total of 222 were caught, this being 32% less than observed in March 2019 with the largest differences observed in the smallest fish 16-30cm inclusive having an L50 length of ~30cm compared to 25cm in 2019. Catch numbers were also 13% lower that observed in 2020 in June but showed a similar L50 value. The catch weight in the western Channel was 201.5kg and was observed to be 8% greater than that seen in March 2019 (186.7kg) and was indicative of more of the larger specimens caught. The catch weight was observed to be 7% less than in June 2020.

In the Celtic Sea with the reduced number of locations completed in 2021, a total of 57 fish were caught in 2021 (28 stations) compared to 165 fish in 2019 (49 stations) with the additional fish in 2019 caught mostly in the stratum not fished in 2021 (stratum C, D & F). Catches in the Celtic Sea in 2021 (67.7kg) were 20% less than that observed in 2019 (158.1kg) from the reduced locations fished.

#### Anglerfish: (Lophius budegassa)

*Lophius budegassa* were observed in greatest abundance in the western English Channel around the Isles of Scilly. In the Celtic Sea, the greatest abundance was observed south of the Republic of Ireland as far south as 49° north close to the Canyons MCZ and due south of the Isles of Scilly in stratum H.

In the western Channel, a total of 87 were caught, this being 107% greater than observed in March 2019 (42 fish) with the largest differences observed in the smallest fish 11-23cm inclusive and having an L50 length of ~17cm compared to 25cm in 2019. Catch numbers were also 102% higher than that observed in 2020 in June where the L50 value was observed to be ~28cm. The catch weight in the western Channel was 34.0kg and was observed to be 64% greater than that seen in March 2019 (20.7kg) and was observed to be 65% greater than in June 2020.

In the Celtic Sea with the reduced number of locations completed in 2021, a total of 158 fish were caught in 2021 (28 stations) compared to 140 fish in 2019 (49 stations) equating to a 13% increase in numbers despite the reduced numbers of locations fished. The catch weight in the Celtic Sea in 2021 (102.9kg) were 7% greater than that observed in 2019 (96.1kg) from the reduced locations fished. These increases were almost entirely due to increased catches in the most westerly and southerly locations fished in stratum G, H K and N.





#### Lemon sole:

Lemon sole was caught predominantly off the Cornish and south Devon coast and around the Isles of Scilly, with smaller catches observed in the mid-Channel areas and in the French stratum. In the Celtic Sea, catches were mostly observed south-east of the Republic of Ireland and to the north of the Isles of Scilly.

Catch numbers in the western Channel were 170 in 2021 compared to 134 in March 2019 and 206 in June 2020, equating to an increase from 2019 of 27% and a decrease from 2020 of 17%. Compared to the 2019 survey, more fish were caught in the length range of 18-24cm inclusive but showing a similar L50 value of ~24cm in 2021 compared to ~26cm in 2019. In the Celtic Sea, catch numbers for the reduced stations were 83 compared to 124 observed in 2019, a 33% reduction with the reduction mostly being due to not fishing locations in stratum C and F which were quite productive in 2019.

Catch weights of lemon sole in the western Channel increased in 2021 (37.5kg) compared to March 2019 (34.4kg) but were less than that observed in June 2020 (52.0kg) equating to a 9% increase and a 28% reduction, respectively.

#### Common cuttlefish:

Common cuttlefish *Sepia officinalis* were caught predominantly in the deeper mid channel waters of the western Channel and off the French south-west of the Channel Islands. In the Celtic Sea, catches were mostly limited to an area north-west of Brest, France in stratum H.

Catch numbers in the western Channel were 517 in 2021 compared to 424 in March 2019 and 210 in June 2020, equating to an increase from 2019 of 22% and an increase from 2020 of 146%. In the Celtic Sea, catch numbers for the reduced stations were 184 compared to 138 observed in 2019, a 33% increase. Catch weights of common cuttlefish in the western Channel increased in 2021 (165.6kg) compared to March 2019 (109.4kg) and to June 2020 (30.8kg) equating to increases of 51% and 538% respectively.

#### Other species observations

#### Skates and rays:

Thornback ray *Raja clavata*, undulate ray *Raya undulata*, marbled electric ray *Torpedo marmorata*, shagreen ray *Leucoraja fullonica*, common electric ray, sting ray and flapper skate *Dipturus intermedius* all had increased catches compared to the 2019 survey.

The largest ray catch was thornback ray (106.3kg) which had an increase in catch weight compared to the 2019 survey (46.9kg) of 127% with a similar increase compared to the 2020 survey (41.2kg). In the western Channel, 89 were caught compared to just 41 in 2019 and 27 in 2020 but the additional fish caught in the length range of 48-65cm inclusive. A total catch of 88.3kg of undulate ray were caught in 2021 with 46 individuals observed. This is a 57% and





188% increase in catch weight and numbers from the 2019 survey (16 fish) with all specimens caught in the western Channel in both years. Catches of marbled electric ray, shagreen ray, common electric ray, sting ray and flapper skate all increased in 2021 but from low levels.

Cuckoo ray *Leucoraja naevus* (69.2kg), blue skate *Dipturus batis* (25.4kg) and spotted ray *Raja montagui* (25.0kg) all had decreases in catch weight compared to the 2019 survey with falls of 5%, 18% and 53% respectively. Only two small-eyed ray, *Raja microocellata* were caught on the 2021 survey but the areas in which they are most abundant were not fished (stratum B and C in the Celtic Sea).

#### Shark species:

All shark species catches decreased in 2021, with decreases in weight caught of greaterspotted dogfish (nursehound) *Scyliorhinus stellaris* of ~54%, lesser-spotted dogfish *Scyliorhinus canicular* of ~9% and starry smooth-hound *Mustelus asterias* of 60% compared with the last survey conducted in March 2019.

Lesser spotted dogfish remained the most prevalent species caught on the 2021 survey in terms of catch weight with 443.6kg and 1121 individuals caught in total. In the western Channel a total of 363.8kg and 887 individuals were caught compared to 321.4kg and 889 individuals in 2019 and 260.3kg and 559 individuals in 2020. The reduced numbers of stations fished in the Celtic Sea in 2021 led to only 78.7kg and 232 individuals caught with the productive stratum B, C and D not fished. The 2019 survey recorded a total of 164.0kg and 522 individuals caught.

Starry smooth-hound catches amounted to a total of 49.0kg and 35 individuals caught, with 38.8kg and 29 individuals caught in the western Channel. This was a 65% fall in catch numbers and a 64% fall in catch weight compared to the 2019 survey. However these numbers represented an increase on the 2020 survey conducted in June of 88% weight and 107% in number.

#### Flatfish:

Brill *Scophthalmus rhombus* catches in 2021 were almost identical to those observed in 2019 at ~22.7kg but was 5% less than observed on the June 2020 survey. Turbot, *Scophthalmus maximus* catches in 2021 were ~60% less than observed in 2019. There were zero catches in June 2020.

