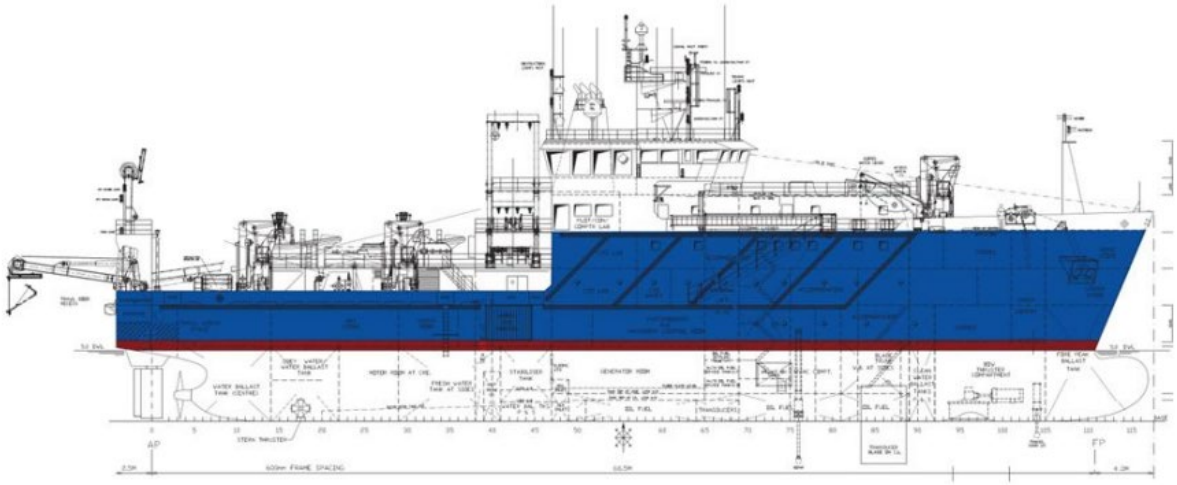
Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR
Survey: Integrated International Triennial English Mackerel Egg Survey (MEGS) and Annual Nephrops Survey (NEPS) - CEND102025

2025 English MEGS Report



MEGS STAFF:

Name	Role
Linford Mann	SIC
Samantha Barnett	2IC
Charlotte Reeve	Sampler
Aimee Cuskeran	Sampler
James Pettigrew	Sampler
Bella Voak	Sampler
Josh Tate	Electronics
Peter Hamstead	Electronics
Bryan Goodsir-Thompson (part 1)	RV engineer
Tom Woods (part 1)	Sampler
Matt Eade (part 1)	Sampler
Rose Finneran (part 2)	Sampler
Nevena Almeida (part 2)	Sampler

DURATION: 31 May and 27 June 2025 (28 days at sea [24 dedicated to MEGS]).

LOCATION: ICES divisions 27.4.a-c - North Sea: 53.25°N - 7.75°E - 59.75°N - 2.25°W (Figure 1).

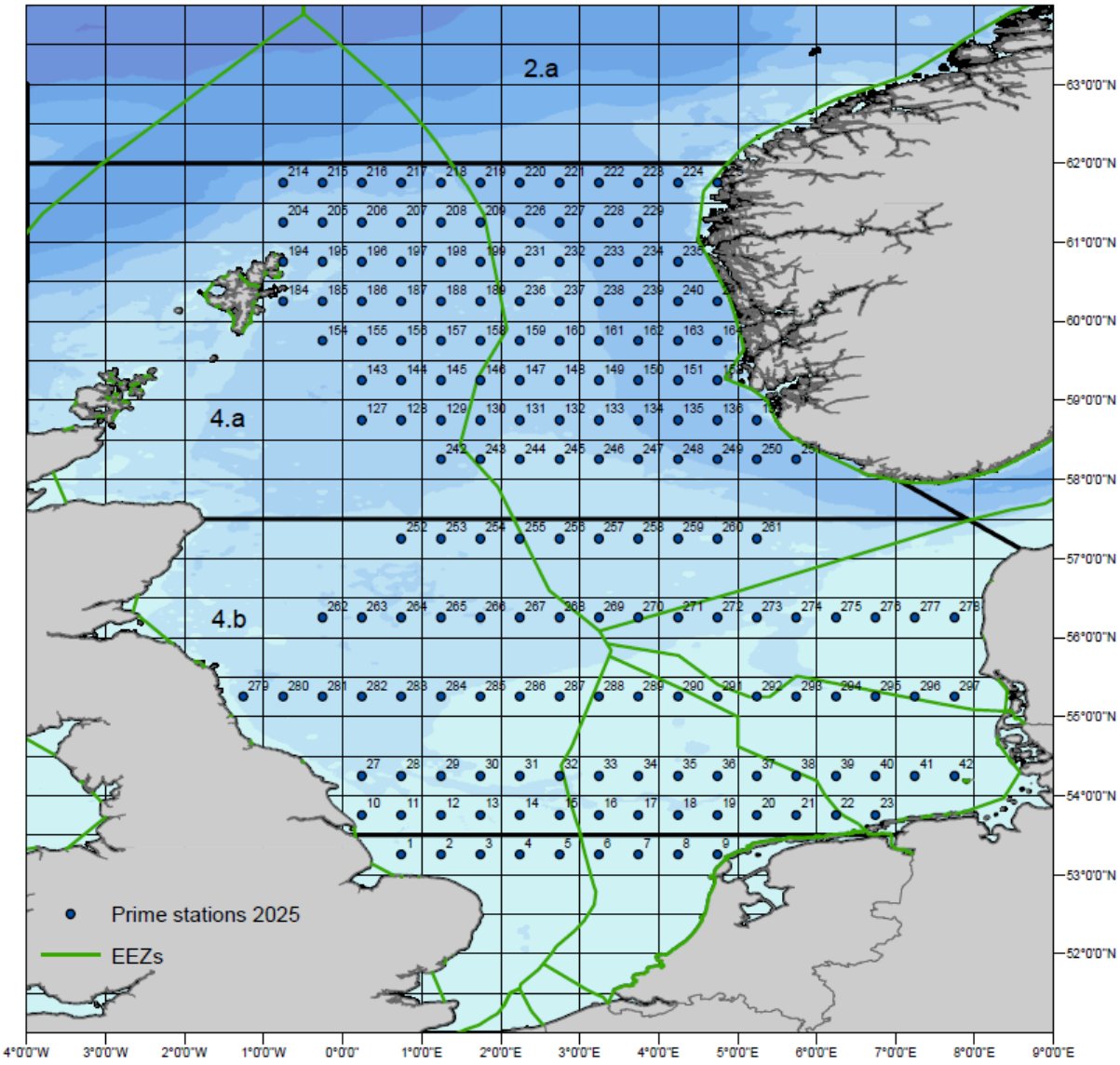


Figure 1. Original 2025 English MEGS grid. Ichthyoplankton Prime station indicated with blue dots

AIMS

MEGS PRIMARY AIMS:

