

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

**2017 RESEARCH VESSEL PROGRAMME  
REPORT: RV ENDEAVOUR: SURVEY 15/17**

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S Shaw (2IC)  
M Brown  
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G Burt  
J Pettigrew  
C Jennings  
J Ford  
M Whybrow (23 July-1 August)  
A Howat (23 July-1 August)  
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**DURATION:**

19<sup>th</sup> July – 1<sup>st</sup> August 2017

**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 epi-benthos by catch taken in the 4-metre beam trawl and to quantify 12 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 record details of surface sightings of any marine mammals, sea turtles and large pelagic fish, and record observations on jellyfish aggregations.
8. To sample litter caught in the beam trawl on every station.

#### **OPPORTUNISTIC AIMS:**

9. Carry out additional tows to tag and release sole (*Solea solea*) as part of an Ifremer and Agrocampus Ouest project (SMAC).  
[http://wwz.ifremer.fr/smac\\_eng/The-SMAC-program](http://wwz.ifremer.fr/smac_eng/The-SMAC-program)
10. To tag and release specimens of various commercially exploited skates (*Rajidae*) and other select elasmobranchs.
11. Collect specimens of selected species for otolith training of new Cefas market sampling staff (Ben Hatton, Cefas Lowestoft).
12. To collect hermits in whelks (Vladimir Laptikhovsky, Cefas Lowestoft).
13. To collect buried edible crab for entrainment simulation studies (Linford Mann, Cefas Lowestoft).
14. To retain any whole frozen black seabream (*Spondyliosoma cantharus*) for subsequent maturity stage analysis at the Cefas laboratory (Louise Cox).
15. All squid were frozen for future work on statolith preparation/ageing (Vladimir Laptikhovsky/Mark Smith/Jo Smith, Cefas Lowestoft).
16. Carry out additional tows to compare catch rate between 15 and 30 minute tows, using the 4m beam trawl.
17. Collection of a variety of fish species for Cefas 20<sup>th</sup> anniversary London visit (Ian Holmes, Cefas Lowestoft).
18. Collect and freeze squid eggs for embryonic analyses (Vladimir Laptikhovsky, Cefas Lowestoft).
19. CSSF OT Blue Belt camera/winch system trials (Marc Whybrow, Cefas Lowestoft).
20. Collect and freeze whole and fin clips samples from a number of species for an environmental DNA project (Katherine Maltby, Exeter University & Rupert Collins, Bristol University).
21. To collect a ring net plankton sample at the West Gabbard Smart buoy for SLA021 programme (Sophie Pitois, Cefas Lowestoft).

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

The SIC (Joanne Smith), 2IC (Steve Shaw) and Charlotte Jennings travelled from Lowestoft to Portland, joining the Cefas Endeavour (CEND) on the afternoon of 17 July. The following day was spent setting up the EDC kit, testing the software and unpacking the gear to check that everything was present. The rest of the scientific crew joined the vessel at 1600hrs on 18 July. Vessel safety inductions were given for those needing them at 1900hrs that day.

The vessel sailed from Portland at 0500h on the morning of 19 July, heading to the first survey station (Prime 43). En-route to this position, a toolbox talk and scientist safety briefings took place.

The survey commenced with a shakedown beam trawl tow (beam number 1) at prime station 43, in the English sector of VIId, east of Portland to fully test the gear deployment and the on-board fish sampling systems. This was followed by the deployment of the ESM2 logger with Niskin bottle. On successful completion of the first station, an emergency muster and abandon ship drill took place. All equipment was working well so the survey continued with the days fishing completing prime stations 45, 23, 24 and 25.

Once the day's fishing was complete, CEND steamed east overnight to begin operations the following morning at prime station 75, successfully completing seven stations (Primes 75, 80, 74, 73, 64, 63, 60) and two sole tagging tows (Prime 64). The following day, eight stations (Primes 61, 62, 66, 65, 94, 67, 58, 59) and four sole tagging tows (two at Prime 65 and two close to Prime 59) were completed. The additional sole tagging tows were a success with 119 sole tagged over the two days (Figure 4, Table 7).

Between the 22–23 July, twelve stations were fished for the full 30 minutes, one station (Prime 26) was fished for 20 minutes due to a history of large catches of brittle stars (). Prime 22 was hauled after 21 minutes due to sudden increase in weight, prime 55 was hauled after 15 minutes due to static gear and prime 49 was only fished for 11 minutes due to static gear and was therefore invalid (no alternative tows were available). Five sole were successfully tagged at primes 44 and 57.

An emergency drill was carried out on the morning of the 23 July to demonstrate BA (breathing apparatus) and EEED (Emergency Escape Breathing Devices). On completion of the days fishing, a boat transfer was carried out off Christchurch to pick up Marc Whybrow and Alfie Howat (Cefas MIST). Marc and Alfie joined the vessel to fully test a newly purchased winch and camera system required for commercial work later in the year. The system is designed to be portable to enable transport and use overseas, so it is essential to have confidence in the ability to transit, set up and use in a range of circumstances. This completed the English sector of the Channel so CEND then steamed overnight to prime station 10 to begin the French sector.

Work began the following morning in the French sector, near Barfleur at prime station 10, followed by primes 8, 9, 12, 6, 4 and 7. Prime 9 was fished for 20 minutes due to a history of large catches of brittle stars (*Ophiura ophiura*) and prime 12 was not fished due to static gear and a tanker anchored on the tow. Prime 7 saw a good abundance

of sea horses (11). On the evening of the 24 July, camera work was carried out in deeper waters close to our final fishing tow. The camera and winch worked well, apart from slow communications to the subsea pc (stills camera), however improvements were made to speed this up and in total 15 stills were taken.

Six valid fishing stations (Primes 1, 11, 21, 20, 19, 18) were successfully fished on 25 July. Prime 21 was fished for 20 minutes due to a history of large catches of sand. This tow has a long history of large catches and it may be advisable to move the tow next year. Fishing continued east along the French coast with seven fishing stations (Primes 17, 16, 39, 40, 38, 37 & 29), one sole tagging tow (Prime 39) and two 15 minute comparative tows (Prime 37 & 29) completed on the 26 July. These tows were a comparison to the standard 30-minute tow, sole caught at these stations were tagged and released by Ifremer staff. Camera trials were conducted on the evenings of 25/26 July after completion of scheduled fishing stations with a total of 210 stills taken.

Thirteen fishing and one camera stations were successfully fished between the 27-28 July (Primes 36, 35, 72, 71, 77, 76, 70, 69, 68, 95, 79, 96 & 97), completing the French sector and all core stations in the Channel. Prime stations 72 and 35 were repeated for 15 minutes as comparison tows and there were two additional sole tagging tows completed. Prime 79 was invalid due to a large 20M pinnacle showing on the echosounder shortly after shooting. Upon hauling the gear did initially struggle to lift, however once on-board there was no damage, just an anchor hung up in the chain mat. The tow was successfully re-fished, south of the obstacle. In total, 45 sole were tagged by IFREMER staff along the French coast.

Work continued in the North Sea the following morning (29 July) with completion of seven fishing and one sole tagging station (41 soles tagged) (Primes 82, 83, 98, 99 & 100). Prime 82 was repeated for 15 minutes as a comparison tow. Following the days fishing, CEND steamed to the West Gabbard SMART buoy to collect a plankton sample (200um ring net) (Additional aim 22).

CEND steamed overnight to the additional stations off Ostend, Belgium. Five stations were completed in these waters (Primes 113,114,115,116 & 118). Prime 118 had to be abandoned due to a cable over the tow shortly after shooting but was repeated and successfully fished slightly north of the tow. Plans to work in the Thames area the following day were abandoned as CEND had to steam to Lowestoft in order to urgently disembark one crew member. The crew member was safely transferred to shore using the Lowestoft pilot at 2000 hrs.

