

**THE CENTRE FOR ENVIRONMENT, FISHERIES & AQUACULTURE SCIENCE,  
LOWESTOFT LABORATORY, LOWESTOFT, SUFFOLK, NR33 0HT.**

**RESEARCH VESSEL SURVEY REPORT**

**RV CEFAS ENDEAVOUR  
Survey: CEND 11/19**

**STAFF:**

Whole Survey		16-20 July only	
Name	Role	Name	Role
Joanne Smith	SIC	Manuel Nicolaus	CSEMP SIC
Linford Mann	2IC	Alex Callaway	CSEMP 2IC
Ian Holmes	Sampler	John Bignell	CSEMP
Mary Brown	Sampler	Caroline Daumich	CSEMP
Charlotte Jennings	Sampler	Paul Nelson	CSEMP
James Pettigrew	Sampler	Marta Vannoni	CSEMP
Chris Popham	Sampler	Freya Goodsir	CSEMP
Joseph Watson	Univ. of Reading		

**DURATION:** 16 – 29 July (14 days)

**LOCATION:** Eastern English Channel (VIId), Southern North Sea (IVc)

**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 sentinel species as agreed at the Beam Trawl Working Group.
5. To collect samples of demersal fish for chemical analysis from the North Sea in support of the Clean Seas Environmental Monitoring Programme (CSEMP).

6. To collect fish samples at CSEMP sites for fish disease and biochemical markers (e.g. EROD, AChE and bile metabolites analysis).
7. To sample representative CSEMP stations using day grab, for polycyclic aromatic hydrocarbons (PAHs), trace metal contaminants, organic contaminants (PCBs, PBDEs and HBCD), sediment particle size analysis (PSA) and marine litter.
8. To conduct marine litter surveys by collecting benthic litter information from the trawls and collecting sediment samples for litter analysis.

#### **SECONDARY AIMS:**

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

#### **OPPORTUNISTIC AIMS:**

14. To tag and release specimens of various commercially exploited skates (*Rajidae*) and other selected elasmobranchs.
15. Collect specimens of selected species for ID purposes as well as length-weight measurements where still required.
16. Collect information on discard survivability of starry smooth-hounds (*Mustelus asterias*) (Jo Silva, Cefas Lowestoft).
17. Collect muscle samples from sole (*Solea solea*) (Katie St. John Glew, School of Ocean and Earth Science, National Oceanography Centre, Southampton).

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

The SIC (Joanne Smith) joined the Cefas Endeavour (CEND) on the afternoon of 14 July for delivery of gear to the vessel. The following morning Linford Mann (2IC), Ian Holmes, Charlotte Jennings and Ben Hatton set up the EDC and fish room, testing the software and unpacking the gear to check that everything was present. Vessel safety inductions were given for those needing them at 1300h that day. The rest of the scientific crew joined the vessel at 0700h on 16 July. The vessel sailed from Lowestoft at 0900h on the morning of 16 July, steaming to the first fishing station (Prime 105). Before operations commenced toolbox talks, scientist safety briefings and an abandon ship drill were carried out.

The survey commenced at 1039h, 16 July with the deployment of the ESM2 logger with Niskin bottle, followed by a shakedown beam trawl tow (beam number 4) at prime 105, to fully test the gear deployment and the on-board fish sampling systems. All equipment was working well so the survey continued with the days fishing completing prime stations 104, 103, 102 and 100. Prime 100 was reduced to a 20-minute tow due to cables over the tow. Work began the following morning at prime station 99 and continued in a southerly direction, completing prime stations 99, 98, 83, 82, 97, 96 and 119. On completion of the final tow, CEND steamed to the outer Thames area to begin overnight CSEMP operations (Figure 2) of 4 day-grab deployments at CSEMP prime station 484.

On the morning of 18 July, work began in the eastern Channel at prime station 75, with a further 6 prime stations (80, 74, 73, 65, 66, 64) completed during the day. These tows resulted in the usual high numbers of flatfish, with higher than usual catches of spider crab (*Maja squinado*). Prime stations 65 and 66 resulted in high numbers of plaice (*Pleuronectes platessa*) and sole compared to previous years. Prime station 74 had lower than normal numbers of plaice and sole, however there was a large increase in whiting (*Merlangius merlangus*) on this tow. The evening CSEMP activities commenced at 2000h, fishing CSEMP prime station 484. On the morning of 19 July work began at prime station 63, with 8 prime stations (63, 60, 61, 62, 94, 67, 58, 59) completed. The evening CSEMP activities commenced at 20:00 hrs, fishing in the Newhaven area. Work continued the following morning at prime stations 57 and 56.

With the CSEMP work now complete, these staff were put ashore at Newhaven by small boat, and a man overboard drill in the Newhaven area was also carried out. Fishing recommenced at 1400h at prime station 55 with a further 4 prime stations completed (primes 55, 54, 53, 51) during the day. An unusual Snakelock anemone (*Anemonia viridis*) was observed at prime 55 (Figure 4). The following day, work started at prime 52 with 14 prime stations (primes 52, 27, 50, 49, 26, 22, 42, 43, 45, 47, 44, 23, 24 and 25) fished over the following 2 days (21 – 22 July). Prime station 49 was abandoned and prime station 47 reduced to 24 minutes due to too much static gear. Prime 26 resulted in the usual large catch (on deck sort) of brittle stars (*Ophiothrix fragilis*). A large female lobster (*Homarus gammarus*) was caught and released at prime station 25.

On completion of the English sector of VIId, CEND steamed to the French coast starting at prime station 10, fishing 6 prime stations (primes 10, 8, 9, 7, 6 and 12) over the day. Prime station 9 was reduced to 27 minutes due to static gear at the end of the tow. At this prime

station, a total of 48 baskets of brittle stars and mixed benthos was caught. On the morning of the 24 July, fishing continued on the French coast at prime 4, fishing 14 primes (primes 4, 1, 11, 21, 20, 19, 18, 17, 16, 39, 40, 29, 36 and 35) over the following two days. Primes stations 1, 11 and 21 were fished for 20 minutes at a 3:1 warp ratio to avoid previously caught large muddy catches, these stations were cleaner and smaller than expected, with a higher than expected catch of plaice at prime station 1. Prime station 20 was fished for 20 minutes to avoid static gear. An enclosed space drill was carried out at 1130h.

Fishing continued on the French coast at prime station 38, fishing 6 prime stations (primes 38, 37, 72, 71, 77 and 76). Prime station 71 was fished for 20 minutes at a 3:1 warp ratio to avoid a previously caught large catches of sand/mud. All of these stations resulted in large catches of small flat fish and crabs, taking a number of hours to process. Prime station 77 resulted in a large catch (on deck sort) of starfish, crabs and fish, there was no history of this at this prime station. However, last year this prime station did result in a large catch of mussels (*Mytilidae*), and these grounds have been very unpredictable in recent years. Prime station 72 resulted in a very good catch of sole. Attempts were made to carry out some trial tows in ICES rectangles that lacked data, however after some investigation it was clear that there would not be any clear tows due to static gear and poor fishing grounds.

The tows in the French/English Channel and North Sea were completed on the evening of 27 July with 6 prime stations fished (Primes 70, 69, 68, 95, 79 and 78). Prime station 69 could only be fished for 17 minutes due to static gear at the end of the tow. Prime stations 68 and 95 were fished for 20 minutes at a 3:1 warp ratio to avoid previous large catches of brittlestars. Prime station 79 had to be re-fished due to a hole in the cod end and liner. Following the days fishing, CEND steamed to the Belgium coast completing 6 additional stations (Prime stations 113, 114, 115, 116, 118 and 119) on 28 July. Prime 119 was a station that had not been fished for many years, the ground was not great, but a clear 20-minute valid tow was located and successfully fished. These Belgian station catches mainly consisted of the usual catches of small flat fish.