1. Deployment of the Gulf VII high-speed plankton sampler at 172-Prime stations to collect ichthyoplankton samples;
2. Onboard analysis of ichthyoplankton samples for enumeration and staging of Atlantic mackerel *Scomber scombrus* and Atlantic horse mackerel *Trachurus trachurus* eggs using ImageJ/ObjectJ;
3. Collection of environmental meta data including sea state, wind conditions, and instrument data (water conductivity, temperature, depth, salinity, internal and external flowrate, and Gulf VII pitch);

4. Completion of 14-fishing stations (as minimum) to collect adult Atlantic mackerel using rod and line (<40m water depth) the VDK (van der Kooij) herring trawl (>40m water depth);
5. To collect biological data, including maturity and weight at age, of caught adult Atlantic mackerel;
6. To collect fecundity samples for DEPM, as well as ovary samples for AEPM, from selected adult Atlantic mackerel;
7. To record EK80 acoustic data to detect Atlantic mackerel shoaling and spawning aggregations;

NEPS PRIMARY AIMS:

8. To conduct a standard Underwater Video Survey (UVS) of Nephrops burrow densities using UVS sledge on the Farn Deeps grounds, and to evaluate Nephrops abundance (C. Firmin - Cefas, Lowestoft);
9. To run exploratory multibeam tows over planned stations to check for obstructions (C. Firmin - Cefas, Lowestoft);

MEGS SECONDARY AIMS:

10. Collection of continuous mesozooplankton digital data via the onboard flowthrough Plankton Imager System (PIS) for abundance analysis (J. Scott - Cefas, Lowestoft);
11. To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox';
12. To collect salinity water samples (surface and near-bottom) using a Niskin with ESM2 logger (P. Nelson - Cefas, Lowestoft);
13. To collect and process chlorophyll water samples (surface) once per 24hrs (as minimum) (N. Greenwood - Cefas, Lowestoft);

NARRATIVE: (ALL TIMES ARE GMT)

On 30 May, 9-Cefas staff mobbed the RV CEND, inspecting gear and installing and testing survey equipment as required.

On 31 May, the remaining 6-Cefas survey staff joined the RV at 0900hr. A survey brief was completed at 1000hr, and a ship emergency drill completed at 1100hr. The RV departed Lowestoft at 1300hr, transiting to Prime 1 to complete an ESM2 and Niskin water sample. ESM2 and Niskin water samples were completed, where possible, at sunrise and sunset each day (~0430hr and 0930hr). Water chlorophyll samples were also completed each day from the Niskin sampler. The Plankton Imager System (PIS) was turned on for data collection, and the EK80 acoustic data set to record for the duration of survey operations. The Gulf VII high-speed plankton sampler was then deployed at Prime 1, successfully collecting a valid zooplankton sample. All instruments on the Gulf VII (main, and external electronic flowmeters and environmental sensors) operated as required.

On 01 June, 8 stations (Primes 2, 3, 4, 5, 6, 7, 8 and 9) were competed. At Prime 3, tow data was streamed but did not record resulting in an invalid tow. The station was repeated successfully. At Prime 9, a fishing station was completed using rod and lines. A total catch of 1.3 kg Atlantic mackerel was caught and sampled.

On 02 June, 5 plankton stations (Primes 22, 23, 42, 41 and 40) were competed. During transit to Prime 22, a fishing station was completed catching 0.9 kg of Atlantic mackerel. At Prime 40, another fishing station was conducted however no Atlantic mackerel were caught.

On 03 June, 5 plankton stations (Primes 39, 38, 37, 36 and 35) were competed. During transit to Prime 37, a fishing station was completed however no Atlantic mackerel were caught. Following completion of Prime 26, weather deteriorated, and strong swell + winds impacted ability to safely deploy the Gulf VII. The RV remained on station (Prime 35) and scientific crew continued data extractions, data checking, and plankton sample analysis. At 1900hr swell + winds reduced and the Gulf VII was deployed. During the tow, the internal flowmeter failed due to a minor mechanical error. The undamaged flowmeter was rehoused, and a successful plankton station was completed.

On 04 June, 8 plankton stations (Primes 34, 33, 32, 31, 30, 29, 28, and 27) were completed. During transit to Prime 32, a fishing station was completed, and 1 Atlantic mackerel was caught and sampled. At Prime 27, a plankton station was attempted, however a technical issue occurred resulting in an invalid tow. The Gulf VII was redeployed, however the same issue occurred which again resulted in an invalid tow. A system reboot was performed, and the station was successfully completed at the third attempt. At Prime 27 a fishing station was also completed. A total of 24.69 kg Atlantic mackerel were caught and sampled. During fishing, a Cefas staff member unfortunately sustained a minor injury and it was deemed that the staff member required onshore medical attention. The RNLI was contacted and a lifeboat despatched, and the staff member was transferred to Scarborough A&E.

On 05 – 08 June, MEGS operations paused with the Nephrops UWTV survey taking over. The UWTV camera sledge was deployed in the Farn Deeps (FU6) to collect Nephrops burrow data. At each station, a single pass with the multibeam system was undertaken to scan for underwater obstructions. Following this, a sledge-mounted TV camera was deployed, and a visually clear 10-minute tow was recorded. Footage was observed by NEPS staff and nephrop burrows counted. This process was repeated for all NEPS stations. During this time, MEGS staff completed analysis of backlogged plankton samples as well as data QC.

On 09 June, MEGS operations resumed and 4 plankton stations (Primes 284, 283, 282, and 281) were competed. At Prime 284, a calibration tow was completed and was successful. At Prime 282, the plankton deployment was invalid due to data streaming issues. To swiftly resolve the issue, the Gulf VII plankton sampler (A) was swapped with the spare sampler (B). As a result, another calibration tow was completed and successful to ensure sensors and flowrates were operating as expected. It was later identified that the Gulf VII GoPlug seal was compromised, causing ingress and resulting in data loss. Throughout the day, NEPS staff completed Nephrop burrow QC and packed NEPS equipment.

On 10 June, 5 plankton stations (Primes 279, 306, 307, 262, and 263) were competed. At 1000hr, NEPS staff were transferred by sea-taxi to Seahouses, and 3 replacement MEGS staff joined.

On 11 June, 9 plankton stations (Primes 264, 265, 266, 267, 268, 269, 270, 272, and 273) were competed. At Prime 266, there was an invalid plankton station due to data streaming issues. The station was reattempted and successfully completed. At Prime 266, the VDK (van der Kooij) 20 x 40 pelagic trawl was deployed as a shakedown tow and fishing station. While not deployed on an acoustic mark, the trawl operated as required and caught 0.52kg of Atlantic mackerel. At Prime 269, there was another invalid plankton station due to data streaming issues. The station was reattempted and completed successfully. At Prime 272, a rod and line fishing station was completed but where was no catch.

On 12 June, 6 plankton stations (Primes 274, 275, 276, 277, 278, and 251) were completed. At Prime 275, a fishing station was completed catching 0.385kg of Atlantic mackerel.

On 13 June, 5 plankton stations (Primes 250, 249, 248, 247, 246) were successfully completed. At Prime 249, a rod and line fishing station was completed, catching 31.7kg of Atlantic mackerel. At Prime 245, the Rochester wire was damaged. The wire and Gulf VII sampler was safely recovered and an incident report raised. The repair required mechanical and electrical re-termination, resin curing and load testing. To resume operations, the SideScan wire was prepared for use with the Gulf VII sampler.

