

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

**2018 RESEARCH VESSEL PROGRAMME
REPORT: RV ENDEAVOUR: SURVEY 12/18**

J Smith (SIC)
S Shaw (2IC)
M Brown
K Downes
J Pettigrew
C Jennings
C Popham
C Lazard (Ifremer)

DURATION:

14 – 27 July 2018

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

NARRATIVE: (ALL TIMES ARE GMT)

The SIC (Joanne Smith) and Charlotte Jennings travelled from Lowestoft to Fowey, joining the Cefas Endeavour (CEND) on the afternoon of 12 July. Steve Shaw was part of the scientific team on the previous survey (CEND 11/18), so following docking he was able to begin setting up the EDC and fish-room. The following day was spent finishing off 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 1630h on 13 July. Vessel safety inductions were given for those needing them at 1700h that day.

The vessel sailed from Fowey at 1800h on the evening of 13 July, steaming overnight to the first survey station (Prime 43) off Poole in the English sector of Vllld. On the morning of the 14 July, a toolbox talk and scientist safety briefings took place.

The survey commenced with deployment of the ESM2 logger with Niskin bottle, followed by a shakedown beam trawl tow (beam number 4) at prime station 43, to fully test the gear deployment and the on-board fish sampling systems. Upon 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, 42, 23 and 24.

Once the day's fishing was complete, CEND steamed east overnight to begin operations the following morning at prime station 27, successfully completing seven stations (Primes 27, 52, 51, 50, 49, 53 & 54) during the day. After survey operations had finished, a small-boat transfer was carried out to bring on-board a member of crew (engineer). The following day, seven stations (Primes 55, 56, 57, 58, 59, 67 and 94) and five sole tagging tows were completed. Prime 55 was hauled after 23 minutes due to static gear on the tow. Work continued in an easterly direction completing 13 prime stations and 6 sole stations over the next two days (Primes 60, 62, 61, 66, 65, 64, 63, 75, 73, 74 (English channel) 119, 78, 79 (North sea)). Prime 62 could only be fished for 1 nm due to static gear surrounding the tow. All of these stations had large catches of flatfish and mud, with prime stations 65 and 66 having higher than normal numbers of plaice and sole. Prime station 74 resulted in a large catch of plaice and sole, taking 5 hours to sort. On the evening of the 18 July, a small-boat transfer was carried to change over Masters, dropping off N Fagan and picking up B Salter.

On the morning of 19 July, CEND steamed to prime 69 to begin work in the French sector of VIId with six fishing stations were successfully completed (primes 69,68,70,35,36,29). Prime station 69 yielded a large catch of small mussels (*Mytilus edulis*). Historically, this location had yielded a catch of large plaice, but those have not been caught at this location for many years. The following morning CEND steamed back to the Poole area, working in a southerly direction, completing five stations in the English sector of VIId (primes 44,47,22,26,25) and two in the French sector of VIId (primes 10&12). Prime station 26 resulted in the usual large catch of brittle stars but with very little fish.

CEND continued working in an easterly direction along the French coast, completing 20 fishing stations and two sole tows. Prime stations 8, 9, 7,6, 4, 1, and 11 were completed on 21 July; Prime stations 21, 20, 19, 18, 39 and 40 were completed on 22 July and prime stations 38, 37, 76, 72, 77, 71 and 95 were completed on 23 July. Prime Stations 17 and 18 could not be fished due to static gear on the tows and no alternative tows could be found. Prime 39 had to be fished 1nm before the start of the tow to avoid static gear. Prime 21 resulted in the usual large catch of mud and shingle and prime 77 had an unusually large catch of mussels (juveniles) and these was also observed at nearby prime 69. This completed the French sector.

CEND steamed overnight to complete final fishing station in the English sector (prime 80) and five stations off the coast of Belgium (Prime stations 113, 114, 118, 115 & 116). Prime 113 had to be fished for just 20 minutes due to a cable at the end of the tow. Work began the following morning of 25 July in the North sea, completing eleven fishing stations (Prime stations 96, 97, 82, 83, 98, 99, 100, 102, 103, 104 & 105) and 2 sole tows over the 2 days. Prime station 100 had to be fished for just 20 minutes due to a cable at both the start and end of the tow. Prime station 83 resulted in an European eel (*Anguilla anguilla*).

Following fishing operations, a fire drill (accommodation room fire) was conducted and then staff spent the afternoon/evening cleaning up for demob whilst CEND steamed to Middlesbrough for a scheduled dry-dock visit. The pilot boarded at 0830h and CEND docked at 0948h All scientific staff travelled home the same day.

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.

A total number of 5 stations were reduced to 20 minute tows due to history of large by-catches or bad ground, 6 tows were reduced to between 21 - 24 minutes due to static gear and 1 was reduced to 20 minutes due to cables on 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.

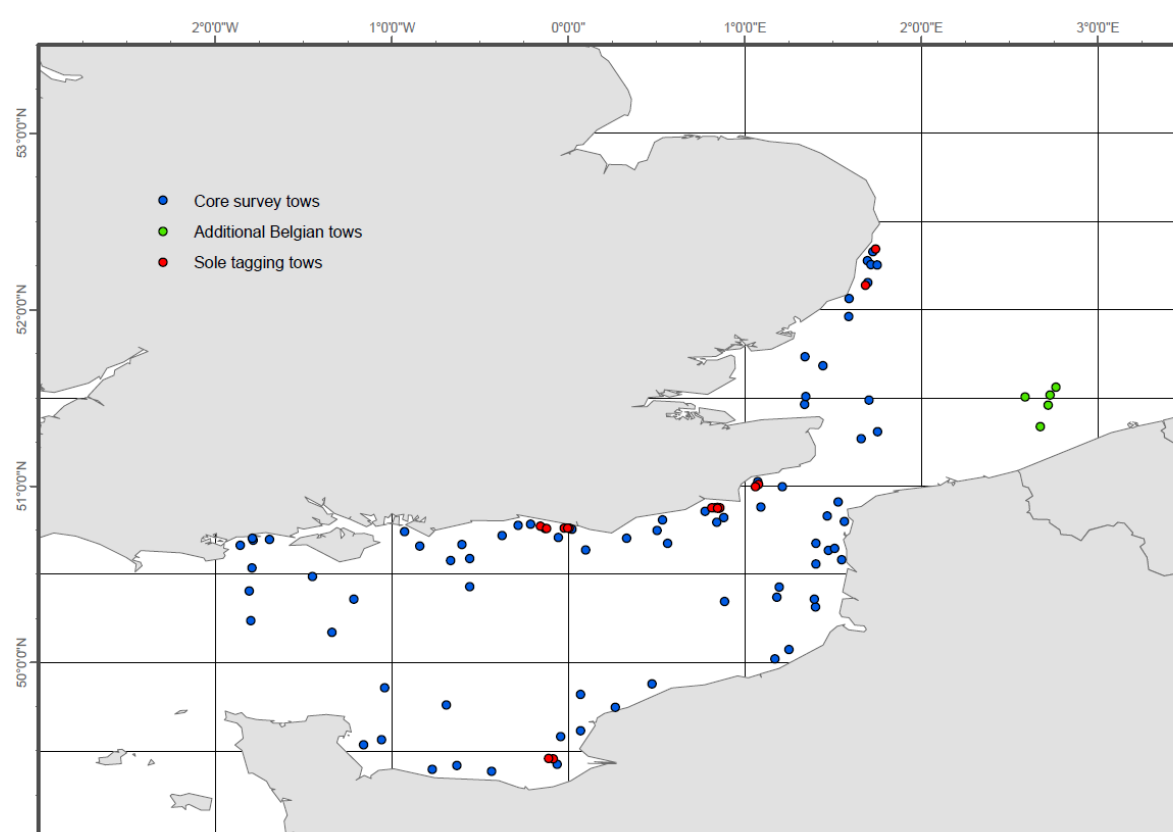
Table 1 Survey Prime stations not worked or reduced in tow duration