On the morning of 31 July, the survey resumed operations off Thames area completing two 30-minute survey tows, two 15-minute comparative tows and five sole tagging tows (60 sole tagged), (Prime 78 & 119). Following a full days fishing, CEND steamed north to Shipwash (near Prime 96) where drop camera operations were conducted in the evening. Unfortunately, this was unsuccessful due to poor water visibility.

The following day four stations were fished (Primes 102, 103, 104 & 105), completing the North Sea part of the grid and the entire survey. Following fishing operations, a fire drill (engine room fire) was conducted and then staff took the afternoon/evening to clean up and demob. A pilot boarded at 1528h and CEND docked at 1600h into

Lowestoft. All scientific staff stayed aboard overnight, enabling unloading to take place early 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 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.

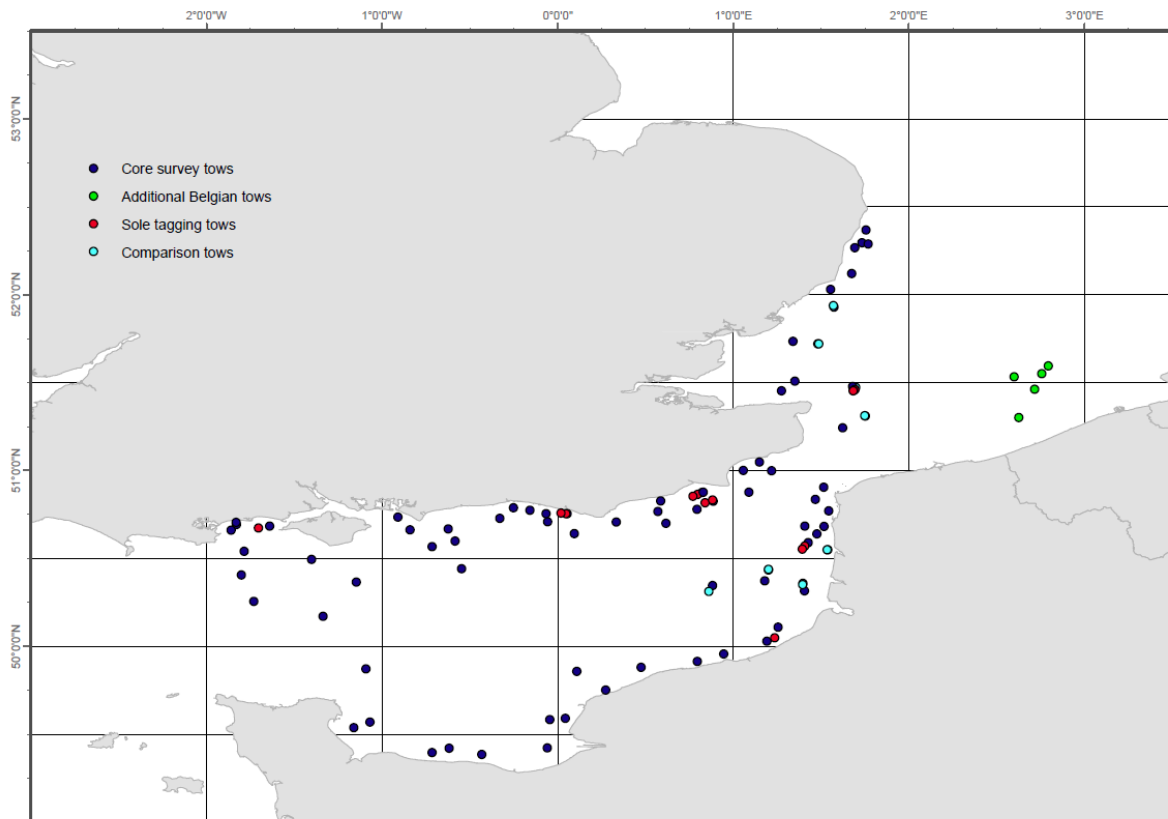
All fish and selected commercial shellfish were identified to species, weighed and measured with large catches of an individual species being sub-sampled. All catch details and sample data were entered directly into the Electronic Data Capture (EDC) system and uploaded directly into the Fishing Survey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

A total number of 4 stations were reduced to 20-24 minute tows due to history of large by-catches or bad ground, 1 tow was reduced to 21 minutes due to static gear and 1 was reduced to 28 minutes due to a cable at the end of the tow. Figure 1 shows the beam trawl station positions on the survey and Table 1 shows the number of gear deployments undertaken on the survey. Table 5 shows the species caught on the survey and the number of valid tows where they were caught.

**Table 1** The number of valid and invalid tows fished during the survey.

Region	Valid 30 minutes	Valid Tows under 30 minutes	Invalid	Abandoned due to static gear	Total tows
VIIId (English)	30	4	1	0	35
VIIId (French)	24	4	1	1	30
IVc	11	3	1	0	15
<b>Total</b>	<b>65</b>	<b>11</b>	<b>3</b>	<b>0</b>	<b>79</b>

**Figure 1** Core & additional stations fished during 2017 survey



### Aims 2 & 3.

All otolithed fish were measured to the whole cm below, weighed individually, sexed and given a sexual maturity code. Table 2 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*), lobster (*Homarus gammarus*), scallops (*Pecten maximus*), oysters (*Ostrea edulis*), velvet swimming crab (*Nicotra puberty*), crawfish (*Palinurids Eliphaz*) and spider crab (*Maia squinado*). Queen scallops (*Aequipecten opercularis*) and Octopus (*Octopodidae*) were weighed and counted.

The numbers of individual fish measured this year for the main commercial species can be seen in Table 3 and the total catch weight of the main commercial species can be seen in Table 4. In total, 216 different species were recorded. Table 5 shows the number of stations each species was observed.

**Table 2** Otoliths collected from the main commercial species by strata.

Region	Brill	Cod	Dab	Flounder	Lemon sole	Plaice	Sole	Whiting	Turbot
VlId English	10	0	45	11	16	938	180	46	5
VlId French	12	2	37	29	38	821	143	95	25
North Sea (IVc)	2	0	39	41	48	108	205	46	1
<b>Total</b>	<b>24</b>	<b>2</b>	<b>121</b>	<b>81</b>	<b>102</b>	<b>1867</b>	<b>528</b>	<b>187</b>	<b>31</b>

**Table 3** Number of fish measured from the main commercial species by strata.

Region	Brill	Cod	Dab	Flounder	Lemon sole	Plaice	Sole	Whiting	Turbot
VlId English	10	0	183	12	17	2371	484	51	5
VlId French	12	2	325	32	42	2553	606	242	25
North Sea IVc	2	0	286	46	81	113	1643	124	1
<b>Total</b>	<b>24</b>	<b>2</b>	<b>794</b>	<b>90</b>	<b>140</b>	<b>5037</b>	<b>2733</b>	<b>417</b>	<b>31</b>

**Table 4** Comparison of catch weight (kg) for the main commercial species over the last 8 surveys (2010-2017) (raised to 30-minute tows)

Weight in Kg								
	2010	2011	2012	2013	2014	2015	2016	2017
<b>Plaice</b>	662	882	679	790	1238	1042	975	836
<b>Sole</b>	188	172	144	169	235	171	183	214
<b>Dab</b>	86	111	61	107	87	73	70	47
<b>Lemon sole</b>	18	66	49	38	38	24	18	14
<b>Cuttlefish</b>	132	66	109	57	48	35	101	103
<b>Flounder</b>	27	47	34	35	72	17	29	19
<b>Whiting</b>	28	30	17	20	30	89	24	52
<b>Brill</b>	14	26	3	16	10	14	10	11
<b>Turbot</b>	18	24	16	10	9	15	17	15
<b>Bass</b>	3	13	3	3	9	2	7	15
<b>Cod</b>	0	4	13	2	16	13	0	1