On 14 June, the RV remained at Prime 250 while re-termination of the Rochester wire and setup and testing of the SideScan wire was completed. Mechanical and electrical re-termination of the Rochester wire was successful, requiring a minimum of 12hrs cure time for the resin to set. The SideScan wire was successfully setup and load tested. However, due to strong winds and swell the Gulf VII plankton sampler couldn't be deployed via the SideScan wire throughout the day. To utilise downtime, all backlogged haul data and plankton samples were analysed and QCed.

On 15 June, the SideScan wire became operational. Wind and swell improved and 7 plankton stations (Primes 245, 244, 243, 242, 302, 301, and 140) were completed. At Primes 245, 244, and 243, the SideScan wire was used for deployments. However, at Prime 243 SideScan winch power was temporarily lost. The gear was recovered, and the station invalid. The Gulf VII sampler was moved to the newly repaired and now available Rochester wire. The plankton station was reattempted and successfully completed. At Prime 242 and additional Primes 302 and 301, mackerel egg counts were low (<5 n/tow). As such, assumption was made that remaining additional stations on the transect line would also have low egg counts, resulting in the transect line deemed complete. Due to concerns over remaining MEGS time and number of outstanding plankton stations, it was decided that the survey grid would be reduced. The plan impacts WGMEGS data coverage aims but allow England to deliver minimum coverage requirements for specific survey areas.

On 16 June, 6 plankton stations (Primes 142, 144, 146, 148, 150, and 152) were competed. Between Primes 142 and 144, a fishing station was completed, catching 0.205kg Atlantic

mackerel. At Prime 152, another fishing station was completed, catching 1.935 kg Atlantic mackerel for sampling.

On 17 June, 10 plankton stations (Primes 241, 240, 239, 238, 237, 236, 189, 188, 187, 186) were competed. At Prime 187, the plankton sampler comms dropped out resulting in an invalid tow. The station was reattempted and successfully completed. At Prime 186, a fishing station was completed catching 1.205kg of Atlantic mackerel.

On 18 June, 4 plankton stations (Primes 185, 184, 196 and 197) were competed. A fishing station was attempted at Prime 118 using the VDK trawl. Unfortunately, the trawl sensors provided inadequate headline height data and did not function as required. No fish were caught. Another fishing station was completed using rod and line. No fish were caught. Following this, strong winds and swell suspended operations for 5hrs, and review of the forthcoming forecast deemed no sampling possible for the next few days. With remaining survey time declining, it was decided to abandon the northern-most two transect lines. At Prime 197, two invalid plankton deployments occurred due to issues with comms and the external flowmeter impellor. The impellor was replaced and the plankton station successfully completed.

On 19 June, 7 plankton stations (Primes 198, 199, 231,232, 233, 234, and 235) were competed. At Prime 199, the plankton sampler external impeller stopped working, resulting in an invalid deployment. Unfortunately, the following 3 deployments were also invalid at Prime 199, despite changing the impeller and cleaning the mechanisms. The plankton sampler (B) was changed for the repaired spare sampler (A) and a calibration deployment completed. Another calibration deployment was completed and deemed successful. At Prime 234, a fishing station was completed catching 0.882kg of Atlantic mackerel.

On 20 June, 8 plankton stations (Primes 164, 163, 162, 161, 160, 158, 157, and 156) were competed. At Prime 159, the plankton sampler stopped streaming data during the haul resulting in an invalid deployment. The station was repeated and successfully completed. At Prime 163, a fishing station was completed catching 2.4kg of Atlantic mackerel. At Prime 156, another fishing station was also completed, no Atlantic mackerel were caught.

On 21 June, 10 plankton stations (Primes 155, 154, 125, 126, 127, 128, 129, 130, 131, and 132) competed. At Prime 131, a fishing station was also completed, no Atlantic mackerel were caught.

On 22 June, 4 plankton stations (Primes 133, 134, 135, and 136) competed. Prime 137 was attempted, however strong wind and tide prevented deployment. With conditions deteriorating rapidly for deployment and transit, Prime 137 was abandoned. Between Prime 134 and 135, a fishing station was also completed catching 15.36kg of Atlantic mackerel.

On 23 June, 3 plankton stations (Primes 285, 286, and 287) were competed. At Prime 285, comms was lost to the plankton sampler resulting in an invalid deployment. The station was reattempted and successfully completed. At Prime 286, swell and wind increased putting pressure in tow ability and resulting in an invalid tow. Unfavourable deployment conditions

continued for 8hrs. The station was reattempted and successfully completed. At Prime 287, a fishing station was completed but no mackerel were caught. Upon arrival to Prime 288 (2300hr), strong swell and wind prevented deployment. The RV remained on station until favourable conditions returned.

On 24 June, 5 plankton stations (Primes 288, 289, 290, 291, and 19) were competed.

On 25 June, 5 plankton stations (Primes 18, 17, 16, 15, 14, 13, 12, 11, and 10) were competed. On transit between Prime 17 and 16, a fishing station was completed catching 9.9kg of Atlantic mackerel. At Prime 10, another fishing station was completed but no Atlantic mackerel were caught.

On 26 June, Cefas staff dismantled, cleaned and packed all plankton and fisheries equipment from deck, dry lab, and wet lab areas. All plankton sample and environmental data was final QC'd and data archived appropriately. The RV transited to Lowestoft port at economic speed and received pilot ~2130hr.

On 27 June, demobbing commenced at 0800hr.

RESULTS
MEGS PRIMARY AIMS:

1. **Deployment of the Gulf VII high-speed plankton sampler at 189-Prime stations to collect ichthyoplankton samples**

The 2025 English MEGS consisted of 172 plankton stations across the North Sea. Prior to the survey, an additional 17 plankton stations in the Scottish EEZ were added to the survey grid as requested by the International Council for the Exploration of the Seas Working Group on Mackerel and Horse Mackerel Egg Surveys (ICES WGMEGS). In total, 132 plankton stations were completed using the Gulf VII high-speed plankton sampler (Figure 1). Ichthyoplankton samples were collected at all completed plankton stations.

