

THE CENTRE FOR ENVIRONMENT, FISHERIES & AQUACULTURE SCIENCE,  
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**RESEARCH VESSEL SURVEY REPORT**

**RV CEFAS ENDEAVOUR**

**Survey: CEND 10/21**

**STAFF:**

<b>Name</b>	<b>Role</b>
Jo Smith	SIC
Linford Mann	2IC
Charlotte Jennings	Sampler
Mary Brown	Sampler
Scott Davis	Sampler
Chris Popham	Sampler
James Pettigrew	Sampler

**DURATION:** 2 – 15 July (14 days)

**LOCATION:** Eastern Channel (7d), Southern North Sea (4c)

**PRIMARY AIMS:**

1. To undertake a beam trawl survey in the southern North Sea and Eastern Channel as part of an ICES co-ordinated research programme.
2. To obtain fisheries independent data on the distribution and abundance of commercial flatfish species.
3. To collect biological data, including maturity and weight at age of commercial species, to satisfy the requirements of the EU data regulations.
4. To identify the epibenthos by-catch taken in the 4-metre beam trawl and to quantify 14 species as agreed at the Beam Trawl Working Group.

## **SECONDARY AIMS:**

5. To collect full depth, conductivity, temperature and depth profiles at each trawl station alongside surface and near-bottom water samples using a Niskin with ESM2 logger.
6. To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'.
7. To sample litter by-catch caught in the beam trawl at every station.
8. Collection of one plankton sample 500m from the West Gabbard Smart buoy (Sophie Pitois, Cefas Lowestoft).
9. The collection & preparation of water samples for chlorophyll determination (Naomi Greenwood, Cefas Lowestoft).

## **OPPORTUNISTIC AIMS:**

10. To tag and release specimens of various commercially exploited skates (*Rajidae*) and other selected elasmobranchs.
11. Collect specimens of selected species for ID purposes as well as length-weight measurements where still required.
12. To carry out full biological sampling on common cuttlefish (*Sepia officinalis*).
13. To provide video footage of a schedule 1 dispatch on a round fish for tagged tuna training (Sam Roslyn, Cefas Lowestoft).
14. Collect and freeze or sample (if time allows) queen scallops (*Aequipecten opercularis*) for length weight relationship analysis (Andy Lawler, Cefas Lowestoft).

## **NARRATIVE: (ALL TIMES ARE GMT)**

The scientific crew joined the vessel at Lowestoft on the morning of 29 June, proceeding with COVID-19 testing and cabin isolation. Sailing was delayed due to a scientist receiving an inconclusive result. Negative test results for all staff were received by the evening of 1 July, allowing the survey to continue with survey operations whilst following government guidelines. The vessel sailed from Lowestoft at 0600hr on the morning of 2 July, steaming to Prime 105 with deployment of the ESM2 logger with Niskin bottle, followed by a shakedown beam trawl tow (beam number 4), to fully test the gear deployment and the on-board fish sampling systems. All equipment worked as required so the survey continued with the days fishing completing prime stations 104, 103, 102 and 100. Prime 104 was invalid due to a problem with the warp but was successfully re-fished. An abandon ship drill was carried out at 1130hr.

On the morning of 3 July, work continued in the North Sea at prime station 99 followed by a further 6 fishing stations (98, 83, 82, 97, 96 & 119). Catches have been similar to previous years, with heavy sand, broken shell and mud stations where expected. A single twait shad (*Alosa fallax*) was caught at Prime 96 (Figure 4). The anadromous species (covered by conservation Appendix III of the Bern Convention, and Appendix II+V of the European Community Habitats Directive) is of special interest to the survey. Unfortunately, as the specimen perished in the net it could not be returned alive. Fishing continued in the North Sea (79) followed by further five stations in the English sector of the Eastern Channel (75, 80, 74, 73 & 64). A fire drill was carried out at 11:00 involving both crew and scientific staff.

The evening of 4 July CEND steamed to start work in the French sector to enable the survey to continue operations whilst high winds passed through the channel over a 24 hour period. On the morning of 5 July fishing began at prime 40, with a further 6 stations fished that day (39, 16, 17, 18, 19, and 20). The final station of the day (Prime 21) was invalid due to a ~4.5 tonne catch of sand, mud and clay, flipping the gear during hauling. The station was not repeated and abandoned. At Prime 16 a 54cm European sea bass (*Dicentrarchus labrax*) was caught and used for the Home Office Schedule 1 round fish dispatch training video (Aim 13). Fishing continued in the French sector, working in a westerly direction and successfully completing 7 stations (Primes 11, 1, 4, 6, 7, 9, and 8). Whilst high winds passed through the channel, planned activity and fishing operations was not affected. Due to historic catches of heavy sand and mud, Prime stations 11, 1, 4, 6, 7, and 9 were fished for 20 minutes.

On 7 July fishing continued mid channel, working in a north westerly direction and completing 5 stations (Primes 12, 10, 25, 26, and 22). After Prime 10, fishing activity returned to the English sector, completing primes 25, 26 and 22. Prime 26 was fished for 20 minutes due to history of large brittle star catches.

Fishing continued in the English sector working in an easterly direction, successfully completing 14 stations (Primes 49, 50, 51, 27, 52, 53, 55, 56, 57, 59, 58, 54, 67, and 94). A new tow was created for prime 50, south of the original tow due to a dredging area and new cable. Prime 27 was fished for 20 minutes due to a history of large catches of brittlestar, the catch resulted in an on the deck sort and a large monk (7 kilos). Due to a navigational passage plan error, Prime 54 was initially missed from the days plan. The error was rectified, and the station was fished, resulting in two benthic stations being completed in area 30E9 (Primes 57 and 54).

Prime 94 was invalid due to static gear on tow, it was re-fished successfully. Primes 61, 62, 60, 63, 66 and 65 were successfully fished in an area historically with a high distribution of static gear, however this year numbers were low which aided operations. A drill was carried out at 11:00hrs demonstrating emergency towing procedure and how to operate the engine room watertight doors.

On 12 July fishing resumed in the French sector completing 7 stations (Primes 29, 35, 36, 37, 38, 76). An new additional tow was conducted in an ICES area lacking data (29F0, 50°22'42"N, 00°58'79"E - 50°22'90"N, 01°00'12"E), resulting in a large catch of elasmobranchs, oyster, broken shell, and shingle. Prime 76 was invalid due to major gear damage, the net was replaced with the beam 1 and repairs were made between operations. Fishing continued the next morning with six stations fished (Primes 72, 71, 77, 70, 69 and 95), completing the French sector. Prime 68 was not fished due to too much static gear. There was a notable increase in the number of spider crabs (*Maja Squinado*) caught along this coast.

Morning of the 14 July CEND completed the final North Sea station (Prime 78), passage was then made to Belgium completing 5 additional stations (Primes 113, 114, 115, 116 and 118). The final day involved completion of the Gabbard plankton station and clean down/demob ready for docking into Lowestoft on 15 July at 12:00.

## **RESULTS:**

### **Primary aims.**

**Aim 1.** The survey gear was the standard 4m beam trawl number 4, with chain mat, flip-up ropes and a 40mm cod-end liner. Beam trawl number 1 was on-board as a spare and was used after beam 4 sustained gear damage at Prime 76.