Prime Station Number	Sector	Reason for not working or reduction in tow time	Alternative tow or tow time
49	English	Static gear on tow	22 minutes
55	English	Static gear on tow	23 minutes
62	English	Static gear on tow	20 minutes
47	English	Static gear on tow	24 minutes
12	French	Static gear on tow	22 minutes
9	French	History of large catch	20 minutes
1	French	History of large catch	20 minutes
21	French	History of large catch	20 minutes
20	French	Static gear on tow	21 minutes
17	French	DNF too much Static	No Alternative
16	French	DNF too much Static	No Alternative
71	French	History of large catch	20 minutes
95	French	History of large catch	20 minutes
100	North sea	Cables on tow	20 minutes

Table 2 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
VId (English)	31	4	0	0	35
VId (French)	21	7	0	2	30
IVc (North sea)	13	1	0	0	14
Total	65	12	0	2	79

Figure 1 Core & additional stations fished during 2018 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 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 (*Homarus gammarus*), King scallop (*Pecten maximus*), European flat oyster (*Ostrea edulis*), velvet swimming crab

(*Necora puber*), Common spiny lobster (*Palinurus elephas*) and Greater spider crab (*Maja squinado*). Queen scallops (*Aequipecten opercularis*) and 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 (2011-2018) can be seen in Tables 5 and Table 6. In total, 210 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
Vld English	11	0	49	29	22	978	192	44	6
Vld French	9	1	22	27	18	687	147	51	13
North Sea (IVc)	3	1	40	55	39	153	194	62	2
Total	23	2	111	111	79	1818	533	157	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
Vld English	11	0	322	31	26	3510	721	69	6
Vld French	9	1	222	28	23	2031	411	151	16
North Sea (IVc)	3	1	149	55	74	221	1144	113	2
Total	23	2	693	114	123	5762	2276	333	24

Table 5 Comparison of catch weight (kg) for the main commercial species over the last 8 surveys (2011-2018) (raised to 30-minute tows)

Weight in Kg								
	2011	2012	2013	2014	2015	2016	2017	2018
Plaice	882	679	790	1238	1042	975	836	846
Sole	172	144	169	235	171	183	214	231
Dab	111	61	107	87	73	70	47	41
Lemon sole	66	49	38	38	24	18	14	11
Cuttlefish	66	109	57	48	35	101	103	60
Flounder	47	34	35	72	17	29	19	27
Whiting	30	17	20	30	89	24	52	27
Brill	26	3	16	10	14	10	11	13
Turbot	24	16	10	9	15	17	15	13
Bass	13	3	3	9	2	7	15	8
Cod	4	13	2	16	13	0	1	1

Table 6 Comparison of catch numbers for the main commercial species over the last 8 surveys (2011-2018) (raised to 30-minute tows)

Numbers								
	2011	2012	2013	2014	2015	2016	2017	2018
Plaice	4723	3054	3778	7197	5635	5137	5364	5904
Sole	1828	1347	1522	2084	2229	1770	2805	2398
Dab	1929	897	1484	1684	1183	954	917	720
Lemon sole	379	262	222	258	171	119	162	124
Cuttlefish	401	623	404	214	91	526	500	279
Flounder	166	119	118	262	72	127	95	119
Whiting	425	195	600	388	1201	239	927	400
Brill	41	8	25	31	32	20	24	24
Turbot	43	16	20	18	23	27	31	25
Bass	9	4	4	9	2	3	23	6
Cod	11	10	7	43	8	0	2	2

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

<i>Acanthocardia aculeata</i>	5	<i>Aequipecten opercularis</i>	39
<i>Aequorea</i> spp	44	<i>Agonus cataphractus</i>	39
<i>Alcyonidium diaphanum</i>	59	<i>Alcyonidium parasiticum</i>	1
<i>Alcyonium digitatum</i>	36	<i>Alpheus macrocheles</i>	1
<i>Ammodytes tobianus</i>	5	<i>Anemone unidentified</i>	32
<i>Anguilla anguilla</i>	1	<i>Anseropoda placenta</i>	11
<i>Aphia minuta</i>	1	<i>Aphrodite aculeata</i>	30
<i>Apletodon microcephalus</i>	1	<i>Archidoris pseudoargus</i>	17
<i>Arnoglossus laterna</i>	35	<i>Ascidacea</i>	37
<i>Aspitrigla (chelonichthys) cuculus</i>	30	<i>Assorted rocks</i>	45
<i>Asterias rubens</i>	64	<i>Atelycyclus rotundatus</i>	5
<i>Aurelia aurita</i>	25	<i>Blennius ocellaris</i>	6
<i>Botryllus schlosseri</i>	15	<i>Broken shell</i>	31
<i>Buccinum undatum</i>	21	<i>Buenia jeffreysii</i>	4
<i>Buglossidium luteum</i>	36	<i>Calcarea</i>	1
<i>Callionymus lyra</i>	65	<i>Callionymus reticulatus</i>	1
<i>Calliostoma zizyphinum</i>	2	<i>Cancer pagurus</i>	21
<i>Carcinus maenas</i>	2	<i>Cellariidae</i>	5
<i>Chaetopterus tubes</i>	26	<i>Chaetopterus variopedatus</i>	1
<i>Chartella</i> spp	1	<i>Chlamys varia</i>	5
<i>Chlorophyceae</i>	10	<i>Chrysaora hysoscella</i>	51
<i>Ciliata mustela</i>	1	<i>Ciliata septentrionalis</i>	1
<i>Clupea harengus</i>	1	<i>Conger conger</i>	2
<i>Corystes cassivelaunus</i>	1	<i>Crangon allmanni</i>	2
<i>Crangon crangon</i>	9	<i>Crangonidae</i>	5
<i>Crepidula fornicata</i>	8	<i>Crossaster papposus</i>	14
<i>Ctenolabrus rupestris</i>	2	<i>Ctenophora</i>	3
<i>Cucumariidae</i>	1	<i>Cuttle eggs</i>	22
<i>Cyanea lamarckii</i>	18	<i>Diazona violacea</i>	3
<i>Dicentrarchus labrax</i>	4	<i>Diplecogaster bimaculata</i>	1
<i>Dogfish egg cases</i>	10	<i>Dromia personata</i>	7
<i>Ebalia tuberosa</i>	1	<i>Echiichthys (trachinus) vipera</i>	19
<i>Echinocardium cordatum</i>	1	<i>Echinocardium</i> spp	14
<i>Eledone cirrhosa</i>	3	<i>Ensis ensis</i>	1
<i>Epibenthic mixture</i>	64	<i>Eupagurus / pagurus in adamsia</i>	8
<i>Eupagurus / pagurus in buccinum</i>	23	<i>Eupagurus / pagurus in suberites</i>	3
<i>Eurynome aspersa</i>	1	<i>Eutrigla (chelonichthys) gurnardus</i>	24
<i>Filograna implexa</i>	1	<i>Flustra foliacea</i>	45
<i>Fucus</i> spp	16	<i>Fucus vesiculosus</i>	12
<i>Gadus morhua</i>	2	<i>Gaidropsarus vulgaris</i>	2
<i>Galathea</i> spp	4	<i>Gastropod eggs</i>	9
<i>Gibbula</i> spp (monodonta spp)	2	<i>Glycymeris glycymeris</i>	6

