Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR
Survey: CEND 15/2024.

STAFF:

1st Half (~15 days)	2nd Half (~15 days)
9 staff	9 staff
daylight fishing/night-time MIKNET sampling	daylight fishing/night-time MIKNET sampling
Staff	**Staff**
Richard Humphreys (SIC)	Richard Humphreys (SIC)
Nicola Hampton (2IC)	Nicola Hampton (2IC)
Georgia Robson	Georgia Robson
Wendy Edwards	Wendy Edwards
Ben Hatton	Zach Radford
Sam Roslyn	Johnathan Ball
Emily Roebuck	Charlie Hobbs
Louise Straker Cox (MIKNET)	Aaron Brazier (MIKNET)
	Nevena Almeida (MIKNET)
	Maisie Evans (Student)

DURATION: 2 August – 30 August 2024 (29 days at sea)

LOCATION: North Sea (ICES divisions 27.4a, b and c)

PRIMARY AIMS:

1. To carry out a groundfish survey of the North Sea as part of the ICES coordinated IBTS, using a hybrid GOV trawl in order to obtain information on:
   a) Distribution, size composition and abundance of all fish species caught.
   b) Age – length distribution of selected species.
   c) Distribution of fish in relation to their environment.
   d) Distribution of macrobenthos and anthropogenic debris.
   e) Surface and bottom temperature and salinity data using ESM2 profiler/mini-CTD logger and Niskin Bottle.
   f) Length weight & maturity information using individual fish measurements, in support of the EU Data Regulation.

g) To conduct marine litter surveys of seafloor macrolitter (following the ICES guidelines) to gather data towards the OSPAR Commission Common Indicator for seafloor litter and UK Evidence Group marine litter indicators.

2. Collect surface sea water samples for Caesium/Tritium testing to be performed post-survey. (R Hillier – Cefas, Lowestoft).

SECONDARY AIMS:

3. Tag and release specimens of starry smooth-hound *Mustelus asterias*, spurdog *Squalus acanthias*, tope *Galeorhinus galeus*, common skate *Dipturus batis* species-complex, blonde ray *Raja brachyura* and cuckoo ray *Leucoraja naevus,* in support of the ICES Working Group for Elasmobranch Fishes work to inform on stock units for demersal elasmobranchs. (J Ellis/S Phillips – Cefas, Lowestoft)

4. To freeze any unusual fish species for subsequent identification / verification in the laboratory, including specimens of eelpout (*Zoarces, Lycodes* and *Lycenchelys*), sea scorpions (Cottidae, sub-area IVa only), and any unusual fish species, which may also be used in otolith research. (J Ellis – Cefas, Lowestoft)

5. To retain any dead specimens of tope (*Galeorhinus galeus*) and common skate (*Dipturus batis* species-complex) for biological studies. Collect additional reproductive data from skates and rays, including outer clasper length (from live and dead males), testes weight (from dead males), ovary weight and shell gland width (from dead females), and collect a section of vertebral column (comprising ca. 6-8 vertebrae from that part overlying the body cavity; samples to be kept frozen) (J Ellis/S Phillips – Cefas, Lowestoft)

6. Retain any dead specimens of shad, lamprey and sea trout for biological studies (T Basic – Cefas, Lowestoft).

7. Collect fisheries acoustic data continuously at five operating frequencies (38, 70, 120, 200 and 333kHz), using the Simrad EK80 split beam sounder. The data will contribute to the existing 20+ year time series of acoustic data in the North Sea and will be used as part of Cefas' Mackerel Science Reference Group to monitor changes in mackerel distribution and abundance (J van der Kooij – Cefas, Lowestoft).

8. Cetacean observations will be recorded where possible and sent to the Sea Watch Foundation.

9. Identification, count, measure and weight all jellyfish caught in GOV trawl will allow the continuation of the North Sea August Jellyfish dataset started in 2012; As the dataset

grows from year to year, this should allow the evaluation of changes in jellyfish community and biomass with time. (S Pitois – Cefas, Lowestoft)

10. Collect squid egg samples to map spawning grounds. This could be highly relevant in studying squid stock's structure. Retain any specimens of *Loligo* (not L. forbesi – keep all if in doubt) and all ommastrephid squids (Illex, Todaropsis, Todarodes) for maturity and age analysis, respectively. 25 Alloteuthis are to be retained for maturity and age analysis. (V Laptikhovsky - Cefas, Lowestoft)

11. Collect, retain and filter surface water samples from Ferrybox underway water supply every 12 hours (or once a day) for subsequent chlorophyll sampling in support of SLA25. (N Greenwood – Cefas, Lowestoft)

12. Zooplankton plankton sampling using ringnet to collect sample from the Gabbard smart buoy site. (S Pitois – Cefas, Lowestoft)

13. Collect queen scallops (queenies) *Auquipecten opercularis* to allow for experimental work on ageing, for L/W relationship analysis, development of length to height parameters and, to provide specimens to Bangor University for further work which will be made available to ICES WGScallop. (J Harvey – Cefas, Lowestoft)

14. Collect additional information on garfishes *(Family Belonidae) and saury pike (Scomberesox saurus)* in terms of total length (mm), body length (mm) and total weight (0.1g). (J Silva – Cefas, Lowestoft)

15. Maturity photos for specific species for future reference guides. (S Barnett/B Hatton – Cefas, Lowestoft)

16. Sampling and processing where possible of fish larvae during the International Bottom Trawl Survey using the Methot Isaac Kidd (MIK) midwater plankton trawl. (R Nash – Cefas, Lowestoft)

17. Stomach sampling, EU has approved the plans for a pilot on collecting stomach data (as discussed during IBTSWG 2021). For this a 5-year rolling scheme of species is proposed. According to the new scheme plaice *Pleuronectes platessa* and hake *Merluccius merluccius* should be collected in 2024.

18. To collect (bag and freeze) at each relevant station, 20 specimens each of age 0 and age ≥ 1 of anchovy and sardine. This is in support of study using isotopes in fish lenses to investigate migration and connectivity linked to adjacent areas (J van der Kooij & R Ourens/Cefas obo S Garrido/IPMA)

NARRATIVE (All times stated are GMT)

"RV Cefas Endeavour", henceforth referred to as CEND 15/24, sailed from Lowestoft at 0700hr on Friday 2 August. There were eight Cefas scientific staff on board.

A standard day consisted of collecting surface and bottom water samples at the start and end of the day to provide salinity samples and chlorophyll samples as part of the primary aim, along with deployment of an ESM2 profiler to measure environmental parameters through the water column (temperature, salinity, fluorescence, light, turbidity, and dissolved oxygen). Between these deployments, up to four 30-minute tows with the standard IBTS rigged GOV (Grand Overture Verticalé) trawl were planned. Since 2014, the net used during this survey has been a polyethylene net with nylon sleeve and cod-end. Throughout the survey, fisheries acoustic data were collected continuously at five operating frequencies (38, 70, 120, 200 and 333kHz), using the Simrad EK80 split beam sounder.

On 2 August CEND 15/24 departed the port of Lowestoft and transited to prime station 1 to begin this year's survey. Due to the need to use as much of the available daylight hours as possible, the vessel did not divert to the West Gabbard smart buoy site to collect a plankton sample. Once at prime station 1 an ESM2 profiler and Niskin water sampler were deployed successfully, before completing a GOV trawl. Unfortunately, a ferrule on the headline parted on deployment leading to significant gear damage and meant no fishing operations could be achieved. Repairs extended into the evening, and as a result, no MIKNET sampling took place.

On 3 August at first light CEND 15/24 deployed the GOV trawl at prime station 1, the catch (189.6 kg) consisted mainly of moon jellyfish *Aurelia aurita* (70.06 kg) and starry smooth-hound *Mustelus asterius* (49.64 kg). This catch also contained lots of Queen scallops *Aequipecten opercularis* (22.74kg), a high number of '0 group' whiting *Merlangius merlangus* (5kg) and 2 mantis shrimp *Rissoides desmaresti* (Figure 1). CEND 15/24 then continued east to prime station 2, however during deployment of the GOV it was noticed that a further two ferrules had failed and were repaired without causing damage to the net. On recovery it was noticed that there was a tear in the lower port wing end, and a rock was found in the cod end. Using the sensor readings, it was apparent that this happened at the end of the trawl, and as the catch composition was similar to recent years, the haul was deemed valid. This catch (257.6 kg) consisted mainly of bib *Trisopterus luscus* (95.76 kg) and pilchard *Sardinia pilchardus* (63.62 kg).

Figure 1. Two mantis shrimp caught at prime station 1

CEND 15/24 resumed activity on the 4 August at prime station 3, the catch (788.5 kg) consisted mainly of bib (330.9 kg), horse mackerel *Trachurus trachurus* (125 kg), pilchard (59.4 kg) and whiting (51.1 kg). CEND 15/24 then moved on to prime station 6, unfortunately there was a slight delay at this station due to a fishing vessel operating on our previous towline. A new suitable position was found 1 mile east of the previous tow. Prime 6 yielded a small catch (59.7 kg) of mostly compass jellyfish *Chrysaora hysoscella* (17.3 kg) and epibenthos (9.26 kg). Following this, prime station 5 gave us the smallest catch of the weekend (20.4 kg) consisting mostly of mackerel *Scomber scombrus* (10 kg) and lesser weever *Echiichthys vipera* (4.05 kg).

On 5 August, CEND 15/24 completed prime stations 4, 9 and 10. The largest catch of the day (1,078.7 kg) was caught at prime station 9, consisting of mostly whiting (799.3 kg). Whiting was the most abundant species at all three prime stations. Of note river lamprey *Lampetra fluviatilis* (40 cm, 0.163 kg) was also recorded at prime station 9.

6 August saw CEND 15/24 start on prime station 6 and worked west, successfully completing this and prime stations 5 and 4, respectively. The largest catch was recorded at prime station 4 (>450 kg), and whiting, sprat *Sprattus sprattus* and grey gurnard *Eutrigla gurnardus* were the most abundant species in catch weight across all three stations. Of note, twelve greater weever fish *Trachinus draco* were caught at prime station 5, and retained as per secondary aim 13

CEND 15/24 commenced 7 August with a successful GOV trawl at prime station 20. Due to the presence of wind farms and cables, this trawl was shortened to 20 minutes. The total catch from this tow was 91.0 kg, consisting mostly of whiting (37.8 kg) and dab *Limanda limanda* (27.6 kg). CEND 15/24 then moved on to complete prime station 21, 30 and 29. Of note, two ocean quahogs *Arctica islandica* were caught at prime station 29 (Figure 2).

Figure 2. Two ocean quahogs caught at prime station 29 weighing 420g.

8 August began at prime station 39 which gave us the largest catch of the day totalling 1066.5 kg, abundant in mackerel (970.4 kg). CEND 15/24 then moved on to complete prime stations 38 and 37 which both contained mostly haddock *Melanogrammus aeglefinus* and dab. Of note, a parasite was removed from a Spurdog *Squalus acanthias* and taken back for further analysis (Figure 3).

Figure 3. Parasite found on a spurdog at prime station 38.

On 9 August CEND 15/24 began the day at prime station 28. The GOV trawl resulted in a catch of 832.7 kg, primarily consisting of haddock (556.4 kg), dab (142.4 kg), and whiting (95.7 kg). Unfortunately, due to adverse weather conditions, no further operations could be conducted.

On the 10 August, a GOV trawl at prime station 17 resulted in the smallest catch of the day at 295.5 kg, mostly haddock (123.9 kg), whiting (85.5 kg), and dab (69.3 kg). At prime station 16, the catch amounted to 1471 kg, abundant in mackerel (1307.3 kg). Prime station 8 saw another catch abundant in mackerel at 836.2 kg. Notably, a large female starry smooth hound *Mustelus asterias* was also caught at this station (126 cm, 7.9 kg, Figure 4). The final station of the day, prime station 7, yielded a catch of 1244.2 kg, primarily whiting (611.6 kg), horse mackerel (383.3 kg), and mackerel (211.4 kg).

Figure 4. Female starry smooth hound caught at prime station 8.

On 11 August, CEND 15/24 began at prime station 15 and continued west completing prime stations 14 and 13. Prime station 14 gave us the largest haul of the survey so far 1831.4 kg, primarily herring *Clupea harengus* (1617.7 kg). Once all sample processing had been completed, the MIKNET was rigged ready to be deployed for SOP development and flowmeter calibrations. Unfortunately, once it was deployed no headline readings were being received so the MIKNET could not be deployed. The MIKNET was then recovered, and the decision was made to pause this work while an assessment of the method of deployment was completed.

CEND 15/24 started 11 August at prime station 77, the catch totalled 739.7 kg, primarily mackerel (317.2 kg) and haddock (193kg). A female flapper skate *Dipturus intermedius* (221 cm, ~85 kg) was also caught here. Prime station 22 had a similar-sized catch at 745.2 kg, with

whiting (415.5 kg) and haddock (217.4 kg) being the main species. Prime station 23 produced the biggest catch of the survey 3563.0 kg, with herring (1507.9 kg), whiting (1094.5 kg), and haddock (921.9 kg) being the most abundant. Large marks were seen on the EK80 echosounder throughout this trawl (Figure 5), and as the doors and headline sensor were showing that the net was filling up, the decision was made to haul early at 19 minutes.