**Table 5** Comparison of catch numbers for the main commercial species over the last 8 surveys (2009-2017) (raised to 30-minute tows)

Numbers								
	2010	2011	2012	2013	2014	2015	2016	2017
<b>Plaice</b>	3043	4723	3054	3778	7197	5635	5137	5364
<b>Sole</b>	1755	1828	1347	1522	2084	2229	1770	2805
<b>Dab</b>	1359	1929	897	1484	1684	1183	954	917
<b>Lemon sole</b>	166	379	262	222	258	171	119	162
<b>Cuttlefish</b>	769	401	623	404	214	91	526	500
<b>Flounder</b>	103	166	119	118	262	72	127	95
<b>Whiting</b>	576	425	195	600	388	1201	239	927
<b>Brill</b>	32	41	8	25	31	32	20	24
<b>Turbot</b>	18	43	16	20	18	23	27	31
<b>Bass</b>	6	9	4	4	9	2	3	23
<b>Cod</b>	2	11	10	7	43	8	0	2



**Table 6:** List of species caught during the survey and number of stations at which they were recorded.

<i>Abra alba</i>	2	<i>Abra spp</i>	1
<i>Acanthocardia spp</i>	5	<i>Aequipecten opercularis</i>	45
<i>Aequorea spp</i>	24	<i>Agonus cataphractus</i>	41
<i>Alcyonidium diaphanum</i>	67	<i>Alcyonium digitatum</i>	44
<i>Alpheus macrocheles</i>	3	<i>Ammodytes tobianus</i>	6
<i>Anemone unidentified</i>	29	<i>Anguilla anguilla</i>	1
<i>Anseropoda placenta</i>	10	<i>Aphia minuta</i>	1
<i>Aphrodite aculeata</i>	30	<i>Aporrhais pespelicani</i>	1
<i>Archidoris pseudoargus</i>	21	<i>Arnoglossus laterna</i>	30
Ascidiacea	39	<i>Aspitrigla (chelidonichthys) cuculus</i>	22
Assorted rocks	43	<i>Asterias rubens</i>	69
<i>Atelycyclus rotundatus</i>	5	<i>Aurelia aurita</i>	8
<i>Belone belone</i>	1	<i>Blennius ocellaris</i>	4
<i>Botryllus schlosseri</i>	8	Broken shell	28
Bryozoa	2	<i>Buccinum undatum</i>	34
<i>Buenia jeffreysii</i>	1	<i>Buglossidium luteum</i>	46
<i>Callionymus lyra</i>	69	<i>Callionymus reticulatus</i>	3
<i>Cancer pagurus</i>	43	<i>Carcinus maenas</i>	1
Cellariidae	1	<i>Chaetopterus tubes</i>	19
<i>Chlamys varia</i>	8	Chlorophyceae	2
<i>Chrysaora hysoscella</i>	46	<i>Ciliata mustela</i>	1
<i>Ciliata septentrionalis</i>	4	<i>Cirrepedia</i>	5
<i>Cliona celata</i>	2	<i>Clupea harengus</i>	2
<i>Conger conger</i>	4	<i>Corbula gibba</i>	1
<i>Crangon allmanni</i>	1	<i>Crangon crangon</i>	13
<i>Crepidula fornicata</i>	9	<i>Crossaster papposus</i>	17
<i>Ctenolabrus rupestris</i>	5	Cuttle eggs	33
<i>Cyanea capillata</i>	1	<i>Cyanea lamarckii</i>	13
<i>Diazona violacea</i>	1	<i>Dicentrarchus labrax</i>	12
<i>Diplecogaster bimaculata</i>	3	Dogfish egg cases	12
<i>Dromia personata</i>	7	<i>Ebalia spp</i>	1
<i>Dysidea fragilis</i>	5	<i>Echiichthys (trachinus) vipera</i>	27
<i>Ebalia tumefacta</i>	1	<i>Eledone cirrhosa</i>	1
<i>Echinocardium spp</i>	16	<i>Eupagurus / pagurus in adamsia</i>	18
Epibenthic mixture	61	<i>Eupagurus / pagurus in suberites</i>	4
<i>Eupagurus / pagurus in buccinum</i>	24	<i>Euspira (polinices) catena</i>	2
<i>Eurynome aspersa</i>	2	<i>Eutrigla (chelidonichthys) gumardus</i>	10
<i>Euspira fusca</i>	4	<i>Flustra foliacea</i>	36
<i>Filograna implexa</i>	5	<i>Fucus vesiculosus</i>	3
<i>Fucus spp</i>	27	<i>Galathea spp</i>	7
<i>Gadus morhua</i>	1	<i>Glycymeris glycymeris</i>	6
Gastropod eggs	1	<i>Gobius niger</i>	6

<i>Gobius gasteveni</i>	6	<i>Halichondria panicea</i>	4
<i>Gobius paganellus</i>	8	<i>Henricia oculata</i>	10
<i>Haliclona oculata</i>	6	<i>Hippocampus hippocampus</i>	15
<i>Hinia (nassarius) reticulatua</i>	12	<i>Homarus gammarus</i>	8
<i>Holothuroidea</i>	5	<i>Hydrallmania falcata</i>	11
<i>Hyas coarctatus</i>	8	<i>Hyperoplus lanceolatus</i>	3
HYDROIDA (order)	43	<i>Inachus spp</i>	26
<i>Inachus dorsettensis</i>	9	<i>Labrus mixtus (l. Bimaculatus)</i>	1
<i>Labrus bergylta</i>	2	Lepadidae	4
<i>Laminaria spp</i>	11	<i>Liocarcinus depurator</i>	20
<i>Limanda limanda</i>	45	<i>Liocarcinus pusillus</i>	1
<i>Liocarcinus marmoreus</i>	6	<i>Loligo (alloteuthis) subulata</i>	49
<i>Liparis montagui</i>	1	<i>Loligo vulgaris</i>	2
<i>Loligo forbesi</i>	2	<i>Lutraria lutraria</i>	1
<i>Lophius piscatorius</i>	2	<i>Macropodia tenuirostris</i>	16
<i>Macropodia spp</i>	13	<i>Maja squinado</i>	59
<i>Mactra stultorum</i>	1	<i>Metridium senile</i>	9
<i>Merlangius merlangus</i>	37	<i>Microstomus kitt</i>	14
<i>Microchirus variegatus</i>	15	Molgulidae	4
<i>Modiolus modiolus</i>	4	<i>Molva molva</i>	1
<i>Mollusca-bivalvia</i>	2	<i>Mustelus asterias</i>	25
<i>Mullus surmuletus</i>	1	<i>Mytilus edulis</i>	6
<i>Myoxocephalus scorpius</i>	4	<i>Nemertesia antennina</i>	16
<i>Necora puber</i>	79	<i>Nemertesia spp</i>	3
<i>Nemertesia ramosa</i>	4	<i>Nudibranchia</i>	6
<i>Nereis spp</i>	2	<i>Ophiotrix fragilis</i>	33
<i>Ocenebra erinacea</i>	1	<i>Ophiura ophiura</i>	20
<i>Ophiura albida</i>	11	<i>Pachymatisma johnstonia</i>	7
<i>Ostrea edulis</i>	10	Paguridae	7
<i>Pagrus pagrus</i>	1	<i>Palaemon serratus</i>	8
<i>Pagurus bernhardus</i>	1	<i>Pandalus montagui</i>	7
<i>Pandalidae (family)</i>	1	<i>Pegusa (solea) lascaris</i>	17
<i>Pecten maximus</i>	16	Phaeophyceae	22
<i>Pentapora foliacea</i>	12	<i>Pholis gunnellus</i>	1
<i>Philine aperta</i>	3	<i>Pisa armata</i>	13
<i>Pilumnus hirtellus</i>	2	<i>Pisidia longicornis</i>	19
<i>Pisa tetraodon</i>	1	<i>Pleurobrachia pileus</i>	1
<i>Platichthys flesus</i>	16	<i>Polybius (liocarcinus) holsatus</i>	51
<i>Pleuronectes platessa</i>	65	<i>Pomatoschistus spp</i>	24
<i>Polymastiidae</i>	7	<i>Psammechinus miliaris</i>	42
<i>Porifera</i>	33	<i>Raja clavata</i>	52
<i>Raja brachyura</i>	12	<i>Raja montagui</i>	9
<i>Raja microocellata</i>	2	<i>Raspailia spp</i>	5
<i>Raja undulata</i>	4	<i>Rissoides (meiosquilla) desmaresti</i>	4
Rhodophyceae	22	<i>Sabellaria spinulosa</i>	10
<i>Rossia macrosoma</i>	1	<i>Scaphander lignarius</i>	1