<i>Gobius gasteveni</i>	6	<i>Gobius niger</i>	3
<i>Gobius paganellus</i>	2	<i>Haliclona oculata</i>	3
<i>Henricia oculata</i>	7	<i>Henricia</i> spp	1
<i>Hinia (nassarius) reticulatua</i>	8	<i>Hippocampus hippocampus</i>	7
<i>Hippocampus ramulosus (h. Guttulatus)</i>	1	<i>Holothuroidea</i>	3
<i>Homarus gammarus</i>	10	<i>Hyas coarctatus</i>	1
<i>Hydrallmania falcata</i>	1	<i>Hydroida (order)</i>	49
<i>Hyperoplus lanceolatus</i>	2	<i>Inachus dorsettensis</i>	25
<i>Inachus leptochirus</i>	12	<i>Inachus</i> spp	11
<i>Labrus bergylta</i>	5	<i>Laminaria</i> spp	11
<i>Lepadidae</i>	1	<i>Leucosiidae</i>	1
<i>Limanda limanda</i>	52	<i>Liocarcinus depurator</i>	25
<i>Liocarcinus marmoreus</i>	10	<i>Liparis liparis</i>	1
<i>Loligo (alloteuthis) subulata</i>	56	<i>Macropodia</i> spp	2
<i>Macropodia tenuirostris</i>	24	<i>Maja squinado</i>	65
<i>Marthasterias glacialis</i>	7	<i>Merlangius merlangus</i>	29
<i>Metridium senile</i>	1	<i>Microchirus variegatus</i>	7
<i>Microstomus kitt</i>	16	<i>Mollusca-bivalvia</i>	3
<i>Mullus surmuletus</i>	3	<i>Mustelus asterias</i>	9
<i>Myoxocephalus scorpius</i>	4	<i>Mytilus edulis</i>	19
<i>Necora puber</i>	33	<i>Nemertesia antennina</i>	16
<i>Nemertesia ramosa</i>	3	<i>Nemertesia</i> spp	1
<i>Nereis</i> spp	1	<i>Nerophis lumbriciformis</i>	1
<i>Nudibranchia</i>	9	<i>Ocenebra erinacea</i>	2
<i>Ophiocomina nigra</i>	2	<i>Ophiothrix fragilis</i>	25
<i>Ophiura ophiura</i>	36	<i>Orcinus orca</i>	1
<i>Ostrea edulis</i>	3	<i>Paguridae</i>	16
<i>Palaemon serratus</i>	2	<i>Palliolum tigerinum</i>	1
<i>Pandalus montagui</i>	4	<i>Parablennius gattorugine</i>	1
<i>Pecten maximus</i>	12	<i>Pegusa (solea) lascaris</i>	10
<i>Pentapora foliacea</i>	13	<i>Phaeophyceae</i>	20
<i>Pholis gunnellus</i>	2	<i>Pisa armata</i>	13
<i>Pisa tetraodon</i>	2	<i>Pisidia longgicornis</i>	13
<i>Platichthys flesus</i>	19	<i>Pleurobrachia pileus</i>	1
<i>Pleuronectes platessa</i>	67	<i>Pollachius pollachius</i>	1
<i>Polybius (liocarcinus) holsatus</i>	45	<i>Polyplacophora</i>	1
<i>Pomatoschistus</i> spp	20	<i>Pontobdella muricata</i>	1
<i>Porella compressa</i>	1	<i>Porifera</i>	29
<i>Psammechinus miliaris</i>	44	<i>Raja brachyura</i>	5
<i>Raja clavata</i>	38	<i>Raja microocellata</i>	1
<i>Raja montagui</i>	5	<i>Raja undulata</i>	3
<i>Raspailia</i> spp	26	<i>Rhodophyceae</i>	13
<i>Rissoides (meiosquilla) desmaresti</i>	5	<i>Rossia macrosoma</i>	1
<i>Sabellaria spinulosa</i>	5	<i>Scaphander lignarius</i>	2
<i>Scaphopoda</i>	1	<i>Scomber scombrus</i>	1

<i>Scomberesox saurus</i>	1	<i>Scophthalmus maximus (psetta maxima)</i>	17
<i>Scophthalmus rhombus</i>	16	<i>Scyliorhinus canicula</i>	32
<i>Sepia officinalis</i>	45	<i>Sepiolidae</i>	6
<i>Serpula vermicularis</i>	6	<i>Serpulidae</i>	3
<i>Sipunculidae</i>	1	<i>Solea solea</i>	60
<i>Spatangus purpureus</i>	3	<i>Spondyllosoma cantharus</i>	8
<i>Sprattus sprattus</i>	1	<i>Styela clava</i>	16
<i>Suberites spp</i>	6	<i>Symphodus (crenilabrus) balloni</i>	6
<i>Symphodus (crenilabrus) melops</i>	1	<i>Syngnathus acus</i>	3
<i>Taurulus bubalis</i>	1	<i>Tethya aurantia</i>	8
<i>Trachinus draco</i>	4	<i>Trachurus trachurus</i>	2
<i>Trigla (chelonichthys) lucerna</i>	35	<i>Trigloporus (chelonichthys) lastoviza</i>	9
<i>Trisopterus luscus</i>	31	<i>Trisopterus minutus</i>	32
<i>Trochidae</i>	2	<i>Tubularia spp</i>	2
<i>Ulva lactuca</i>	15	<i>Urticina (tealia) felina</i>	15
<i>Whelk eggs</i>	16	<i>Xanthid crab</i>	3
<i>Xantho pilipes</i>	13	<i>Zeugopterus (phrynorhombus) norvegicus</i>	1
<i>Zeugopterus (phrynorhombus) regius</i>	5	<i>Zeus faber</i>	8