On completion of the survey, CEND steamed 25 hours to Portland. The pilot boarded at 1500h and CEND docked at 1630h, 29 July, with most scientific staff travelling home the following day. However, myself, Linford and Charlotte took part in a 'Cefas Day' on the vessel before steaming back to Lowestoft, docking at 2000h on 31<sup>st</sup> July. Demobbing was carried out the following morning.

## 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 but was not needed during the survey.

A SAIV Micro CTD was attached to the headline on the trawl in order to allow the recording of temperature and salinity at each station. In addition, surface and bottom water 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.

**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
49	English	Static gear on tow	No, too much gear
47	English	Static gear on tow	24 minutes
11	French	History of large catch	20 minutes
9	French	Static gear at end of tow	27 minutes
1	French	History of large catch	20 minutes
21	French	History of large catch	20 minutes
20	French	Static gear on tow	20 minutes
71	French	History of large catch	20 minutes
95	French	History of large catch	20 minutes
69	French	Static gear at end of tow	17 minutes
68	French	History of large catch	20 minutes
100	North Sea	Cables on tow	20 minutes

A total number of 7 stations were reduced to 20 minute tows due to history of large by-catches or bad ground, 3 tows were reduced to between 17 - 27 minutes and 1 tow abandoned due to static gear and 1 tow was reduced to 20 minutes due to cables over 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 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	Not Fished	Total tows
VIId (English)	33	1	0	0	1	35
VIId (French)	21	9	0	0	0	30
IVc (North Sea)	13	1	6	1	0	21
Total	67	11	6	1	1	86

Figure 1: Core & additional stations fished during 2019 survey.

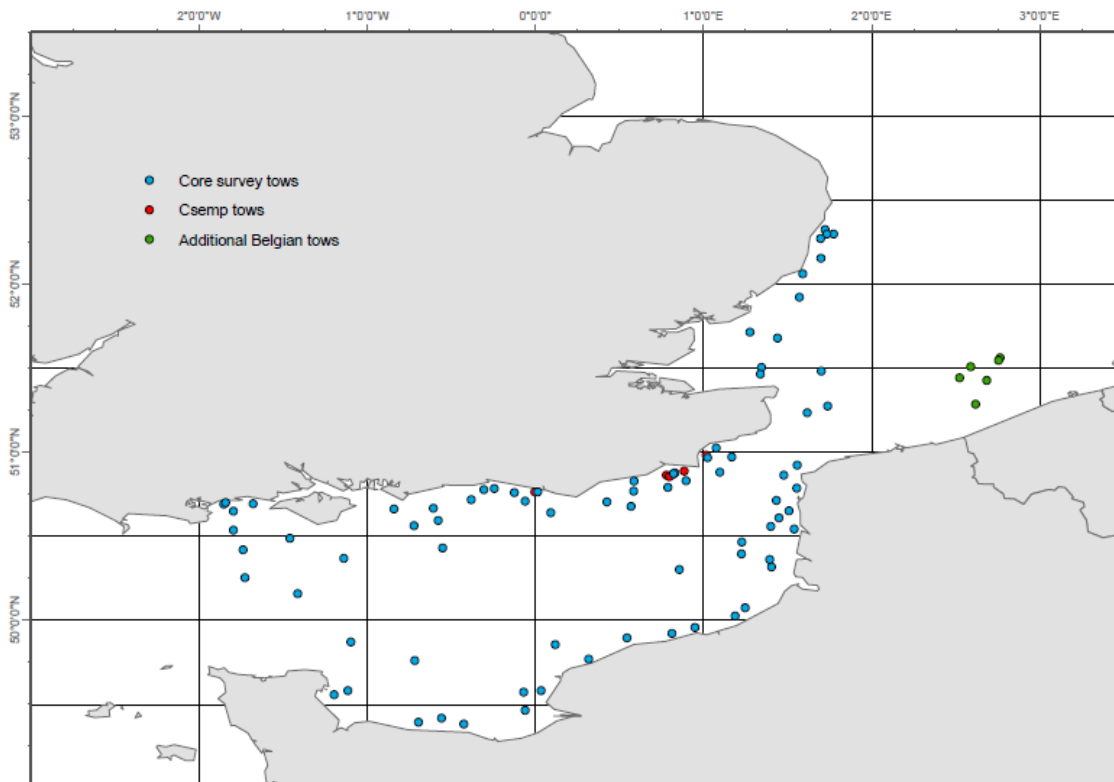
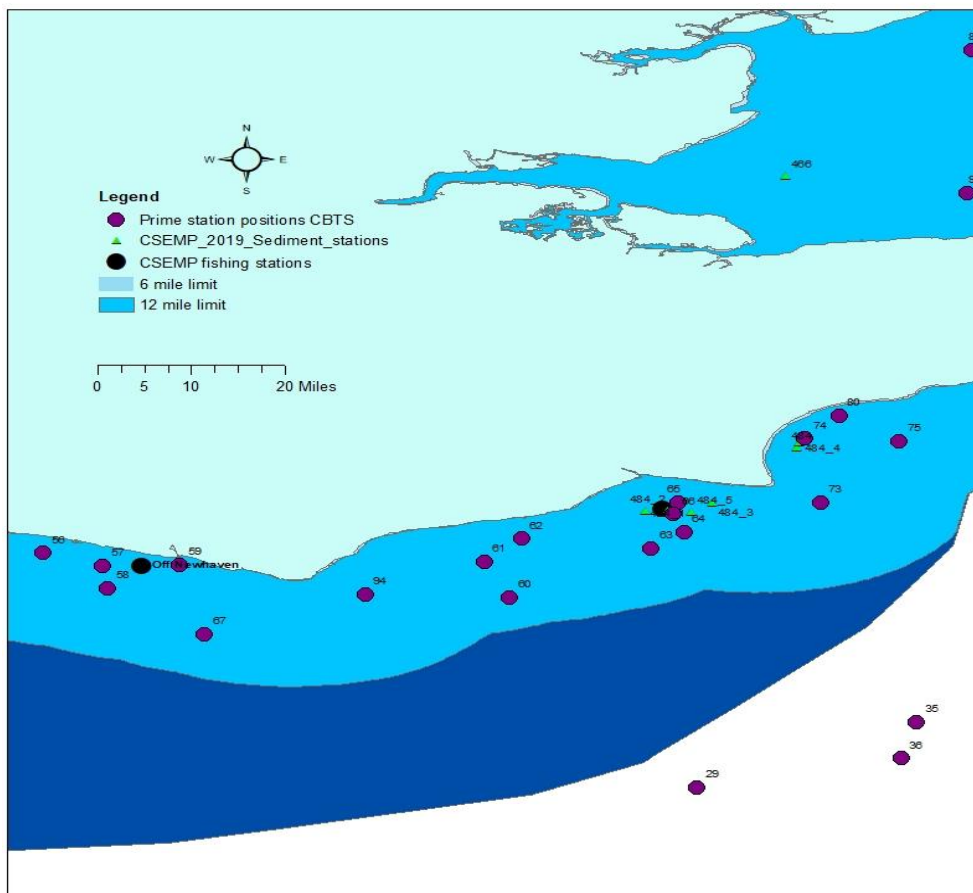


Figure 2: CSEMP stations fished during 2019 survey.