A SAIV Micro CTD was attached to the headline on the trawl to allow the recording of temperature and salinity at each station. In addition, surface and bottom seawater samples and an ESM2 logger profile were taken twice daily.

A typical station consisted of deployment of the 4m beam trawl with mini CTD attached to the headline and deployed from the starboard winch. The beam was routinely towed for 30 minutes at a warp/depth ratio of 3.5:1 unless the ground was known to yield an unmanageable by-catch, in which case the warp and tow duration were shortened to 3:1 and 20 minutes respectively. If a strong tide was running, the warp/depth ratio was increased to 4:1 to ensure that the gear was settled on the seabed.

All fish and selected commercial shellfish were identified to species, weighed and measured with large catches of an individual species being sub-sampled. All catch details and sample data were entered directly into the Electronic Data Capture (EDC) system and uploaded directly into the Fishing Survey System (FSS). Station details were manually entered into the FSS using information collected from the Transas bridge logging system and bridge logbook.

A total number of 9 stations were reduced to 20-minute tows due to history of large by-catches or bad ground. Five tows were reduced to between 20 - 28 minutes and 3 abandoned due to either the presence of commercial static gear or bad ground. One tow was reduced to 22 minutes, and another moved south due to cables over the tow and 1 had to be re-fished due to bad ground 14 minutes into the tow (Table 1). Figure 1 shows the beam trawl station positions on the survey and Table 2 shows the number of gear deployments undertaken on the survey.

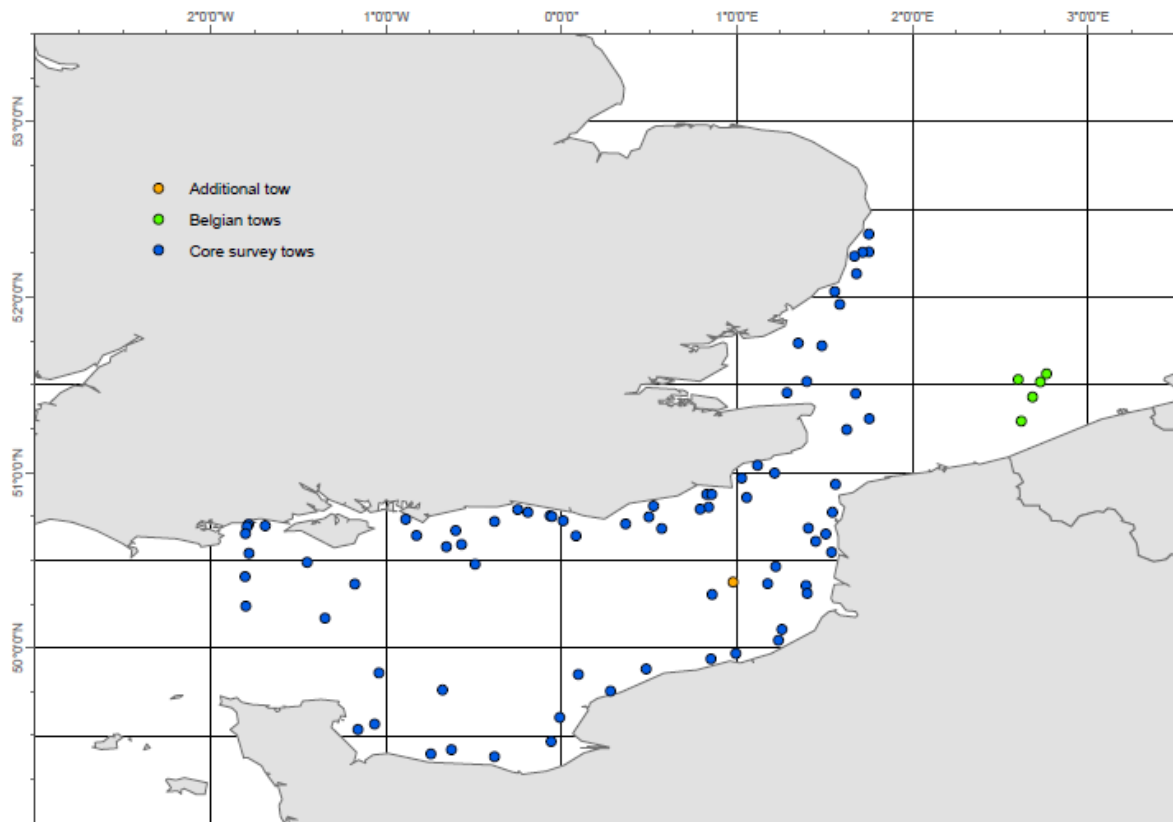
Table 1 Survey Prime stations not worked or reduced in tow duration

Prime Station Number	Sector	Reason for not working or reduction in tow time	Alternative tow or tow time
1	French	History of large catch	20 minutes
4	French	History of large catch	20 minutes
6	French	History of large catch	20 minutes
7	French	History of large catch	20 minutes
9	French	History of large catch	20 minutes
11	French	History of large catch	20 minutes
20	French	10 m spike on tow	28 minutes
21	French	Large catch, gear damage	DNF
26	English	History of large catch	20 minutes
27	English	History of large catch	20 minutes
38	English	Hauled early, bad ground	25 minutes
50	English	Cable and dredge area	Tow moved south
65	English	Hauled early, bad ground	14 minutes Re-fished
68	French	Static gear on tow	DNF
69	French	Static gear on tow	23 minutes
70	French	Static gear on tow	20 minutes
71	French	Hauled early, bad ground	22 minutes
76	French	Damage to beam	DNF
94	French	Static gear on tow	6 minutes Re-fished
95	French	History of large catch	20 minutes
100	North Sea	Cables on tow	22 minutes
104	North Sea	Warp issues	Refished

Table 2 The number of valid additional and invalid tows fished during the survey

Region	Valid 30 minutes	Valid Tows under 30 minutes	Additional tows	Invalid	Total tows (exc. Not fished)	Not Fished
7d (English)	32	2	0	1	35	0
7d (French)	15	12	1	3	31	3
4c (North Sea)	13	1	0	1	15	0
Total	60	15	6	5	86	3

Figure 1 Core & additional stations fished during 2021 survey



### Aims 2 & 3.

All otolithed fish were measured to the whole cm below, weighed individually, sexed and given a sexual maturity stage. Table 3 shows the numbers of otolith samples collected for the main commercial fish species. All non-commercial finfish by-catch were identified to species level, weighed and measured. In addition, the following shellfish and cephalopods were also weighed and measured whenever they were present in the catch, cuttlefish (*Sepia officinalis*), European common squid (*Alloteuthis subulate*), common squid (*Loligo vulgaris*), edible crab (*Cancer pagurus*), European lobster (*Homarus gammarus*), King scallop (*Pecten maximus*), European flat oyster (*Ostrea edulis*), velvet swimming crab (*Necora puber*), common spiny lobster (*Palinurus elephas*), greater spider crab (*Maja squinado*) and Queen scallop (*Aequipecten opercularis*). Curled octopus (*Eledone cirrhosa*) were weighed and counted.