Plaice

Overall catch weight (846 kg) and catch number (5904 fish) of plaice was higher than in 2017 (836 kg; 5364 fish) (Tables 5 & 6). In the English VIld sector, catch weights (23%) and catch numbers (48%) were higher than in 2017 with increases also observed in the Southern North Sea (up 5% and 89% respectively). However both catch weight (31%) and numbers (25%) were lower in the French VIld sector (Figure 11). Catch numbers were higher than the average (5152 fish) for the past 8 years (2011-2018), however weight was lower (927kg). Recruited plaice (≥ 21 cm) distribution was similar to previous years, with high numbers seen off Hastings, Brighton (VIld English sector). Dieppe and Boulogne (VIld French sector) were slightly lower in numbers this year and there was a greater number seen in the Poole area (Figure 5). Pre-recruit plaice (< 21 cm) distribution and numbers were lower this year, most abundant off Hastings (VIld English sector), Dieppe and Boulogne (VIld French sector), although the distribution was not so well spread. There was a large increase in pre-recruit numbers in the Dungeness area but a decrease in the grounds off Hastings (Figure 7).

Sole

Catch numbers of sole were slightly lower this year with 2398 fish caught compared to 2805 fish in 2017, whereas sole catch weight at 231 kg was higher compared to 2017 at 214 kg (Table 5 & 6). Both catch weight and numbers in 2018 were higher than the average historic catch rate 2011-18 (2015 fish, 192 kg). There was a decrease in sole catch numbers (25%) and weight (29%) in the VIld French sector and North sea (catch numbers 29% and weights 8%), but an increase in English VIld sector (catch numbers 49% and weights 43%), compared to the previous year. Recruited sole (≥ 21 cm) were most abundant off Folkstone (VIld English sector) and Aldeburgh

(Southern North Sea) (Figure 6). Abundance was lower at the Thames stations of the North Sea sector and further west (Le Havre & Dieppe) in the French sector than in previous years. Pre-recruit sole (<21cm) were most abundant between Folkestone to Dungeness (VIId English sector) and on the inshore North sea stations. There was a decrease in numbers off Boulogne and Le Havre (VIId French sector) (Figure 8).

Other species

Catches of whiting, dab, turbot, lemon sole, cuttle fish and bass were lower this year, however there was an increase in the number of flounder and brill caught compared to 2017 (Table 5 & 6). There was an increase in the number of lemon sole and dab in the English Sector, however a decrease in the French Sector and Southern North Sea. Lemon sole catches were largest off Ramsgate, with an increase off Thames area and Dungeness and a decrease off Aldeburgh (Figure 10). Dab catches were largest off Hastings, with a slight increase off Dungeness and decrease off Aldeburgh and Boulogne (Figure 9). An European Eel (*Anguilla anguilla*) was caught and released at Prime station 83. Sea horse (*Hippocampus Hippocampus*) numbers increased in the English sector (36%) but were lower in the French sector (81%), compared to 2017.

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 shrimps (*Meiosquilla desmaresti*) being encountered. All 12 full benthic stations in VIId and 3 in IVc were sampled successfully. A full benthic sort could not be carried out on prime station 74 due to a large catch late in the day, however this was replaced by a full benthic sort at prime station 80.

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'.

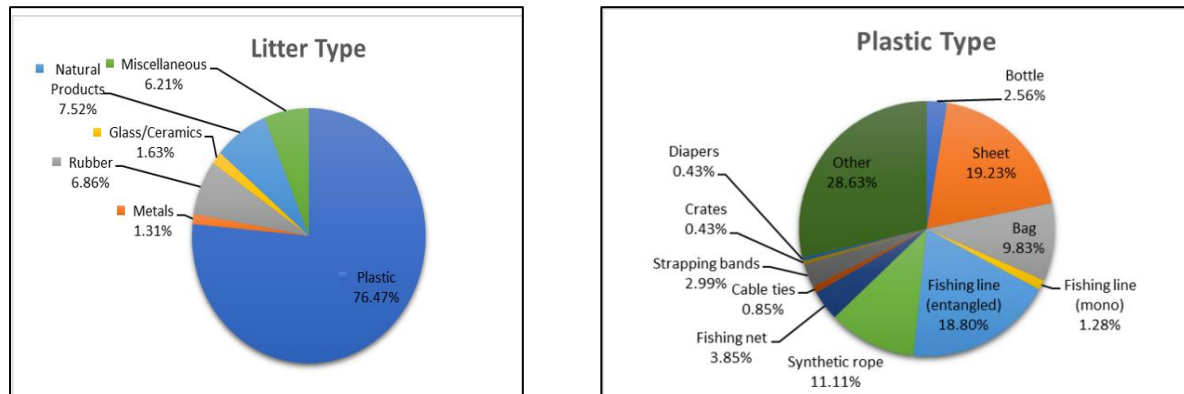
Aim 7

There were no sightings of marine mammals, sea turtles, large pelagic fish or observations of jellyfish aggregations recorded due to not having a dedicated observer on-board

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

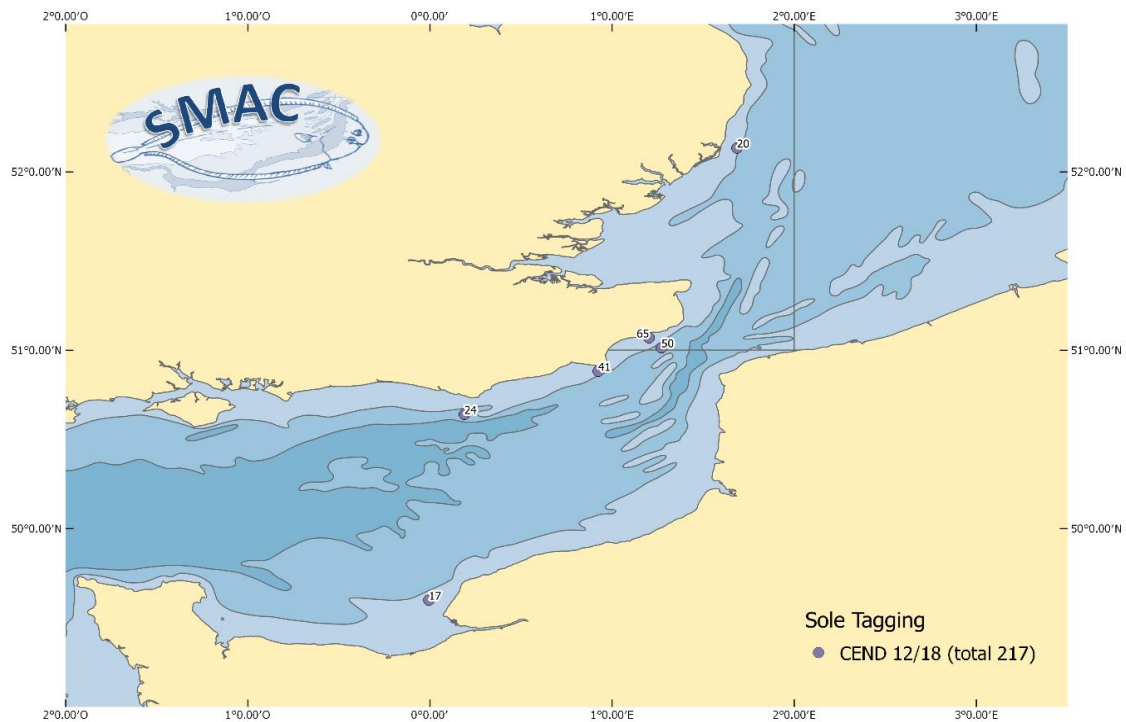


Opportunistic aims

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). One colleague from Ifremer joined the survey and was able to tag and release a total of 217 sole (Figure 4)