### Aims 2 & 3.

All otolithed fish were measured to the whole cm below, weighed individually, sexed and given a maturity stage. Table 3 shows the numbers of otolith samples collected for the main commercial fish species. All non-commercial finfish by-catch caught 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*), *Alloteuthis spp*, *Loligo spp*, edible crab (*Cancer pagurus*), European lobster, 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 caught of the main commercial species, raised to the standard 30-minute tow (2011-2019) can be seen in Tables 5 and Table 6. In total, 202 different species were recorded and 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
VIIId English	7	0	27	9	25	718	136	24	2
VIIId French	9	0	42	54	17	790	145	37	18
North Sea	5	3	19	50	52	184	222	36	1
Total	21	3	88	113	94	1692	503	97	21

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

Region	Brill	Cod	Dab	Flounder	Lemon sole	Plaice	Sole	Whiting	Turbot
VIIId English	7	0	421	9	43	2314	881	301	2
VIIId French	9	0	301	58	23	1308	440	39	19
North Sea	5	3	233	55	94	222	1385	74	1
Total	21	3	955	122	160	3844	2706	414	24



**Table 5:** Comparison of catch weight (kg) for the main commercial species over the last 8 surveys (2012-2019) (raised to 30-minute tows).

	2012	2013	2014	2015	2016	2017	2018	2019
Plaice	679	790	1238	1042	975	836	846	622
Sole	139	169	235	171	183	214	231	234
Dab	59	107	87	73	70	47	41	42
Lemon sole	49	38	38	24	18	14	11	14
Cuttlefish	109	57	48	35	101	103	60	111
Flounder	34	35	72	17	29	19	27	28
Whiting	17	20	30	89	24	52	27	44
Brill	3	16	10	14	10	11	13	10
Turbot	16	10	9	15	17	15	13	10
Bass	3	3	9	2	7	15	8	5
Cod	13	2	16	13	<1	1	1	<1

**Table 6:** Comparison of catch numbers for the main commercial species over the last 8 surveys (2012-2019) (raised to 30-minute tows).

	2012	2013	2014	2015	2016	2017	2018	2019
Plaice	3052	3778	7197	5635	5137	5364	5904	5546
Sole	1298	1522	2084	2229	1770	2805	2398	3342
Dab	880	1484	1684	1183	954	917	720	989
Lemon sole	262	222	258	171	119	162	124	170
Cuttlefish	623	404	214	91	526	500	279	495
Flounder	119	118	262	72	127	95	119	131
Whiting	187	600	388	1201	239	927	400	431
Brill	8	25	31	32	20	24	24	21
Turbot	16	20	18	23	27	31	25	23
Bass	4	4	9	2	3	23	6	14
Cod	10	7	43	8	0	2	2	3

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

<i>Acanthocardia aculeata</i>	2	<i>Acanthochitona crinatus</i>	1
<i>Acanthodoris pilosa</i>	1	<i>Aequipecten opercularis</i>	34
<i>Aequorea spp</i>	9	<i>Agonus cataphractus</i>	31
<i>Alcyonidium diaphanum</i>	62	<i>Alcyonium digitatum</i>	40
<i>Ammodytes tobianus</i>	4	<i>Anemone unidentified</i>	7
<i>Anseropoda placenta</i>	13	<i>Antalis entalis</i>	2
<i>Aphrodite aculeata</i>	27	<i>Aplysia punctata</i>	2
<i>Archidoris pseudoargus</i>	16	<i>Arenicola marina</i>	3
<i>Arnoglossus laterna</i>	29	<i>Ascidia virginea</i>	1
<i>Asciacea</i>	40	<i>Aspitrigla (chelidonichthys) cuculus</i>	29
<i>Assorted rocks</i>	49	<i>Asterias rubens</i>	59
<i>Atelycyclus rotundatus</i>	5	<i>Aurelia aurita</i>	15
<i>Blennius ocellaris</i>	2	<i>Botrylloides leachi</i>	4
<i>Botryllus schlosseri</i>	4	<i>Broken shell</i>	39
<i>Buccinum undatum</i>	31	<i>Buglossidium luteum</i>	34
<i>Bugula spp</i>	1	<i>Callionymus lyra</i>	60
<i>Callionymus maculatus</i>	2	<i>Calliostoma zizyphinum</i>	2
<i>Cancer pagurus</i>	28	<i>Carcinus maenas</i>	2
<i>Cellariidae</i>	2	<i>Cerastoderma (cardium) edule</i>	1
<i>Chaetopterus tubes</i>	22	<i>Chlamys varia</i>	16
<i>Chlorophyceae</i>	12	<i>Chrysaora hysoscella</i>	36
<i>Ciliata mustela</i>	1	<i>Conger conger</i>	5
<i>Crangon allmanni</i>	6	<i>Crangon crangon</i>	3
<i>Crangonidae</i>	1	<i>Crepidula fornicata</i>	10
<i>Crossaster papposus</i>	15	<i>Ctenolabrus rupestris</i>	1
<i>Ctenophora</i>	2	<i>Cucumariidae</i>	1
<i>Cuttle eggs</i>	27	<i>Cyanea capillata</i>	7
<i>Cyanea lamarckii</i>	35	<i>Diazona violacea</i>	1
<i>Dicentrarchus labrax</i>	4	<i>Diodora graeca</i>	1
<i>Diplecogaster bimaculata</i>	2	<i>Dogfish egg cases</i>	19
<i>Dromia personata</i>	10	<i>Dummy species one</i>	6
<i>Echiichthys (trachinus) vipera</i>	18	<i>Echinocardium cordatum</i>	2
<i>Echinocardium spp</i>	8	<i>Eledone cirrhosa</i>	1
<i>Epibenthic mixture</i>	63	<i>Eupagurus / pagurus in adamsia</i>	9
<i>Eupagurus / pagurus in buccinum</i>	13	<i>Eupagurus / pagurus in suberites</i>	4
<i>Euspira pulchella</i>	2	<i>Eutrigla (chelidonichthys) gurnardus</i>	13
<i>Filograna implexa</i>	3	<i>Flustra foliacea</i>	44
<i>Fucus spp</i>	17	<i>Fucus vesiculosus</i>	9
<i>Gadus morhua</i>	1	<i>Gaidropsarus vulgaris</i>	1
<i>Galathea spp</i>	4	<i>Gastropod eggs</i>	5
<i>Glycymeris glycymeris</i>	5	<i>Gobius gasteveni</i>	7