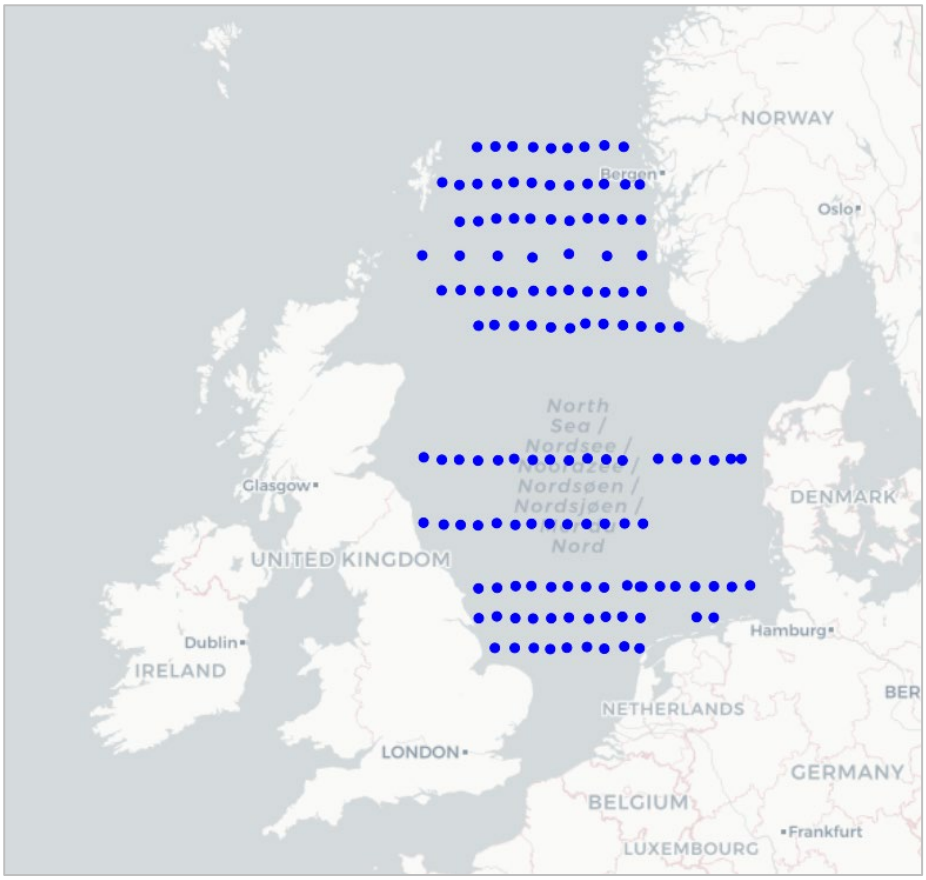


Figure 1. Plankton stations completed on the 2025 English MEGS (blue dots)

Unfortunately, due to poor weather conditions and time constraints, 51 plankton stations were not completed (Table 1). A further 6 plankton stations were also not completed, however these were additional stations in the Scottish EEZ which were supplementary to the survey grid (*). A total of 20 deployments were invalid but repeated due to software (data streaming) and hardware (impeller and GoPlug) issues.

Table 1. List of plankton stations not completed

Prime number	Reason	Prime number	Reason
20	Not attempted	218	* Not attempted - additional Scottish station
21	Not attempted	299	* Not attempted - additional Scottish station
292	Not attempted	300	* Not attempted - additional Scottish station
293	Not attempted	124	* Not attempted - additional Scottish station
294	Not attempted	153	* Not attempted - additional Scottish station
295	Not attempted	141	* Not attempted - additional Scottish station
296	Not attempted	143	Not attempted and skipped
297	Not attempted	145	Not attempted and skipped
303	Not attempted – completed by Aqua DTU	147	Not attempted and skipped
304	Not attempted – completed by Aqua DTU	149	Not attempted and skipped
305	Not attempted – completed by Aqua DTU	151	Not attempted and skipped
252	Not attempted – completed by Aqua DTU	137	Poor weather - attempted but abandoned
253	Not attempted – completed by Aqua DTU	194	Poor weather - attempted but abandoned
254	Not attempted – completed by Aqua DTU	195	Time Not attempted
255	Not attempted – completed by Aqua DTU	204	Poor weather - attempted but abandoned
256	Not attempted – completed by Aqua DTU	205	Not attempted
257	Not attempted – completed by Aqua DTU	206	Not attempted

258	Not attempted – completed by Aqua DTU	207	Not attempted
259	Not attempted – completed by Aqua DTU	208	Not attempted
260	Not attempted – completed by Aqua DTU	209	Not attempted
261	Not attempted – completed by Aqua DTU	226	Not attempted
214	Not attempted	227	Not attempted
215	Not attempted	228	Not attempted
216	Not attempted	229	Not attempted
217	Not attempted	221	Not attempted
218	Not attempted	222	Not attempted
219	Not attempted	223	Not attempted
220	Not attempted	225	Not attempted
224	Not attempted		

2. Onboard analysis of ichthyoplankton samples for enumeration and staging of Atlantic mackerel and Atlantic horse mackerel eggs using ImageJ/ObjectJ

Zooplankton samples from all 132 plankton stations were analysed onboard using traditional ichthyoplankton taxonomic processes as well as ImageJ/ObjectJ for fish egg identification, digital measuring and enumeration (Table 2). Distribution and abundance for Atlantic mackerel and Atlantic horse mackerel were plotted post-survey (Figures 2, 3, 4, and 5). Sample analysis Quality Control (QC) was completed on 25% of all samples by experienced senior zooplankton taxonomists.

Table 2. Total numbers of eggs caught on the 2025 English MEGS

Atlantic mackerel eggs	**Number**
1A	2622
1B	676
Stage 1 (stage 1A and 1B combined)	3298
Total (Stage 1A – 5)	8143
Atlantic horse mackerel eggs	**Number**
1A	305
1B	55
Stage 1 (stage 1A and 1B combined)	360
Total (Stage 1A – 5)	881

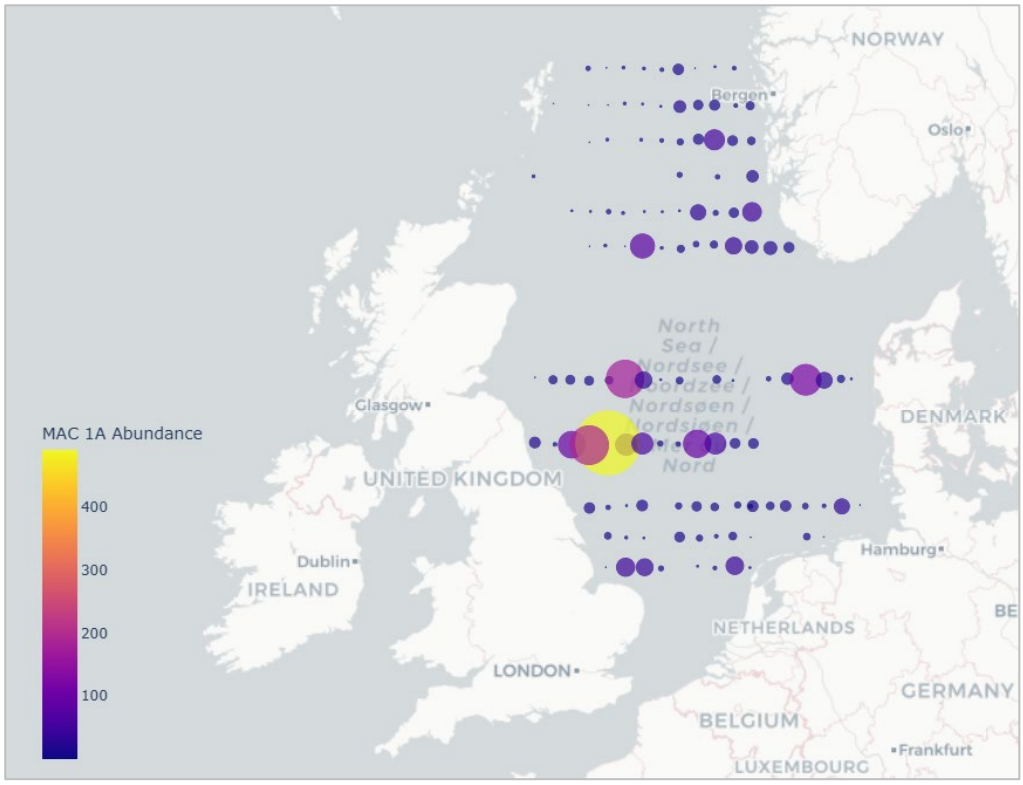


Figure 2. Distribution of newly spawned Atlantic mackerel eggs stage IA (number/tow)