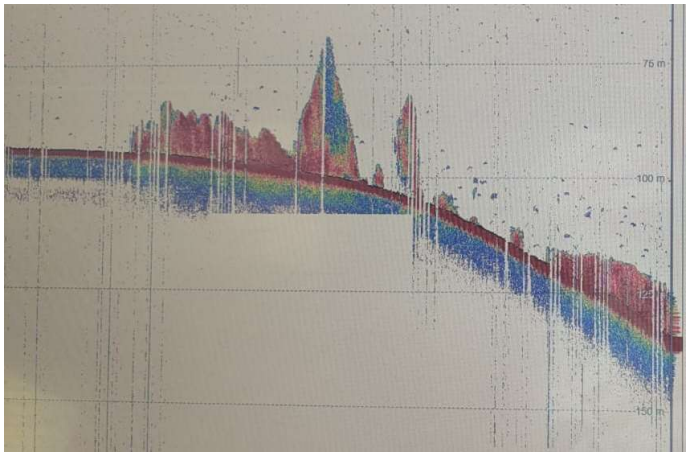


Figure 5. Large marks on EK80 during trawl at prime station 23.

On 13 August the catch at prime station 24 was 131.1 kg and composed mainly haddock (69 kg) and whiting (37.3 kg). At prime station 33, the second GOV trawl of the day yielded 170.6 kg, primarily haddock (112.7 kg) and whiting (23.7 kg). The final GOV trawl of the day at prime station 34 produced 358.8 kg, mainly herring (142.7 kg), haddock (122.7 kg), and whiting (75.6 kg).

14 August started at prime station 35 (80.7 kg). Once completed, CEND 15/24 went on to complete prime station 42, this yielded a catch of 160 kg and consisted of mostly haddock (98.7 kg) and whiting (47.6 kg). Prime station 46 yielded a similar catch of again mostly haddock (78.5 kg) and whiting (17.6 kg). The final GOV trawl of the day was completed at prime station 76, this gave us the largest catch of the day 658 kg, consisting mostly of herring (290.6 kg) and haddock (296.4 kg).

15 August began at prime station 41, this was followed by prime stations 32 and 31. Prime station 31 was the largest catch of the day 285.3 kg and contained mostly mackerel (167.1 kg). Haddock was the most abundant species caught at prime stations 41 and 32. Once all prime stations were completed, CEND 15/24 transited to Aberdeen for a scheduled crew change.

On 16 August, CEND 15/24 left Aberdeen at ~2300hr and transited to prime station 40 ready for first light. The next day CEND 15/24 then worked east, successfully completing this and prime stations 45, 53 and 52, respectively. The largest catch was recorded at prime station 52 (1470 kg), and herring, haddock and were the most abundant species in catch weight across all three stations.

18 August began with the MIKNET calibration this was followed by the first successful deployment. A GOV trawl was also completed at prime station 51. The catch at this station

totalled 488.9 kg, consisting primarily of mackerel (236.6 kg) and haddock (171.6 kg). CEND 15/24 then proceeded to prime station 59, where another GOV trawl was completed. The catch amounted to 437.3 kg, with haddock (185.6 kg) and epibenthos (73.5 kg) making up the majority. At prime station 60, the third GOV trawl of the day resulted in a catch of 217.5 kg, which included haddock (69.5 kg), whiting (26.3 kg), and mackerel (24.7 kg). The final GOV trawl of the day was conducted at prime station 61 which resulted in a catch of 1431.4 kg and consisted of mostly herring (1241 kg).

19 August began at prime station 66 with a MIKNET deployment. A GOV trawl was also completed at this station, yielding a total catch of 448.1 kg, with the primary species being mackerel (219.3 kg), herring (83.6 kg), and haddock (37.9 kg). CEND 15/24 then proceeded to prime station 71. This resulted in a small catch of 35.2 kg, mainly consisting of cod *Gadus morhua* (6.6 kg), horse mackerel (6.4 kg), Argentine *Argentina spp* (4.8 kg), epibenthos (4.8 kg), and haddock (4.7 kg). Although the total catch was lower than in 2023, the overall species composition remained similar.

The next day's operations began at prime station 73, the catch at this station totalled 352.5 kg, containing mostly mackerel (262 kg). A flapper skate was also caught and tagged at this station. CEND 15/24 then moved on to prime station 74, the GOV trawl yielded a smaller catch of 182.6 kg. This haul was primarily composed of mackerel (64.9 kg) and epibenthos (56.2 kg). The final station of the day, prime station 75, produced the largest catch with a total of 697.4 kg. Mackerel was the most abundant part of the catch again at 506.1 kg, accompanied by blue whiting *Micromesistius poutassou* (66.7 kg) and Argentine (42.9 kg).

On 21 August CEND 15/24 started the day at prime station 70 with a MIKNET deployment. A GOV trawl at this station resulted in a catch totalling 523.5 kg the largest catch of the day, abundant in mackerel (283 kg) and horse mackerel (83.7 kg). Of note, a large wolffish *Anarhichas lupus* (97 cm, 10.5 kg) was caught at this prime station (Figure 6). CEND 15/24 then moved on to prime station 69, 68 and 67 completing all stations successfully with varied catches of haddock, mackerel, cod and blue whiting.

Figure 6. Wolffish measuring 97cm caught at this prime station 70

On 22nd August, operations began late due to bad weather, with the first trawl of the day at prime station 62 yielding 740.0 kg, abundant in herring (532.9 kg). Prime Station 63 followed with a smaller catch of 226.8 kg, primarily haddock (174.5 kg).

Operations on 23 August began with a GOV trawl at prime station 64, resulting in a catch of 727.0 kg, mainly cod (350.1 kg), haddock (225.1 kg), and mackerel (35.6 kg). The catch at prime station 65 totalled 212.2 kg, with horse mackerel (100.9 kg) being the most abundant species. At prime station 57, the catch was 230.9 kg, mostly saithe *Pollachius virens* (107.5 kg) and whiting (28.4 kg). After fishing had concluded, MIKNET calibrations were carried out.

24 August began early with a MIKNET deployment at prime station 58. The first GOV trawl of the day yielded a catch of 839.4 kg, containing mostly saithe (546.7 kg) and whiting (189.4 kg). A GOV trawl was then completed at prime stations 50, 49 and 48 with mackerel and haddock being the primary species caught.

25 August began with a MIKNET deployment, the first GOV trawl of the day was then conducted resulting in a catch of 190.8 kg, with haddock (108.2 kg) being the most abundant species. At prime station 55 the GOV trawl yielded a catch of 515.2 kg, mainly haddock (366.0 kg) and whiting (38.6 kg). The final GOV trawl was conducted at prime station 54 and this resulted in a catch of 213.7 kg, primarily herring (47.7 kg) and whiting (41.4 kg). An ESM2 and Niskin deployment was not carried out at the end of the day due to deteriorating weather conditions.

On 26 August CEND 15/24 started at prime station 47, then continued east and completed prime stations 43, 44 and 36 with haddock and herring being the most abundant species caught at all four prime stations. Prime station 36 contained the largest haul of the day, with a total catch of 510.8 kg, mostly haddock (407.3 kg).

On 27 August, operations began at prime station 25. The trawl yielded a catch of 263.3 kg, primarily composed of haddock (168 kg), along with whiting (32.3 kg) and dab (26.4 kg). The next GOV trawl at prime station 26, resulted in a catch of 260.1 kg. This catch was contained mostly mackerel (107.7 kg) and dab (76.0 kg). Lastly, at prime station 27, a GOV trawl was conducted with a smaller catch of 60.2 kg. Dab was the most abundant species, making up 43.1 kg of the catch, followed by grey gurnard (7.2 kg). With this, the survey that makes up the English component of the IBTS quarter 3 survey was complete. At the request of the co-ordinator, however, CEND 15/24 was tasked to complete four tows on behalf of Germany.

CEND 15/24 started the 28 August in ICES rectangle 37F3 with a GOV trawl, this resulted in a large catch of 1,549 kg, with whiting being the dominant species at 1,197 kg. The catch also included haddock (261.7 kg) and dab (34.8 kg). CEND 15/24 then moved on to rectangle 36F3, where the GOV trawl yielded a much smaller catch of 78.1 kg, with dab making up 24.8 kg of the total. Next in rectangle 36F2, the GOV trawl produced a catch of 498.7 kg, abundant in whiting (425.7 kg). Lastly, in rectangle 36F1, the GOV trawl's final catch of the 2024 survey was 193.2 kg, with dab (56.1 kg) and starry smooth-hound (54.78 kg) as the most abundant species.

RESULTS:

PRIMARY AIMS:

1. To carry out a groundfish survey of the North Sea as part of the ICES coordinated IBTS.

Due to gear damage at prime station 1, and some lost time due to weather around two days of survey time was lost this year. Despite the early setbacks CEND 15/24 managed to catch up lost time and complete all survey stations and four additional stations. A valid haul with the GOV trawl was completed at 80 prime stations (Table 1). Surface and bottom salinity samples were collected at 45 sites by ESM2 and Niskin water sampler.

Gear: The survey was fished using a hybrid GOV trawl (polyethylene trawl with a nylon sleeve and cod-end). GOV working trawl #1 was used for the entire survey. Net geometric sensors were used to monitor headline height, wing spread, and door spread (Figure 8).

Catches: At each station, the catch of each species was weighed and all fish, or representative sub-samples, were measured. Table 2 ranks the top 15 fish species by weight, compared to that seen over the previous four years, whilst Table 3 lists the species that were weighed and measured/counted across the survey's prime stations. Table 4 shows the number of fish sampled for age determination and other biological information. All data were recorded to computer database using Cefas' Electronic Data Capture system and uploaded to the Fishing Survey System (FSS) and duplicated onto the replacement system Scientific Fisheries System (SFS). Figure 9 shows the length distribution of cod, haddock, whiting, saithe, Norway pout *Trisopterus esmarki* , herring, mackerel, sprat, plaice and hake, with the distribution and relative abundance (raised numbers per hour) of these species given in Figures 10–19.

Table 1: Gear deployments on the English IBTS Q3 2024 survey.

Gear	Valid	Additional	Invalid	Total
GOV (IBTS standard gear)	76[1]	0	2	78
GOV (IBTS standard gear) Extra Stations	4[2]	0	0	4
ESM2+Niskin	46	0	2	48
Methot Isaac Kidd (MIK) midwater plankton trawl	5	0	0	5

[1]76 of the 77 prime stations were completed by RV Cefas Endeavour, prime 72 was completed by Norway.
[2]Four additional stations were also completed in ICES Rectangles, 37F3, 36F3, 36F2 and 36F1.

Table 2: Top 15 fish species (by total catch weight, standardised to 30-minute tows) in 2024 and corresponding catch weights in preceding years. Note: Species that were ranked in the top 15 species in earlier years, but were outside the top 15 in 2024, are not shown.

Common English Name	Scientific Name	2024 weight (kg)	2023 weight (kg)	2022 weight (kg)	2021 weight (kg)	2020 weight (kg)
Haddock	*Melanogrammus aeglefinus*	10090	13405	14209	6572	8597
Whiting	*Merlangius merlangus*	8800	5412	7044	5653	5073

Herring	*Clupea harengus*	9088	15727	14211	7863	17650
Mackerel	*Scomber scombrus*	7370	3888	7068	4841	4029
Dab	*Limanda limanda*	1745	1993	2866	3102	3248
Sprat	*Sprattus sprattus*	956	1970	1993	3446	2712
Horse mackerel	*Trachurus trachurus*	892	1651	2249	955	2030
Saithe	*Pollachius virens*	750	642	232	319	279
Cod	*Gadus morhua*	629	807	459	521	376
Bib	*Trisopterus luscus*	428	2	0	388	1
Plaice	*Pleuronectes platessa*	345	516	430	374	290
Blue whiting	*Micromesistius poutassou*	336	1008	123	758	370
Starry smooth hound	*Mustelus asterias*	332	200	74	77	27
Grey gurnard	*Eutrigla gurnardus*	266	401	625	561	808
Lesser-spotted dogfish	*Scyliorhinus canicula*	222	229	193	227	140

Table 3: Fish, cephalopods and commercial shellfish caught and number of prime stations where they were recorded.

Scientific Name	Common English Name	Stns	Scientific Name	Common English Name	Stns
Hippoglossoides platessoides	American plaice (long rough dab)	50	*Lepidorhombus whiffiagonis*	megrim	8
Lophius piscatorius	anglerfish (monkfish)	20	*Illex (loligo) illecebrosus*	northern shortfin squid	38
Argentinidae	argentines	25	*Loligo forbesi*	northern squid	27
Clupea harengus	Atlantic herring	57	*Nephrops norvegicus*	Norway lobster	13
Trisopterus luscus	bib pouting	4	*Trisopterus esmarki*	Norway pout	23
Raja brachyura	blonde ray	1	*Phrynorhombus norvegicus*	Norwegian topknot	0
Helicolenus dactylopterus	blue mouth redfish	13	*Sardinia pilchardus*	pilchards	3
Micromesistius poutassou	blue whiting	12	*Pleuronectes platessa*	plaice	61
Capros aper	boarfish	8	*Agonus cataphractus*	pogge (Armed bullhead)	7
Scophthalmus rhombus	brill	5	*Pollachius pollachius*	pollack	3
Myoxocephalus scorpius	bullrout	4	*Trisopterus minutus*	poor cod	18
Gadus morhua	cod	35	*Aequipecten opercularis*	queen scallop	18
Callionymus lyra	common dragonette	33	*Aspitrigla cuculus*	red gurnard	3