Megrim *Lepidorhombus whiffiagonis* catches in 2021 (170.7kg) were ~9% up on the 2019 survey (157.6kg) even with the Celtic Sea only partly fished. Catches in the Celtic Sea amounted to 141.7kg and 966 fish and equated to being 9% and 22% higher than observed in 2019, despite the reduced number of tows. Witch *Glyptocephalus cynoglossus* catches in 2021 were 12% larger than observed in 2019 with most caught in the Celtic Sea. There were zero catches in June 2020.





#### Roundfish:

Whiting-pout (Bib) *Trisopterus luscus* were the most prevalent roundfish species caught on the 2021 survey with 158.3kg and 632 specimens caught, a 16% and 17% reduction from the observations in the 2019 survey. However, catches in the western Channel increased from the June 2020 survey by 30% (weight) and by 23% (numbers). Haddock *Melanogrammus aeglefinus* 

Catches were 16% up on the 2019 survey with catch numbers down by 32%. The increase in catch weight is due to the increased catches in the Celtic Sea where despite the reduced area coverage, catch weight increased by 32%.

The catch weight of hake *Merluccius merluccius* (112.4kg) increased by ~50% but fell by 14% in terms of numbers (169) compared to the 2019 survey (75.1kg and 196 respectively). Catch numbers of cod *Gadus morhua* were small with just 13.5kg and 6 fish caught in 2021 equating to reductions of 18% and 70%. Whiting, *Merlangius merlangus* catches were down by 52%.

Blue whiting *Micromesistius poutassou* catch weight and number in 2021 were 70.1kg and 762 fish, respectively. These were both up compared to the 2019 survey where 56.0kg and 593 fish were caught. Only 5 European seabass were caught in 2021 compared with the 56 caught in 2019, but that year was unprecedented with zero caught in 2020 and just 1 caught in 2018 and 5 in 2017. No catches were observed in the western Channel in 2021 or 2019.

#### <u>Gurnards:</u>

The most prevalent gurnard species caught on the survey was red gurnard *Aspitrigla (chelidonichthys) cuculus* with a total catch of 116.2kg and 671 individuals caught. This was an increase from the 2019 survey in catch weight of 13% (102.83kg) and catch numbers of 5% (642 fish). Most of the catch was taken in the western Channel where the increases were 30% and 22% respectively. Grey Gurnard *Eutrigla (chelidonicthys) gurnardus* catches also increased from the 2019 survey with 41.5kg and 1117 fish equating to increases of 56% and 46% respectively. Streaked gurnard *Trigloporus (chelidonichthys) lastoviza* catches were also up compared to the 2019 survey with increases of 10% in weight and 5% in catch numbers. Tub gurnard *Trigla (chelidonichthys) lucerna* catches weight (13.4kg) was down slightly from the 2019 survey with a decrease of 6% but catch numbers (129 fish) increased by 93%. No specimens of long-finned gurnard *Chelidonichthys obscura* were caught on the 2021 survey.

#### Shellfish:

Greater spider crab *Maia squinado* were the most abundant shellfish species caught on the survey with 394.4kg and 1070 individuals. Catch weight increased by 15% in terms of weight (341.9kg) but were 8% down by number caught (1160 individuals). In both these survey years, catch weight and numbers were less than observed on the 2020 survey where the weight was 540.1kg and numbers caught were 1492 individuals for just the western Channel.

Queen scallop Aequipecten opercularis catches on this survey amounted to 133.3kg, much higher than observed in 2019 or 2020. A total of ~33500 individuals were caught in 2021





compared to ~25000 individuals in 2020 and ~21500 individuals in 2019 although in this year no size measurements were taken. All queen scallops were caught in the western Channel in all years. Catches of scallop *Pecten maximus* were 78.2kg compared to just 52.0kg in 2019 and 65.2kg in 2020. Catch numbers were 541 individuals in 2021 compared to 334 in 2019 and 477 in 2020 with over 90% being caught in the western Channel. Other shellfish species catches in 2021 were less than observed in 2019 with edible crab, *Cancer pagurus* (down 43%), European lobster *Homarus gammarus*; (down 47%), Norwegian lobster *Nephrops norvegicus* (down 10%). However catches of common spiny lobster, *Palinurus elephas* were up by 44%) but catches were still less than 10kg over the survey.

#### Other species of note:

Black sea-bream *Spondyliosoma cantharus* catch weight and numbers on this survey were 22.6kg and 150 fish in total and were down by 62% and 69% compared to the 20219 survey. These falls are almost entirely due to reduced catches in the western Channel and catches in the Celtic Sea are usually minimal with on 4 fish caught on the 2019 survey. Red mullet *Mullus surmuletus* catch weight and numbers on this survey were 18.0kg, up from 15.6kg in 2019 and just 2.4kg in 2020. Boarfish *Capros aper* catches were 45.5kg this year compared to 88.3kg in 2019 and 45.1kg in 2020.

A total of 120 species were caught on the survey in 2021, 6 less than observed in 2019 but 16 more than observed in 2020 when only the western Channel was fished. Species of note included two comber *Serranus cabrilla* caught on this survey time series for only the second time with 2 specimens also caught on the 2020 survey and only one other specimen being caught previously on any Cefas survey since 1985. One common electric ray was caught this year, being only the ninth specimen caught on this survey series since 2006. One pearlfish was caught this year with this being only the second such specimen caught on the survey series. Finally, five specimens of blue-mouth redfish were caught in stratum E in the Celtic Sea.

# 2) To recover the smart-buoy located at the West Gabbard which had moved off site due to weather and place a new smart-buoy as the correct designated location.

At the west Gabbard smart-buoy site in the outer Thames, the smart-buoy that had drifted off site due to inclement weather was successfully recovered and a replacement smart-buoy deployed in the correct location. This was later confirmed by colleagues at Cefas to be transmitting data. These operations were carried out on the morning of 7 March.





#### SECONDARY AIMS

3) Collect information on the distribution of macrobenthos; distribution and classification of anthropogenic debris; distribution of fish in relation to their environment.

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. In total, 193 species and benthic type were caught on the survey compared to 249 in 2019. On this survey, rocks were the largest component with a total of 3.672 tonnes caught compared to 3.144 tonnes in 2019. The most abundant benthic lifeform on this survey was the common brittle star *Ophiothrix fragilis* (Figure 4) with a total catch of 1.355 tonnes caught. This was also the most abundant benthic lifeform in 2019 where a total of 2.113 tonnes were caught.

Figure 4 Common brittle star Ophiothrix fragilis, most abundant benthic lifeform caught.



Of particular note was the capture of parthenopid crab *Distolambrus maltzami* (Figure 5) caught in the Celtic Sea at station N(1). This was significant as this was the first confirmed record of this species this far north in the Atlantic and the first capture recorded on any Cefas survey. Also of note was the capture of a tasselled nudibranch *Kaloplocamus ramosus* (Figure 5) caught at two locations in the Celtic Sea. This is also the first confirmed sighting of this species in UK waters.