The numbers of individual fish measured this year for the main commercial species can be seen in Table 4. The total catch weight and numbers of the main commercial species raised to the standard 30-minute tow (2014-2021) can be seen in Tables 5 and Table 6. In total, 202 different species were recorded. Table 7 shows the number of stations that each species was observed.

Table 3 Otoliths collected from the main commercial species by strata

Region	Brill	Cod	Dab	Flounder	Lemon sole	Plaice	Sole	Whiting	Turbot
7d English	7	0	17	4	14	602	82	6	5
7d French	14	0	52	15	19	662	144	16	26
North Sea	1	0	23	48	39	321	197	38	2
Total	22	0	92	67	72	1585	423	60	33

Table 4 Number of fish measured from the main commercial species by strata

Region	Brill	Cod	Dab	Flounder	Lemon sole	Plaice	Sole	Whiting	Turbot
7d English	5	0	274	13	16	3274	539	50	4
7d French	7	0	713	88	8	1747	788	138	13
North Sea	1	0	222	11	48	359	1103	855	1
Total	13	0	1209	112	72	5380	2430	1043	18

Table 5 Comparison of catch weight (kg) for the main commercial species over the last 8 surveys (2014-2021) (raised to 30-minute tows)

	2014	2015	2016	2017	2018	2019	2020	2021
Plaice	1238	1042	975	836	846	721	541	619
Sole	235	171	183	214	231	234	200	187
Dab	87	73	70	47	41	42	29	58
Lemon sole	38	24	18	14	11	14	13	7
Cuttlefish	48	35	101	103	60	111	95	79
Flounder	72	17	29	19	27	28	18	16
Whiting	30	89	24	52	27	44	51	112
Brill	10	14	10	11	13	10	8	5
Turbot	9	15	17	15	13	10	18	9
Bass	9	2	7	15	8	5	11	4
Cod	16	13	0	1	1	0	0	0

Table 6 Comparison of catch numbers for the main commercial species over the last 8 surveys (2014-2021) (raised to 30-minute tows)

	2014	2015	2016	2017	2018	2019	2020	2021
Plaice	7197	5635	5137	5364	5904	5546	4586	5379
Sole	2084	2229	1770	2805	2398	3342	2636	2430
Dab	1684	1183	954	917	720	989	641	1209
Lemon sole	258	171	119	162	124	170	113	72
Cuttlefish	214	91	526	500	279	495	475	527
Flounder	262	72	127	95	119	131	71	112
Whiting	388	1201	239	927	400	431	542	1042
Brill	31	32	20	24	24	21	24	13
Turbot	18	23	27	31	25	23	35	18
Bass	9	2	3	23	6	14	9	4
Cod	43	8	0	2	2	3	0	0

Table 7: List of species caught during the survey and number of stations at which they were recorded

<i>Abra spp</i>	1	<i>Acanthocardia aculeata</i>	1
<i>Acanthodoris pilosa</i>	1	<i>Aequipecten opercularis</i>	26
<i>Aequorea spp</i>	23	<i>Agonus cataphractus</i>	30
<i>Alcyonidium diaphanum</i>	63	<i>Alcyonium digitatum</i>	43
<i>Alloteuthis subulata</i>	41	<i>Ammodytes tobianus</i>	1
<i>Anseropoda placenta</i>	9	<i>Aphrodite aculeata</i>	33
<i>Archidoris pseudoargus</i>	10	<i>Arnoglossus laterna</i>	33
<i>Ascidia virginea</i>	2	<i>Ascidia</i>	35
<i>Asterias rubens</i>	62	<i>Atelecyclus rotundatus</i>	4
<i>Aurelia aurita</i>	5	<i>Blennius ocellaris</i>	5
<i>Botrylloides leachi</i>	1	<i>Botryllus schlosseri</i>	10
<i>Broken shell</i>	35	<i>Buccinum undatum</i>	30
<i>Buglossidium luteum</i>	36	<i>Callionymus lyra</i>	59
<i>Callionymus reticulatus</i>	3	<i>Cancer pagurus</i>	19
<i>Catshark (dogfish) eggcase</i>	13	<i>Cerastoderma (cardium) edule</i>	1
<i>Chelidonichthys (aspitrigla) cuculus</i>	29	<i>Chelidonichthys (trigla) lucerna</i>	31
<i>Chlamys varia</i>	14	<i>Chlorophyceae</i>	5
<i>Chrysaora hysoscella</i>	16	<i>Ciliata septentrionalis</i>	2
<i>Cliona celata</i>	3	<i>Clupea harengus</i>	1
<i>Conger conger</i>	9	<i>Corbula gibba</i>	1
<i>Crangon allmanni</i>	4	<i>Crangon crangon</i>	10
<i>Crepidula fornicata</i>	8	<i>Crossaster papposus</i>	15
<i>Ctenolabrus rupestris</i>	2	<i>Ctenophora</i>	7
<i>Cucumariidae indet</i>	6	<i>Cuttlefish eggs</i>	18



<i>Cyanea lamarckii</i>	18	<i>Dendronotus frondosus</i>	2
<i>Diazona violacea</i>	1	<i>Dicentrarchus labrax</i>	4
<i>Diplecogaster bimaculata</i>	1	<i>Donax vittatus</i>	1
<i>Dromia personata</i>	7	<i>Ebalia tuberosa</i>	1
<i>Echiichthys (trachinus) vipera</i>	32	<i>Echinocardium cordatum</i>	1
<i>Echinocardium spp</i>	7	<i>Eledone cirrhosa</i>	3
<i>Ensis siliqua</i>	1	<i>Epibenthic mix unidentified</i>	60
<i>Eupagurus / pagurus in buccinum</i>	17	<i>Eupagurus / pagurus in suberites</i>	2
<i>Eurynome aspera</i>	1	<i>Euspira (polinices) catena</i>	1
<i>Euspira pulchella</i>	3	<i>Eutrigla gurnardus</i>	11
<i>Filograna implexa</i>	5	<i>Flustra foliacea</i>	46
<i>Fucus spp other furoid algae</i>	33	<i>Fucus vesiculosus</i>	8
<i>Gaidropsarus vulgaris</i>	2	<i>Galathea spp</i>	2
<i>Galathea squamifera</i>	1	<i>Gari fervensis</i>	1
<i>Glycymeris glycymeris</i>	6	<i>Gobius gasteveni</i>	9
<i>Gobius niger</i>	3	<i>Gobius paganellus</i>	3
<i>Golfingiidae</i>	5	<i>Halichondria panicea</i>	3
<i>Haliclona oculata</i>	1	<i>Henricia oculata</i>	8
<i>Henricia spp</i>	2	<i>Hinia (nassarius) reticulatua</i>	8
<i>Hippocampus hippocampus</i>	5	<i>Homarus gammarus</i>	7
<i>Hyalinoecia tubicola</i>	1	<i>Hydrallmania falcata</i>	7
<i>Hydroida (order)</i>	53	<i>Hyperoplus lanceolatus</i>	10
<i>Inachus dorsettensis</i>	18	<i>Inachus leptochirus</i>	11
<i>Inachus spp</i>	3	<i>Labrus bergylta</i>	2
<i>Laetmonice (hermione) hystrix</i>	1	<i>Laevicardium crassum</i>	2
<i>Limanda limanda</i>	50	<i>Liocarcinus depurator</i>	11
<i>Liocarcinus marmoreus</i>	1	<i>Liocarcinus pusillus</i>	1
<i>Liparis montagui</i>	1	<i>Liparis spp</i>	1
<i>Lophius piscatorius</i>	4	<i>Lytocarpia myriophyllum</i>	22
<i>Macoma balthica</i>	1	<i>Macropodia tenuirostris</i>	21
<i>Maja squinado</i>	59	<i>Marthasterias glacialis</i>	1
<i>Merlangius merlangus</i>	26	<i>Metridium senile</i>	17
<i>Microchirus variegatus</i>	5	<i>Micromesistius poutassou</i>	6
<i>Microstomus kitt</i>	12	<i>Molgulidae (molgula spp)</i>	1
<i>Mollusca-bivalvia</i>	3	<i>Mullus surmuletus</i>	7
<i>Mustelus asterias</i>	20	<i>Myoxocephalus scorpius</i>	6
<i>Mytilus edulis</i>	10	<i>Necklace shell egg mass</i>	14
<i>Necora puber</i>	34	<i>Nemertesia antennina</i>	18
<i>Nemertesia ramosa</i>	9	<i>Nereis spp / nereidae</i>	1
<i>Nucula nitidosa</i>	1	<i>Nudibranchia</i>	1
<i>Ophiocomina nigra</i>	3	<i>Ophiothrix fragilis</i>	15
<i>Ophiura albida</i>	1	<i>Ophiura ophiura</i>	32
<i>Ostrea edulis</i>	4	<i>Paguridae</i>	5
<i>Pagurus prideaux in adamsia</i>	8	<i>Palaemon serratus</i>	3
<i>Pandalus montagui</i>	3	<i>Parablennius gattorugine</i>	1