Molva molva	common ling	9	*Mullus surmuletus*	red mullet	15
Leucoraja naevus	cuckoo ray	11	*Lampetra fluviatlis*	River lamprey	1
Sepia officinalis	cuttlefish	2	*Pollachius virens*	saithe	20
Sepiolidae	cuttlefish (without cuttlebone)	4	*Arnoglossus laterna*	scaldfish	21
Limanda limanda	dab	51	*Pecten maximus*	scallop	5
Solea solea	Dover sole	5	*Gadiculus argenteus*	silvery pout	11
Cancer pagurus	edible crab	12	*Lumpenus lampretaeformis*	snake blenny	4
Engraulis encrasicolus	European anchovy	3	*Buglossidium luteum*	solenette	21
Alloteuthis subulata	European common squid	20	*Callionymus maculatus*	spotted dragonette	15
Merluccius merluccius	European hake	21	*Raja montagui*	spotted ray	4
Scomber scombrus	European mackerel	65	*Sprattus sprattus*	sprat	18
Loligo vulgaris	European squid	0	*Squalus acanthias*	spurdog	5
Dipturus intermedia	flapper skate	2	*Amblyraja radiata*	starry ray	20
Platichthys flesus	flounder	3	*Mustelus asterius*	starry smooth-hound	12
Enchelyopus cimbrius	four-bearded rockling	7	*Lithodes maja*	stone crab	12
Gobius spp.	gobies	1	*Rossia macrostoma*	stout bobtail	1
Phycis blennoides	greater fork beard	1	*Microchirus variegates*	thickback sole	1
Syngnathus acus	greater pipefish	1	*Liza ramada*	Thin lipped grey mullet	1
Hyperoplus lanceolatus	greater sandeel	9	*Raja clavate*	thornback ray	3
Trachinus draco	Greater weever fish	2	*Galeorhinus galeus*	tope	1
Eutrigla gurnardus	grey gurnard	69	*Trigla lucerne*	tub gurnard	8
Dipturus batis	Grey skate	1	*Scophthalmus maximus*	turbot	5
Melanogrammus aeglefinus	haddock	36	*Brosme brosme*	Tusk	1
Myxine glutinosa	hagfish	6	*Necora puber*	velvet swimming crab	6
Trachurus trachurus	horse mackerel	43	*Lophius budegassa*	white anglerfish (black bellied)	4
Hyperoplus immaculatus	immaculate sandeel	3	*Merlangius merlangus*	whiting	58
Zeus faber	John dory	6	*Glyptocephalus cynoglossus*	witch	13
Microstomus kitt	lemon sole	62	*Anarhichas lupus*	wolf-fish	3
Todaropsis eblanae	lesser flying squid	6	*Octopodidae*		12

Scyliorhinus canicula	lesser spotted dogfish	24			
Trachinus vipera	lesser weever	11			
Homarus gammarus	lobster	1			

Table 4: Number of biological samples taken for ageing by species.

Common English Name	Number of samples taken
Haddock	1627
Whiting	1570
Plaice	1411
Herring	1018
Norway pout	390
Cod	235
Mackerel	219
Saithe	215
Dab	208
Lemon sole	184
Grey gurnard	173
Hake	89
Anglerfish (monkfish)	57
Blue-mouth redfish	45
Striped red mullet	38
Witch	37
Ling	32
Tub gurnard	22
Sole	18
Red Gurnard	10
Brill	10
Turbot	10
Black-bellied anglerfish	7
John dory	7
Pollack	5

Starry smooth-hound	204
Starry ray	56
Spurdog	54
Spotted ray	26
Cuckoo ray	22
Thornback ray	7
Flapper skate	2
Blonde ray	1
Tope	1
Blue skate	1
Total	8011

NB. All catch weights and number of fish caught are standardised to a full 30-minute tow

Gadiformes

Total cod catches during the 2024 survey (629 kg; Table 2) were lower compared to 2023 (807 kg) but still higher than the preceding years. This was also true of their distribution (Table 3), seen at 15 fewer prime stations than last year (35, compared to 50 in 2023). The number of individuals caught across the survey was also much lower than in the previous year (n = 192, compared to n = 440 in 2023). The numbers of <15 cm cod was also very low in comparison to previous years (n= 1 individual compared to n = 12 individuals in 2023) This is very low when compared to catches in earlier years (n = 77 in 2021 and n = 295 in 2020). Individuals >35cm made up 73.5 % of the total catch weight this year (65.8% in 2023), but individuals between 15cm & 35cm made up only 25.9% of this year's total weight compared to 31.3% in 2023 (Figure 10a). The lower catch numbers this year has resulted in a lower number of biological samples collected, with 184 taken, compared to 414 last year (Table 4). Cod <12 cm are not sampled for age (assigned as 0-groups). It is worth noting that 58.3% of cod caught during this survey were caught at one station, prime station 64.

Haddock catches were also down with 10.09 t caught compared to 13.41 t in 2023 but was still much higher than the catch of 6.57 t in 2021. The overall distribution was also much lower this year, with haddock caught at 36 stations (29 less than in 2023). Biological samples were also down with 1627 compared to 1921 last year. There was also a decrease in the number of individuals recorded (n=35147 compared to n=53541 in 2023). Catches containing 0-group haddock have also declined and is evident in the length distribution observed on this year's survey (Figure 10b). Individuals <15cm accounted for only 0.8 % of the numbers measured compared to 2.6% in 2023 and 23.3% in 2022.

Whiting catches are the highest recorded in five years, with 8.8 t caught, compared to 5.41 t in 2023. Despite these increased catch weights, whiting was caught at fewer prime stations than in 2023 (58 compared to 78 in 2023). Despite the increase in catch weight, the decrease in catch distribution meant the numbers of biological samples collected decreased (1570 in 2024 compared to 1876 in 2023). The numbers of individuals recorded this year also increased (n=82192, compared to n=47969 in 2023). The increase in catch weight could be attributed to completing four extra stations this year, one of these extra stations had the largest whiting catch of the survey 1.2 t. In total, 13.0 % of all whiting caught this year were <14 cm compared to 12.5 % in 2023. Whiting <12 cm were caught at 39 of the 77 prime stations this year, compared to 53 of the 79 prime stations in 2023.

The total saithe catch weight was up to a five-year high of 750 kg, compared to the 642 kg recorded in 2023. This is the largest total catch weight recorded for saithe since 2019 (972 kg). However, the spatial distribution decreased from 2023 (20 prime stations, compared to 24 last year) and 73% of the saithe catch weight was caught at prime station 58. The decreased spatial distribution this year resulted in a decrease in biological samples with 173 otoliths collected, compared to 259 the previous year.

Norway pout catches (184 kg) were significantly lower than in 2023 (903 kg) and were the lowest seen in five years. The spatial distribution has also decreased, with Norway pout caught at only 23 stations compared to 41 last year. Norway pout have a limited length range and so otolith sample numbers are normally consistent year on year, but with the decreased spatial distribution this year, less otoliths were taken (235 compared to 434 in 2023), however this number is similar to that seen before 2023. Norway pout had two distinct length cohorts (5–10 cm and 11–20 cm; Figure 10e), as seen in previous years. Norway pout under <10 cm are not sampled for age (assigned as 0-groups) and this year n=61 individuals were recorded as such, compared with n= 108 in 2023. The number of individuals recorded this year is much lower than in 2023 (n=2466 compared to n=4604 in 2023). 45.1% of the total Norway pout caught this year were <10 cm compared to 33.3% last year, however this is still less than the 63.2% seen in 2022.

Hake caught this year (57 kg) was lower in than the previous year but higher than in 2022 (112 kg in 2023, 38kg in 2022). For the sixth year running hake was not in the top 15 fish species by total catch weight (ranked 29, compared to the rank of 20 in 2023). Hake were also caught at fewer prime stations than last year, being seen at only 21 prime stations compared to 30 last year. Fewer individuals were also caught (n=91) and biologically sampled (n=89) than last year (n=121 and 112, respectively), however this was still above that seen in 2022 (n = 40 and 40, respectively).

Pleuronectiformes

Plaice catches were lower this year than in previous years (345 kg compared to 516 kg in 2023). The spatial distribution was only slightly lower than in 2023 with plaice present at 61 prime stations (62 in 2023, 61 in 2022). Maturity stages for plaice remained mixed, as observed in previous years, with stages at this time of year normally being seen as spent, however both mature and spawning individuals were all recorded this year. The number of individuals

measured decreased from the previous year (n = 2660 compared to n = 4389 in 2023). With smaller catch weights and a decreased spatial distribution, the numbers of otoliths taken decreased to 1411 (1554 in 2023). Length distributions this year were similar to last year, apart from a decline in the "0- group" plaice (n= 72 individuals <15 cm, compared to n=340 in 2023, n= 138 in 2022, n=14 individuals in 2021).

Total lemon sole catch weight this year of 132 kg was a decrease on the last few years (195 kg in 2023, 176 kg in 2022). Despite the decrease in catch weight the spatial distribution increased with lemon sole recorded at 62 stations, compared to 59 last year, however this increase could be due to the fact four extra stations were completed this year. Due to the decrease in total catch weight fewer individuals were caught this year (n=1376, compared to n=2199 in 2023 and n=1911 in 2022) however a similar number of biological samples were taken (n=215) compared to (n=212) in 2023.

Dab catches have continued to decline with 1.745 t caught this year compared to 1.993 t in 2023 and 2.866 t in 2022. The spatial distribution also declined with dab caught at 51 prime stations, compared to 64 the previous year. With a decrease in weight caught and lower spatial distribution, fewer numbers were measured (n = 32500 compared to n =40026) and as a result, a decrease in otoliths collected this year. Length distributions remained similar to the previous years, but with a decrease in <10 cm individuals this year (n= 135 compared to n=1365 in 2022 but still higher than the n=183 in 2021).

Pelagic fish

Herring was ranked third for catch weight on this year's survey after being first last year. The total catch weight of herring was a third lower than that seen in 2023, 9.088t, compared to 15.727 t. The spatial distribution also decreased with herring caught at 57 stations, compared to 70 last year, however this is similar to 2022 where herring were caught at 59 stations. Decreased catch weights and spatial distribution resulted in fewer individuals measured this year (n=5503) compared to n=8550 in 2023 with actual numbers caught also being lower this year (n=~104000) compared to 2023 (n=~198000). The numbers of biological samples taken also decreased (n=1018) compared to n=1284 last year.

Sprat catches have continued to decline with 956 kg caught this year compared to 1.97 t caught in 2023. The spatial distribution has also decreased with sprat caught at only 18 stations compared to 28 last year. 92.2% of the sprat caught during this survey, was caught at prime station 12 (877.1 kg). Length distributions look similar to previous years, but individuals caught this year increased n~ 228000 compared to n~ 183000 in 2023, but similar to n~ 252000 in 2022). 190 biological samples were taken from sprat this year.

Mackerel catches were the highest they have been in recent years with 7.37t caught (3.88 t in 2023, 7.07 t in 2022). However, the spatial distribution decreased with mackerel present at only 65 stations, compared to 68 in 2023. The number of individuals recorded increased (n=28310) compared to (n=18145 in 2023). A similar number of biological samples were taken

(n=390) compared with 2023 (n=386). The number of mackerel catches over 100 kg also increased this year, with 17 stations this year compared to 13 in 2023.

Total catches of horse mackerel in 2024 (892 kg) decreased compared to the last few years (1.651 t in 2023, 2.249 t in 2022). The spatial distribution also decreased with horse mackerel present at only 43 prime stations. This is much lower than in 2023 where horse mackerel were caught at 71 of the stations, but similar to 2022 where horse mackerel was present at 46 prime stations. Due to the lower catch weights and spatial distribution, numbers of individuals recorded was down this year (n=14058) compared to n=73244 in 2023, n =95353 in 2022).

Elasmobranchs

A total of 772 kg of elasmobranchs were caught this year, which is an increase from 574 kg seen in 2023. Starry smooth-hound were the top caught species this year (total catch weight 332 kg, up from 200 kg in 2023), followed by lesser-spotted dogfish, *Scyliorhinus canicula* (total catch 222 kg compared to 229 in 2023), spurdog (66 kg up from 11.6 kg), starry ray *Amblyraja radiata* (18 kg, compared to 24kg in 2023) and cuckoo ray *Leucoraja naevus* (10 kg down from 22 kg in 2023). Two flapper skate were caught during the survey (85.3 kg, up from 20.54 kg in 2023). One grey skate was also caught (0.56 kg) A total of four individuals were tagged with Petersen discs and released (two starry smooth-hounds, one flapper skate and one spurdog).

Cephalopods and commercial shellfish

The highest cephalopod catch weight this year was northern squid *Loligo forbesii*, this was an increase in the catch weight from last year (66 kg compared to 28 kg in 2023), however the spatial distribution decreased slightly (27 prime stations, compared to 30 in 2023). Length distributions were similar to that of 2023, but the number of individuals measured at length increased due to the increase in catch weights (n=4205 compared to n=760 in 2023). Broadtail shortfin squid *Illex coindetii* catch weights were slightly up at 12 kg compared to 11.8 kg in 2023. European common squid *Alloteuthis subulata* weights were noticeably larger compared to last year (46.2 kg, compared to 11.3 kg in 2023 and 36.1 kg in 2022). Curled octopus numbers have increased to 17 individuals compared to 13 individuals recorded in 2023.

Edible crab *Cancer pagurus* catch weight were much lower than last year 14.4 kg compared to 37.8 kg in 2023. Velvet swimming crab *Necora puber* catches increased significantly compared to that seen in 2023 (11.7 kg compared to 0.6 kg last year). One European lobster *Homarus gammarus* was caught on the survey this year, while stone crab *Lithodes maja* catch weights were slightly lower (15.4 kg compared to 16.9 kg last year).

Ichthyological observations

72 fish species were recorded on the survey this year, Species of note were the blue-mouth redfish *Helicolenus dactylopterus*, Tusk *brosme brosme* and flapper skate *Dipturus intermedius*.

Macrobenthos

132 taxa of macrobenthos were recorded on this year's survey, six less than in 2023. The sand star *Astropecten irregularis* was the most widely distributed, the same as in 2023 and 2022, with presence recorded at 67 of the 80 prime stations completed, compared to 59 in 2023.

Marine litter

Overall, there were 132 litter items logged, totalling 24.604kg in weight. Of those 132 items, 104 were plastic, just under 79% of all litter collected. Out of the 82 trawls/stations, 25 trawls had no litter items recorded, meaning litter was found in 69.5% of your trawls (57 trawls) and averaged 2.32 items per trawl.