Figure 4 Map of positions of tagged sole by Ifremer



Aim 10

Three undulate ray (*Raja undulata*), one blonde ray (*Raja brachyura*), and one painted ray (*Raja microcellata*) were tagged and released.

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)
24/8/2018

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Figure 5 Abundance (number caught per 30-minute tow) of recruited (≥ 21 cm TL) plaice

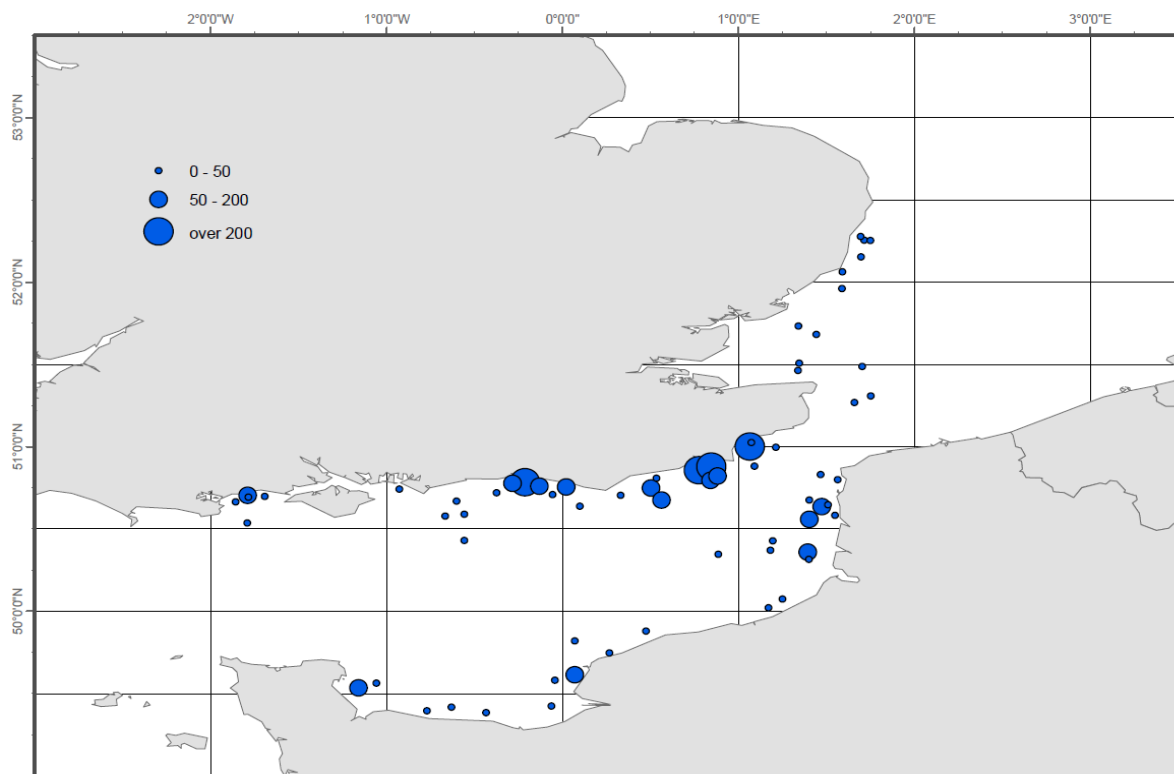


Figure 6 Abundance (number caught per 30-minute tow) of recruited (≥ 21 cm TL) sole