<i>Gobius niger</i>	4	<i>Gobius paganellus</i>	2
<i>Halichondria panicea</i>	5	<i>Haliclona oculata</i>	6
<i>Henricia oculata</i>	8	<i>Hinia (nassarius) reticulatua</i>	4
<i>Hippocampus hippocampus</i>	6	<i>Holothuroidea</i>	3
<i>Homarus gammarus</i>	9	<i>Hyas araneus</i>	2
<i>Hyas coarctatus</i>	5	<i>Hydrallmania falcata</i>	14
<i>Hydroida (order)</i>	42	<i>Hyperoplus lanceolatus</i>	4
<i>Inachus dorsettensis</i>	17	<i>Inachus leptochirus</i>	33
<i>Labrus bergylta</i>	1	<i>Laetmonice (hermione) histrix</i>	1
<i>Laminaria spp</i>	7	<i>Lepadidae</i>	7
<i>Lepadogaster candollei</i>	1	<i>Limanda limanda</i>	34
<i>Liocarcinus depurator</i>	22	<i>Liocarcinus marmoreus</i>	7
<i>Loligo (alloteuthis) subulata</i>	36	<i>Lophius piscatorius</i>	2
<i>Lutraria lutraria</i>	1	<i>Lytocarpia myriophyllum</i>	3
<i>Macoma balthica</i>	1	<i>Macropodia spp</i>	2
<i>Macropodia tenuirostris</i>	30	<i>Maja squinado</i>	62
<i>Merlangius merlangus</i>	24	<i>Metridium senile</i>	13
<i>Microchirus variegatus</i>	8	<i>Microstomus kitt</i>	15
<i>Molgulidae</i>	4	<i>Mollusca-bivalvia</i>	2
<i>Mullus surmuletus</i>	10	<i>Mustelus asterias</i>	19
<i>Myoxocephalus scorpius</i>	4	<i>Mytilus edulis</i>	12
<i>Necora puber</i>	42	<i>Nemertesia antennina</i>	21
<i>Nemertesia ramosa</i>	7	<i>Nudibranchia</i>	1
<i>Ophiocomina nigra</i>	3	<i>Ophiothrix fragilis</i>	21
<i>Ophiura ophiura</i>	37	<i>Ostrea edulis</i>	7
<i>Paguridae</i>	10	<i>Palaemon serratus</i>	2
<i>Pandalus montagui</i>	6	<i>Parablennius gattorugine</i>	1
<i>Pecten maximus</i>	18	<i>Pegusa (solea) lascaris</i>	15
<i>Pentapora foliacea</i>	12	<i>Phaeophyceae</i>	33
<i>Philine aperta</i>	2	<i>Pholis gunnellus</i>	3
<i>Pisa armata</i>	17	<i>Pisidia longgicornis</i>	19
<i>Platichthys flesus</i>	15	<i>Pleuronectes platessa</i>	59
<i>Polybius (liocarcinus) holsatus</i>	37	<i>Polychaeta</i>	2
<i>Polymastiidae</i>	2	<i>Pomatoschistus spp</i>	11
<i>Pontobdella muricata</i>	1	<i>Porifera</i>	14
<i>Psammechinus miliaris</i>	46	<i>Raja brachyura</i>	10
<i>Raja clavata</i>	48	<i>Raja microocellata</i>	1
<i>Raja montagui</i>	12	<i>Raja undulata</i>	7
<i>Raspailia spp</i>	22	<i>Rhodophyceae</i>	27
<i>Rissoides (meiosquilla) desmaresti</i>	2	<i>Rossia macrosoma</i>	1
<i>Sabellaria alveolata</i>	1	<i>Sabellaria spinulosa</i>	12
<i>Scaphander lignarius</i>	2	<i>Scophthalmus maximus</i>	14
<i>Scophthalmus rhombus</i>	9	<i>Scyliorhinus canicula</i>	40

<i>Scyphozoa</i>	21	<i>Securiflustra securifrons</i>	1
<i>Sepia officinalis</i>	56	<i>Sepiolo atlantica</i>	5
<i>Sipunculidae</i>	3	<i>Solea solea</i>	62
<i>Solenocera membranacea</i>	2	<i>Spatangus purpureus</i>	2
<i>Spirontocaris spp</i>	1	<i>Spisula spp</i>	1
<i>Spondyliosoma cantharus</i>	8	<i>Styela clava</i>	21
<i>Suberites spp</i>	9	<i>Symphodus (crenilabrus) balloni</i>	8
<i>Syngnathus acus</i>	5	<i>Taurulus bubalis</i>	1
<i>Tethya aurantia</i>	18	<i>Trachinus draco</i>	5
<i>Trachurus trachurus</i>	1	<i>Trigla (chelidonichthys) lucerna</i>	28
<i>Trigloporus lastoviza</i>	13	<i>Trisopterus luscus</i>	36
<i>Trisopterus minutus</i>	23	<i>Tritonia hombergi</i>	1
<i>Tubularia spp</i>	4	<i>Ulva lactuca</i>	24
<i>Unidentified laminaria</i>	1	<i>Urticina (tealia) felina</i>	18
<i>Whelk eggs</i>	13	<i>Xanthid crab</i>	16
<i>Zeugopterus (phrynorhombus) regius</i>	2	<i>Zeugopterus punctatus</i>	2
<i>Zeus faber</i>	6	<i>Zostera spp</i>	2

### Plaice

Overall catch weight (622 kg) and catch number (5546 fish) of plaice was lower than in 2018 (846 kg; 5904 fish) (Tables 5 & 6). In the English VIId sector, catch weights (-49%) and catch numbers (-35%) were lower than in 2018. However, both catch weight (75%, 10%) and numbers (41%, 2%) were higher in the French VIId and North Sea respectively (Figure 11). Catch numbers were higher than the average (4898 fish) for the past 10 years (2009-2019), however weight was lower (861 kg). Recruited plaice ( $\geq 21$ cm) distribution was similar to previous years, with high numbers seen off Hastings, Brighton (VIId English sector), Dieppe and Boulogne (VIId French sector) however numbers were slightly lower than the previous year, particularly in the Poole area (Figure 5). Pre-recruit plaice ( $< 21$ cm) distribution and numbers were lower this year, most abundant off Hastings (VIId English sector), Dieppe and Boulogne (VIId French sector), although the distribution was not so well spread. There was an increase in pre-recruit numbers in the Brighton and Le Havre area (Figure 7).

### Sole

Catch numbers of sole was a lot higher this year with 3342 fish caught compared to 2398 fish in 2018, whereas sole catch weight at 234 kg was only slightly higher compared to 2018 at 231 kg (Table 5 & 6). This shows that there were a higher number of juveniles this year. Both catch weight and numbers in 2019 were higher than the average historic catch rate 2009-19 (2093 fish, 192 kg). There was an increase in sole catch numbers in English VIId (21%), French VIId (123%) and North Sea (19%) and weight in French VIId (57%) but a decrease in weight in English VIId (-9 %) and North Sea (-14%) compared to 2018. Recruited sole ( $\geq 21$ cm) were most abundant between Folkestone to Dungeness (VIId English sector) (decrease to previous year) and on the North Sea stations (slight increase).

There was a decrease in numbers off Poole but a slight increase off Le Havre and Boulogne (VIId French sector) (Figure 6). Pre-recruit sole (<21cm) were most abundant between North Sea to Dungeness (VIId English sector), with an increase in all of these areas except off Folkstone where there was a slight decrease. There was also an increase in the French sector off Le Havre and Boulogne (VIId French sector) (Figure 8).

### Other species

Catches of dab, lemon sole, cuttlefish, flounder, whiting, bass, and cod were higher this year, however there was very slight decrease in the number of turbot and brill caught compared to 2018 (Table 5 & 6). There was an increase in the number of lemon sole and dab in the English, French and North Sea sector. Lemon sole catches were largest off Ramsgate, with a decrease off Harwich and Boulogne. The distribution did seem to stretch further along the English coast than previously observed, between Dover and Hastings (Figure 10). Dab catches were largest off Hastings and Margate, with a slight decrease in the number of stations where dab were present in all sectors (Figure 9). An unusual Snakelock anemone (*Aulactinia veratra*) was observed at prime station 55 (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, benthos 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*); *Sabellaria spinulosa*; sponge crab (*Dromia personate*) and mantis shrimp (*Meiosquilla desmaresti*) being encountered. All 12 full benthic stations in VIId and 3 in IVc were sampled successfully.

### Aim 5

Samples of demersal fish were collected for chemical analysis from the North Sea in support of the Clean Seas Environmental Monitoring Programme (CSEMP).

### Aim 6

Samples were collected at CSEMP sites for fish disease and biochemical markers (e.g. EROD, AChE and bile metabolites analysis).