Surface and bottom temperature and salinity

Environmental data, including surface water samples, vertical profiles from the ESM2 profiler/mini-CTD logger and bottom water samples from Niskin water sampler, were collected at 45 stations.

2. Collect surface sea water samples for Caesium/Tritium (R Hillier – Cefas, Lowestoft).

Caesium and tritium samples were collected from requested prime stations.

SECONDARY AIMS:

3. Tag and release specimens of starry smooth-hound *Mustelus asterias*, spurdog *Squalus acanthias*, tope *Galeorhinus galeus*, common skate *Dipturus batis* species-complex, blonde ray *Raja brachyura* and cuckoo ray *Leucoraja naevus,* in support of the ICES Working Group for Elasmobranch Fishes work to inform on stock units for demersal elasmobranchs. (J Ellis/S Phillips – Cefas, Lowestoft)

Of the species targeted for tagging, 4 individuals were deemed appropriate to attach Petersen discs, tagged and release (Table 5).

Table 5: Species tagged and released.

Scientific Name	Common English Name	Cefas code	Length (cm)	Weight (g)	Sex	Maturity
Mustelus asterias	Starry smooth-hound	SDS	1100	7260	F	U
Mustelus asterias	Starry smooth-hound	SDS	830	1900	M	C
Dipturus intermedius	Flapper skate	SKF	930	4800	F	U
Squalus acanthias	Spurdog	DGS	760	1900	M	C

4. To freeze any unusual fish species for subsequent identification / verification in the laboratory, including specimens of eelpout (*Zoarces, Lycodes* and *Lycenchelys*), sea scorpions (Cottidae, sub-area IVa only), and any unusual fish species, which may also be used in otolith research. (J Ellis – Cefas, Lowestoft)

54 samples of unusual fish/epibenthos were retained for further analysis, including greater weever fish *Trachinus draco*.

5. To retain any dead specimens of tope (*Galeorhinus galeus*) and common skate (*Dipturus batis* species-complex) for biological studies. Collect additional reproductive data from skates and rays, including outer clasper length (from live and dead males), testes weight (from dead males), ovary weight and shell gland width (from dead females), and collect a section of vertebral column (comprising ca. 6-8 vertebrae from that part overlying the body cavity; samples to be kept frozen) (J Ellis/S Phillips – Cefas, Lowestoft)

One tope was brought back for biological studies.

6. Retain any dead specimens of shad, lamprey and sea trout for biological studies (T Basic – Cefas, Lowestoft).

One river lamprey was collected.

7. Collect fisheries acoustic data continuously at five operating frequencies (38, 70, 120, 200 and 333kHz), using the Simrad EK80 split beam sounder. The data will contribute to the existing 20+ year time series of acoustic data in the North Sea and will be used as part of Cefas' Mackerel Science Reference Group to monitor changes in mackerel distribution and abundance (J van der Kooij).

Acoustics data was recorded for the entire survey.

8. Cetacean observations will be recorded where possible and sent to the Sea Watch Foundation.

With no dedicated marine mammal observer on board, observations were limited to *ad-hoc* sightings by bridge crew and SICs and no observations were recorded.

9. Identification, count, measure and weight all jellyfish caught in GOV trawl will allow the continuation of the North Sea August Jellyfish dataset started in 2012; As the dataset grows from year to year, this should allow the evaluation of changes in jellyfish community and biomass with time. (S Pitois – Cefas, Lowestoft)

In total, 978 individual jellyfish (from a total of five species) were measured on the survey (Table 6). Total catch weight (153 kg) was higher than recorded in 2023 (89 kg). Moon jellyfish *Aurelia aurita* was the dominant species, with a total catch weight of 81.376 kg up from 9 kg in 2023. Lion's mane jellyfish *Cyanea capillata* saw a decreased catch weight this year 19 kg

down from 60 kg in 2023. Lion's mane jellyfish had the largest size and weight range (2 –50.0 cm; 4–4178 g). Crystal jellyfish *Aequorea* spp and compass jellyfish *Chrysaora hysoscella* showed increased catch weights compared to the previous years (Table7). Blue jellyfish *Cyanea lamarckii* showed a slight increase on last years catch weight however this was still much lower than in previous years.

Table 6. Details of jellyfish caught and measured during the survey.

Scientific Name	Common English Name	Total weight caught (g)	No. measured	Minimum length (cm)	Maximum length (cm)	Minimum weight (g)	Maximum weight (g)
Aurelia aurita	moon jellyfish	82335	175	3.5	21	6	447
Cyanea lamarckii	blue jellyfish	2697	117	2.5	13.5	1	91
Chrysaora hysoscella	compass jellyfish	42661	493	2.5	22	2	385
Aequorea spp.	crystal jellyfish	9576	169	3	13	6	48
Cyanea capillata	lion's mane jellyfish	1934	24	2	50	4	4178
	Total	153132	978				

Table 7. Jellyfish species (by total catch weight) in 2022 and corresponding catch weights in preceding years.

Scientific Name	Common English Name	2024 weight (g)	2023 weight (g)	2022 weight (g)	2021 weight (g)	2020 weight (g)
Aurelia aurita	moon jellyfish	81376	9204	47345	27234	11129
Cyanea lamarckii	blue jellyfish	2443	2076	72144	27234	19796
Chrysaora hysoscella	compass jellyfish	40883	14986	5226	24698	19046
Aequorea spp.	crystal jellyfish	9202	2557	3650	15717	13125
Cyanea capillata	lion's mane jellyfish	19228	60422	150130	285090	444581
	Total	153132	89245	278495	379973	507677

10. Collect squid egg samples to map spawning grounds. This could be highly relevant in studying squid stock's structure. Retain any specimens of *Loligo* (not L. forbesi – keep all if in doubt) and all ommastrephid squids (Illex, Todaropsis, Todarodes) for maturity and age

analysis, respectively. 25 Alloteuthis are to be retained for maturity and age analysis. (V Laptikhovsky - Cefas, Lowestoft)

No squid eggs were caught during the 2024 survey.

11. Collect, retain and filter surface water samples from Ferrybox underway water supply every 12 hours (or once a day) for subsequent chlorophyll sampling in support of SLA25. (N Greenwood – Cefas, Lowestoft)

24 chlorophyll samples were collected from surface water at the middle of each day throughout the survey with additional samples from sites of interest.

12. Zooplankton plankton sampling using ringnet to collect sample from the Gabbard smart buoy site. (S Pitois – Cefas, Lowestoft)

A ring net deployment at the West Gabbard site was not completed due to time constraints.

13. Collect queen scallops (queenies) *Auquipecten opercularis* to allow for experimental work on ageing, for L/W relationship analysis, development of length to height parameters and, to provide specimens to Bangor University for further work which will be made available to ICES WGScallop. (J Harvey – Cefas, Lowestoft)

It was requested on survey that samples would be measured on the EDC and would not be brought back to the lab. 191 length / weight measurements were taken.

14. Collect additional information on garfishes *(Family Belonidae) and saury pike (Scomberesox saurus)* in terms of total length (mm), body length (mm) and total weight (0.1g). (J Silva – Cefas, Lowestoft)

No garfish/ saury pike were caught during this survey

15. Maturity photos for specific species for future reference guides. (S Barnett/B Hatton – Cefas, Lowestoft)

No maturity photos were taken during CEND 15/24.

16. Sampling and processing where possible of fish larvae during the International Bottom Trawl Survey using the Methot Isaac Kidd (MIK) midwater plankton trawl. (R Nash – Cefas, Lowestoft)

5 valid MIKNET deployments took place and were processed during CEND 15/24.

17. Stomach sampling, EU has approved the plans for a pilot on collecting stomach data (as discussed during IBTSWG 2021). For this a 5-year rolling scheme of species is proposed. According to the new scheme plaice and hake should be collected in 2024.

Stomach sampling took place onboard for plaice and hake, 116 plaice were sampled and 13 hake. 44 anglerfish, brill and turbot stomachs were collected and brought back to the lab for analysis.

18. To collect (bag and freeze) at each relevant station, 20 specimens each of age 0 and age ≥ 1 of anchovy and sardine. This is in support of study using isotopes in fish lenses to investigate migration and connectivity linked to adjacent areas (J van der Kooij & R Ourens/Cefas obo S Garrido/IPMA)

No juvenile anchovy or sardine were collected during CEND 15/24.

ACKNOWLEDGEMENTS

The survey team would like to acknowledge the outstanding work by the officers and crew of RV Cefas Endeavour, not only helping us successfully complete the survey, while doing so with the mindset of maintaining safety as the number one priority on board. In addition, the efforts by Brian Salter and the rest of the AWSM management team in securing the delivery of the survey and all required accompanying gear was much appreciated.

Nicola Hampton
Deputy Scientist in Charge
25/11/2024

DISTRIBUTION:

Participants of survey
Marine Operations
J Thompson (PM)
I Holmes (PI)
R Clarke (PL)
Cefas Fisheries surveys SICs/2ICs
Cefas CDP (Gary Burt)
AWSM - Pinbush
Fishing Skipper/Master Cefas Endeavour
FCO (Overseas EEZ's)

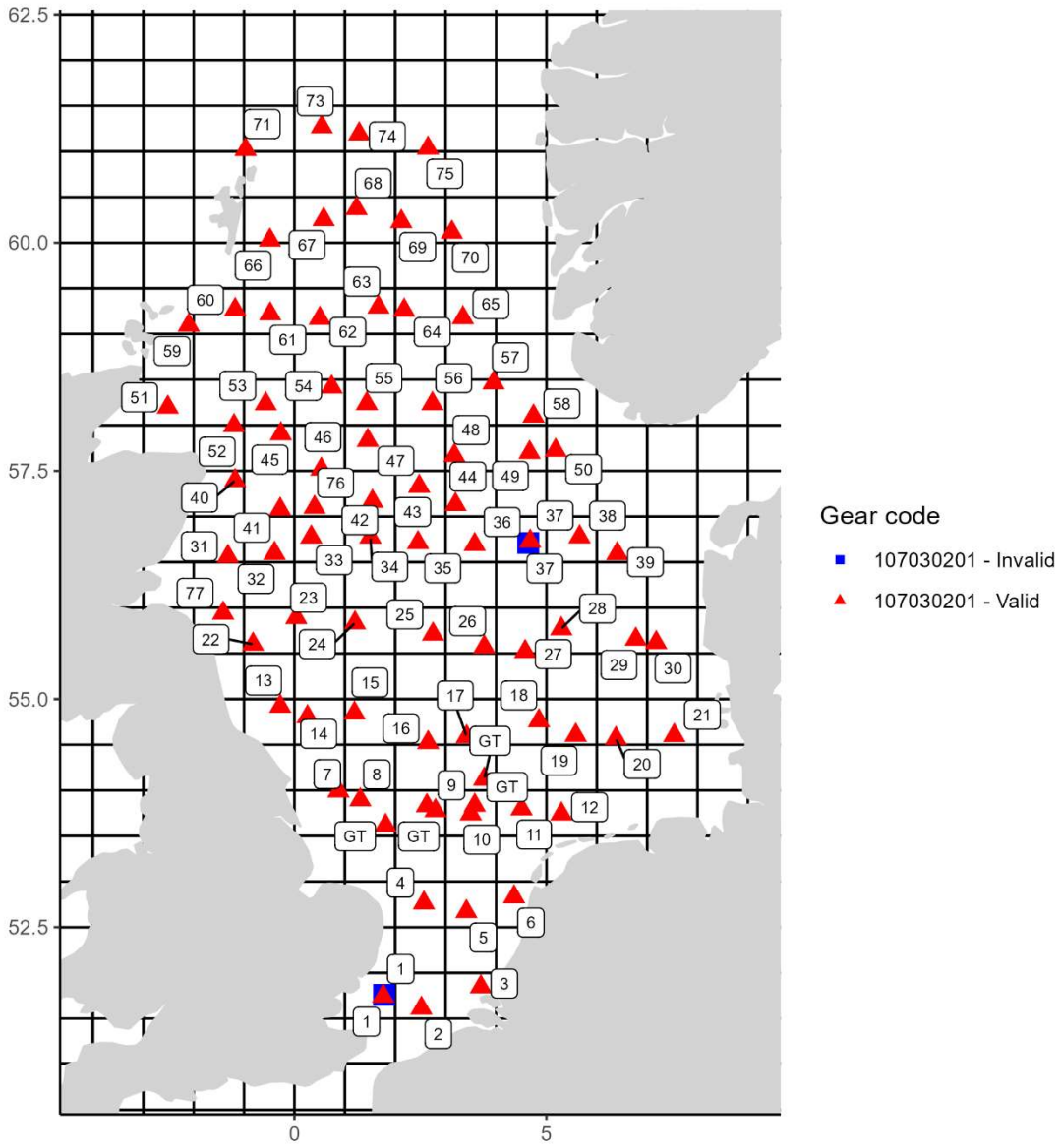
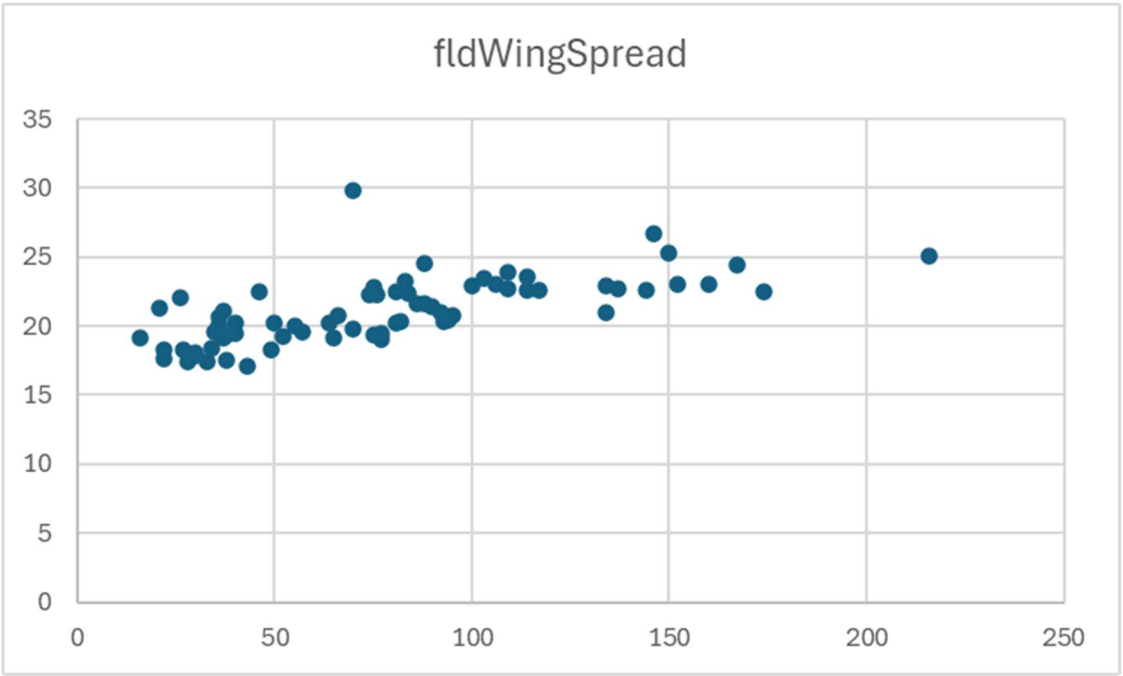