<i>Pecten maximus</i>	11	<i>Pegusa (solea) lascaris</i>	14
<i>Pentapora foliacea</i>	15	<i>Phaeophyceae</i>	25
<i>Philine aperta</i>	13	<i>Pholis gunnellus</i>	2
<i>Phrynorhombus (zeugopterus) norvegicus</i>	1	<i>Pisa armata</i>	13
<i>Pisidia longicornis</i>	14	<i>Platichthys flesus</i>	14
<i>Pleuronectes platessa</i>	60	<i>Polybius (liocarcinus) holsatus</i>	37
<i>Polychaeta</i>	1	<i>Pomatoschistus minutus</i>	3
<i>Pomatoschistus spp</i>	4	<i>Porcellanidae</i>	1
<i>Porifera</i>	14	<i>Portumnus latipes</i>	1
<i>Psammechinus miliaris</i>	39	<i>Raja brachyura</i>	15
<i>Raja clavata</i>	56	<i>Raja microocellata</i>	4
<i>Raja montagui</i>	10	<i>Raja undulata</i>	9
<i>Raspailia spp</i>	18	<i>Rhodophyceae</i>	24
<i>Rissoides (meiosquilla) desmaresti</i>	2	<i>Rocks</i>	41
<i>Sabellaria spinulosa</i>	10	<i>Scaphopoda</i>	1
<i>Scophthalmus maximus (psetta maxima)</i>	11	<i>Scophthalmus rhombus</i>	8
<i>Scyliorhinus canicula</i>	54	<i>Scyliorhinus stellaris</i>	1
<i>Sepia officinalis</i>	52	<i>Sepiola atlantica</i>	11
<i>Skate eggcase</i>	3	<i>Solea solea</i>	61
<i>Spatangus purpureus</i>	2	<i>Spisula spp</i>	3
<i>Spondylisoma cantharus</i>	10	<i>Sprattus sprattus</i>	1
<i>Squid eggs</i>	2	<i>Styela clava</i>	24
<i>Suberites spp</i>	13	<i>Symphodus (crenilabrus) balloni</i>	3
<i>Syngnathus acus</i>	2	<i>Taurulus bubalis</i>	1
<i>Tethya aurantium</i>	12	<i>Trachinus draco</i>	6
<i>Trachurus trachurus</i>	2	<i>Trigloporus lastoviza</i>	14
<i>Trisopterus luscus</i>	27	<i>Trisopterus minutus</i>	20
<i>Tritonia hombergi</i>	8	<i>Tubes of parchment worm</i>	21
<i>Tubularia spp</i>	2	<i>Ulva lactuca</i>	21
<i>Whelk (buccinum) eggs</i>	18	<i>Urticina (tealia) felina</i>	16
<i>Zeugopterus (phrynorhombus) regius</i>	2	<i>Xanthidae</i>	13
<i>Zeus faber</i>	6	<i>Zeugopterus punctatus</i>	3

## Plaice

Overall catch weight (619kg) and catch number (5379 fish) of plaice was higher than in 2020 (541 kg; 4586 fish) (Tables 5 & 6). In the North Sea catch weights were higher (14%) and catch numbers were lower (-30%) than in 2020. In the French 7d sector catch weights and numbers were lower than previous years (-36%, -11%) However, catch weight (58%) and numbers (73%) were a lot higher in English 7d sector (Figure 11). Catch numbers and weights were higher than the average (5158 fish, 829kg) for the past 10 years (2012-2021). Recruited plaice ( $\geq 21\text{cm}$ ) distribution was similar to previous years, with high numbers seen off Hastings and Brighton (7d English sector). Dieppe and Boulogne (7d French sector) had a reduction in numbers compared to last year but there was an increase at the southern North Sea station (Prime 79). Pre-recruit plaice ( $< 21\text{cm}$ ) distribution and numbers were similar to previous years and were most abundant off Hastings (7d English sector) and Dieppe and Boulogne (7d French sector), but there was a decrease seen off Ramsgate.

## Sole

Catch numbers and weights of sole were lower this year with (2430 fish, 187kg) compared to 2020 (2636 fish, 200kg) (Table 5 & 6). Catch weight was lower but numbers higher than the average historic catch rate 2012-2021 (2252 fish, 196 kg). There was a decrease in sole catch numbers in French 7d and North Sea sector (-11%, -30%) and weights in French (-36 %) However, there was an increase in weights in the English and North Sea sector (58%, 14%) and numbers in English 7d (73%) compared to 2020. Recruited sole ( $\geq 21\text{cm}$ ) were most abundant between Folkestone and Hastings (7d English sector) and on the North Sea stations, with a noticeable decrease in distribution along the French coast (Figure 6). Pre-recruit sole ( $< 21\text{cm}$ ) were most abundant in the North Sea, with an increase in numbers especially at the Southern North Sea stations. There was also an increase compared to previous year in Dungeness (7d English sector). There was a decrease in catches off the French coast of Le Havre and between Dieppe to Calais (Figure 8).