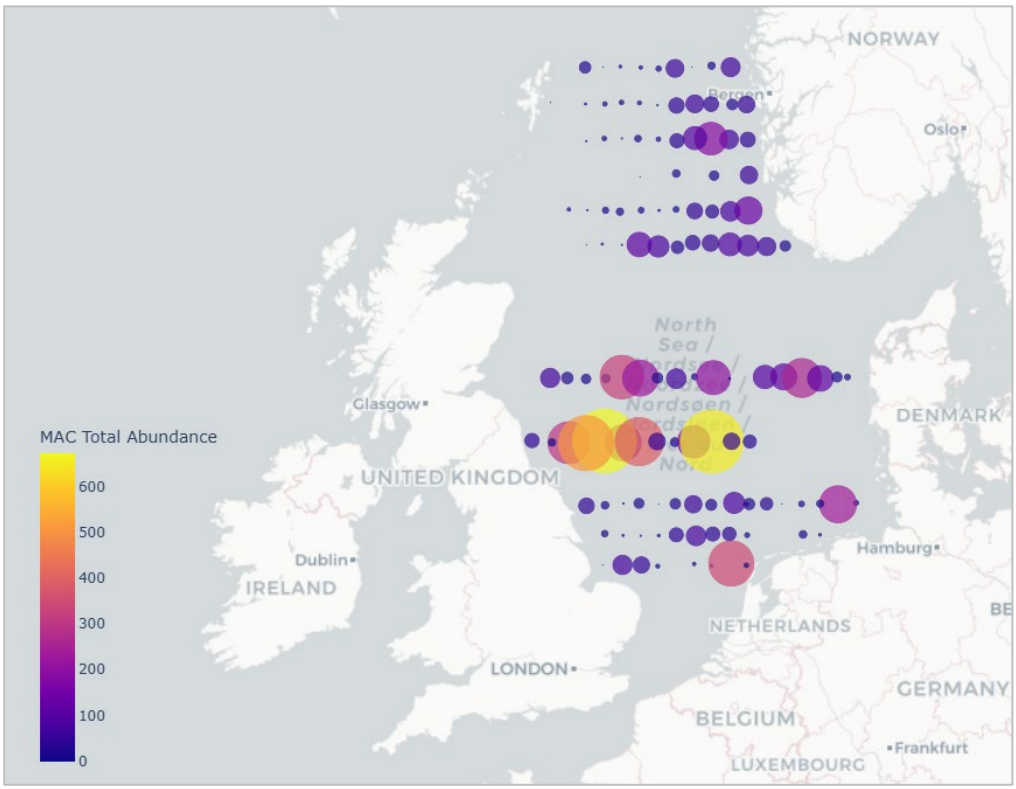


Figure 3. Distribution of all Atlantic mackerel eggs stage IA - 5 (number/tow)

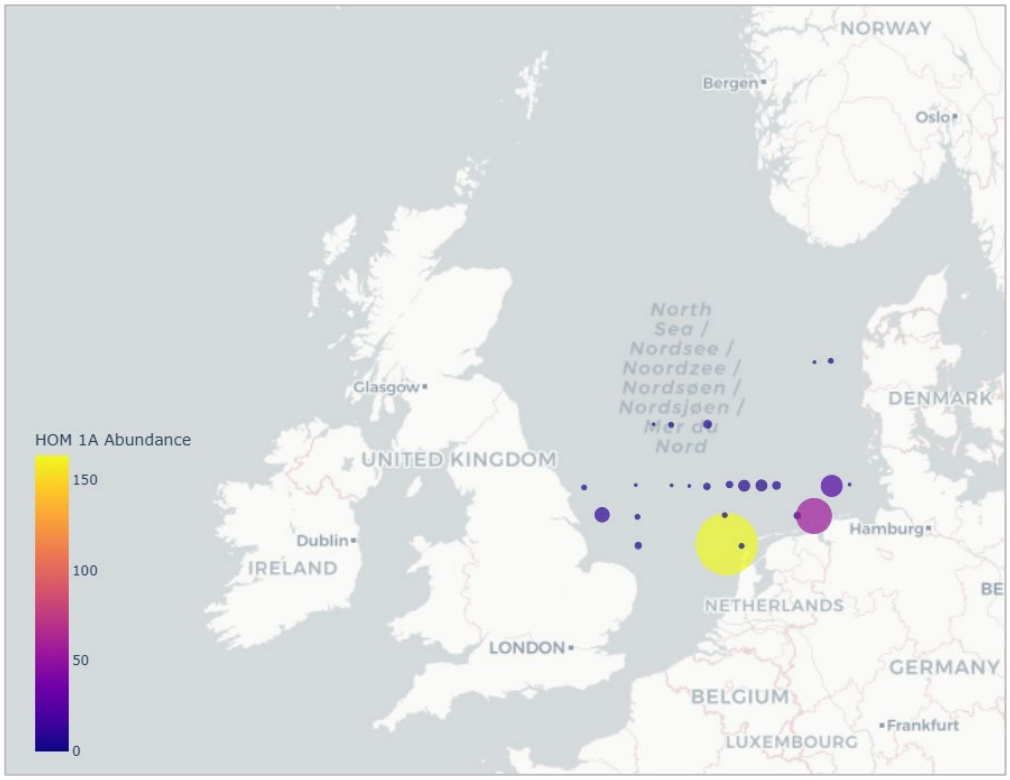


Figure 4. Distribution of newly spawned Atlantic horse mackerel eggs stage IA (number/tow)