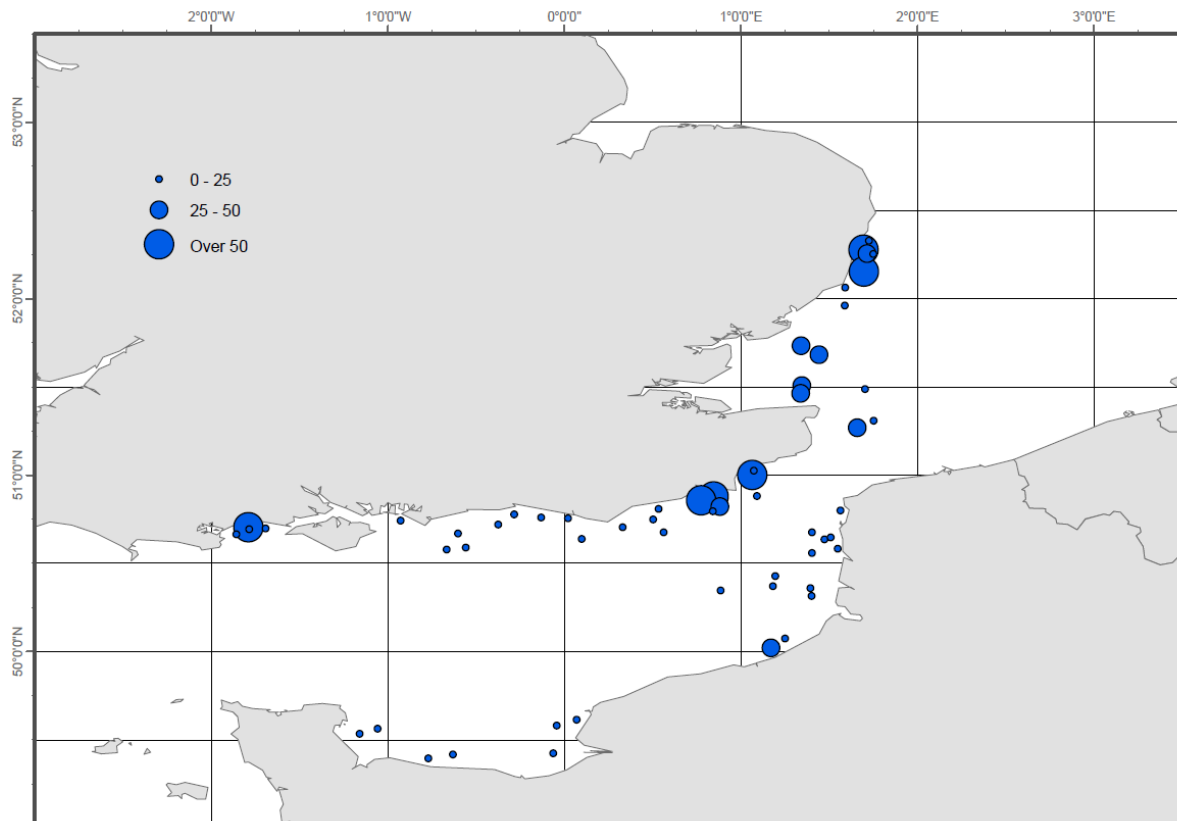


Figure 7 Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) plaice

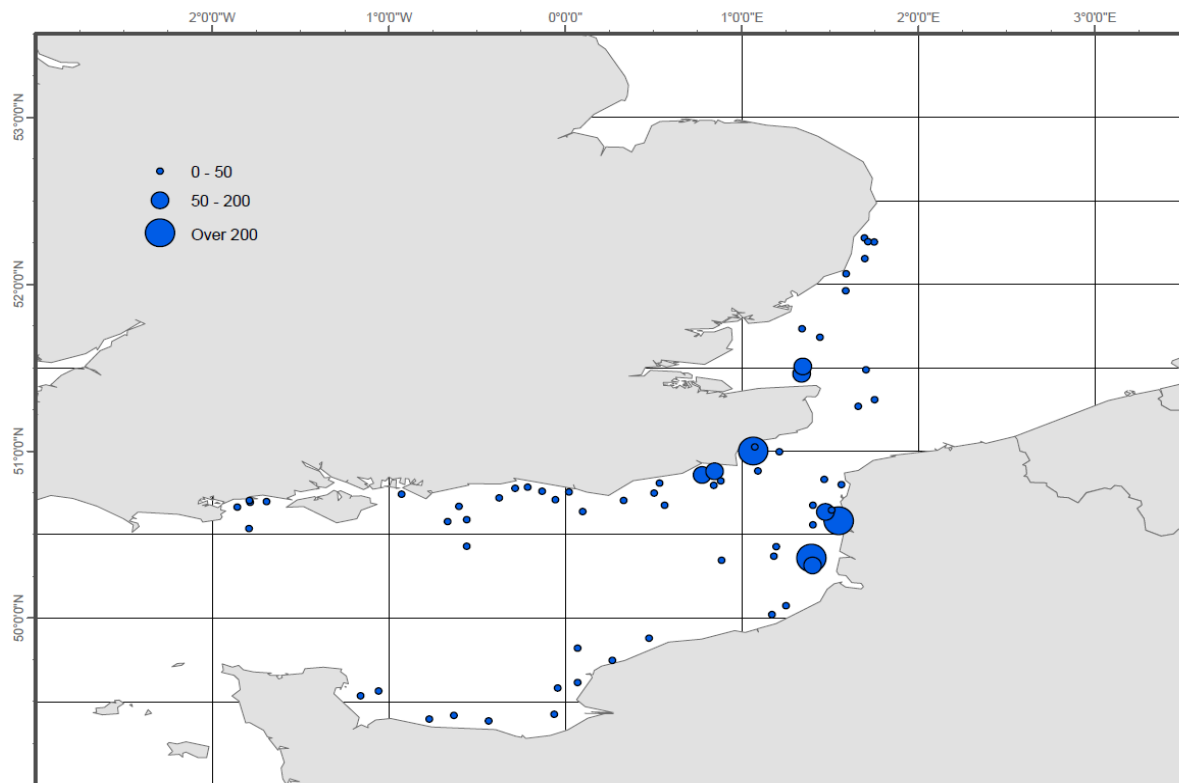


Figure 8 Abundance (number caught per 30-minute tow) of pre-recruit (<21 cm TL) sole