<i>Sagartia spp</i>	1	<i>Scophthalmus maximus (psetta maxima)</i>	17
<i>Scomber scombrus</i>	3	<i>Scyliorhinus canicula</i>	50
<i>Scophthalmus rhombus</i>	14	<i>Sepia officinalis</i>	59
<i>Securiflustra securifrons</i>	3	<i>Sepiolidae</i>	11
<i>Sepiola atlantica</i>	3	<i>Spatangus purpureus</i>	5
<i>Solea solea</i>	63	<i>Spondylisoma cantharus</i>	7
<i>Spisula spp</i>	5	<i>Squid eggs</i>	2
<i>Sprattus sprattus</i>	2	<i>Suberites spp</i>	12
<i>Styela clava</i>	18	<i>Symphodus (crenilabrus) melops</i>	1
<i>Symphodus (crenilabrus) balloni</i>	5	<i>Taurulus bubalis</i>	3
<i>Syngnathus acus</i>	6	<i>Trachinus draco</i>	4
<i>Tethya aurantia</i>	15	<i>Trigla (chelidonichthys) lucerna</i>	40
<i>Trachurus trachurus</i>	10	<i>Trisopterus luscus</i>	40
<i>Trigloporus (chelidonichthys) lastoviza</i>	11	<i>Tritonia hombergi</i>	4
<i>Trisopterus minutus</i>	32	<i>Tubularia spp</i>	5
<i>Trochidae</i>	1	<i>Upogebia spp</i>	5
<i>Ulva lactuca</i>	14	<i>Whelk eggs</i>	10
<i>Urticina (tealia) felina</i>	23	<i>Xantho pilipes</i>	1
<i>Xanthid crab</i>	14	<i>Zeus faber</i>	3
<i>Zeugopterus (phrynorhombus) regius</i>	7		

## **Plaice**

Overall catch weight of plaice (836 kg) was lower, however catch number (5364) was slightly higher than in 2016 (5137 fish, 975 kg) (Table 4 & 5). Catch weights were lower (4%) and catch numbers higher (20%) in the English VIId sector, both catch weight (7%) and numbers (27%) were lower in the French VIId sector, however there was an increase in weight and numbers in the Southern North Sea (32% and 31% respectively) (Figure 11). Catch numbers and weight were higher than the average (3554 fish, 703 kg) for the past 14 years (2004-17). Recruited plaice (>21cm) distribution was similar to previous years, with high numbers seen off Hastings, Brighton (VIId English sector), Dieppe and Boulogne (VIId French sector) (Figure 5). Pre-recruit plaice (<21cm) numbers were higher and most abundant off Hastings (VIId English sector) Dieppe and Boulogne (VIId French sector) (Figure 7).

## **Sole**

Catch numbers and weight of sole were higher this year (2805 fish, 214 kg) compared to 2016 (1770 fish, 183 kg) (Table 4 & 5). Both catch weight and numbers in 2017 were slightly higher than the average historic catch rate 2004-17 (2026 fish, 204 kg). There was a decrease in sole catch numbers (15%) and weight (14%) in the VIId English sector but an increase in French VIId sector (catch 22%, numbers 15%) and a large increase in North Sea (catch 144%, numbers 59%) compared to the previous year. Recruited sole ( $\geq$ 21cm) were most abundant off Folkstone (VIId English sector), Boulogne (VIId French sector) and Aldeburgh (Southern North Sea) (Figure 6).

Abundance was greater at the northerly stations of the North Sea sector and further west (Le Havre & Dieppe) in the French sector than in previous years. Pre - recruited sole (<21cm) were most abundant off Boulogne and Le Havre (VIId French sector), with smaller catches between Folkestone to Brighton (VIId English sector) The North Sea stations showed a large increase in pre-recruits, particularly off Aldeburgh/Southwold (Figure 8).

### **Other species**

Catches of whiting, cod, dab, brill, lemon sole were higher this year, however there was a decrease in the number of flounder and dab caught compared to 2016 (Table 4 & 5). There was a decrease in the number of lemon sole and dab in the Channel. Lemon sole catches were largest off Ramsgate, further north than in previous years (Figure 10), however the catches of dab were largest off Boulogne and Aldeburgh (Figure 9). There were noticeably high numbers of seahorses caught again this year (91) compared to 2016 (28) with two recorded in the English sector. There was also a rare sighting of a white seahorse (*Hippocampus hippocampus*) at prime 76 (Figure 2). Distribution of this species seemed to be spread widely along the French coast rather than at just one location around prime station 7.



**Figure 2** Image of white seahorse (*Hippocampus hippocampus*)

### **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 9 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 shrimps (*Meiosquilla desmaresti*) being encountered. All 12 full benthic stations in VIId and 3 in IVc were sampled successfully.

## Secondary aims

### Aim 5

Depth, conductivity and temperature profiles were successfully taken at 105 trawl stations. In addition, surface and near-bottom water samples taken using a Niskin with ESM2 logger at 28 locations.

### Aim 6

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

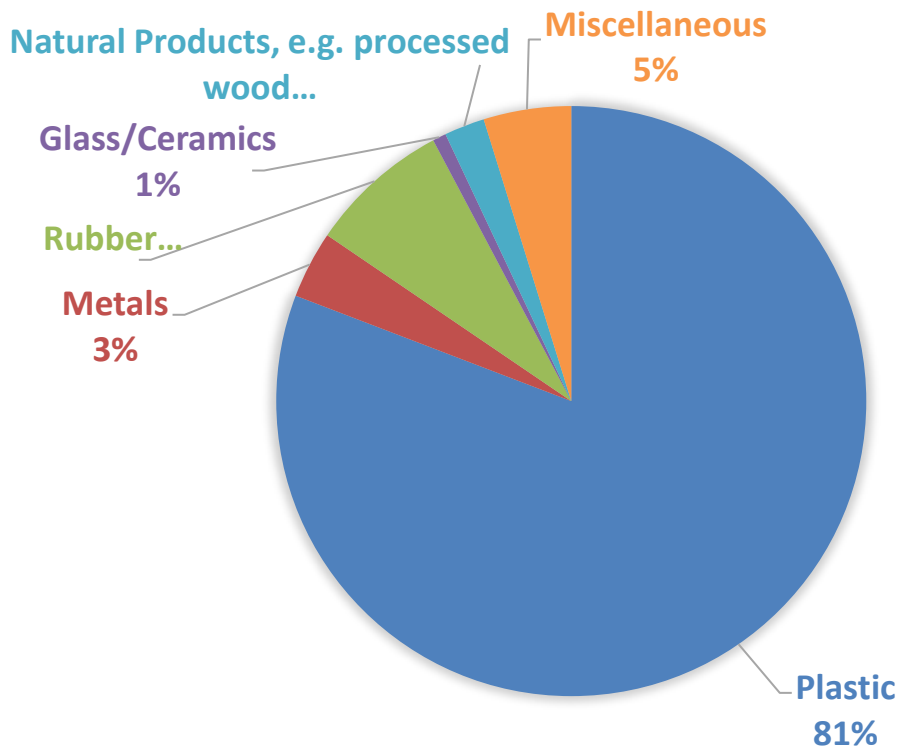
### Aim 7

There were no sighting of marine mammals, sea turtles, large pelagic fish or observations of jellyfish aggregations recorded.