Figure 7. Deployment positions for valid and additional GOV trawl stations giving prime station numbers.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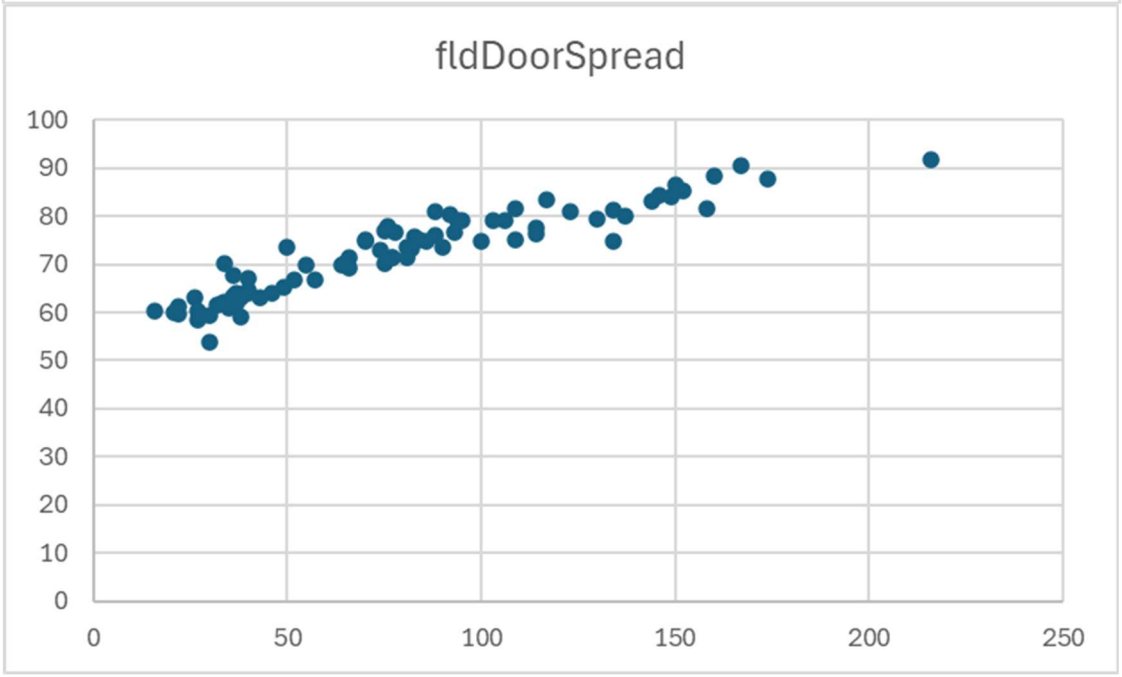
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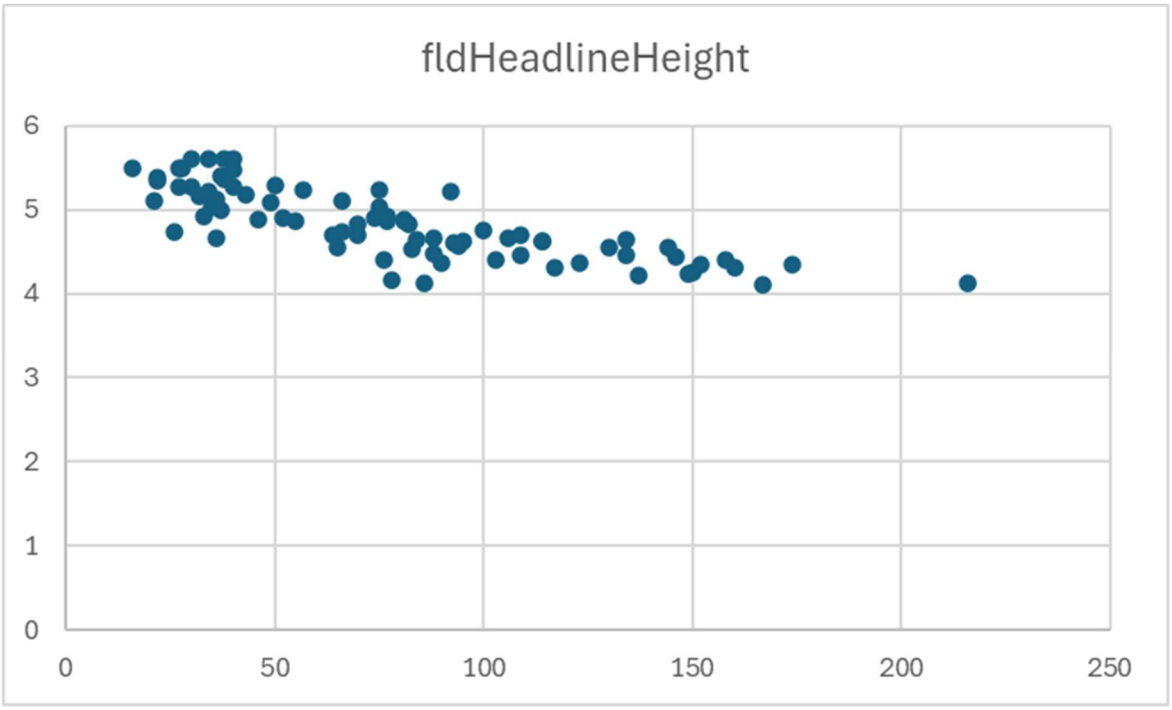
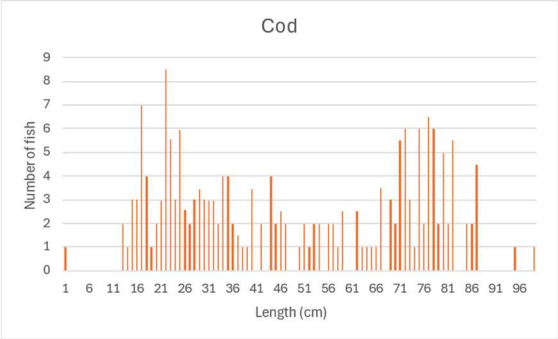
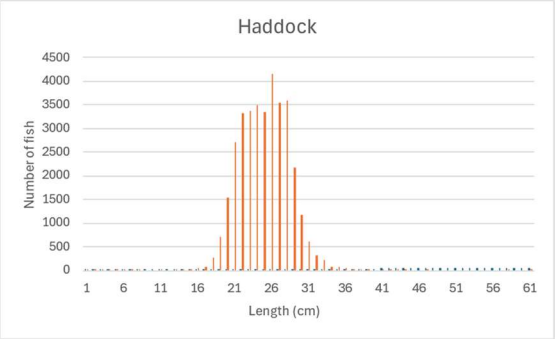


Figure 8. Relationships between door spread, wing spread and headline height with water depth (valid tows only).

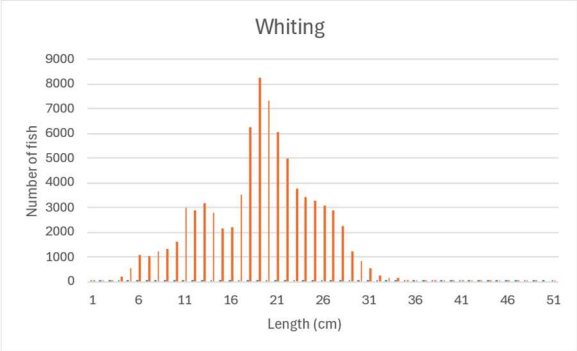
(a)


Cod
Number of fish
Length (cm)

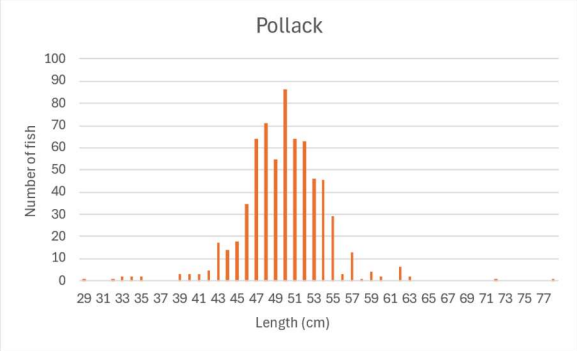
(b)


Haddock
Number of fish
Length (cm)

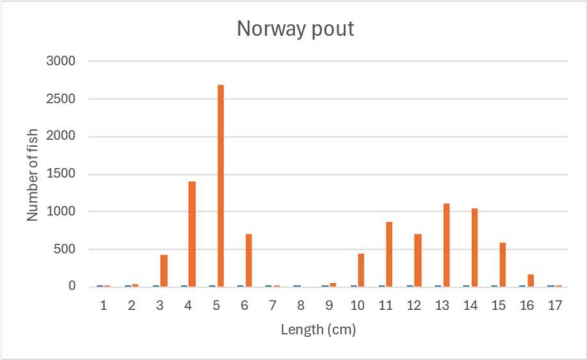
(c)


Whiting
Number of fish
Length (cm)

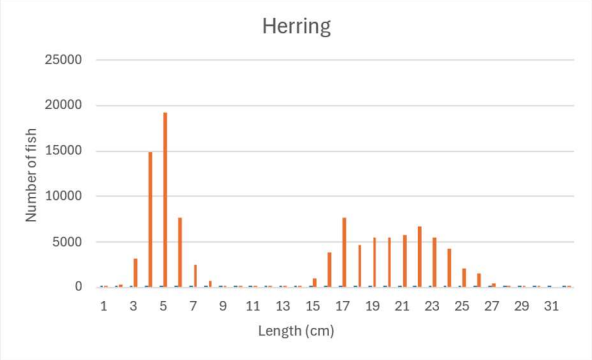
(d)


Pollack
Number of fish
Length (cm)

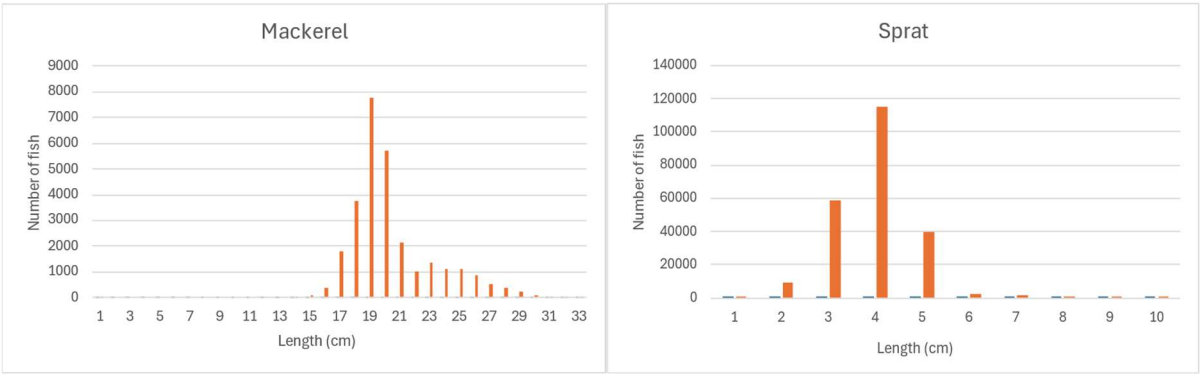
(e)


Norway pout
Number of fish
Length (cm)

(f)


Herring
Number of fish
Length (cm)

(g) (h)



(i) (j)

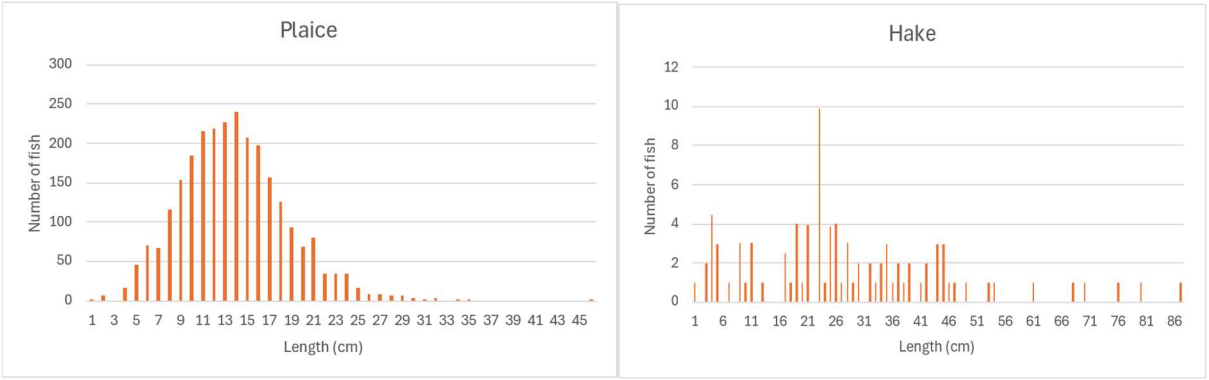


Figure 9. Length distribution plots for (a) cod, (b) haddock, (c) whiting, (d) saithe, (e) Norway pout, (f) herring, (g) mackerel, (h) sprat, (i) plaice and (j) hake.