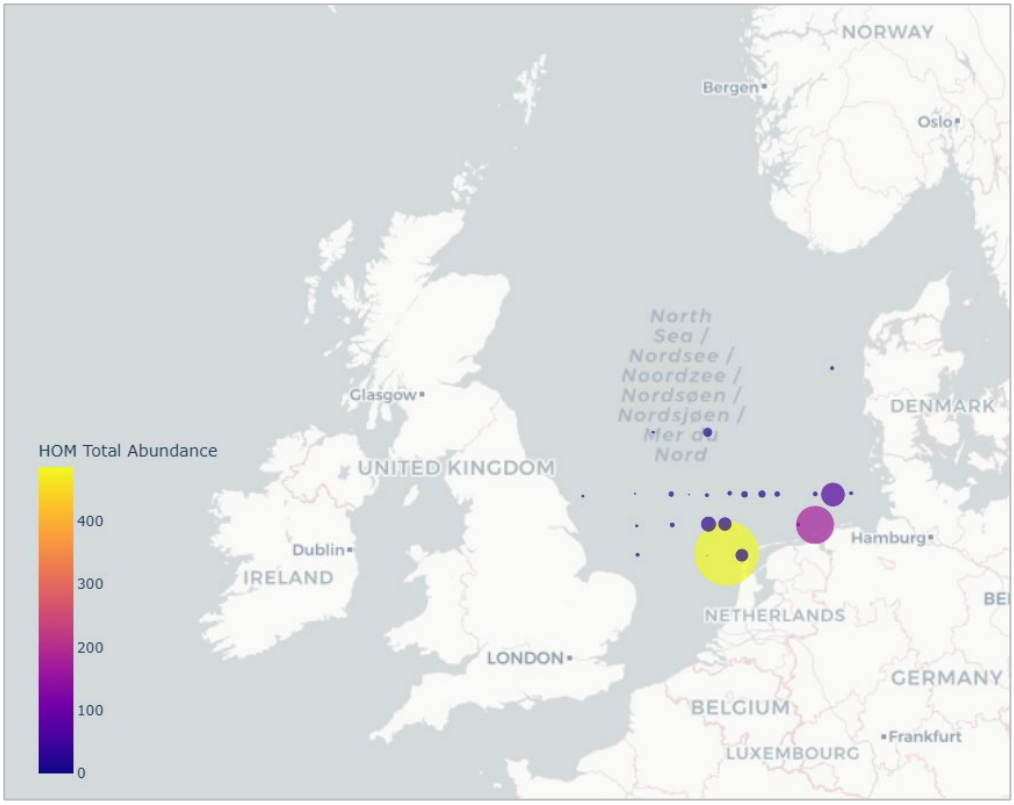


Figure 5. Distribution of all Atlantic horse mackerel eggs stage IA - 5 (number/tow)

3. **Collection of environmental meta data including sea state, wind conditions and instrument data (water conductivity, temperature, depth, and salinity, internal and external flowrate, and Gulf VII pitch)**

At each plankton station, associated environmental metadata which included water conductivity, temperature (Figure 6), depth, salinity, internal and external flow rate and pitch was collected via the Gulf VII high-speed plankton samplers' onboard sensors. Wind speed and direction data was also collected (Figure 7 and 8).

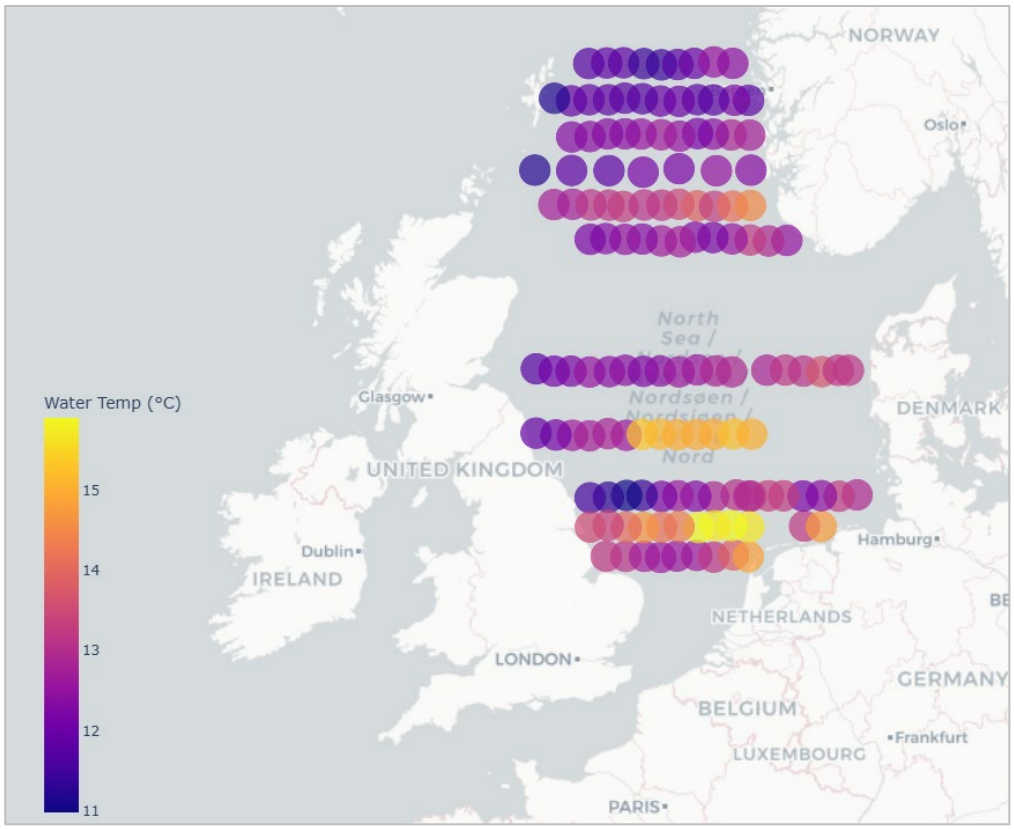


Figure 6. Surface water temperature (˚C) at all completed plankton stations

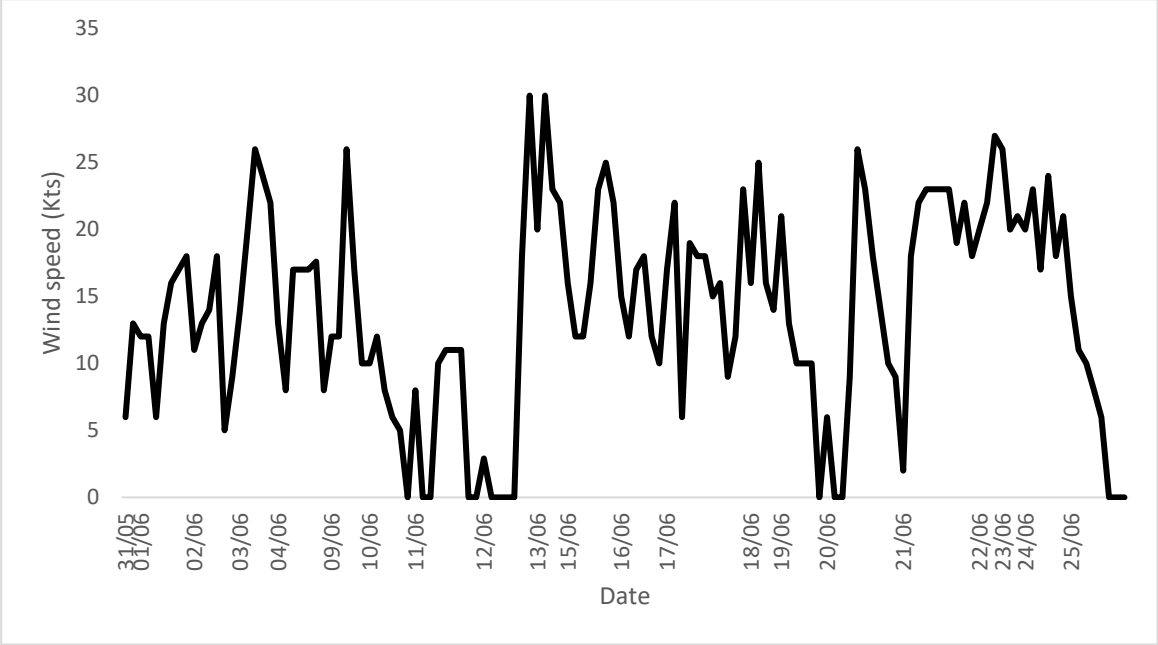


Figure 7. Wind speed (Kts) during survey operations

Figure 8. Wind direction (˚) during survey operations

4. **Completion of 14-fishing stations (as minimum) to collect adult Atlantic mackerel using rod and line (<40m water depth) the VDK (van der Kooij) herring trawl (>40m water depth)**