**Figure 5** Parthenopid crab *Distolambrus maltzami,* caught at station N(1) and tasselled nudibranch *Kaloplocamus ramosus* caught at two locations in the Celtic Sea.



Details of marine litter by-catch caught at all fishing stations were recorded separately by gear and a summary is presented in Figure 6. 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. A total of 680 individual items of marine litter were caught and analysed on the survey. Most litter items caught were classified as plastic (73%, 495 items) and these were mostly made up of synthetic rope (~16%, 112 items), fishing line (19%, 131 items) and plastic sheet/bags (15%, 101 items).





#### Figure 6: Summary of marine litter by-catch on CEND 5/21

4) 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. At 27 sampling locations in the western Channel and 8 locations in the Celtic Sea, 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. In addition, a one location in the western Channel, a SAIV mini CTD and Niskin was deployed instead of the ESM2 logger due to the prevalent sea conditions.

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

The Ferrybox was running throughout the survey sending live data remotely back to Cefas.

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

A total of 5 cetacean sightings were recorded over the course of the survey with 4 of these being common dolphin *Delphinus delphis* and 1 being white-sided dolphin *Lagenorhynchus acutus*. Other observations were made but no recording of details taken due to the distance to the animals or for operational reasons. Details of these sightings were reported to the Sea Watch Foundation and to Marine Life organisations.





7) 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.

8) To tag and release specimens of Plaice, Pleuronectus platessa as part of a Cefas plaice tagging project. (S Roslyn - Cefas, Lowestoft)

No plaice tagging was possible on this survey.

9) To collect biological samples and information for Greater weever, Trachinus draco as part of a Cefas study on species growth and biology. (S Barnett – Cefas, Lowestoft).

No specimens were caught on the survey, so this aim was not achieved.

10) To carry out fieldwork testing of new motion-compensating marine balance(s) provided by Lorrimar Weighing Ltd with a view to purchasing replacements for the current POLS balances.

Over the first 10 days of the survey, weight comparisons were made between the new Lorrimar sea-going balance and the current POLS balances. In total 521 weight comparisons were made using the two types of balances and these showed an average difference in the weight observed of 0.9 grams or an average percentage difference of 0.0002%. All weights comparisons took place in good sea conditions. It would have been preferred to have carried out some comparisons in inclement sea conditions to see how the new balance performed but this was not possible. Unfortunately, after ~10 survey days further testing was not possible as the Lorrimar balance was taken out of marine mode in error, and it was not possible to re-enact this mode at sea. Feedback on the performance detailed the relative speed in obtaining a stable weight to record which appeared slower than the POLS balances and based on this feedback, Lorrimar have adapted the speed/reaction of the scales using the Kalman filtering within the firmware which we are informed gives excellent results in terms of speed, accuracy, and stability. Based on these tests, a recommendation was made to carry out subsequent purchases of these new Lorrimar balances for future use on fisheries surveys.

11) Collect samples of selected benthic invertebrate species for analysis of contaminants. (*K* Dean/A Turner – Cefas, Weymouth).

Bulk samples of representative benthic species were taken from 11 different predetermined 'grouped' stratum for contaminant analysis by colleagues at Cefas in Weymouth. In addition, specimens of indicator species queen scallop, sea mouse *Aphrodite aculeata*, common sunstar *Crossaster papposus* and curly weed *Alcyonidium diaphanum* were collected across the survey area again by the grouped stratum. Finally, a





single sample of a further 19 species were collected when caught on the survey. These samples were frozen and were collected by courier once the survey docked.

12) To collect genetic samples from anglerfish Lophius piscatorius, Black bellied anglerfish Lophius budegassa and European hake Merluccius merluccius in support of the GECKA project.

A total of 202 muscle samples of the three species were taken for the GECKA project (Genetic close-kin analysis) and were stored in vials pre-filled with RNALater. The samples collected by species were:

- Anglerfish Lophius *piscatorius* 71
- Black bellied anglerfish *Lophius budegassa* 63
- European hake *Merluccius merluccius* 68

#### **OPPORTUNISTIC AIMS:**

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

A total of 4 individual fish were deemed to be lively and of an appropriate size to tag with Peterson discs and release back into the sea. These individuals were:

Common Name	Scientific name	Number tagged/released
Starry smooth-hound	Mustelus asterias	8
Blue skate (Grey skate)	Dipturus batis	3
Undulate Ray	Raja undulata	2
Blonde Ray	Raja brachyura	1
	Total	14

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

One length-weight measurement of a shagreen ray was collected. In addition, a total of 36 samples of fish and benthic specimens were kept for subsequent identification confirmation back at Cefas Lowestoft.





These comprised:

Common name	Scientific name	Number of samples
Various parasites	-	11
Spotted dragonet	Callionymus maculatus	10
Reticulated dragonet	Callionymus reticulatus	3
Flying squid	Todarodes saggittatus	2
Starry smooth-hound	Mustelus asterias	1
Northern rockling	Ciliata septentrionalis	1
Blue-mouth redfish	Helicolenus dactylopterus	1
Nudibranch species	-	1
Pearlfish	Echiodon drummondi	1
Flapper skate	Dipturus intermedius	1
European Squid	Loligo vulgaris	1
Crab species	-	1
Immaculate sandeel	Hyperoplus immaculatus	1
Lesser flying squid	Todaropsis eblanae	1
	Total	36

15) 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.

16) 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 west Gabbard at the beginning of the survey at the same time as the smart buoy recovery and deployment operation.

17) Collect surface underway chlorophyll samples for SLA25 (N Greenwood – Cefas Lowestoft)

A total of 20 chlorophyll samples were collected and were frozen in the -80°c freezer for analysis in Lowestoft. All samples were taken between the hours of 11am and 1pm.

18) Queen scallop Aequipecten opercularis collection.

Three bags of whole queen scallops were collected for Andy Lawler/Sam Stott to aid experimental ageing work being conducted at Cefas Lowestoft.





#### 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. I must commend the crew for their skill in recovering the lost beam trawl. Additionally, my thanks also go to the shore based AWSM staff who ensured that the equipment needed for the survey all arrived 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. Special thanks to all on-board for maintaining the Covid-19 safe working practices throughout the survey.

lan Holmes Scientist in Charge 4 May 2021

#### 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 and Republic of Ireland)
G Burt (Data Steward)	Marine Management Organisation (MMO)
T Bailey	AW Ship Management
Southern IFCA	Master/First Officer (Cefas Endeavour)
Devon and Severn IFCA	BODC
Isles of Scilly IFCA	
Cornwall IFCA	





Figure 7: Chart of survey station numbers for CEND 5/21 (4m beam trawl stations only).







**Figure 8**: Survey track showing 4 m beam trawl stations and deployment validity codes (V = valid, I = Invalid) by day.