### Aim 7

Representative CSEMP stations were sampled using day grab, for polycyclic aromatic hydrocarbons (PAHs), trace metal contaminants, organic contaminants (PCBs, PBDEs and HBCD), sediment particle size analysis (PSA) and marine litter.

#### Aim 8

Marine litter survey was carried out by collecting benthic litter information from the trawls and collecting sediment samples for litter analysis.

#### Secondary aims

#### Aim 9

Depth, conductivity and temperature profiles were successfully taken at 84 trawl stations. In addition, surface and near-bottom water samples taken using a Niskin with ESM2 logger at 27 locations.

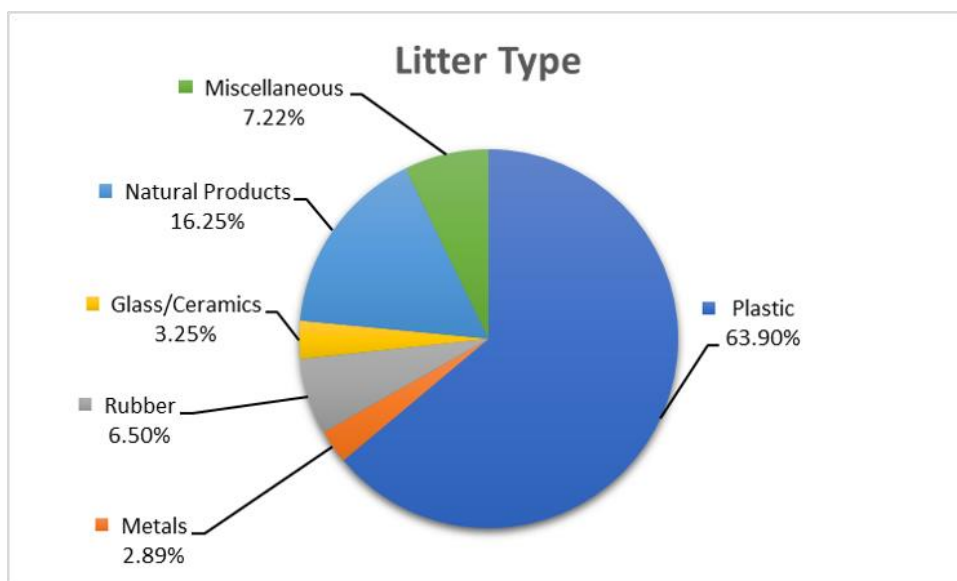
#### Aim 10

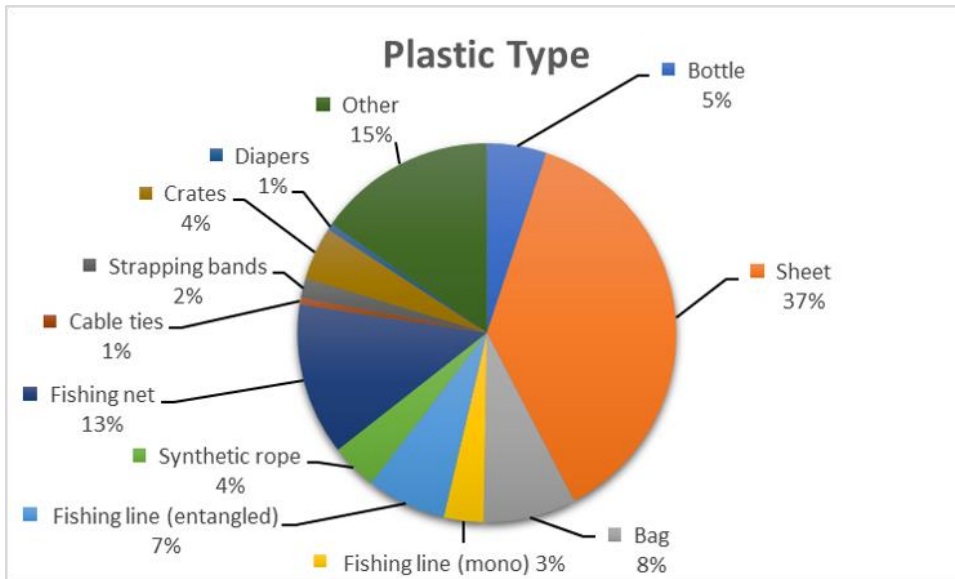
Salinity, temperature, fluorometry and other environmental data was continuously logged using the 'Ferrybox'.

#### Aim 11

Litter by-catch was recorded in line with the protocol provided at every valid beam trawl station. The pie chart below (Figure 3) shows the relative commonality of the main types of litter encountered.

**Figure 3:** Percentage of marine litter collected in the beam trawl.





#### Aim 12

Collection of one sample 500m from the West Gabbard Smart buoy for (Sophie Pitois, Cefas Lowestoft) was collected on CEND 10\_19 as time and survey route allowed this.

#### Aim 13

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

#### Opportunistic aims

#### Aim 14

Three undulate ray (*Raja undulata*) were tagged and released (Tag numbers E679201, E679202, E679203).

#### Aim 15

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

#### Aim 16

Information on discard survivability of starry smooth-hounds was collected (*M. asterias*) (Jo Silva, Cefas Lowestoft).

Aim 17

Muscle samples from sole in the channel were (Katie St. John Glew, School of Ocean and Earth Science National Oceanography Centre Southampton).