A total of 23 fishing stations were completed (Figure 9), with 13 stations being positive for Atlantic mackerel (*Scomber scombrus*). No stations were positive for Atlantic horse mackerel (*Trachurus trachurus*). Due to water depth restrictions for the VDK herring trawl gear deployment, time constraints and trawl door sensor issues, only 2 fishing stations were

completed using the peltic trawl. The other 21 fishing stations were completed using rod and line.

Figure 9. Fishing stations completed on the 2025 English MEGS (red dots)

5. **To collect biological data, including maturity and weight at age, of caught adult Atlantic mackerel**

A total of 345 individual adult Atlantic mackerel (91.382kg) were caught and biologically sampled (length, weight, sex, maturity and otolith extracted) across the survey area. A total of 0kg Atlantic horse mackerel were caught. A total of 2,816.4g ovary was sampled for Atlantic mackerel Annual Egg Production Method (AEPM) and Daily Egg Production Method (DEPM) analysis (Table 3). Specimens of grey gurnard (*Eutrigla gurnardus*), haddock (*Melanogrammus* aeglefinus) and whiting (*Merlangius merlangus*) were caught as bycatch but not retained or biologically sampled.

Table 3. Total weight of adult Atlantic mackerel and horse mackerel caught on the 2025 English MEGS

Station No.	Date	Water depth (m)	Fishing duration (min)	Method	Total mackerel weight (kg)	Total horse mackerel weight (kg)	AEPM samples	DEPM samples
11	01/06/2025	23	26	Rod and line	1.3	0	0	1
13	02/06/2025	22.5	40	Rod and line	0.9	0	1	3
19	02/06/2025	33.4	43	Rod and line	0	0	0	0
24	03/06/2025	36.5	44	Rod and line	0	0	0	0
31	04/06/2025	42.4	47	Rod and line	0	0	0	0
42	04/06/2025	54	75	Rod and line	24.69	0	32	32

60	11/06/2025	83.4	71	Peltic trawl	0.52	0	1	1
70	11/06/2025	59.64	33	Rod and line	0	0	0	0
75	12/06/2025	40	55	Rod and line	0.385	0	0	0
82	13/06/2025	269.1	59	Rod and line	31.7	0	35	35
96	16/06/2025	135.2	32	Rod and line	0.205	0	0	0
102	16/06/2025	248.7	28	Rod and line	1.935	0	2	2
114	17/06/2025	142.2	35	Peltic trawl	1.205	0	1	1
118	18/06/2025	97.3	29	Rod and line	0	0	0	0
119	18/06/2025	162.9	29	Rod and line	0	0	0	0
136	19/06/2025	331.8	30	Rod and line	0.882	0	1	1
140	20/06/2025	273.5	60	Rod and line	2.4	0	4	4
148	20/06/2025	119.6	31	Rod and line	0	0	0	0
159	21/06/2025	102.1	29	Rod and line	0	0	0	0
163	22/06/2025	274.3	42	Rod and line	15.36	0	23	25
170	23/06/2025	27.51	31	Rod and line	0	0	0	0
179	25/06/2025	34.9	42	Rod and line	9.9	0	3	4
187	25/06/2025	19.15	25	Rod and line	0	0	0	0

A total of 109 individual adult Atlantic mackerel (36.7428 kg) were sampled for fecundity analysis. Pitched tail length ranged from 23.0-44.4cm (Figure 10). Female maturity stages (Walsh key) ranged from 2-6 with the highest frequency present at stage 4 – spawning (Figure 11).

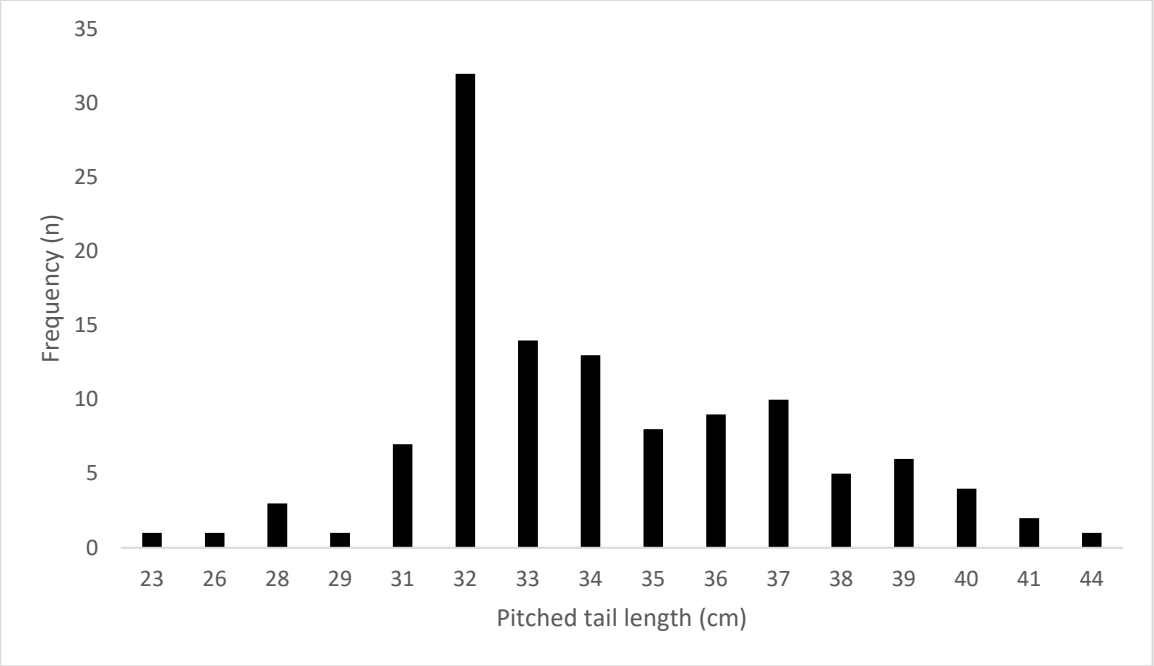


Figure 10. Pitched tail length frequency (n) of DEPM and AEPM sampled female adult Atlantic mackerel