**Figure 9**: Species composition pie plots for CEND 5/21. 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 10**: Distribution and total numbers of major commercial species by station (see Table 2, for species codes).







**Figure 11**: Length distributions (mm) for the major commercial species with total catch numbers by the two different gear types.













### Appendix 1: Station Log information

			Long		Long		Depth	Depth	Tide	Tide	Wind	Wind	Sea	Swell	Swell		
Station	Date/Time	Lat Shot	Shot	Lat Haul	Haul	Distance	Shot	Haul	dir.	speed	dir.	speed	Height	dir.	hgt.	Barom	Gear
1	07/03/2021 07:06	51.9632	2.1298	51.9632	2.1298	0	41	41	27	1.3		0.5				1040	Nutrients or SVP
1	07/03/2021 07:06	51.9632	2.1298	51.9632	2.1298	0	41	41	27	1.3		0.5				1040	Ring nets
2	07/03/2021 08:02	51.9538	2.1107	51.9538	2.1107	0	41	41	27	1.3		0.5				1040	Nutrients or SVP
3	07/03/2021 08:27	51.9615	2.1153	51.9615	2.1153	0	42	42	27	1.3	0	0.5			10	1040	Nutrients or SVP
4	07/03/2021 12:32	51.6497	2.1525	51.6497	2.1525		41	41	229	0.7	0	0.5			7	1040	Nutrients or SVP
5	07/03/2021 16:15	51.2852	1.7712	51.2852	1.7712	0	42	42	195	0.3	350	0.5			6	1036	ESM2 and Niskin
6	07/03/2021 16:36	51.2850	1.7710	51.2745	1.7653	0.6	42	42	195	0.3	350	0.5			6	1036	4m Beam
7	08/03/2021 08:38	50.4335	-2.4290	50.4335	-2.4290	0	47	47	269	1.4	10	0.5			8	1037	ESM2 and Niskin
8	08/03/2021 09:08	50.4343	-2.4038	50.4387	-2.3522	2	47	50	269	1.4	10	0.5			8	1037	4m Beam
9	08/03/2021 12:38	50.6483	-2.7952	50.6495	-2.8477	2	28	30	63	0.1	260	0.5			4	1036.5	4m Beam
9	08/03/2021 12:38	50.6483	-2.7952	50.6495	-2.8477	2	28	30	63	0.1	260	0.5			4	1036.5	Caesium and Tritium
10	08/03/2021 14:02	50.5802	-2.9555	50.5592	-2.9960	2	33	35	63	0.4	260	0.5			8	1036	4m Beam
11	08/03/2021 14:51	50.5467	-3.0013	50.5467	-3.0013		35	35	69	0.5	260	0.5			9	1036	Nutrients or SVP
12	08/03/2021 15:35	50.4738	-2.9657	50.4552	-3.0083	2	49	51	74	0.5	260	0.5			8	1035	4m Beam
13	16/03/2021 07:13	50.2488	-2.5643	50.2488	-2.5643	0	62	62	51	0.6	300	0.5			13	1040.5	ESM2 and Niskin
14	16/03/2021 07:49	50.2512	-2.5535	50.2447	-2.6045	2	62	64	51	0.6	300	0.5			13	1040.5	4m Beam
15	16/03/2021 09:38	50.2645	-2.7698	50.2470	-2.8137	2	61	61	79	1.9	280	0.5			15	1041.5	4m Beam
16	16/03/2021 11:27	50.3142	-2.9887	50.3137	-3.0405	1.9	56	57	87	1.6	286	0.5	240	0.5	1	1041	4m Beam
16	16/03/2021 11:27	50.3142	-2.9887	50.3137	-3.0405	1.9	56	57	87	1.6	286	0.5	240	0.5	1	1041	Caesium and Tritium
17	16/03/2021 13:23	50.2003	-3.2200	50.2102	-3.1712	2	61	60	195	0.3	340	0.5	240	0.5	12	1042.5	4m Beam
18	16/03/2021 14:16	50.2030	-3.1647	50.2030	-3.1647	0	60	60	251	1.3	340	0.5	240	0.5	9	1043	Nutrients or SVP
19	16/03/2021 15:27	50.1278	-3.3525	50.1330	-3.3010	2	64	64	259	2.2	350	0.5	240	0.5	15	1042	4m Beam
20	16/03/2021 17:24	50.0373	-3.5748	50.0408	-3.5230	2	70	68	263	1.5	330	1	330	0.5	20	1043	4m Beam
20	16/03/2021 17:24	50.0373	-3.5748	50.0408	-3.5230	2	70	68	263	1.5	330	1	330	0.5	20	1043	Caesium and Tritium
21	16/03/2021 18:46	50.0162	-3.3348	50.0125	-3.2833	2	72	72	273	0.7	330	0.5	330	0.5	11	1044	4m Beam
22	16/03/2021 20:21	50.0907	-3.1237	50.0828	-3.1740	2	70	71	70	1.2	330	0.5	330	0.5	15	1043	4m Beam
23	16/03/2021 21:49	50.1162	-3.1957	50.1162	-3.1957	0	70	70	79	1.8	350	0.5	330	0.5	16	1043	ESM2 and Niskin
24	17/03/2021 05:34	49.9967	-2.9498	49.9967	-2.9498	0	69	69	229	1	340	0.5	330	0.5	7	1048	ESM2 and Niskin
25	17/03/2021 06:01	49.9953	-2.9560	49.9862	-3.0057	2	69	70	267	0.8	340	0.5	330	0.5	10	1047.5	4m Beam
26	17/03/2021 07:02	49.9890	-3.0040	49.9590	-3.0272	2	71	71	35	0.4	10	0.5	330	0.5	7	1047.5	4m Beam
27	17/03/2021 09:18	49.7798	-2.9487	49.7583	-2.9883	2	77	73	46	1.2	350	0.5	300	0.5	8	1047	4m Beam
28	17/03/2021 11:02	49.8037	-3.1230	49.7823	-3.1625	2	65	71	50	1.1	0	0.5	300	0.5	8	1047.5	4m Beam
28	17/03/2021 11:02	49.8037	-3.1230	49.7823	-3.1625	2	65	71	50	1.1	0	0.5	300	0.5	8	1047.5	Caesium and Tritium
29	17/03/2021 12:57	49.8382	-2.8840	49.8470	-2.8345	1.9	70	71	216	0.1	300	0.5	300	0.5	9	1048	4m Beam
30	17/03/2021 16:42	49.6970	-3.6105	49.6852	-3.6587	2.1	75	77	256	0.6	300	0.5	300	0.5	14	1046	4m Beam
31	17/03/2021 19:00	49.8553	-3.9710	49.8415	-4.0180	2	78	78	78	1	300	0.5	300	0.5	18	1045	4m Beam