**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.

J. Smith  
Scientist in Charge  
14/8/19

**INITIALLED:** I D Holmes

**DISTRIBUTION:**

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



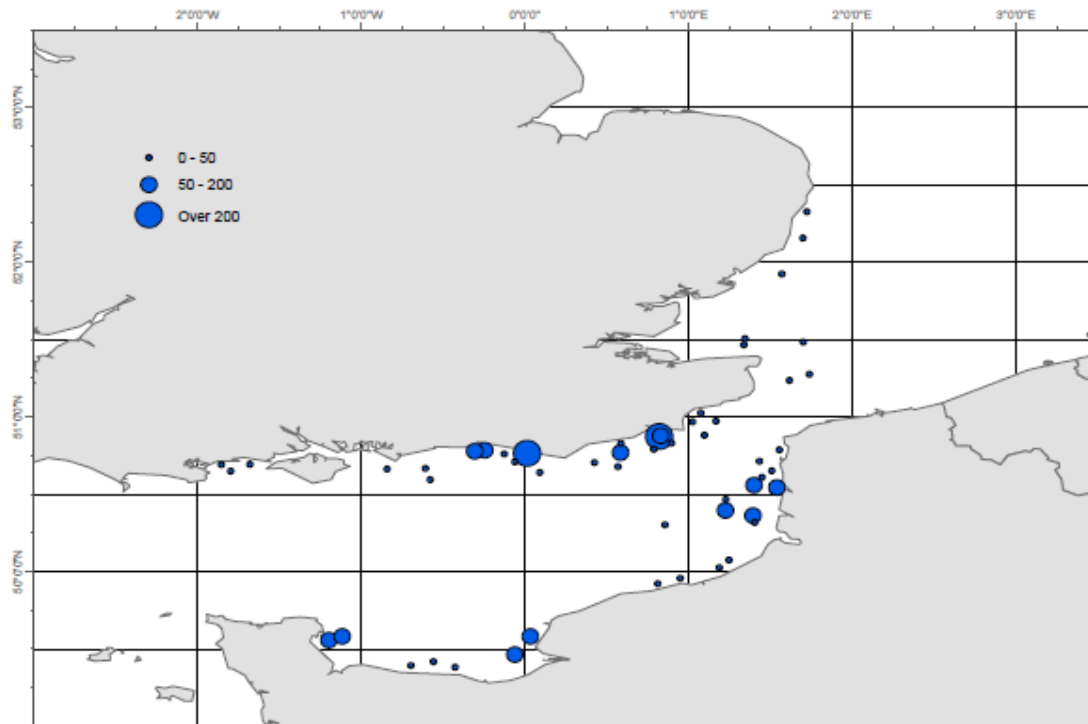


**Figure 4:** Unusual catch of Snakelocks anemone (*Anemonia viridis*).

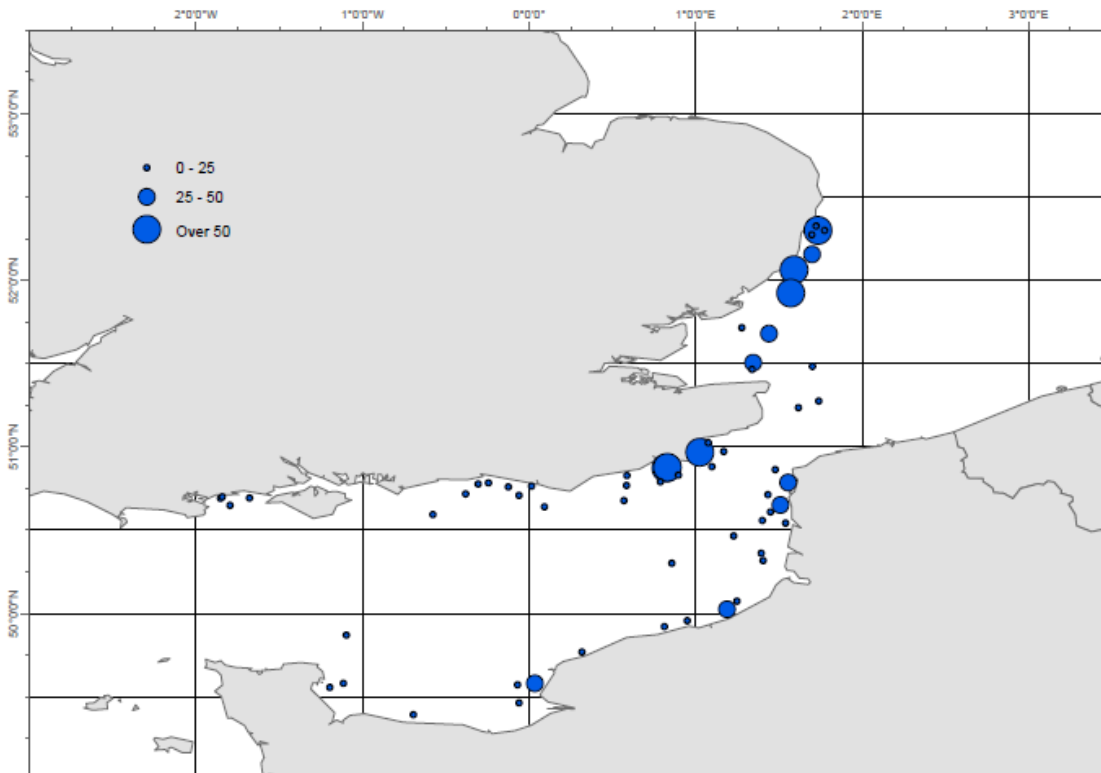




**Figure 5:** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) plaice.

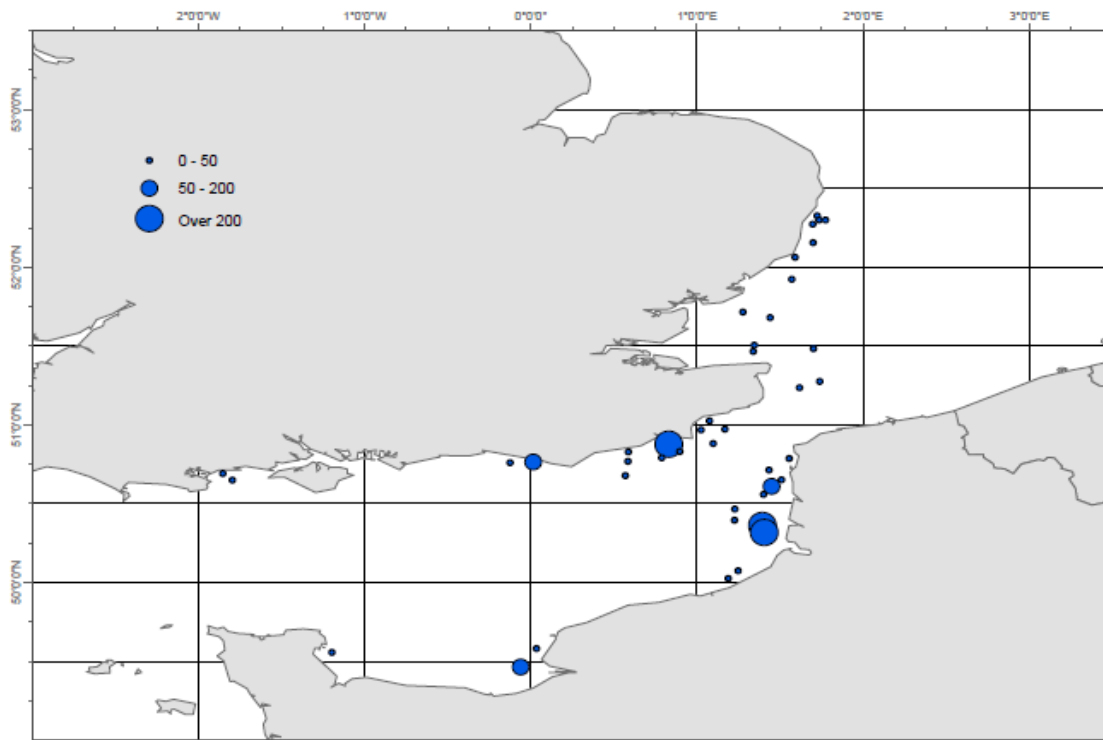