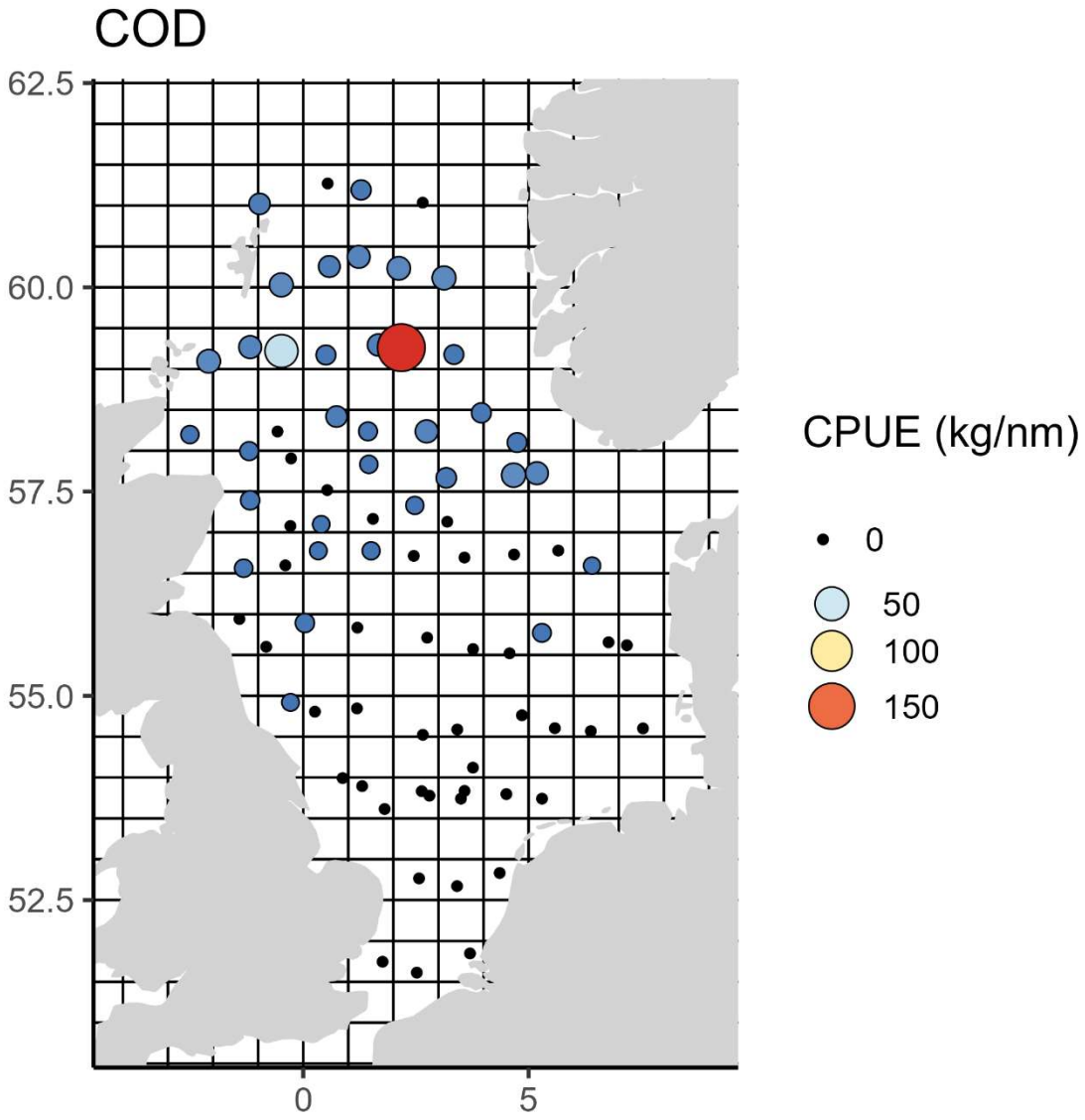


Figure 10. Distribution and relative abundance of cod *Gadus morhua* across the survey.

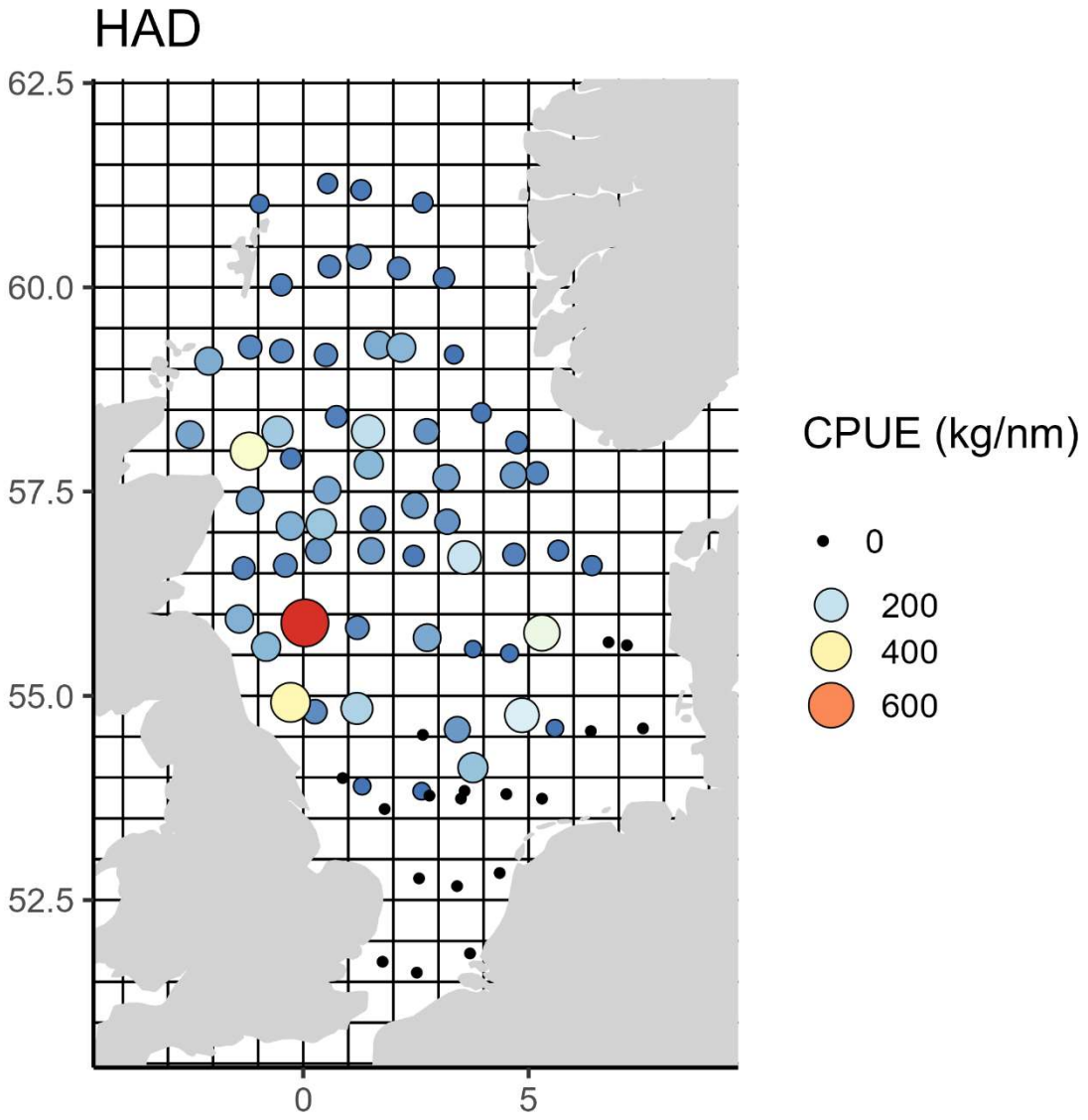


Figure 11. Distribution and relative abundance of haddock *Melanogrammus aeglefinus* across the survey.

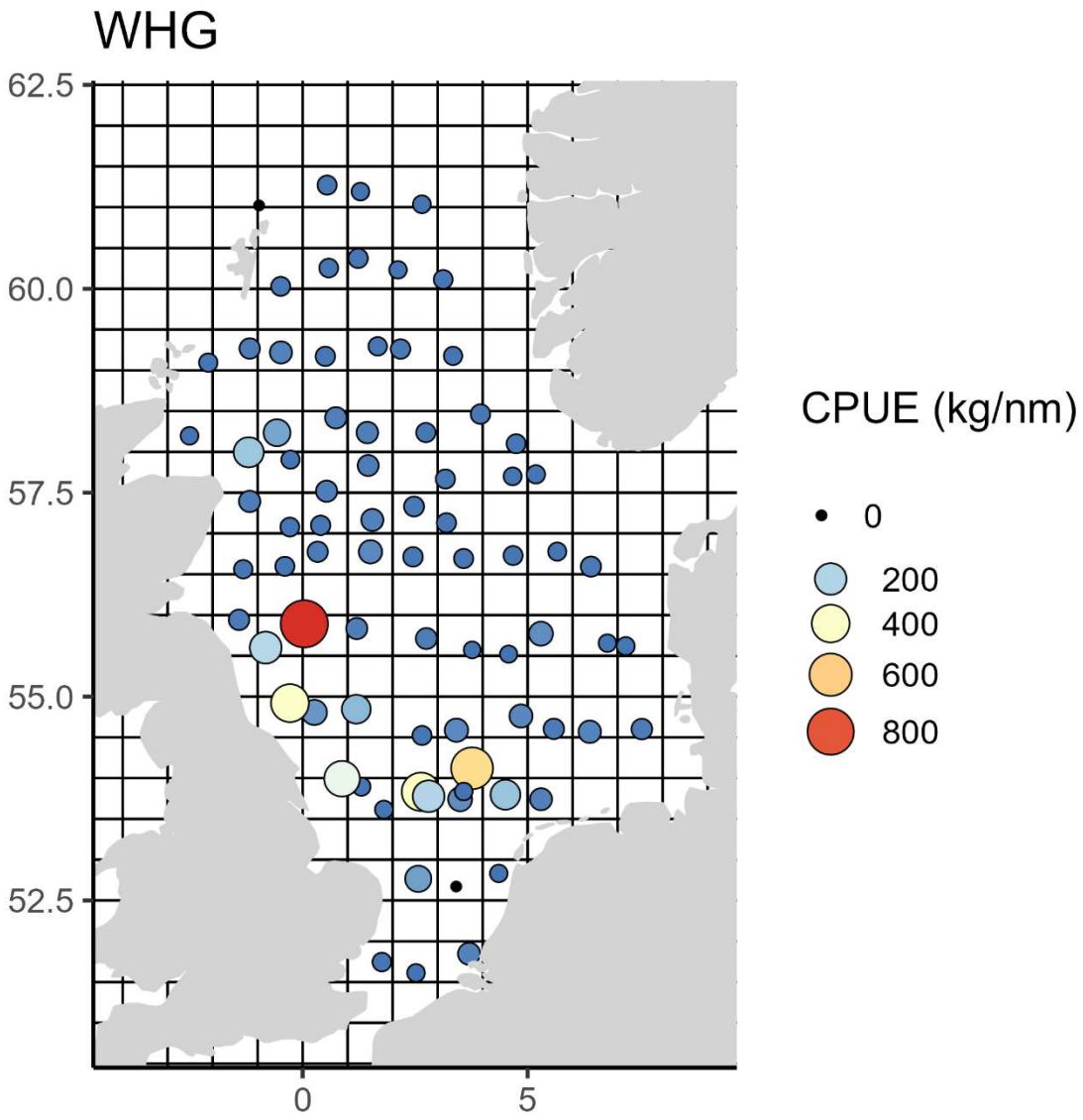


Figure 12. Distribution and relative abundance of whiting *Merlangius merlangus* across the survey.