### Aim 8

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.

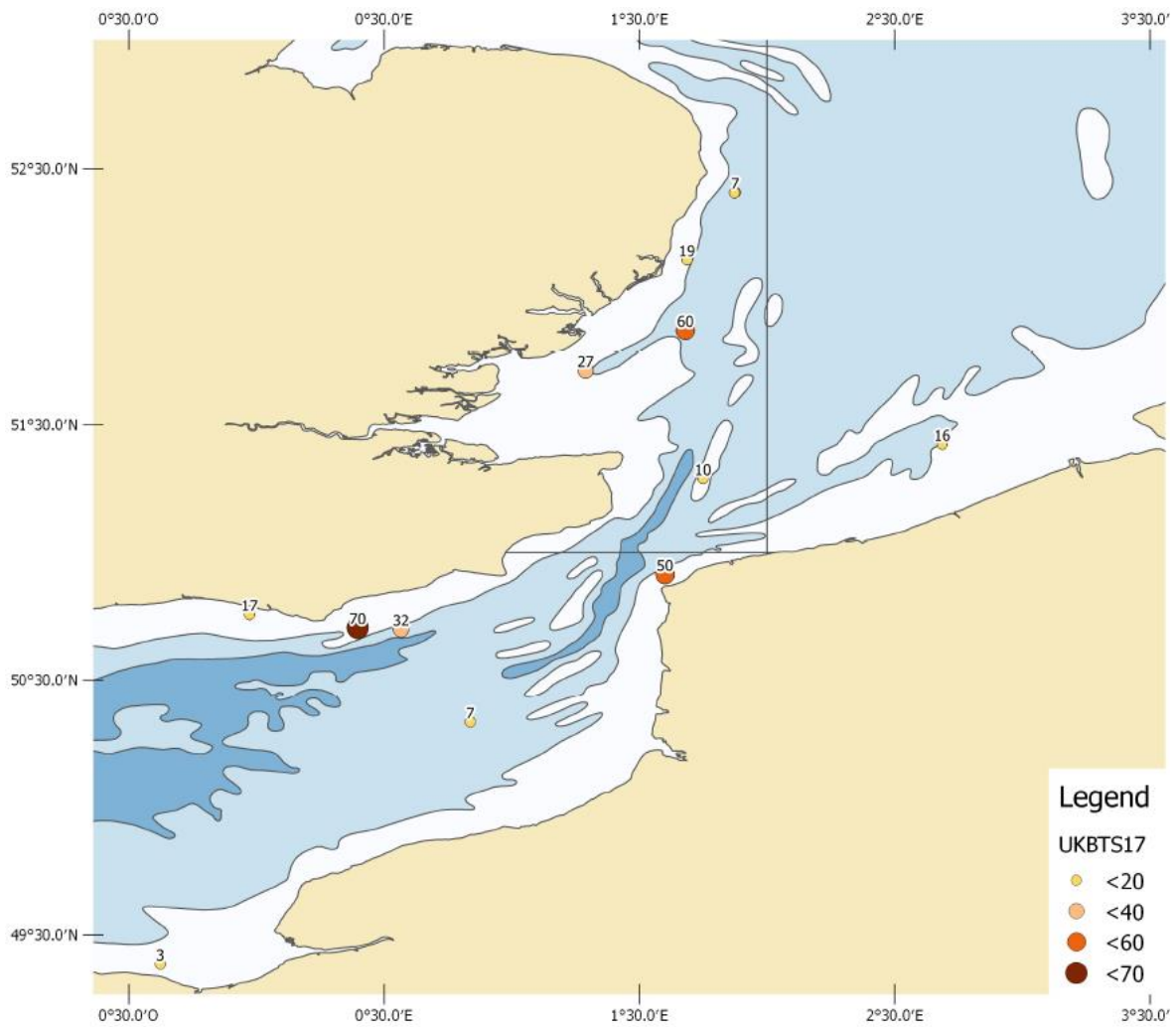
**Figure 3** Percentage of marine litter collected in the beam trawl



## Aim 9

Additional tows with the 4m beam trawl were carried out in order to tag and release sole (*Solea solea*) as part of an Ifremer and Agrocampus Ouest project (SMAC). Two colleagues from Ifremer joined the survey and were able to tag and release a total of 339 sole (Table 7)

**Figure 4** Map of positions of tagged sole by Ifremer



**Table 7** Summary of sole tagging work, showing numbers tagged/released by fishing station.

Station Numbers	Numbers Released	Station Numbers	Numbers Released
15	7	101	6
16	25	104	21
23	70	108	19
30	9	114	16
31	8	119	6
34	2	137	16
49	3	115/116	4
56	3	134-135-136	7
77	4	90/91	42
79	8	128 - 133	60
84	3		

#### **Aim 10**

One undulate ray (*Raja undulata*), one blonde ray (*Raja brachyura*), one nurse-hound (*Scyliorhinus stellaris*) and 15 starry smooth-hounds (*Mustelid asterias*) were tagged and released.

#### **Aim 11**

A variety of fish were frozen for otolith extraction technique training of new market sampling staff (Ben Hatton, Cefas Lowestoft).

#### **Aim 12**

A large bag of hermits in whelks were collected and frozen (Vladimir Laptikhovsky, Cefas Lowestoft)

#### **Aim 13**

No buried edible crab for entrainment simulation studies were caught (Linford Mann, Cefas Lowestoft)

#### **Aim 14**

A small bag (Approx. 16) of black seabream (*Spondyllosoma cantharus*) were collected for subsequent maturity stage analysis at the Cefas laboratory (Louise Cox, Cefas Lowestoft)

### **Aim 15**

All squid were frozen for future work on statolith preparation/ageing (Vladimir Laptikhovsky/Mark Smith/Jo Smith, Cefas Lowestoft)

### **Aim 16**

Additional tows were carried out on eight prime stations (Prime 37, 29, 35, 72, 82, 98, 78 & 119) to compare catch rates between 15 and 30-minute tows.

### **Aim 17**

A number of fish species were collected for Cefas 20<sup>th</sup> anniversary London visit (Ian Holmes, Cefas Lowestoft)

### **Aim 18**

No squid eggs were collected for embryonic analyses (Vladimir Laptikhovsky, Cefas Lowestoft)

### **Aim 19**

A total of 7 deployments, 347 stills and 164 minutes were taken to test the CSSF OT Blue Belt camera/winch system. The systems worked well and was very easy to setup, receiving good feedback from the crew with regards to operating the winch. The issues found included;

- On occasion, the flash wouldn't fire while taking a still image
- Black spots were also noted on the images taken with the stills camera, after inspection dust was found inside of the water corrected lens.

These issues were reported back to STR to be resolved. (Marc Whybrow, Cefas Lowestoft)

### **Aim 20**

Whole fish and fin clip samples were collected and frozen from a number of species for an environmental DNA project (Katherine Maltby, Exeter University & Rupert Collins, Bristol University)

### **Aim 21**

A plankton sample (200um ring net) was collected from West Gabbard SMART buoy for the SLA021 programme (Sophie Pitois, 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.