## Other species

Catches of dab, whiting, cuttlefish, flounder were higher this year, however there was a decrease in the number of turbot, brill, bass and lemon sole caught compared to 2020 (Table 5 & 6). There was a significant decrease in the number of lemon sole in all sectors, catches were largest off Ramsgate (Figure 10). There was an increase in the number of dab in all sectors, catches were largest off Dieppe and Hastings (Figure 9). An unusual catch of a single twait shad (*Alosa fallax*) was caught at Prime 96 (Figure 4).

#### **Aim 4:**

At certain specified stations, a full benthic sort was carried out to identify the numbers and weights of species encountered. In addition, at all other stations, benthic observations were recorded by species or other taxonomic grouping. There were 14 sentinel species that if encountered at any time on any tow, were removed and quantified with ross coral (*Pentapora foliacea*); ross worm (*Sabellaria spinulosa*); sponge crab (*Dromia personate*) and mantis shrimp (*Meiosquilla desmaresti*) being encountered. All 12 full benthic stations in 7d and 3 in 4c were sampled successfully. However, benthic station 54 had to be replaced by prime 57 (navigational error) and benthic station 37 was replaced with prime 38 (large catch).

#### **Secondary aims**

#### **Aim 5**

Depth, salinity and temperature profiles were successfully taken at 86 trawl stations. In addition, surface and near-bottom water samples were taken using a Niskin with ESM2 logger at 27 locations.

#### **Aim 6**

Salinity, temperature, fluorometry and other environmental data was continuously logged using the 'Ferrybox'.

#### **Aim 7**

Litter by-catch was recorded in line with the protocol provided at every valid beam trawl station.

#### **Aim 8**

One sample, 500m from the West Gabbard Smart buoy (Sophie Pitois, Cefas Lowestoft) was collected.

#### **Aim 9**

Water samples (26 samples) were collected for chlorophyll determination (Naomi Greenwood, Cefas Lowestoft)

## **Opportunistic aims**

### **Aim 10**

Two undulate ray (*Raja undulata*) (Tag numbers E677501, E677503) were tagged with Peterson tags and released.

### **Aim 11**

Twelve specimens of selected species were collected for ID purposes to be identified at the lab.

### **Aim 12**

Full biological sampling was carried out on all common cuttlefish (*Sepia officinalis*).

### **Aim 13**

A single European sea bass (*Dicentrarchus labrax*) was caught at prime 16 and used for the Home Office Schedule 1 round fish dispatch training video. The video will be used to train and instruct Cefas staff and commercial fisherman to dispatch blue fin tuna for the CHART project.

### **Aim 14**

Samples of queen scallops (*Aequipecten opercularis*) were collected and frozen for length weight relationship analysis (Andy Lawler, Cefas Lowestoft).

## **ACKNOWLEDGEMENTS:**

As SIC of this survey I would like to offer my sincere thanks to the officers and crew of the Cefas Endeavour for their support and expertise throughout the course of the survey, without which it would not have been possible to achieve the survey aims. I would also like to thank everyone on board for creating a welcoming and happy atmosphere aboard the vessel and always being prepared to go the extra mile, especially in these challenging times.

J. Smith  
Scientist in Charge  
2/8/21

**INITIALED:** I D Holmes

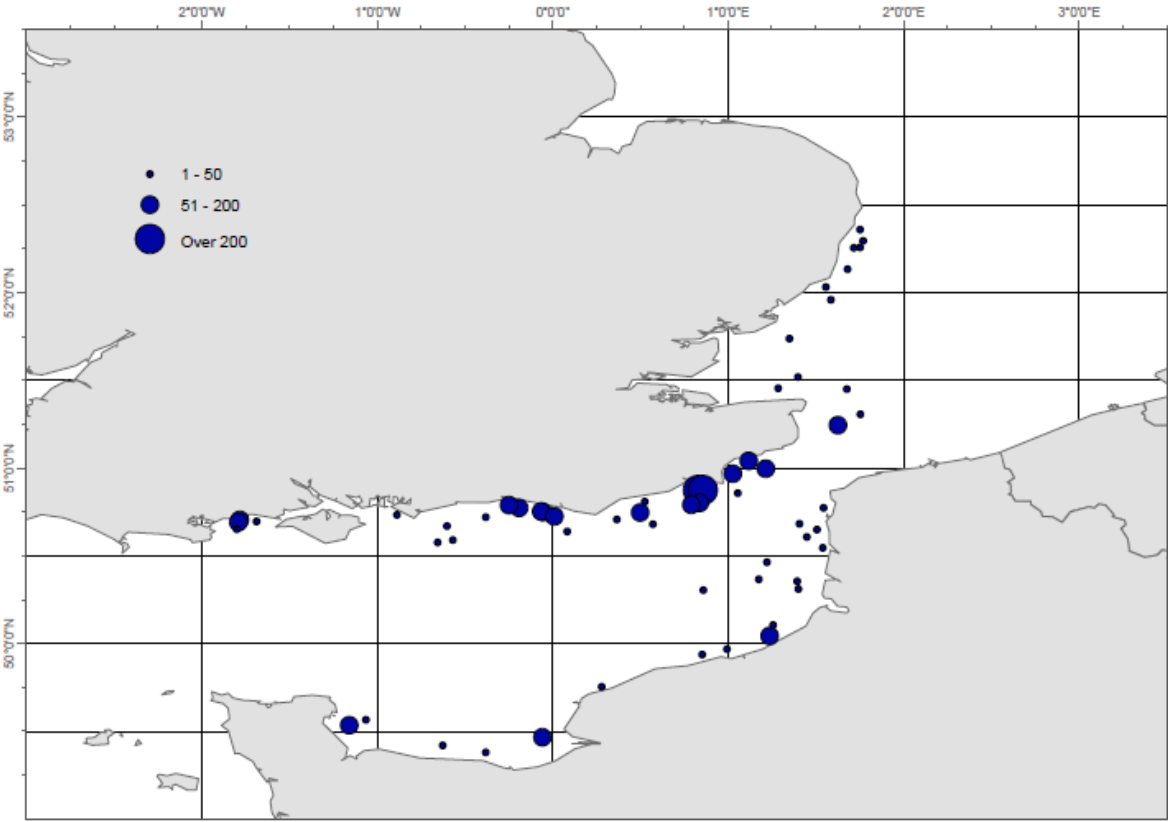
**DISTRIBUTION:**

Survey staff  
D Pettengell (PM)  
P Falconer (PL)  
S Kupschus  
Cefas Fisheries surveys SICs/2ICs  
Cefas CDP (Gary Burt)  
AWSM - Pinbush  
Fishing Skipper/Master Cefas Endeavour  
Els Torreele, Belgium  
Joel Vigneau, France  
FCO (For France and Belgium)  
Kent and Essex, Sussex, Southern and Eastern IFCAs