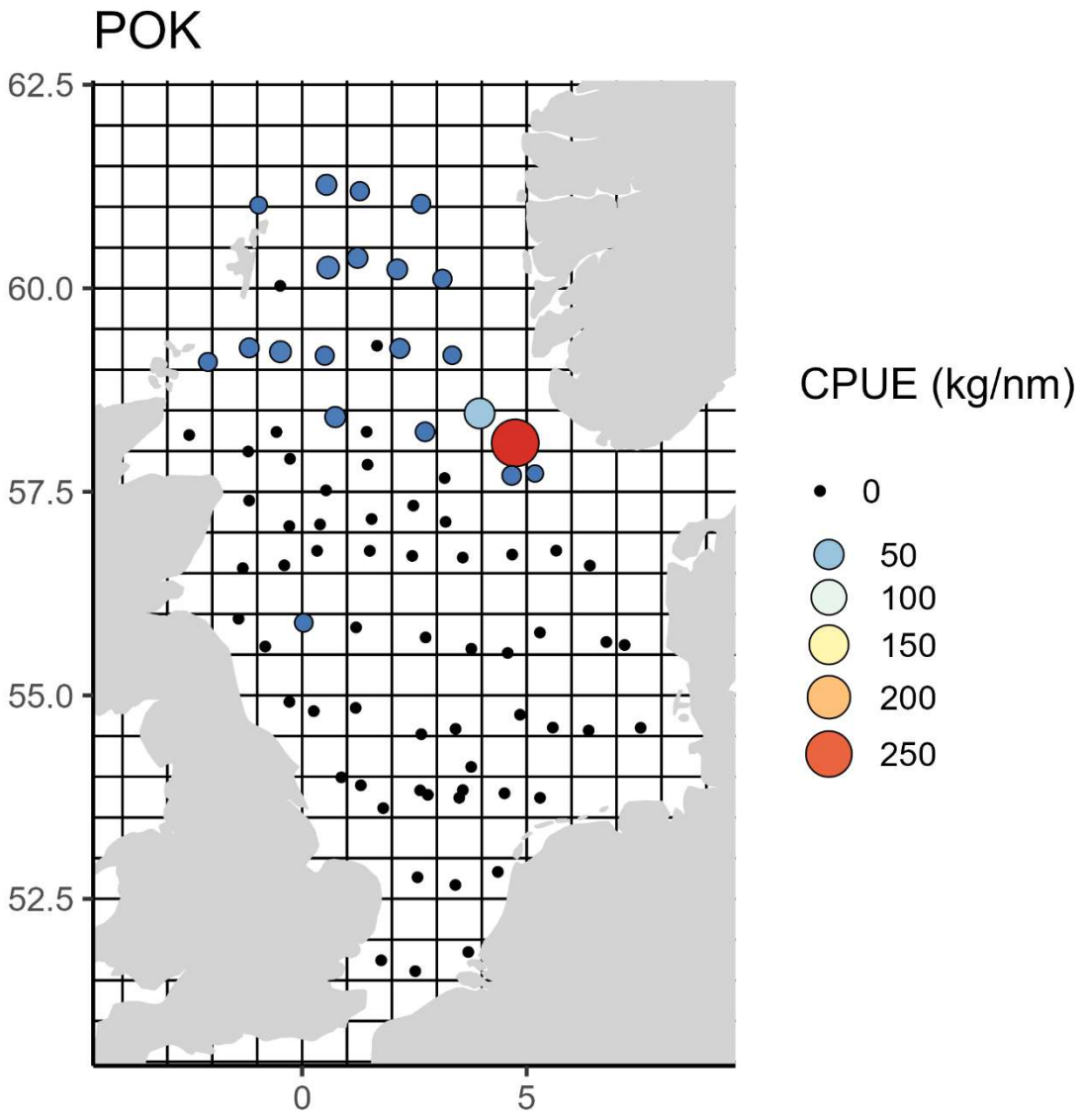


Figure 13. Distribution and relative abundance of saithe *Pollachius virens* across the survey.

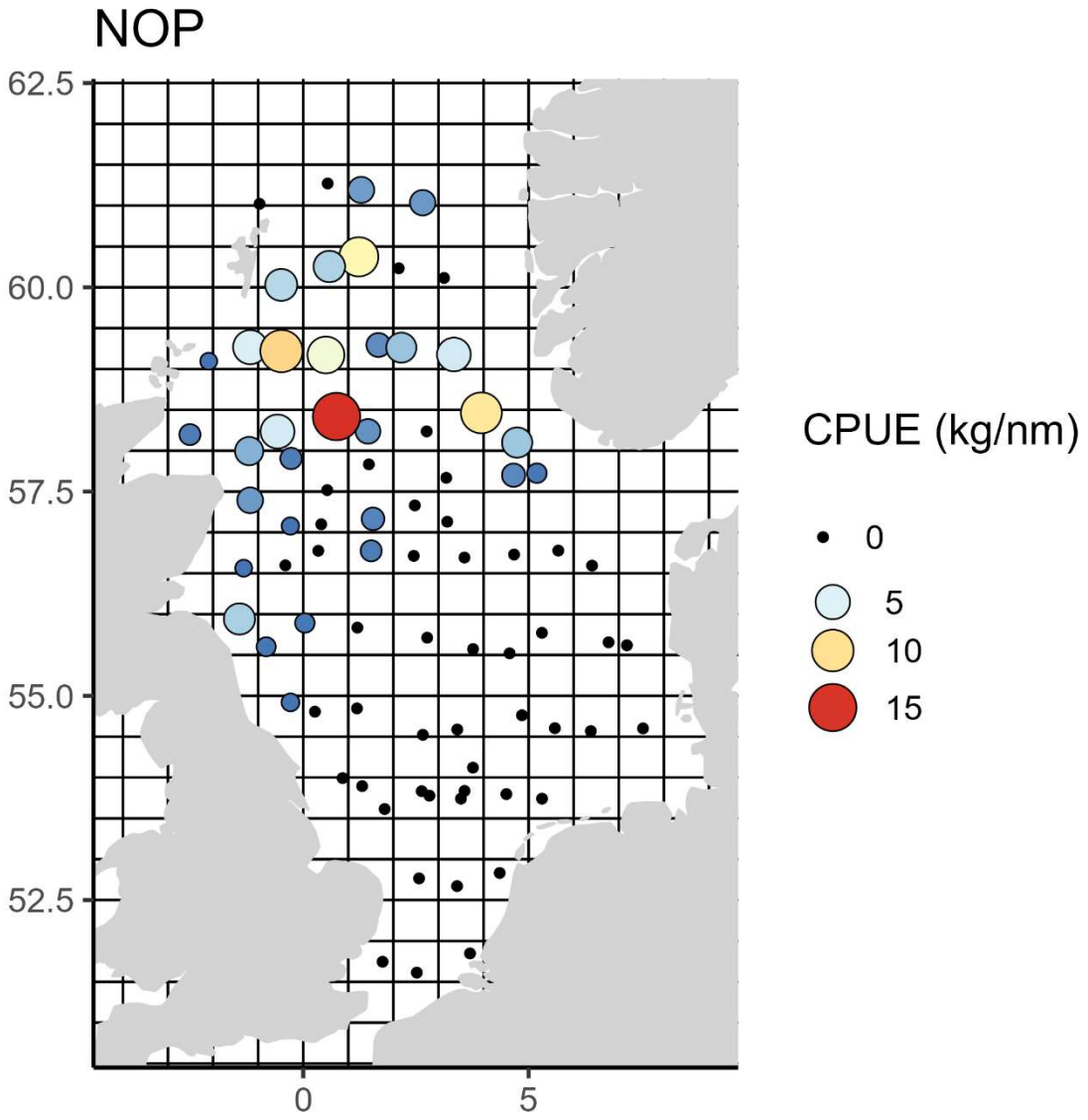


Figure 14. Distribution and relative abundance of Norway pout *Trisopterus esmarkii* across the survey.

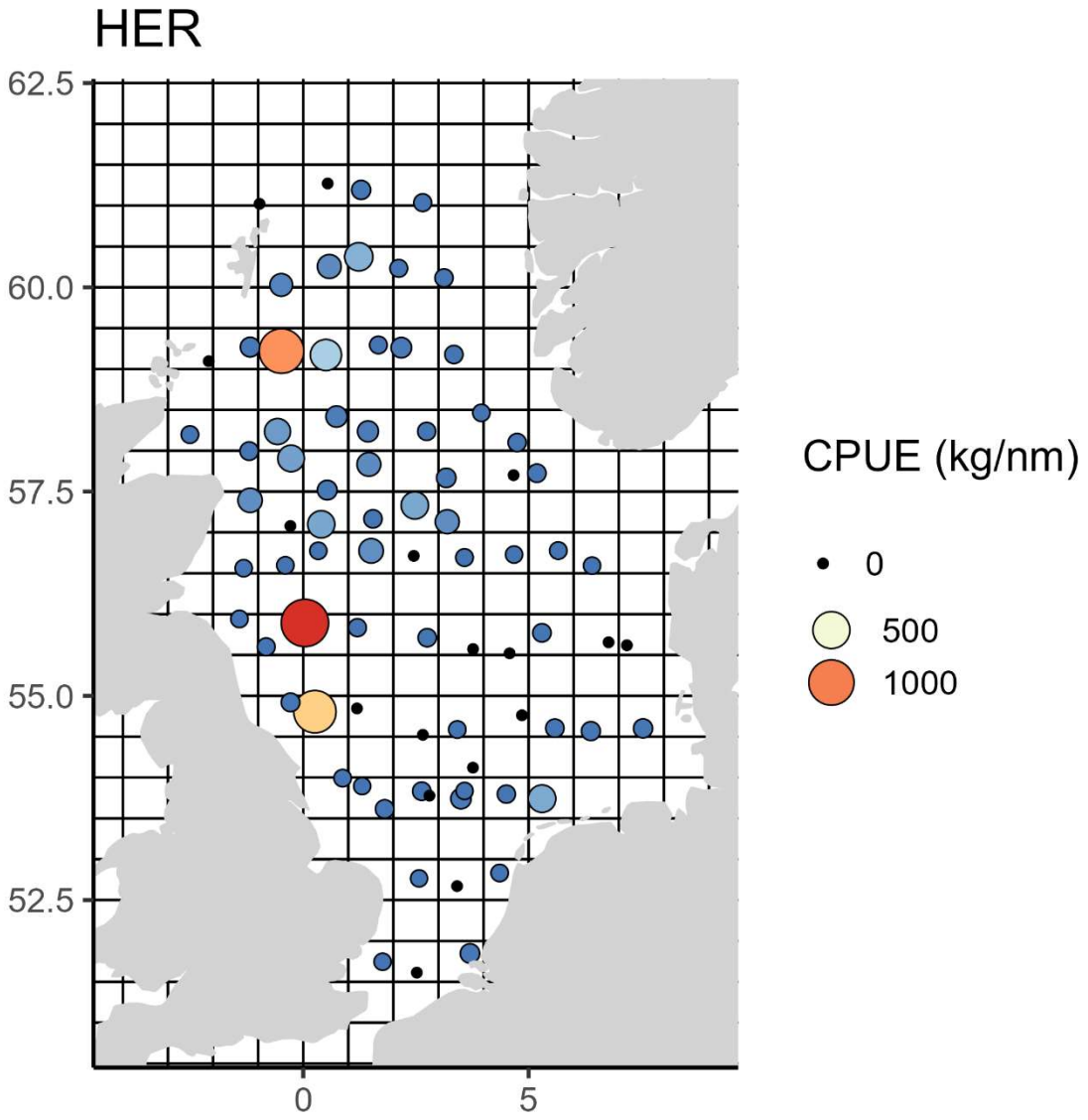


Figure 15. Distribution and relative abundance of herring *Clupea harengus* across the survey.

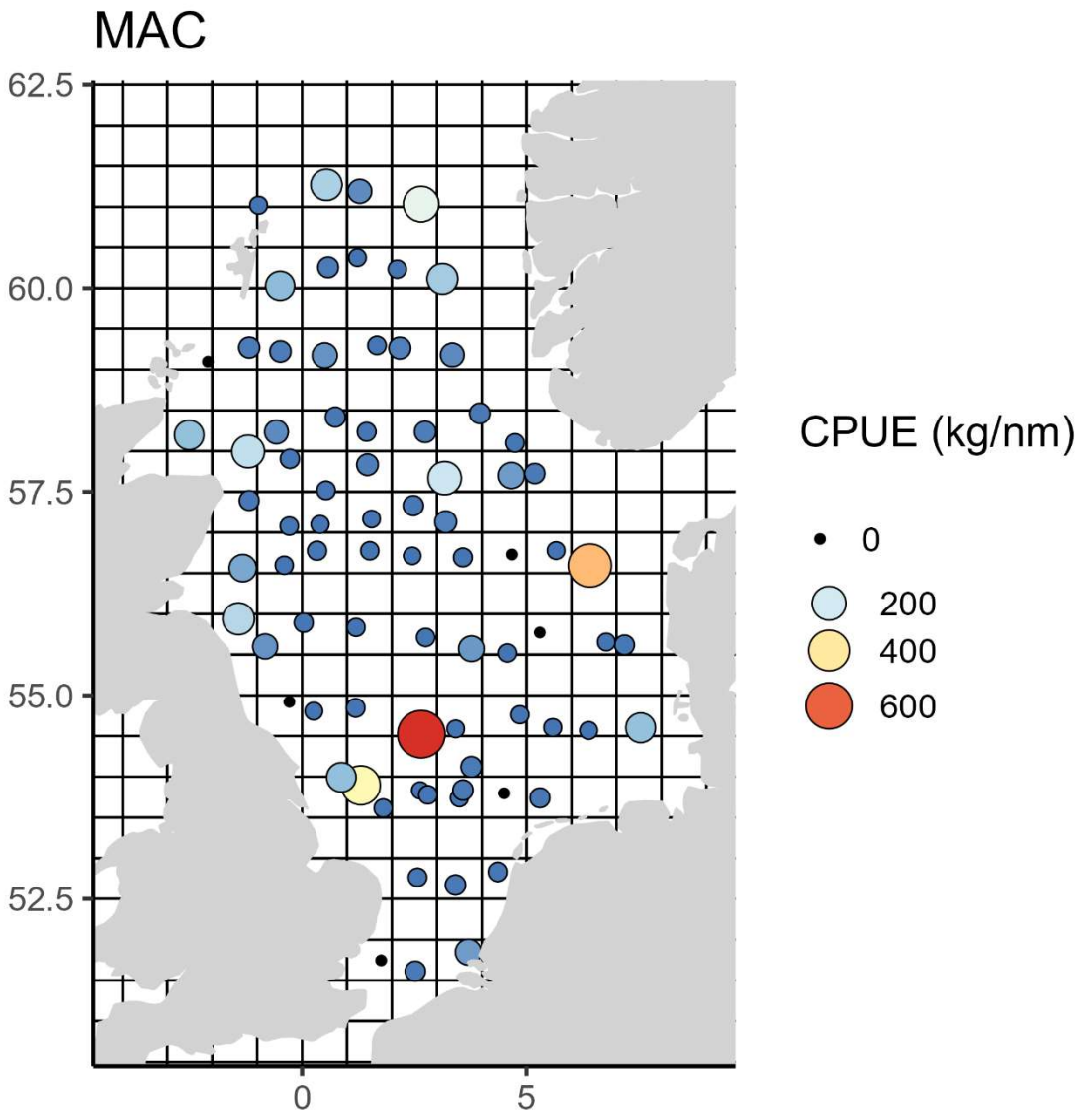


Figure 16. Distribution and relative abundance of mackerel *Scomber scombrus* across the survey.