J Smith (SIC)  
21/8/2017

INITIALLED: I D Holmes

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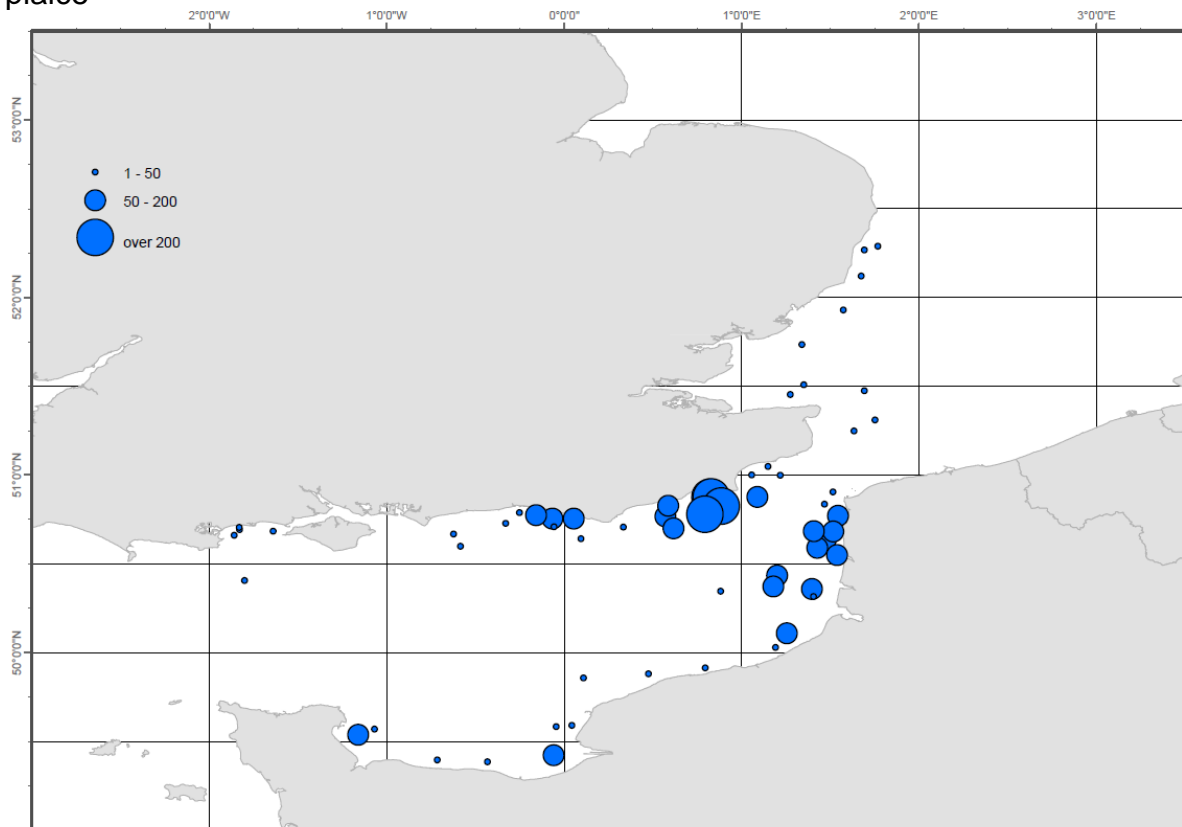
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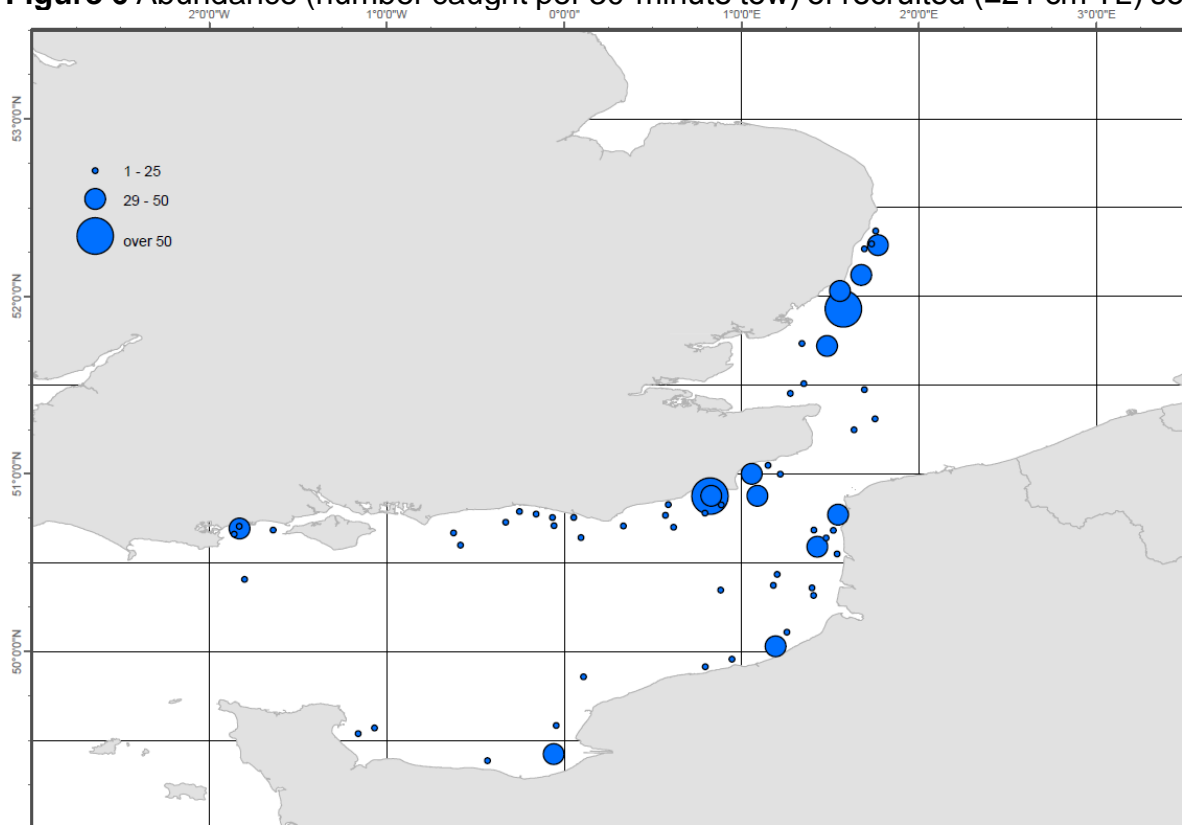
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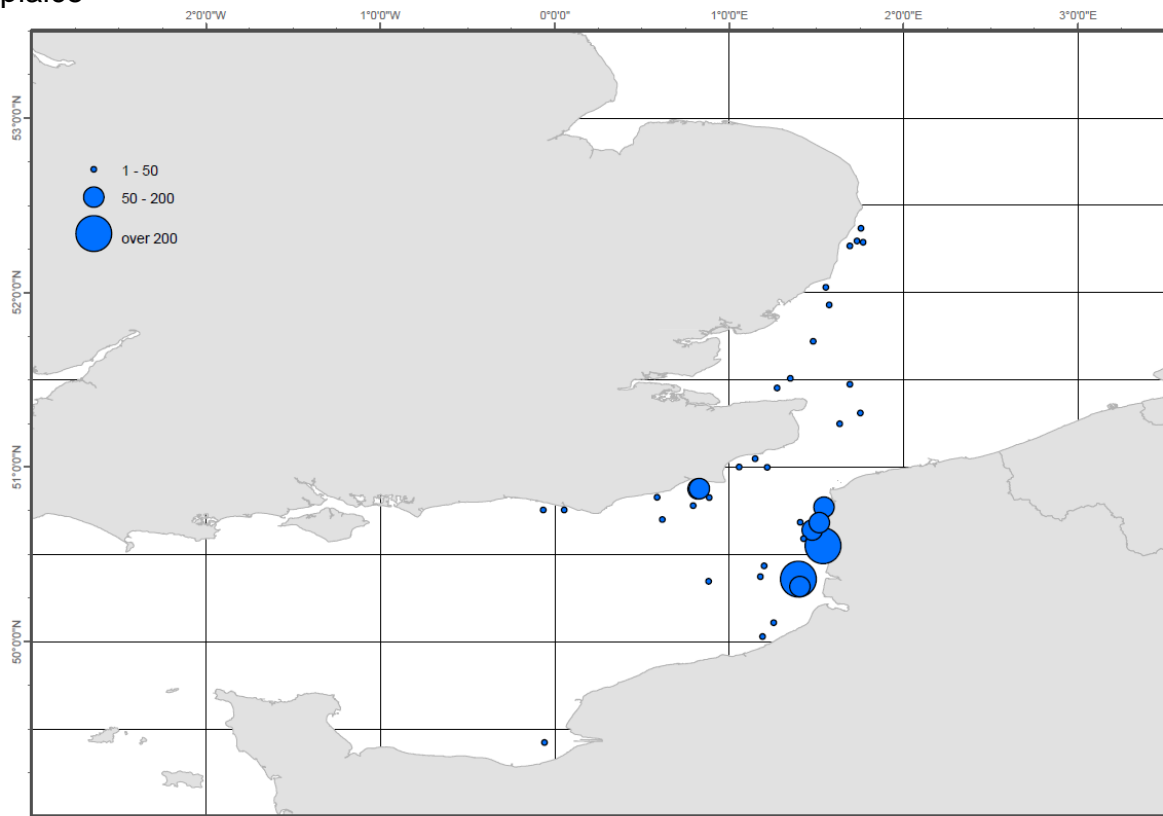
**Figure 5** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) plaice