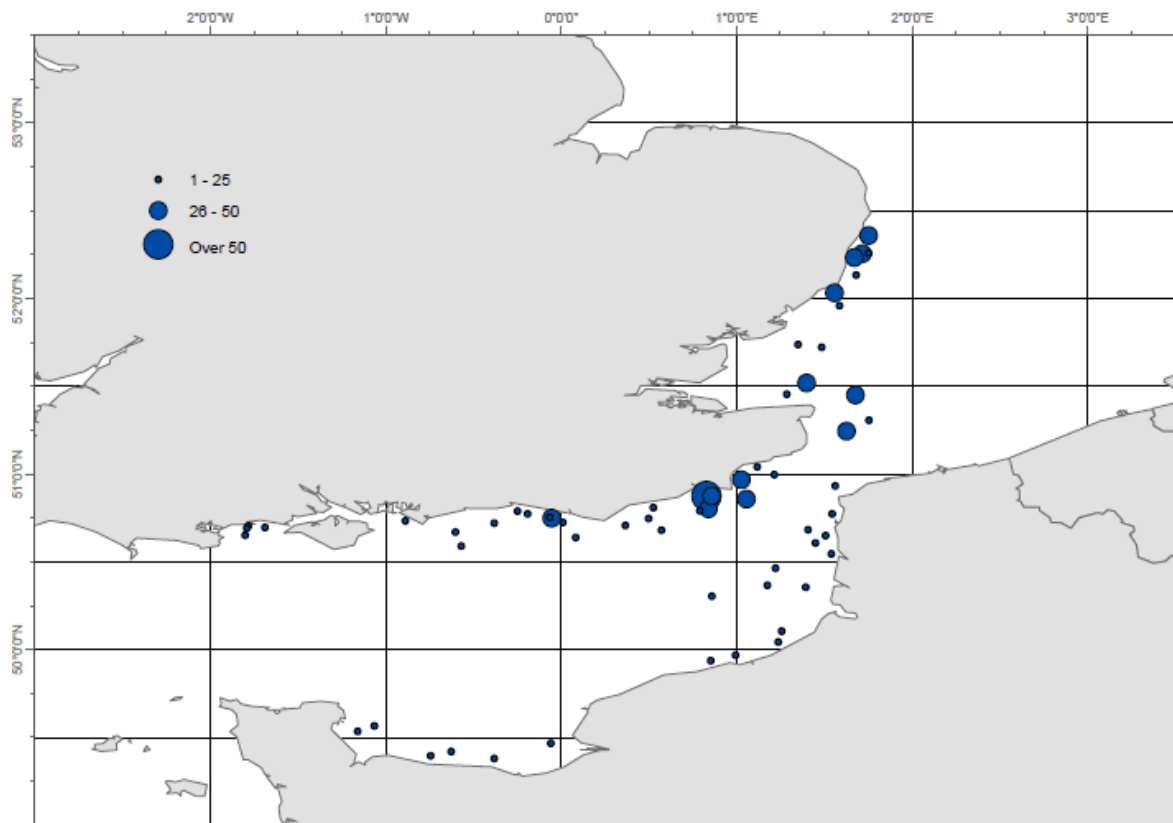
**Figure 4** Unusual catch of a single twait shad (*Alosa fallax*) was caught at Prime 96



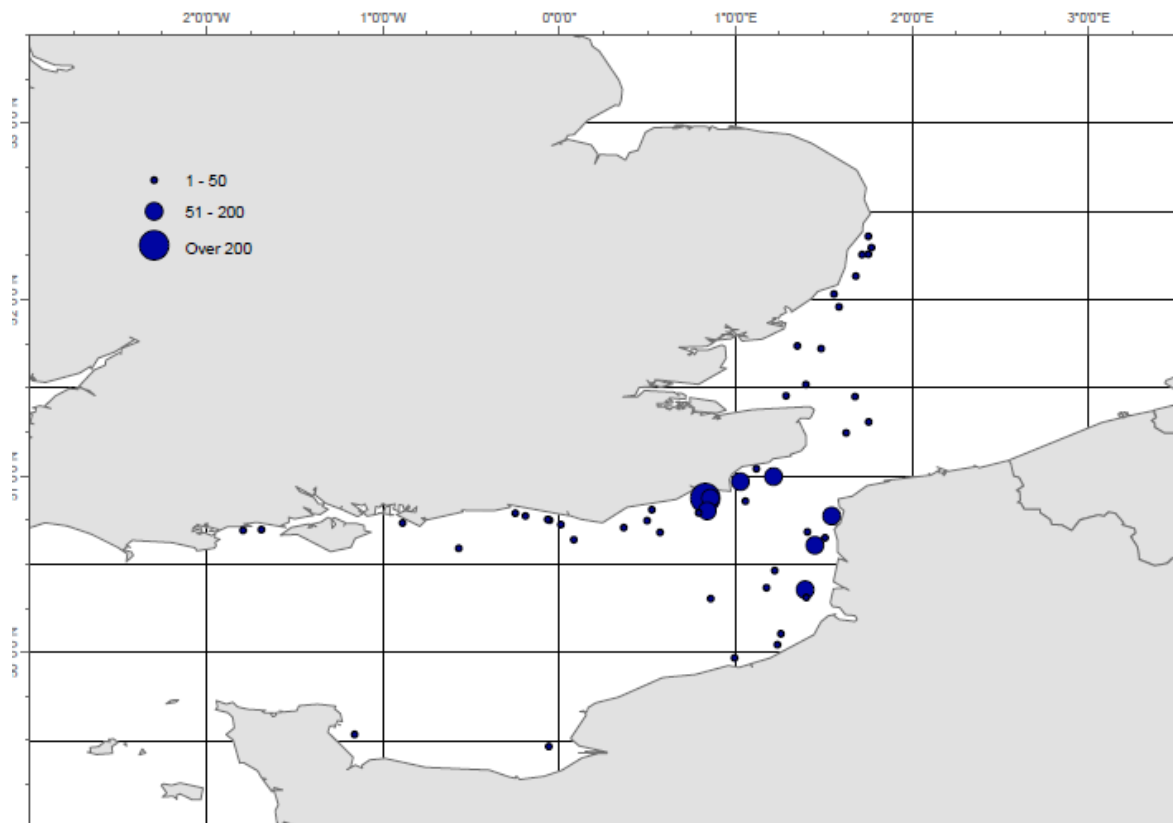
**Figure 5** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) plaice