**Figure 6:** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) sole.

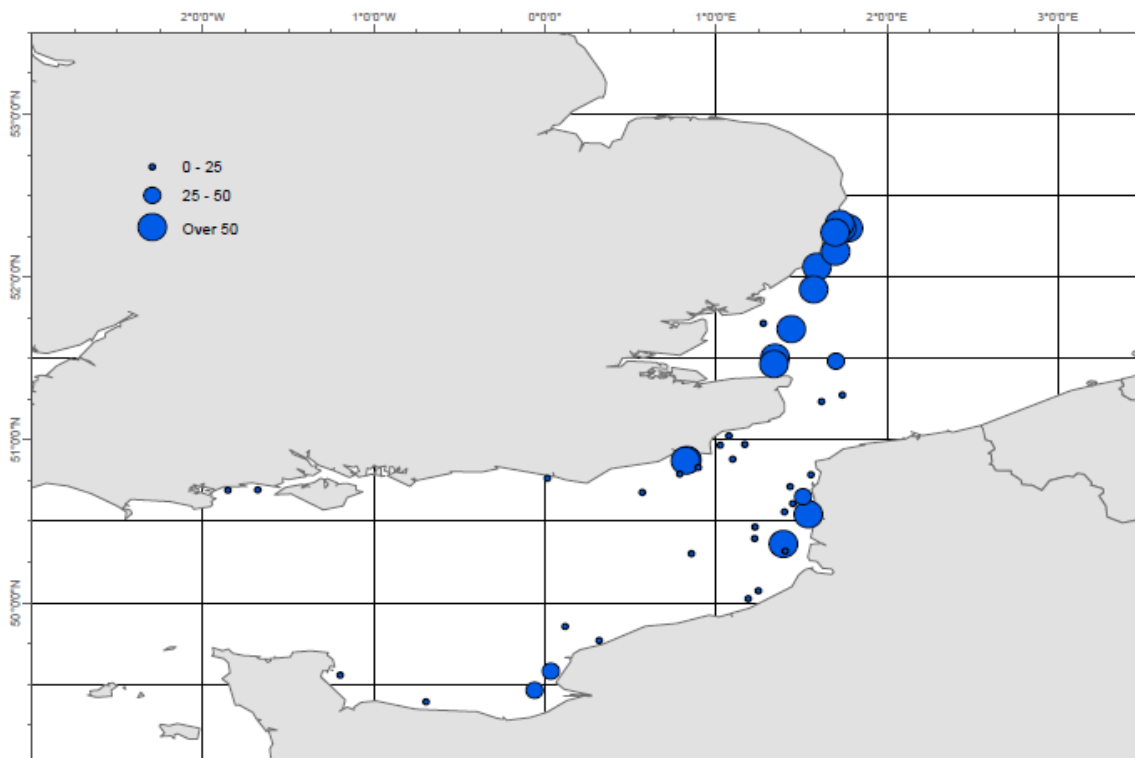




**Figure 7:** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) plaice.

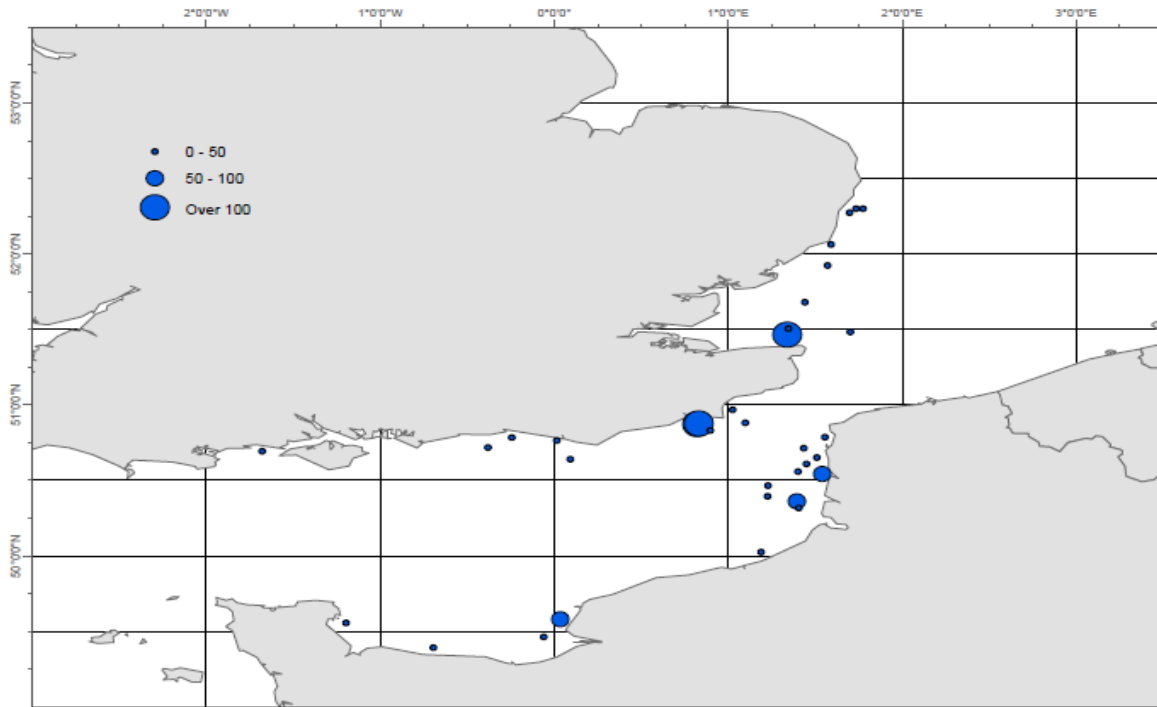


**Figure 8:** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) sole.

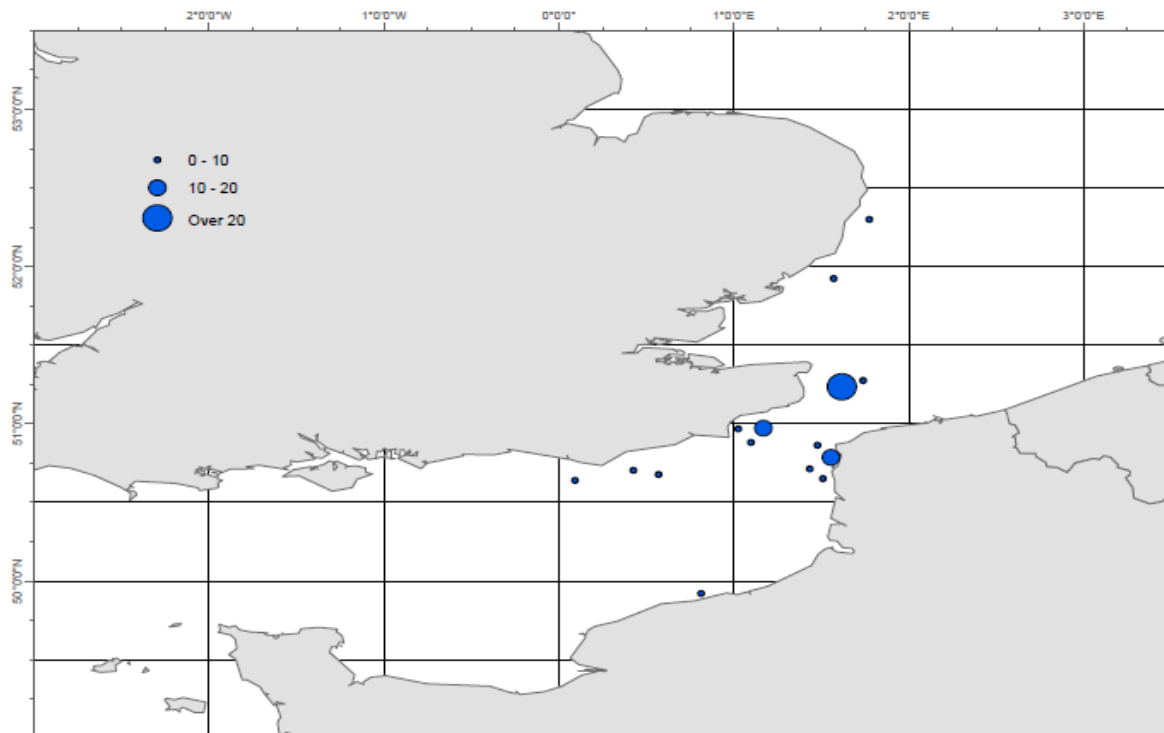




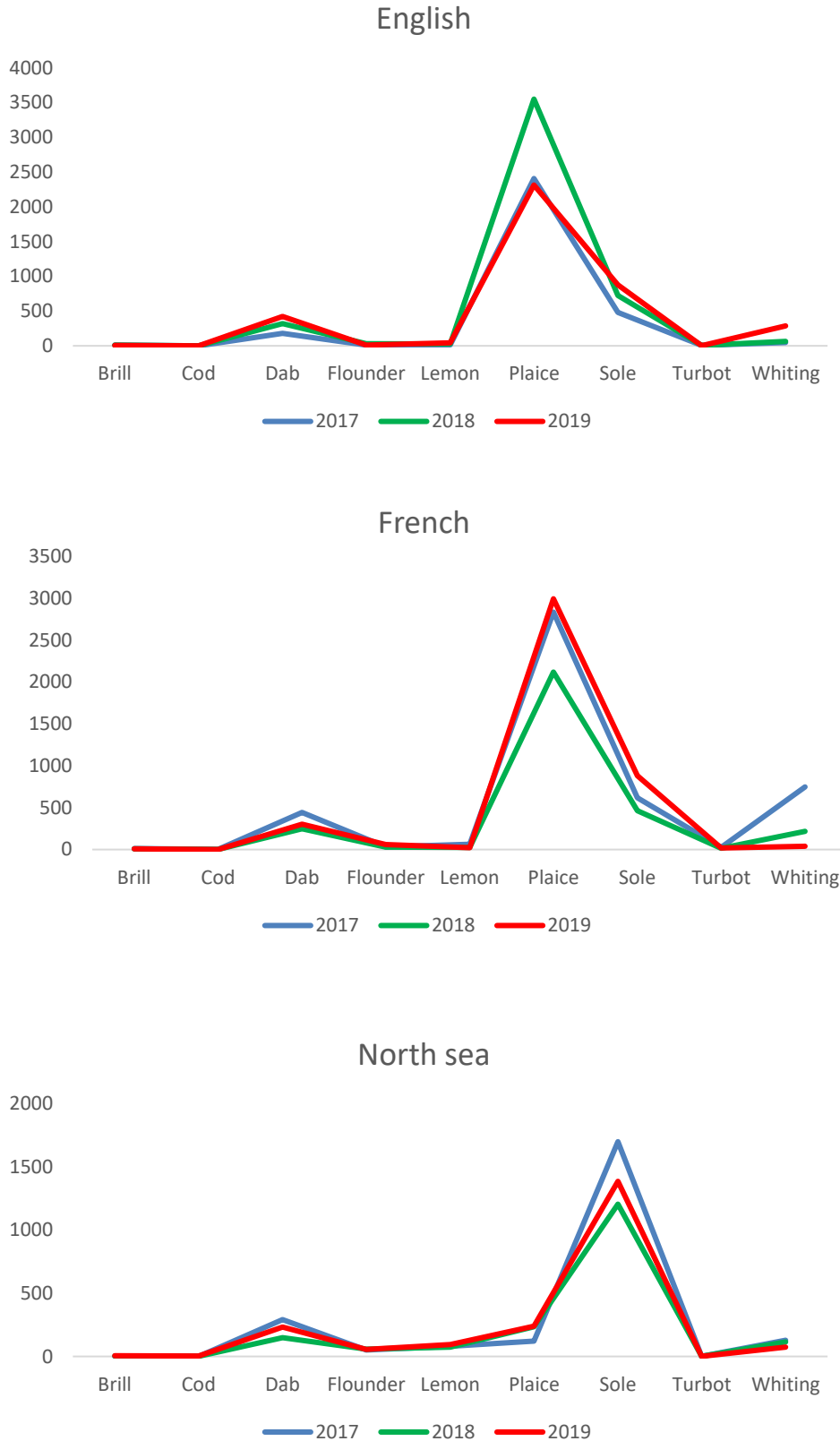
**Figure 9:** Abundance (number caught per 30-minute tow) of Dab.



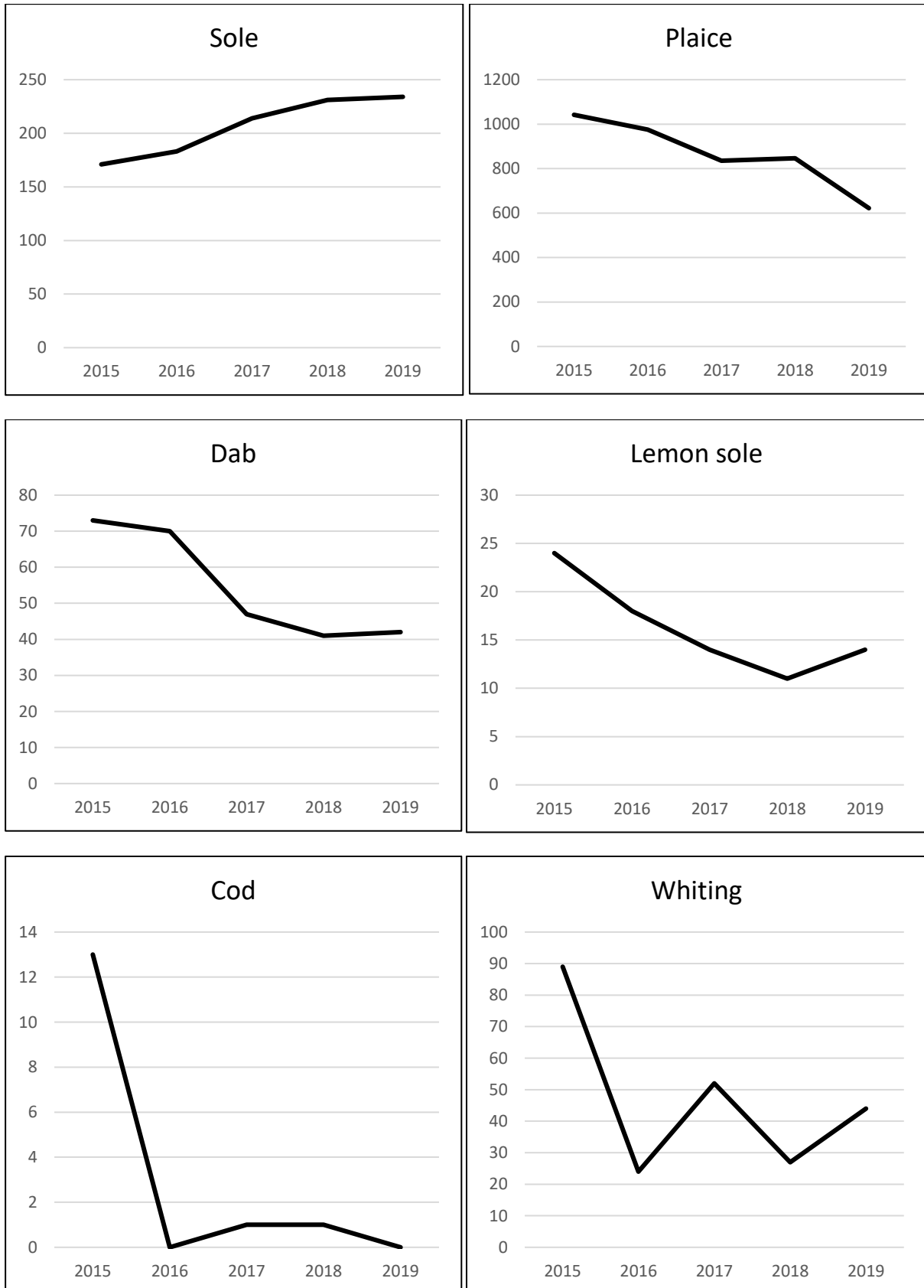
**Figure 10:** Abundance (number caught per 30-minute tow) of Lemon sole.



**Figure 11:** Catch number of selected commercial fish caught in English and French sectors of the eastern Channel (VIIId) and southern North Sea (IVc) during 2016-18 surveys.



**Figure 12:** Comparison of total weight of commercial species caught on survey between 2015–19.



**Figure 12:** Comparison of total weight of commercial species caught on survey between 2015–19 (continued).