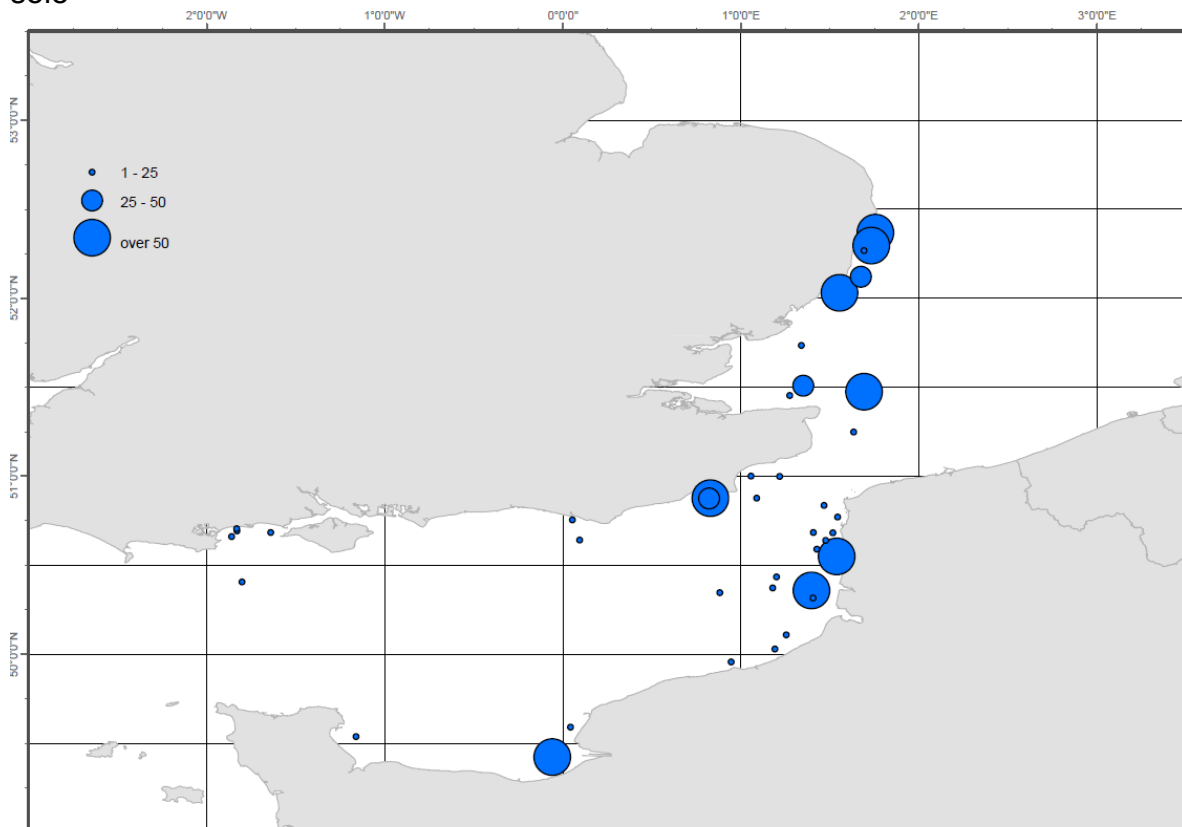
**Figure 6** Abundance (number caught per 30-minute tow) of recruited ( $\geq 21$  cm TL) sole



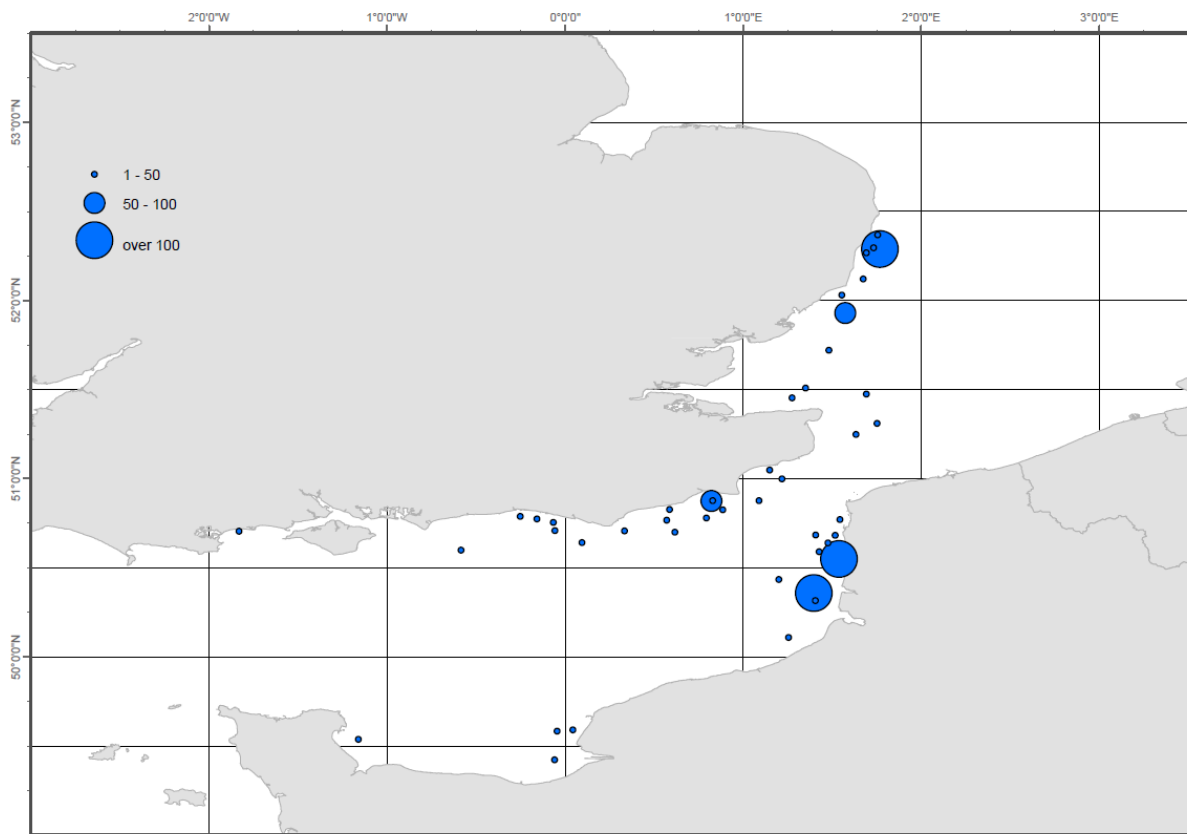
**Figure 7** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) plaice