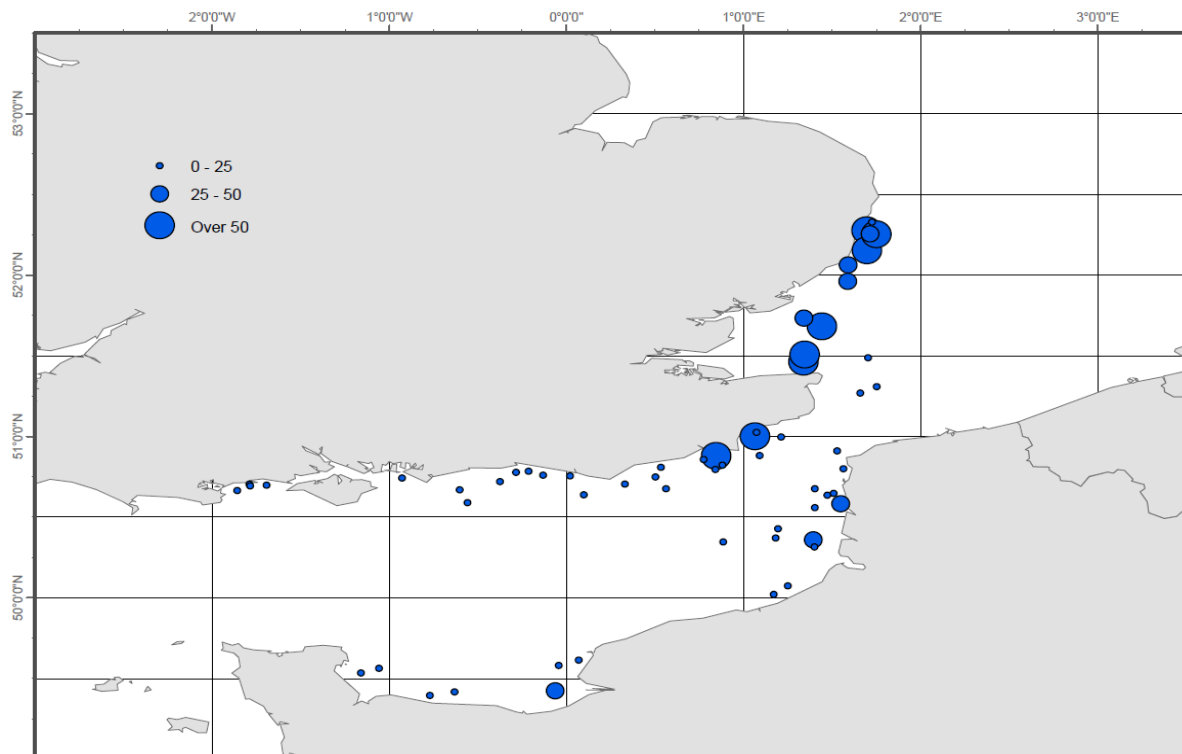


Figure 9 Abundance (number caught per 30-minute tow) of Dab

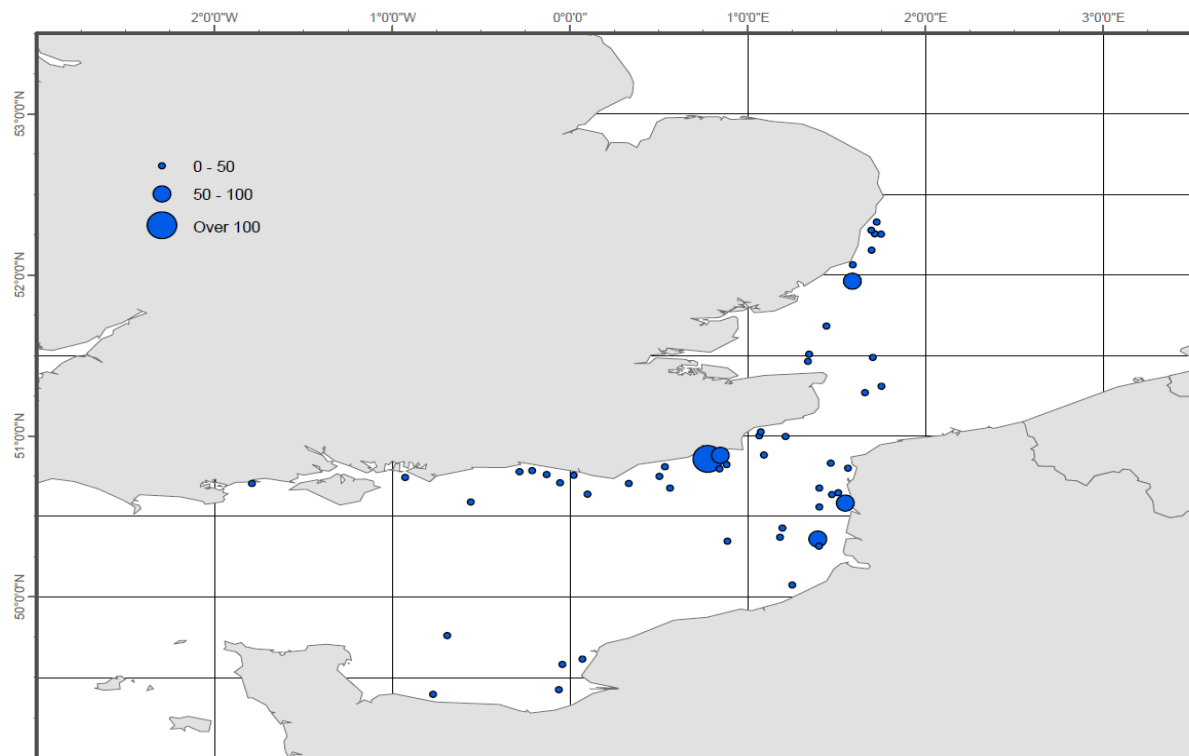


Figure 10 Abundance (number caught per 30-minute tow) of Lemon sole

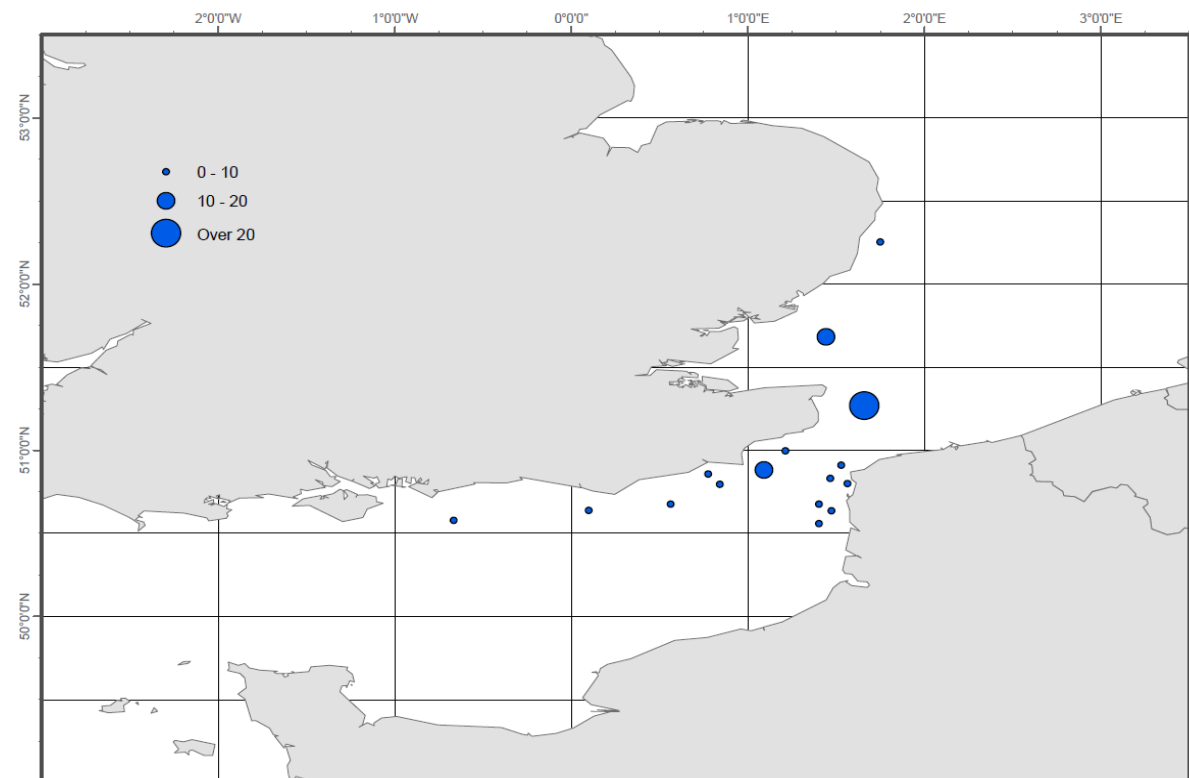


Figure 11 Catch number of selected commercial fish caught in English and French sectors of the Eastern channel (VIId) and southern North Sea (IVc) during 2016-18 surveys