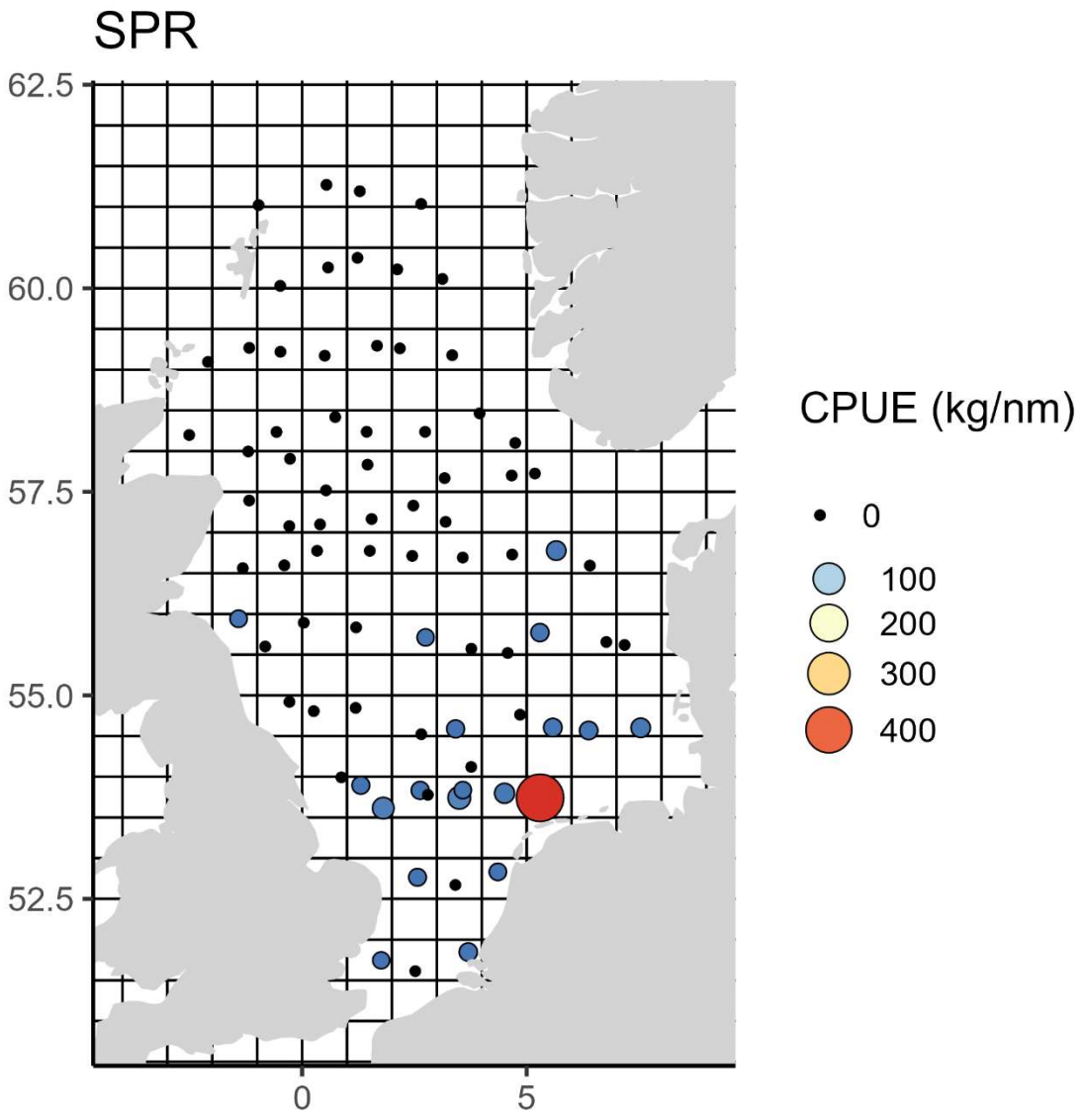


Figure 17. Distribution and relative abundance of sprat *Sprattus sprattus* across the survey.

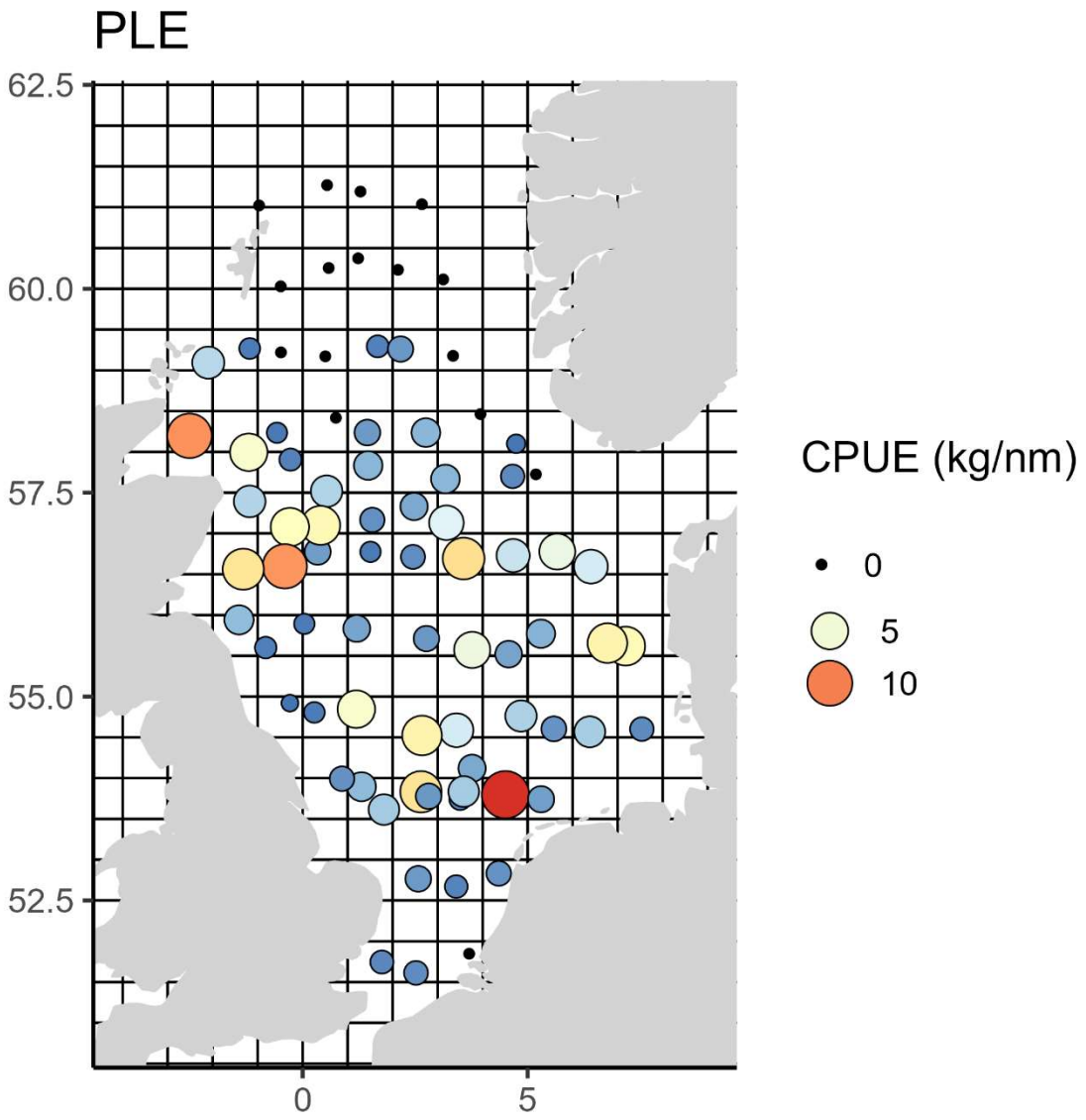


Figure 18. Distribution and relative abundance of plaice *Pleuronectes platessa* across the survey.

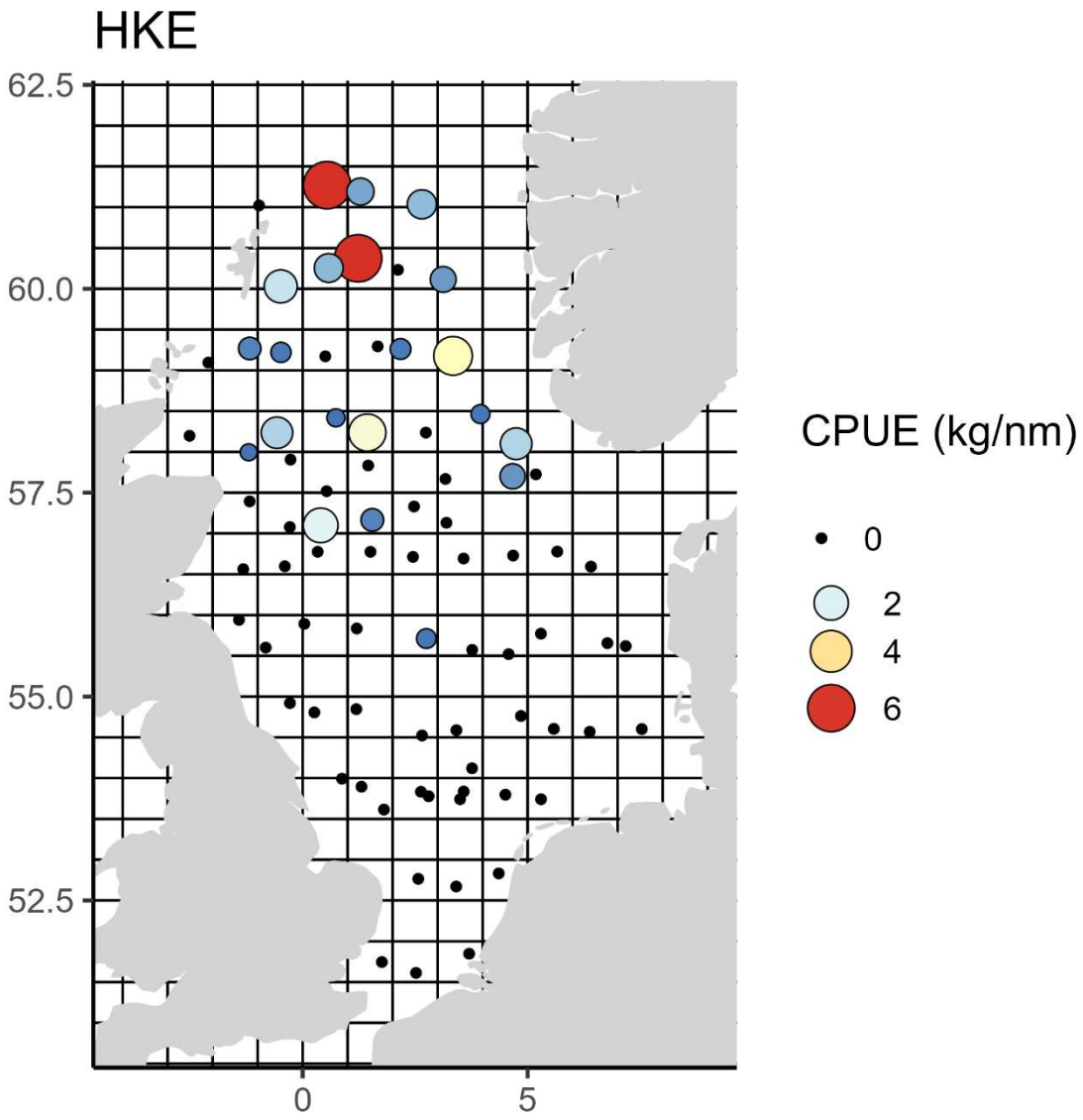


Figure 19. Distribution and relative abundance of hake *Merluccius merluccius* across the survey.

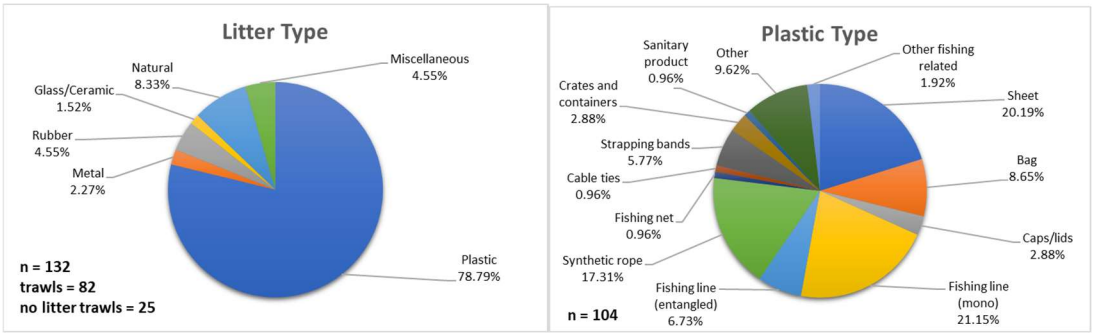


Figure 20. Marine litter collected during the English IBTS-Q3 trawl survey in 2024.