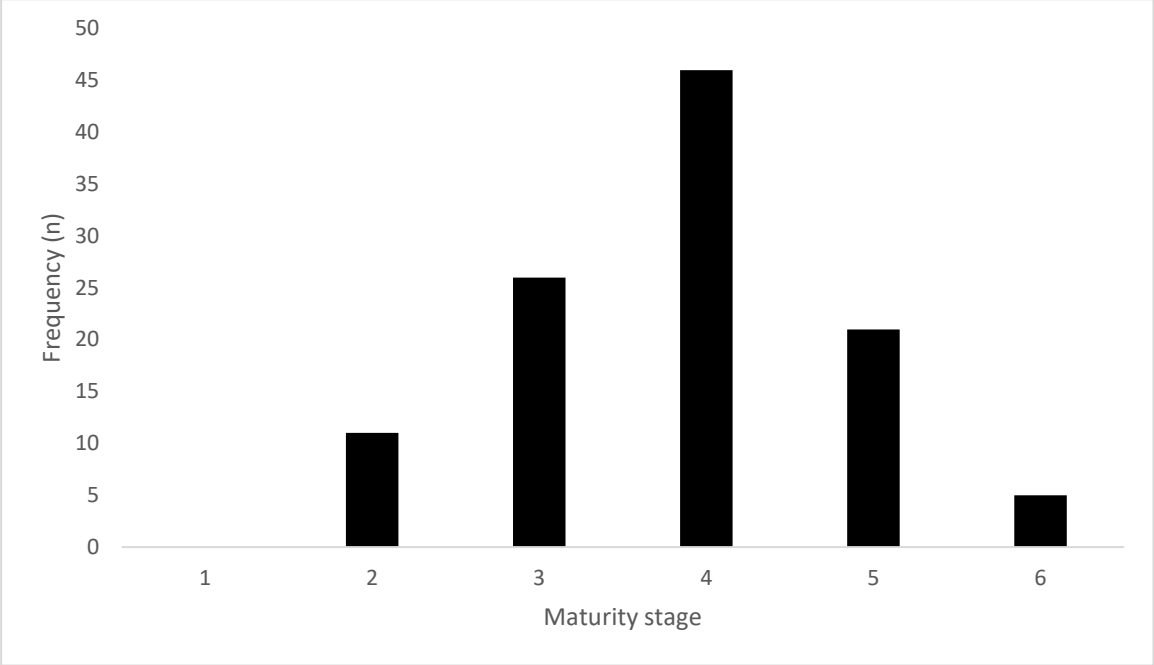


Figure 11. Walsh maturity stage frequency (n) of DEPM and AEPM sampled female adult Atlantic mackerel

6. **To record EK80 acoustic data to detect Atlantic mackerel shoaling and spawning aggregations**

Acoustic data was recorded and collected throughout the survey by the RV CEND vertical split beam scientific echo sounder (Simrad EK80).

NEPS PRIMARY AIMS:

7. **To conduct a standard Underwater Video Survey (UVS) of Nephrops burrow densities using UVS sledge on the Farn Deeps grounds, and to evaluate Nephrops abundance**

A total of 81 stations were completed in the Farn Deeps (FU6) with the UWTV camera sledge (Figure 12). Weather was mostly very good with operations continuing throughout the designated 96-hour time window available. Only 1 station was relocated (TV001) by approximately 1 Nm due to proximity to the Hartlepool harbour navigation zone. All data was input and QC'd onboard, and analysis was also completed to calculate the preliminary abundance estimation.

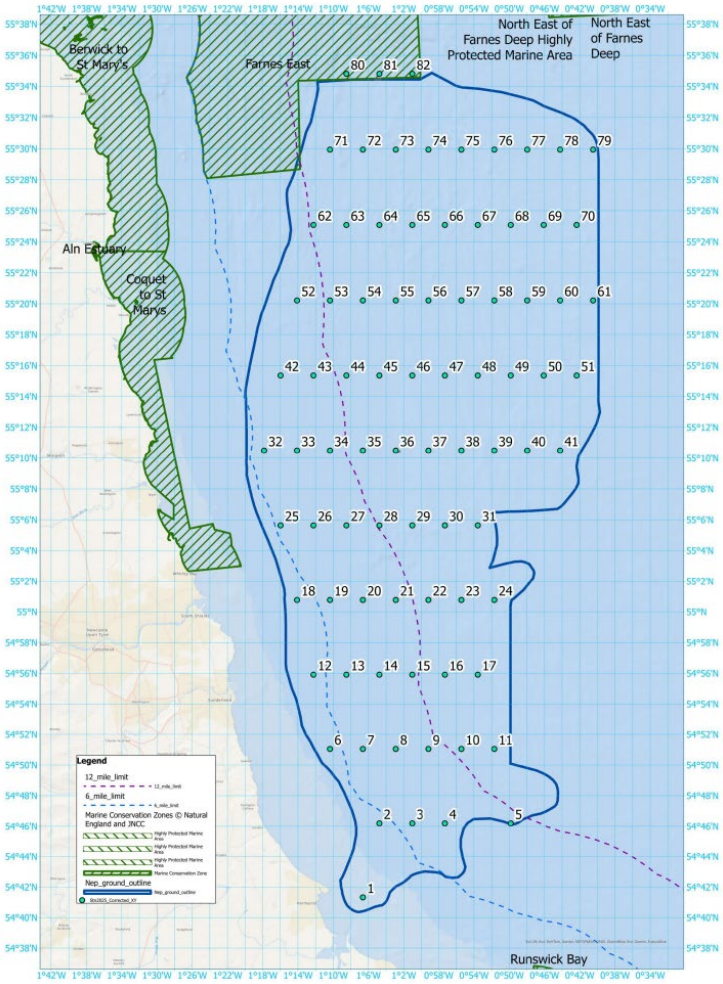


Figure 12. 2025 NEPS grid.

8. **To run exploratory multibeam tows over planned stations to check for obstructions**

All stations were ground-truthed using multibeam. Only 1 station was abandoned due to boulders and risk of damage to the camera sledge.

MEGS SECONDARY AIMS:

9. **Collection of continuous mesozooplankton digital data via the onboard flowthrough Plankton Imager System (PIS) for abundance analysis**

The onboard PIS (PI-10) was used to collect mesozooplankton data to assess abundance and trophic interaction throughout the survey.

10. **To continuously log sub-surface (3m) salinity, temperature, fluorometry and other environmental data using the 'Ferrybox'**

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

11. **To collect salinity water samples (surface and near-bottom) at scientific using a Niskin with ESM2 logger (P. Nelson, Cefas)**

Seawater samples were collected from the surface (4m) and near bottom (4m off seabed), where practical.

12. **To collect and process chlorophyll water samples (surface) once per 24hrs (as minimum) (N. Greenwood, Cefas)**

Chlorophyll samples were collected from surface, where practical. Seawater was collected from the Niskin sampler (500ml) and filtered as required. A total of 24 chlorophyll samples (multiple samples at each station) were collected across the survey area (stations 21, 29, 52, 57, 73, 81, 95, 103, 117, 151, 161, and 177).

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Scientist in Charge
22/08/2025

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