			Long		Long		Depth	Depth	Tide	Tide	Wind	Wind	Sea	Swell	Swell		
Station Dat	ate/Time	Lat Shot	Shot	Lat Haul	Haul	Distance	Shot	Haul	dir.	speed	dir.	speed	Height	dir.	hgt.	Barom	Gear
32 17/0	7/03/2021 20:31	49.7203	-4.0047	49.7077	-4.0522	1.9	82	81	80	1	330	0.5	300	0.5	17	1045	4m Beam
33 17/0	7/03/2021 22:06	49.7030	-4.1320	49.7030	-4.1320	0	82	82	63	0.4	20	1	300	0.5	16	1045.5	ESM2 and Niskin
34 18/0	8/03/2021 05:34	49.5620	-3.6055	49.5620	-3.6055	0	77	77	99	0.2	15	0.5	300	0.5	8	1045	ESM2 and Niskin
35 18/0	8/03/2021 05:52	49.5595	-3.6205	49.5575	-3.6717	2	80	81	99	0.2	15	0.5	300	0.5	8	1045	4m Beam
36 18/0	8/03/2021 07:34	49.4062	-3.7987	49.4062	-3.7987	0	90	90	84	1.4	0				10	1045.5	Caesium and Tritium
37 18/0	8/03/2021 08:33	49.3258	-3.8463	49.3197	-3.8962	2	91	91	81	1.4	0				10	1044.5	4m Beam
38 18/0	8/03/2021 10:55	49.1970	-4.1208	49.1995	-4.0700	2	91	90	272	0.3	0				10	1044.5	4m Beam
39 18/0	8/03/2021 12:20	49.2637	-4.0980	49.2858	-4.0595	2	90	88	262	0.9	0	0.2	270	0.5	12	1044.5	4m Beam
40 18/0	8/03/2021 15:02	49.3748	-4.5567	49.3918	-4.5125	2	94	93	249	1.2	340	0.5	300	0.5	3.7	1043	4m Beam
41 18/0	8/03/2021 16:29	49.3750	-4.5642	49.3898	-4.5183	2	95	95	256	0.8	340	0.5	280	0.5	19	1042	4m Beam
42 18/0	8/03/2021 18:21	49.4955	-4.5475	49.4803	-4.5932	2	88	89	45	0.5	0	1	0	0.5	20	1040	4m Beam
42 18/0	8/03/2021 18:21	49.4955	-4.5475	49.4803	-4.5932	2	88	89	45	0.5	0	1	0	0.5	20	1040	Caesium and Tritium
43 18/0	8/03/2021 21:36	49.6617	-5.1125	49.6447	-5.1568	2	85	87	77	0.9	0	0.5			18	1039.5	4m Beam
43 18/0	8/03/2021 21:36	49.6617	-5.1125	49.6447	-5.1568	2	85	87	77	0.9	0	0.5			18	1039.5	Caesium and Tritium
44 18/0	8/03/2021 23:23	49.6018	-5.2652	49.6018	-5.2652	0	88	88	113	0.4	10	1			23	1039	ESM2 and Niskin
45 19/0	9/03/2021 05:36	49.2098	-4.9792	49.2098	-4.9792	0	98	98	263	0.4	0	1	0	1	17	1037	ESM2 and Niskin
46 19/0	9/03/2021 06:01	49.1990	-4.9997	49.1775	-5.0385	1.9	98	100	31	0.3	0	1	0	1	20	1037	4m Beam
47 19/0	9/03/2021 07:49	49.0123	-5.0912	49.0023	-5.1392	2	103	103	63	1.2	10	1	0	1	20	1037	4m Beam
48 19/0	9/03/2021 08:55	48.9930	-5.1273	48.9688	-5.1620	2	103	103	66	1.1	30	1	0	1	15	1038	4m Beam
49 19/0	9/03/2021 11:45	49.0850	-5.4967	49.1168	-5.4817	2.1	105	103	94	0.5	30	1	0	1	22	1039	4m Beam
50 19/0	9/03/2021 13:05	49.1938	-5.5180	49.2172	-5.4800	2.1	102	100	231	0.6	60	1	0	1	17	1040	4m Beam
51 19/0	9/03/2021 16:35	48.9585	-5.9592	48.9368	-5.9975	2	115	117	316	0.4	60	1	0	1	15	1042	4m Beam
52 19/0	9/03/2021 18:33	48.9052	-6.3247	48.8945	-6.3727	2	121	123	22	0.7	60	0.5	0	0.5	12	1042	4m Beam
53 19/0	9/03/2021 19:49	48.9445	-6.4258	48.9278	-6.4697	2	123	124	58	1.2	80	0.5	0	0.5	13	1042.5	4m Beam
54 19/0	9/03/2021 21:13	48.9307	-6.4295	48.9307	-6.4295	0	123	123	65	1.1	80	0.5	0	1	15	1104.5	ESM2 and Niskin
55 20/0	0/03/2021 05:37	49.1097	-6.2893	49.1097	-6.2893	0	115	115	38	0.5	30	0.5	30	0.5	6	1045	ESM2 and Niskin
56 20/0	0/03/2021 05:58	49.1073	-6.3092	49.0962	-6.3570	2	115	117	68	0.7	30	0.5	30	0.5	5	1045	4m Beam
57 20/0	0/03/2021 08:42	49.3343	-6.7345	49.3465	-6.7820	2	116	115	112	0.5			260	1		1045.5	4m Beam
58 20/0	0/03/2021 11:52	49.6485	-6.5767	49.6718	-6.5395	2.1	101	99	225	0.7		0.2	80	0.5		1046	4m Beam
59 20/0	0/03/2021 13:57	49.8517	-6.6208	49.8838	-6.6067	2	90	90	258	0.4		0.2	80	0.5		1046.5	4m Beam
59 20/0	0/03/2021 13:57	49.8517	-6.6208	49.8838	-6.6067	2	90	90	258	0.4		0.2	80	0.5		1046.5	Caesium and Tritium
60 20/0	0/03/2021 16:10	50.1332	-6.4667	50.1365	-6.4150	2	87	84	3	0.4	300	0.2	80	0.5	5	1046	4m Beam
61 20/0	0/03/2021 17:10	50.1120	-6.4202	50.0807	-6.4373	2	83	83	26	0.6	330	0.2			10	1046	4m Beam
62 20/0	0/03/2021 18:29	50.0483	-6.3892	50.0483	-6.3892	0	83	83	40	0.6	330	0.2	330	0.5	6	1046	ESM2 and Niskin
63 21/0	1/03/2021 05:59	50.0653	-5.4718	50.0653	-5.4718	0	30	30	323	0.2	0	0.2			10	1043	ESM2 and Niskin
64 21/0	1/03/2021 06:31	50.0652	-5.4912	50.0567	-5.5053	0.7	33	41	323	0.2	0	0.2			10	1043	4m Beam
65 21/0	1/03/2021 17:14	50.0030	-5.5107	50.0137	-5.4615	2	44	48	284	0.4	20	0.2			15	1041	4m Beam
66 21/0	1/03/2021 18:26	50.0460	-5.5498	50.0230	-5.5878	2	50	54	305	0.2	10	0.2			18	1041	4m Beam
67 21/0	1/03/2021 21:30	49.7405	-5.8473	49.7388	-5.8988	2	86	87	75	0.4	10	0.2	270	0.5	10	1041	4m Beam