**Figure 6** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) sole

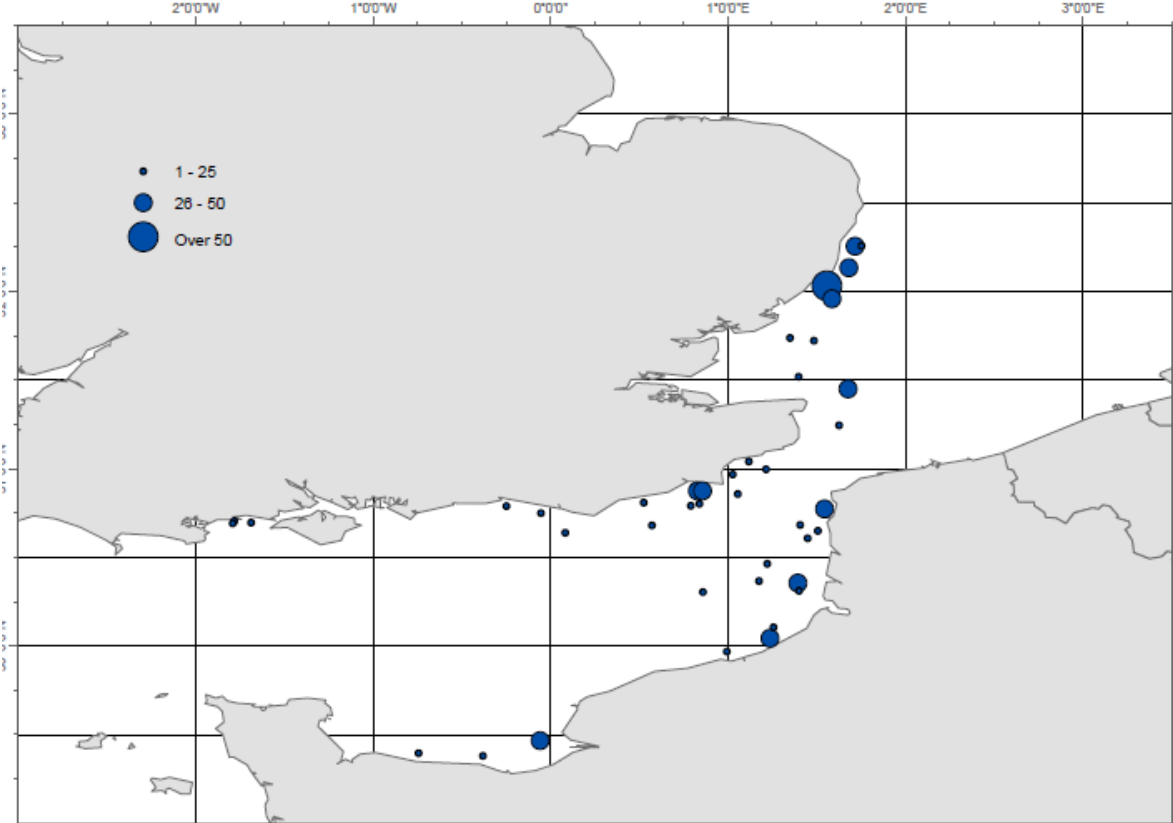


**Figure 7** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) plaice

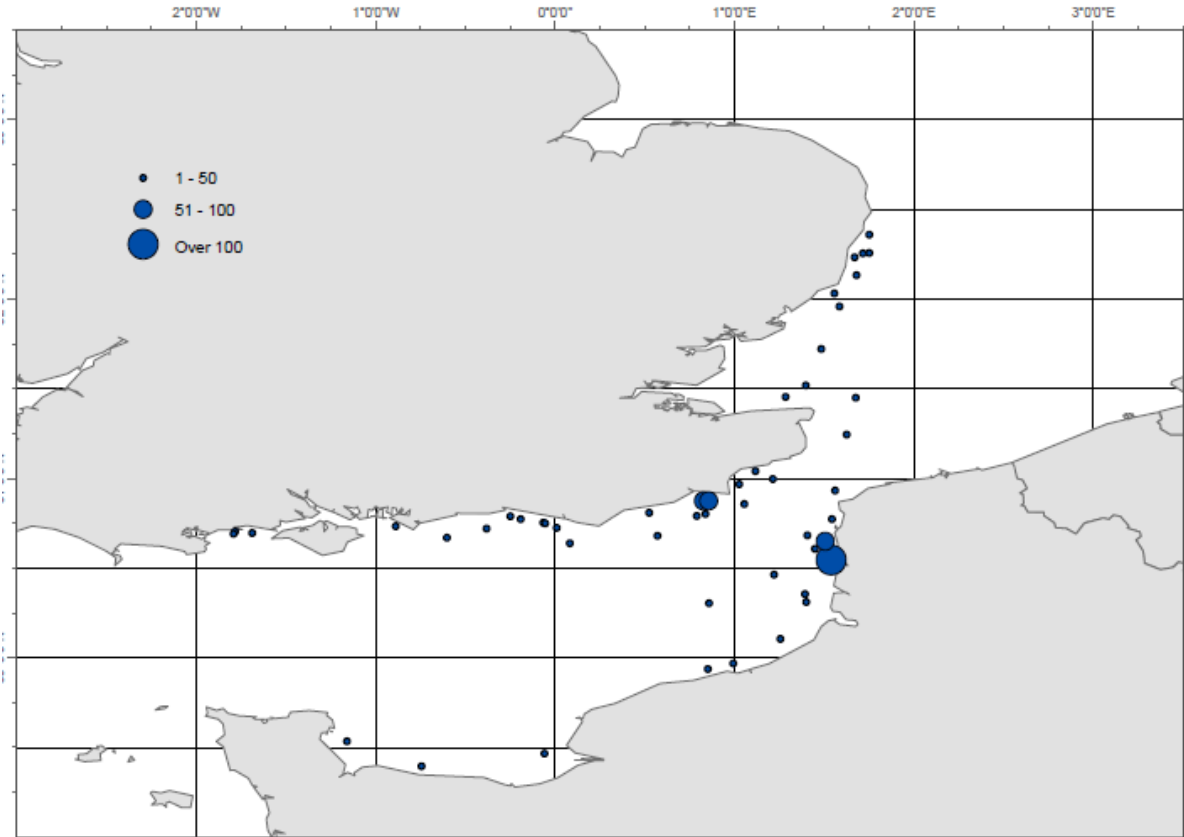




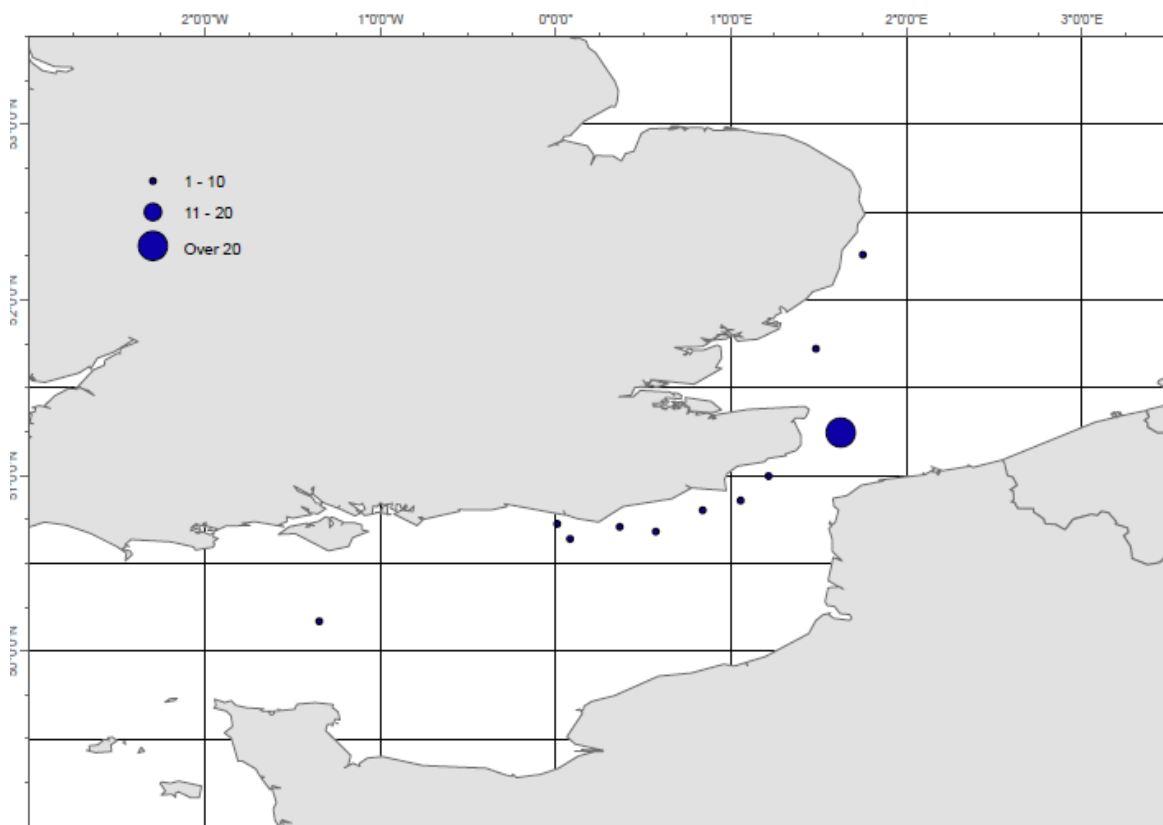
**Figure 8** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) sole