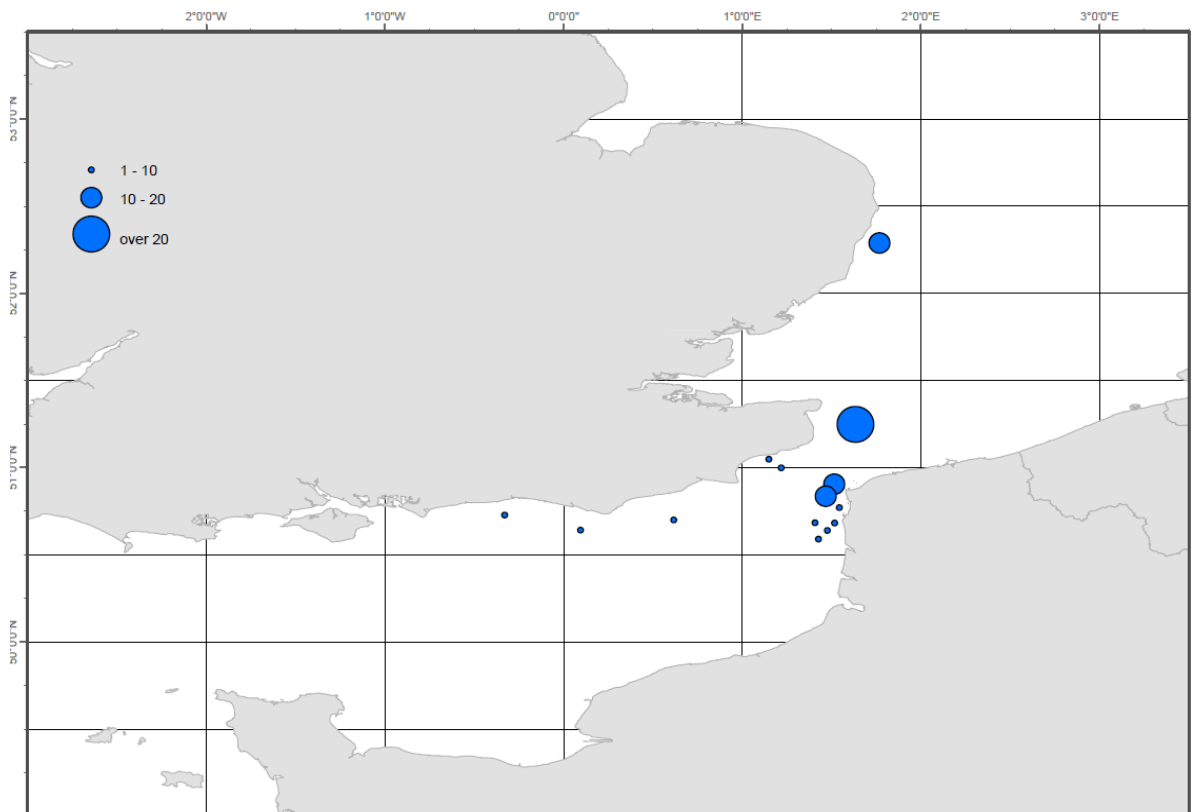
**Figure 8** Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) sole



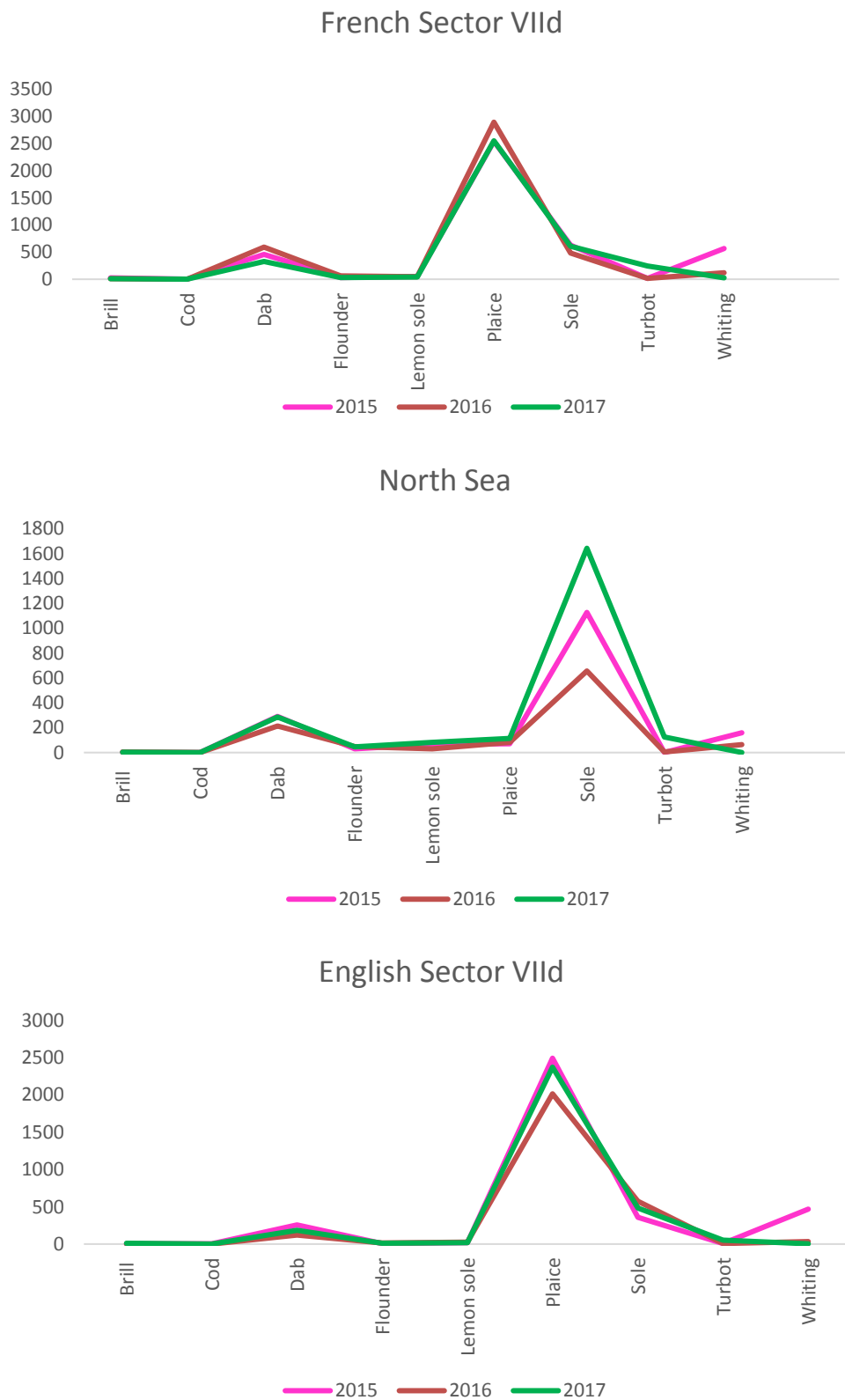
**Figure 9** Abundance (number caught per 30-minute tow) of Dab



**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 (VIId) and southern North Sea (IVc) during 2015-17 surveys.



**Figure 12** Comparison of total weight of commercial species caught on survey between 2007–17