			Long		Long		Depth	Depth	Tide	Tide	Wind	Wind	Sea	Swell	Swell		
Station	Date/Time	Lat Shot	Shot	Lat Haul	Haul	Distance	Shot	Haul	dir.	speed	dir.	speed	Height	dir.	hgt.	Barom	Gear
68	21/03/2021 22:43	49.7220	-5.9555	49.7220	-5.9555	0	89	89	89	0.4	10	0.2	270	0.5	13	1041	ESM2 and Niskin
69	22/03/2021 05:32	49.5735	-6.0177	49.5735	-6.0177	0	96	96	287	0.4	30	0.2	270	0.5	10	1040	ESM2 and Niskin
70	22/03/2021 05:52	49.5623	-6.0215	49.5295	-6.0312	2.1	98	100	322	0.3	30	0.2			6	1040	4m Beam
71	22/03/2021 08:36	49.8218	-6.2570	49.8032	-6.2997	2.1	85	88	42	0.5						1040	4m Beam
72	22/03/2021 11:08	49.8148	-5.8735	49.8357	-5.9145	2.1	83	81	127	0.4	160	0.2			5	1040.5	4m Beam
73	22/03/2021 13:05	49.9085	-5.7053	49.9405	-5.7202	2	72	67	147	1.1	170	0.2			6	1040	4m Beam
74	22/03/2021 14:04	49.9528	-5.7585	49.9862	-5.7637	2	65	62	165	0.8	160	0.2			4	1040	4m Beam
75	22/03/2021 17:59	50.0572	-5.0138	50.0842	-4.9837	2	56	55	201	0.3	190	0.2			6	1038.5	4m Beam
76	22/03/2021 19:37	50.0945	-4.7490	50.0942	-4.6972	2	66	66	5	0.1	190	0.2			9	1038.5	4m Beam
77	22/03/2021 21:04	50.1233	-4.6687	50.1233	-4.6687	0	64	64	12	0.6	200	0.2			4	1038.5	ESM2 and Niskin
78	23/03/2021 05:59	50.1747	-4.8843	50.1747	-4.8843	0	40	40	218	0.2	180	0.2			12	1035	ESM2 and Niskin
79	23/03/2021 06:51	50.1642	-4.7923	50.1713	-4.8347	1.7	57	50	230	0.1	180	0.2			12	1035	4m Beam
80	23/03/2021 08:16	50.2342	-4.7258	50.2115	-4.7643	2	41	47			180	0.2			14	1035	4m Beam
81	23/03/2021 09:54	50.1835	-4.5737	50.1838	-4.5217	1.9	58	58	52	0.1	200	0.7			17	1036	4m Beam
82	23/03/2021 10:50	50.1893	-4.4933	50.2227	-4.4942	2	57	54	86	0.2	200	0.7			15	1036	4m Beam
82	23/03/2021 10:50	50.1893	-4.4933	50.2227	-4.4942	2	57	54	86	0.2	200	0.7			15	1036	Caesium and Tritium
83	23/03/2021 12:15	50.1753	-4.3973	50.1727	-4.3890	0.4	59	59	41	0.3	200	1			20	1036	4m Beam
84	23/03/2021 13:33	50.2752	-4.3680	50.2793	-4.4200	2.1	47	45	39	0.2	190	1			13	1036	4m Beam
85	23/03/2021 15:21	50.2940	-4.1580	50.2858	-4.1075	2	36	36			200	0.5	190	0.5	14	1035	4m Beam
86	23/03/2021 16:55	50.1615	-4.2075	50.1893	-4.1785	2	57	54	215	0.3	200	0.5	200	0.5	13	1035	4m Beam
87	23/03/2021 18:40	50.0337	-4.2973	50.0038	-4.3203	2	69	69	220	0.2	200	0.7	190	0.5	18	1034.5	4m Beam
88	23/03/2021 20:37	50.0340	-4.2752	50.0340	-4.2752	0	67	67	239	0.1	200	0.5	190	0.5	14	1034.5	ESM2 and Niskin
89	24/03/2021 06:06	50.0788	-4.1423	50.0788	-4.1423	0	66	66	272	0.4	220	0.5			11	1033	ESM2 and Niskin
90	24/03/2021 06:18	50.0798	-4.1275	50.0800	-4.0755	1.9	66	66	272	0.4	220	0.5			11	1033	4m Beam
91	24/03/2021 07:28	50.0605	-3.9800	50.0613	-3.9275	2.1	67	65	276	0.6	220	0.5			12	1033	4m Beam
92	24/03/2021 10:35	50.2158	-3.5085	50.2493	-3.5080	2.1	56	53	284	0.6	200	0.5			12	1033.5	4m Beam
93	24/03/2021 12:11	50.3648	-3.4648	50.3975	-3.4543	2	41	28	240	0.1	210	0.5			9	1033	4m Beam
94	24/03/2021 13:30	50.4100	-3.3483	50.3783	-3.3647	2	40	46	22	0.3	230	0.5			10	1032.5	4m Beam
95	24/03/2021 14:53	50.3580	-3.2217	50.3280	-3.2437	1.9	49	50	32	0.4	220	0.5			8	1032.5	4m Beam
96	24/03/2021 16:33	50.3885	-3.1595	50.3772	-3.2082	2.1	48	47	72	0.7	220	0.5			9	1033	4m Beam
96	24/03/2021 16:33	50.3885	-3.1595	50.3772	-3.2082	2.1	48	47	72	0.7	220	0.5			9	1033	Caesium and Tritium
97	24/03/2021 17:44	50.3532	-3.2243	50.3532	-3.2243	0	49	49	72	0.7	220	0.5			8	1032	ESM2 and Niskin
98	25/03/2021 05:34	49.6992	-2.3932	49.6992	-2.3932	0	44	44	17	1.5	240	0.5	240	0.5	10	1035	ESM2 and Niskin
99	25/03/2021 05:47	49.6940	-2.3953	49.6697	-2.4043	1.4	44	52	17	1.5	240	0.5	240	0.5	14	1033	4m Beam
100	25/03/2021 07:02	49.6178	-2.5275	49.5855	-2.5400	2.1	60	56	16	0.5	240	0.5	240	0.5	15	1033.5	4m Beam
101	25/03/2021 09:52	49.4415	-2.0658	49.4597	-2.0530	1.2	25	23	217	2.5	240	0.5	240	0.5	18	1033.5	4m Beam
102	25/03/2021 15:12	49.4308	-2.2753	49.4000	-2.2948	2	54	57	20	1.1	160	0.2	250	0.5	9	1032	4m Beam
103	25/03/2021 16:28	49.3485	-2.3327	49.3295	-2.3745	2	61	60	54	1.3	190	0.2	250	0.7	10	1031.5	4m Beam
104	25/03/2021 20:42	49.1877	-2.6520	49.1787	-2.6023	2.1	59	56	284	1.5	200	0.5	250	0.5	21	1031	4m Beam