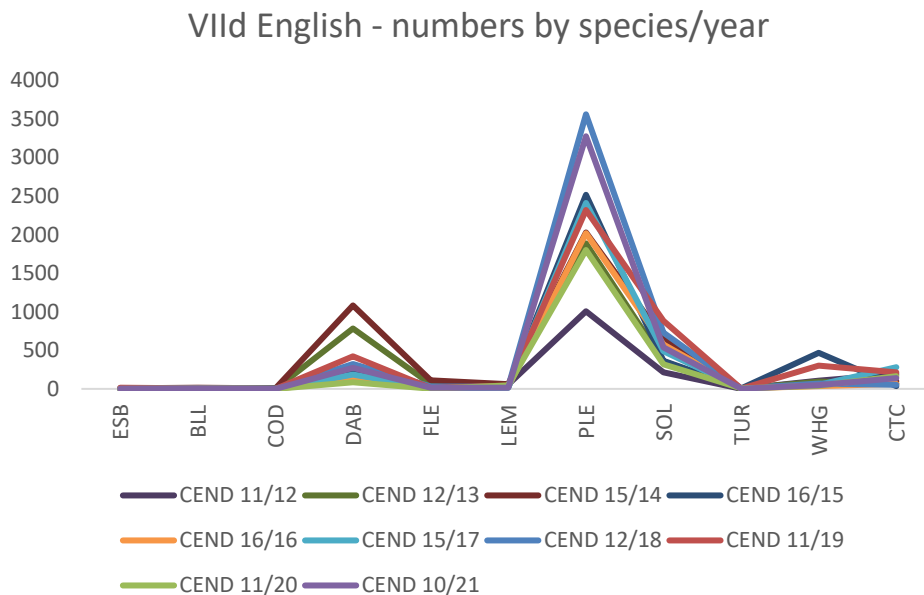
**Figure 9** Abundance (number caught per 30-minute tow) of Dab



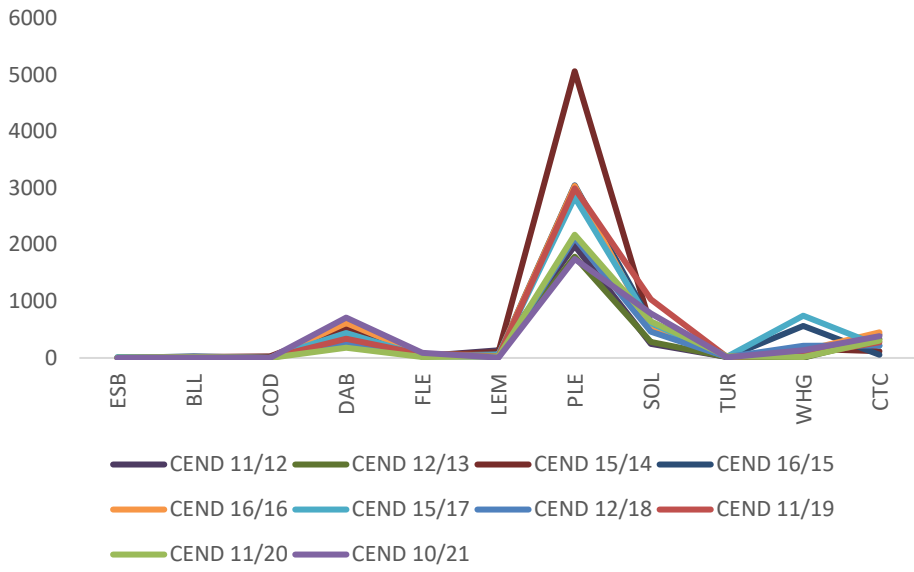
**Figure 10** Abundance (number caught per 30-minute tow) of Lemon sole



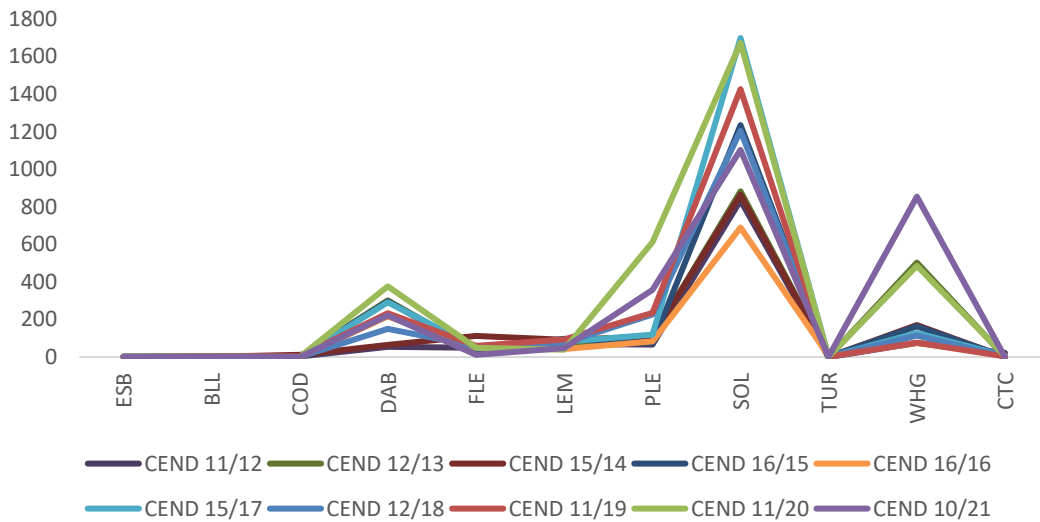
**Figure 11** Catch number of selected commercial fish caught in English and French sectors of the Eastern Channel (7d) and southern North Sea (4c) during 2018-21 surveys



VIIId French - numbers by species/year



IVc - numbers by species/year



**Figure 12** Comparison of total weight of commercial species caught on survey between 2019–21