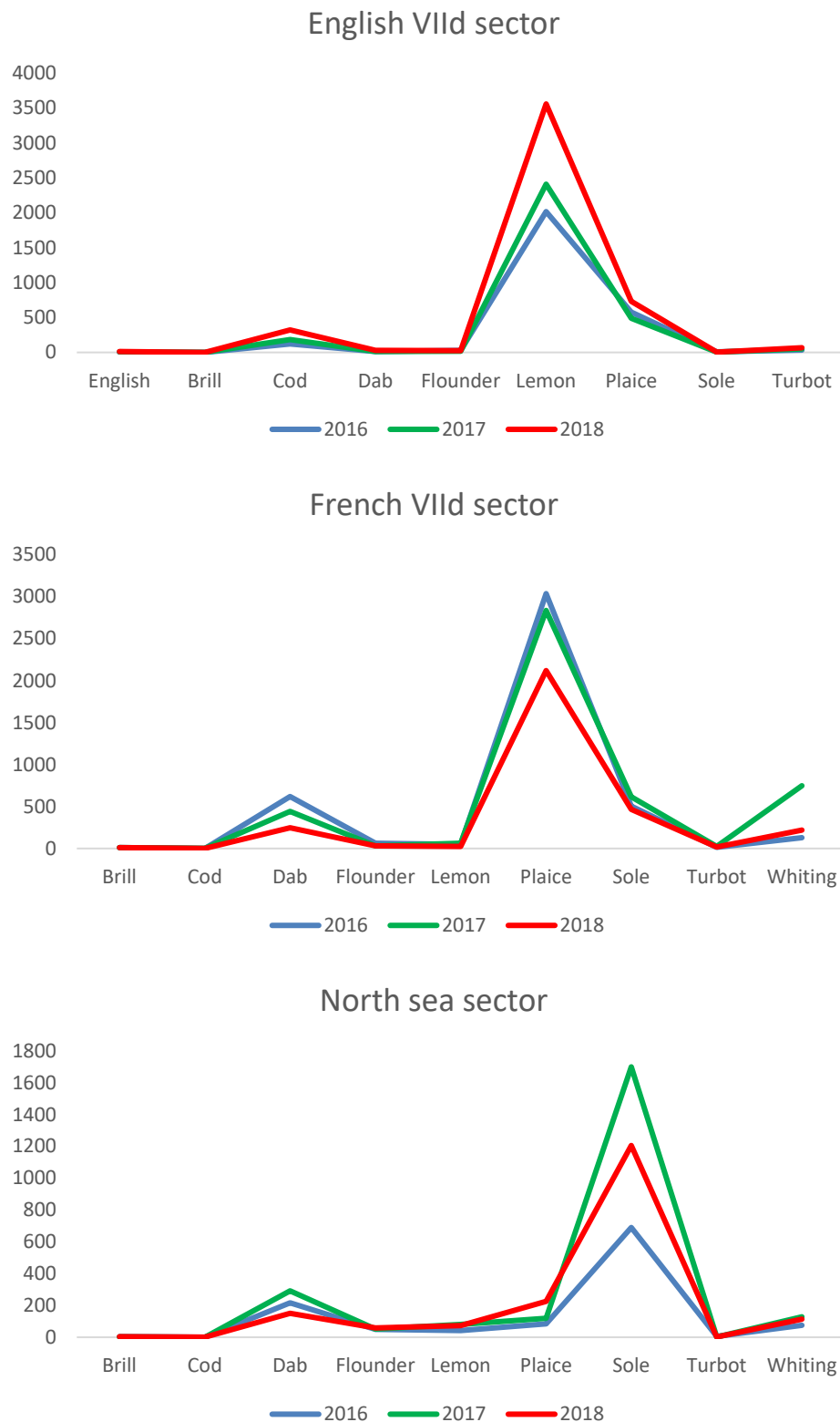


Figure 12 Comparison of total weight of commercial species caught on survey between 2008–18

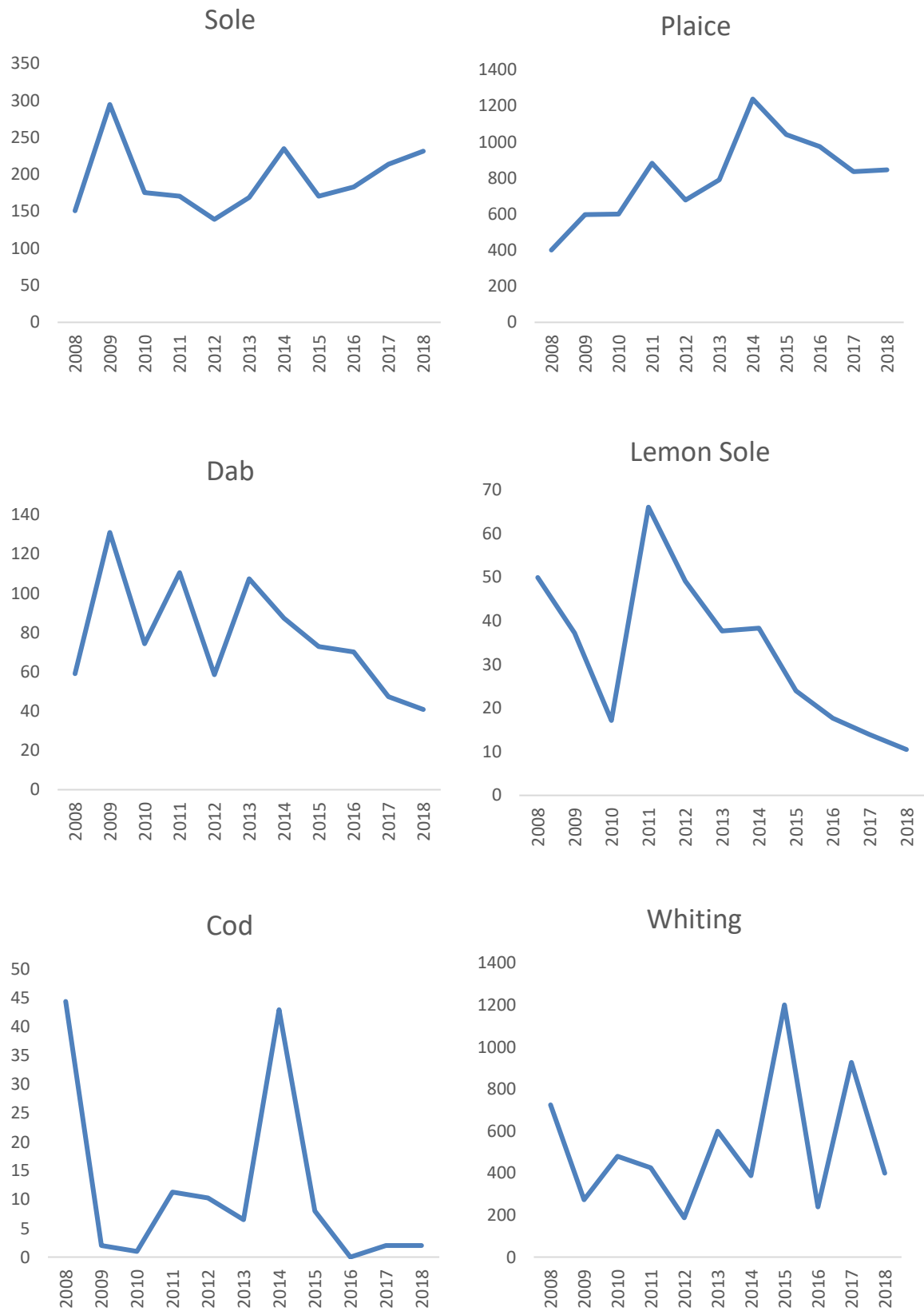


Figure 12 Comparison of total weight of commercial species caught on survey between 2008–18 (continued)