			Long		Long		Depth	Depth	Tide	Tide	Wind	Wind	Sea	Swell	Swell		
Station	Date/Time	Lat Shot	Shot	Lat Haul	Haul	Distance	Shot	Haul	dir.	speed	dir.	speed	Height	dir.	hgt.	Barom	Gear
105	25/03/2021 22:17	49.1613	-2.5182	49.1613	-2.5182	0	53	53	276	1.3	200	0.5	250	0.5	20	1031	ESM2 and Niskin
106	26/03/2021 05:29	49.0200	-1.8825	49.0200	-1.8825	0	23	23	351	0.8	200	0.5	250	0.5	20	1026.5	ESM2 and Niskin
107	26/03/2021 05:44	49.0140	-1.8767	48.9815	-1.8650	2	22	21	340	1	200	0.5	250	0.5	20	1027	4m Beam
108	26/03/2021 08:53	48.9513	-2.3528	48.9368	-2.3385	1	43	42	274	0.7	200	0.5	250	0.5	20	1026	4m Beam
109	26/03/2021 11:16	48.7555	-2.1790	48.7493	-2.1293	2	28	29	218	0.7	210	1.2	250	0.5	28	1026	4m Beam
110	26/03/2021 14:45	48.6375	-2.6240	48.6535	-2.6528	1.5	19	27	134	1.7	270	1	250	0.5	17	1027	4m Beam
111	26/03/2021 16:30	48.8093	-2.7453	48.8420	-2.7538	2.1	45	45	135	0.8	180	0.5	300	0.5	7	1027	4m Beam
112	26/03/2021 18:22	48.9993	-2.6238	48.9993	-2.6238	0	52	52	287	0.5	280	1.2	300	1.2	29	1028	ESM2 and Niskin
112	26/03/2021 18:22	48.9993	-2.6238	48.9993	-2.6238	0	52	52	287	0.5	280	1.2	300	1.2	29	1028	Nutrients or SVP
113	26/03/2021 18:46	49.0222	-2.6165	49.0233	-2.6170	0.1	54	54	287	0.5	280	1.2	300	1.2	29	1028	4m Beam
114	26/03/2021 19:27	49.0602	-2.6352	49.0537	-2.6113	1.1	55	55	301	2.1	270	1.2	300	1.2	28	1029	4m Beam
115	27/03/2021 00:36	49.3888	-3.0063	49.3960	-2.9565	2	69	70	306	1.1	270	2	300	2	30	1032	4m Beam
115	27/03/2021 00:36	49.3888	-3.0063	49.3960	-2.9565	2	69	70	306	1.1	270	2	300	2	30	1032	Caesium and Tritium
116	27/03/2021 04:21	49.1727	-3.0337	49.1673	-3.0842	2.1	73	73	84	2.1	270	2	290	2	25	1034	4m Beam
117	27/03/2021 06:57	48.9755	-3.1393	48.9550	-3.0985	2	69	58	291	0.8	280	1.5	270	2	25	1036	4m Beam
118	27/03/2021 08:07	48.9630	-3.1358	48.9630	-3.1358	0	61	61	291	0.8	290	1.5	280	2	18	1037.5	ESM2 and Niskin
119	27/03/2021 08:21	48.9608	-3.1468	48.9608	-3.1468	0	61	61	291	0.8	290	1.5	280	2	18	1037.5	ESM2 and Niskin
120	27/03/2021 09:49	49.0285	-3.3230	49.0258	-3.2725	2	72	71	272	2.3	280	1	280	2	12	1038	4m Beam
121	27/03/2021 12:40	49.0143	-3.5227	49.0153	-3.4720	2	77	77	349	0.4	260	1	280	2	14	1039	4m Beam
122	27/03/2021 19:11	49.0050	-3.5207	49.0038	-3.4947	1	81	81	249	0.7	230	1	280	2	15	1038	4m Beam
123	27/03/2021 22:51	48.8853	-4.2285	48.8932	-4.1792	2.1	91	91	257	1.5	220	1	280	1.2	20	1038	4m Beam
124	27/03/2021 23:53	48.8970	-4.1375	48.8970	-4.1475	0	89	89	258	1.1	220	1	280	1.2	20	1038	ESM2 and Niskin
125	28/03/2021 02:35	48.9340	-4.5940	48.9125	-4.6332	2	102	103	43	1.5	240	1	280	2	27	1037	4m Beam
126	28/03/2021 08:13	48.7507	-5.1922	48.7507	-5.1922	0	110	110	217	1	220	1	280	1.5	22	1038	Nutrients or SVP
127	28/03/2021 08:37	48.7558	-5.1777	48.7687	-5.1455	1.6	106	104	217	1	220	1	280	1.5	22	1038	4m Beam
128	28/03/2021 11:52	48.6823	-4.6642	48.6823	-4.6642	0	90	90	45	1.5	220	1	260	1.5	14	1039.5	ESM2 and Niskin
129	28/03/2021 12:15	48.6868	-4.6618	48.6868	-4.6618	0	90	90	45	1.5	220	1	260	1.5	14	1039.5	
129	28/03/2021 12:15	48.6868	-4.6618	48.6868	-4.6618	0	90	90	45	1.5	220	1	260	1.5	14	1039.5	Nutrients or SVP
130	28/03/2021 12:37	48.6762	-4.6500	48.6600	-4.6765	1.4	82	77	45	3.2	220	1	260	1.5	22	1039	4m Beam
131	29/03/2021 00:41	48.2710	-5.6235	48.2392	-5.6390	2	117	120	317	1.1	210	1	260	1.7	15	1039	4m Beam
132	29/03/2021 04:14	48.7483	-5.5123	48.7345	-5.5368	1.2	113	118	323	0.8	190	1	270	1.5	17	1039	4m Beam
133	29/03/2021 07:03	48.7002	-5.7667	48.7182	-5.8087	2	119	119	169	1.3	190	1	280	2	9	1038.5	4m Beam
134	29/03/2021 09:21	48.8067	-6.1135	48.8377	-6.0948	2	120	120	225	1.6		0.5	280	2		1038	4m Beam
135	29/03/2021 14:27	49.1010	-7.0547	49.0842	-7.0982	2	130	130	57	0.9	120	0.5	280	2	8	1038	4m Beam
136	29/03/2021 15:40	49.0810	-7.0688	49.0810	-7.0688	0	130	130	77	1.1	120	0.5	280	2	7	1037	ESM2 and Niskin
137	29/03/2021 17:40	48.8570	-7.0803	48.8705	-7.1267	2	144	142	62	0.7	120	0.5	280	2	9	1037	4m Beam
138	29/03/2021 23:43	48.0412	-6.9560	48.0412	-6.9560	0	164	164	242	1.4	110	0.5	280	0.5	10	1037	ESM2 and Niskin
139	30/03/2021 00:18	48.0375	-6.9650	48.0363	-6.9150	2	164	170	261	1.1	110	0.5	280	2	8	1036.5	4m Beam
140	30/03/2021 05:21	48.4245	-7.5752	48.4413	-7.6188	2	175	180	60	0.8	90	0.5	280	1	10	1034	4m Beam
141	30/03/2021 09:33	48.8587	-7.8843	48.8797	-7.8450	2	156	152	225	0.6	90	0.2	280	1.5	9	1034	4m Beam



			Long		Long		Depth	Depth	Tide	Tide	Wind	Wind	Sea	Swell	Swell		
Station	Date/Time	Lat Shot	Shot	Lat Haul	Haul	Distance	Shot	Haul	dir.	speed	dir.	speed	Height	dir.	hgt.	Barom	Gear
142	30/03/2021 15:46	48.6682	-8.9682	48.6682	-8.9682	0	169	169	31	0.7	350	0.2	280	1.5	11	1034.5	ESM2 and Niskin
143	30/03/2021 16:10	48.6620	-8.9752	48.6333	-9.0008	2	169	172	31	0.7	350	0.2	280	1.5	11	1034.5	4m Beam
144	30/03/2021 22:16	48.9498	-9.9328	48.9650	-9.8877	1.9	169	166	234	0.8	30	0.5	280	1.5	10	1034.5	4m Beam
145	31/03/2021 06:04	49.8855	-8.8855	49.8855	-8.8855	0	149	149	54	0.7	20	0.2	280	0.5	10	1032	ESM2 and Niskin
146	31/03/2021 06:26	49.8778	-8.9820	49.8572	-9.0227	2	148	147	54	0.7		0.2	280	1		1032	4m Beam
147	31/03/2021 08:45	49.9028	-8.7270	49.9362	-8.7270	2	140	131	181	0.7	60	0.2	280	1	9	1031.5	4m Beam
148	31/03/2021 12:49	50.3408	-9.0653	50.3408	-9.0653	0	131	131	266	0.7		0.2	290	1		1032	ESM2 and Niskin
148	31/03/2021 12:49	50.3408	-9.0653	50.3408	-9.0653	0	131	131	266	0.7		0.2	290	1		1032	Nutrients or SVP
149	31/03/2021 13:11	50.3428	-9.0487	50.3462	-8.9968	2	130	132	274	0.7		0.2	290	1		1032	4m Beam
150	31/03/2021 15:56	50.3657	-8.5165	50.3518	-8.5368	1.1	109	112	37	0.5	30	0.2	290	1	4	1031	4m Beam
151	31/03/2021 18:57	50.6063	-8.0675	50.5888	-8.1127	2	75	73	75	0.7	90	0.5	280	1	9	1029.5	4m Beam
152	31/03/2021 21:16	50.6210	-8.4708	50.6508	-8.4942	2	111	117	183	0.4	100	0.5	280	1	9	1030	4m Beam
153	01/04/2021 02:52	51.0542	-9.5057	51.0362	-9.4615	2	121	121	301	0.5	70	0.5	280	1	20	1031	4m Beam
154	01/04/2021 07:47	51.3563	-8.5905	51.3630	-8.5383	2	98	97	83	0.3	90	1	280	0.2	19	1031.5	4m Beam
155	01/04/2021 14:19	51.7040	-7.4638	51.7040	-7.4638	0	76	76	264	0.3	70	1	280	1	20	1035.5	ESM2 and Niskin
155	01/04/2021 14:19	51.7040	-7.4638	51.7040	-7.4638	0	76	76	264	0.3	70	1	280	1	20	1035.5	Nutrients or SVP
156	01/04/2021 14:34	51.7075	-7.4558	51.7202	-7.4243	1.4	76	74	264	0.3	70	1	280	1	20	1035.5	4m Beam
157	01/04/2021 18:02	51.9590	-6.8398	51.9553	-6.8023	1.4	64	66	275	0.9	70	1	280	0.5	22	1036	4m Beam
158	01/04/2021 20:27	51.7180	-6.5323	51.7013	-6.5588	1.4	75	74	38	0.7	0	1	280	0.5	9	1037	4m Beam
159	01/04/2021 22:00	51.5597	-6.5593	51.5292	-6.5813	1.9	81	81	26	0.9	40	0.5	280	0.5	12	1038	4m Beam
160	01/04/2021 23:04	51.5083	-6.5967	51.5083	-6.5967	0	82	82	26	0.9	50	0.5	280	0.5	15	1038	ESM2 and Niskin





	Priority	P Reference		Alternative priority
Stratum	number	number	Reason for not working	station worked
1	2	P16024	In Isles of Scilly no trawl area	Str 1; Stn 6
2	3	P20983	Fished and lost beam	Str 2; Stn 6
			Attempted but static gear and MPA area	
4	9	P24507	prevented valid tow	Str 4; Stn 11
			Attempted Static gear + damage. Timing wrong	
10	4	P28094	for daylight repeat	Str 10; Stn 10
10	10	P27672	Station Missed – daylight needed	-
			Poor ground, shallows + Jersey Govt whelk pot	
11	2	P27627	survey	Str 11; Stn 11
11	3	P28598	Alderney potting area	Str 11; Stn 8
11	5	P27735	Inshore, access poor	Str 11; Stn 9
			Cables, Static gear, and reduced	
11	8	P30111	manoeuvrability	Str 11; Stn 10
12	1	P22976	Ger damage and cables	-
12	2	P22728	Gear lost and damage	-
В	2	P21146	No time to complete	-
В	5	P17290	No time to complete	-
С	1	P20776	No time to complete	-
С	2	P21331	No time to complete	-
С	3	P27458	No time to complete	-
С	4	P24915	No time to complete	-
С	5	P25112	No time to complete	-
D	1	P17418	No time to complete	-
D	2	P17448	No time to complete	-
D	3	P17543	No time to complete	-
D	4	P17378	No time to complete	-
D	5	P17521	No time to complete	-
E	2	P12709	No time to complete	-
E	4	P12394	No time to complete	-
F	1	P16556	No time to complete	-
F	2	P12770	No time to complete	-
F	4	P17643	No time to complete	-
F	5	P15864	No time to complete	-
J	2	P22478	No time to complete	-
J	3	P18896	No time to complete	-
J	4	P19464	No time to complete	-
J	5	P22704	No time to complete	-
N	4	P4907	In Canyons MCZ	Str N; Stn 6

### Appendix 2: Survey priority stations not worked on CEND 5/21