



Centre for Environment  
Fisheries & Aquaculture  
Science



# **Research Vessel Survey Report: RV Cefas Endeavour CEND 10/23**

Clean Seas Environmental Monitoring Programme  
(CSEMP)



English Channel, Celtic and Irish Sea

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# Survey Aims

The information generated during this survey will be used to meet UK's obligations for reporting of contaminant, eutrophication and marine litter data to MERMAN and the ICES database and for subsequent assessments for OSPAR and Good Environmental Status (GES descriptors 5, 8, & 10) assessment as part of the 25-year Environmental Plan. After discussions with the Environment Agency (EA) and National Resources Wales (NRW) colleagues a coordinated approach is being taken to help deliver additional EQSD requirements for these agencies.

## Primary aims

1. To collect samples of demersal fish for chemical analysis from the Southern North Sea and English Channel. (Table 1; Figure 1) in support of the Clean Seas Environmental Monitoring Programme (CSEMP) (OSPAR Common indicator and UK specific Indicator assessments).
2. To collect fish samples at CSEMP sites for fish disease biochemical markers (e.g. EROD and bile metabolites analysis and AChE) (UK specific Indicator Assessments).
3. To sample representative CSEMP stations (Table 1; Figure 1) using day grab, for polycyclic aromatic hydrocarbons (PAHs), trace metal contaminants, organic contaminants (PCBs, PBDEs and HBCD), sediment particle size analysis (PSA) and marine litter (OSPAR Common indicator and UK specific Indicator assessments).
4. To sample sediment (using a Shipek grab or Day grab) from 20 stations (maximum) within and around the Inner Tees and Outer Tees dredged material disposal sites. Samples will be assessed for sediment contaminants concentrations and particle size. The survey is funded by the MMO and the results will be summarised in a report which is publicly available on the Defra.gov.uk site and via the MMO. The results will be used by the MMO to aid decisions regarding dredged material disposal applications and the suitability of the screening process for contaminants concentrations.
5. To conduct marine litter surveys of seafloor macrolitter (following the ICES guidelines) and microplastics in sediment and biota, to gather data towards the OSPAR Commission Common Indicator and UK Evidence Group marine litter indicators.
6. To conduct marine litter surveys (OSPAR Common indicator and UK specific Indicator assessments) by collecting benthic litter information from the trawls and collecting sediment samples for litter analysis.
7. To conduct opportunistic sampling of seafloor macro litter for Non-Native Species (NNS) research and development under the Clean Atlantic 2 programme.

## Secondary Aims

8. To collect water conductivity, temperature, nutrient, and depth information, and Plankton community information to provide additional knowledge on Eutrophication levels (OSPAR Common indicator and UK specific Indicator assessments). Calibration exercise at West Gabbard smart buoy using CTD Rosette. Daily chlorophyll sample (night-time hours of dark for GIA03).
9. To collect additional fish for the EA for a comparison study of whole fish, and fish muscle and liver in the quantity of contaminants). EA require 9 fish from stations Amble (244), Tees Bay (294), Outer Humber (377), Inner Wash (387, Rye Bay (486), Off Newhaven (494).
10. To conduct AVANI trawl sampling of surface waters for microplastics, CALPs, to gather data and evidence towards method and indicator assessment developments, supported by the Ocean Country Partnership Programme (OCP).
11. To collect sediment and water samples to analyse two variables and better understand their relationship. The variables are procaryote (bacteria, algae) diversity and levels of B vitamins. This analysis is needed for a CSAO-funded project entitled one health, which looks to add granularity on the relationship between productivity and health with micronutrient availability.
12. Collect sediment samples for rapid find assessment (RFA) and porosity, to calculate percentage fines by volume and void space in the sediment mixture.

## Survey Team

Our survey team consisted of skilled staff members from both Weymouth and Lowestoft, including histopathologists, chemists, ecotoxicologists, research scientists, fisheries scientists, and marine litter scientists. All staff worked on a day shift system and staggering shifts as necessary on busier days.

Name	Role
Freya Goodsir	SIC/sediment
Briony Silburn	2SIC/sediment
Manuel Nicolaus	Otolith/Stomach
Paul Nelson	Data/Water
Gary Siggers	Marine litter/Fish sorting
Izzy Lake	Data/Water
Holly Nel	Marine litter/Fish sorting
Ruth Hicks	FD
Joanna Uzyczak	Ecotox/sediment
Richard Hazelgrove	FD
Sam Westcott	FD/Otolith/Stomach
Ellen Blaker	FD
Phoebe Eddon	Ecotox/sediment

# Survey Particulars

**DURATION:** 18th July from Portland – 28th July in Lowestoft

**LOCATION:** Southern North Sea and English Channel

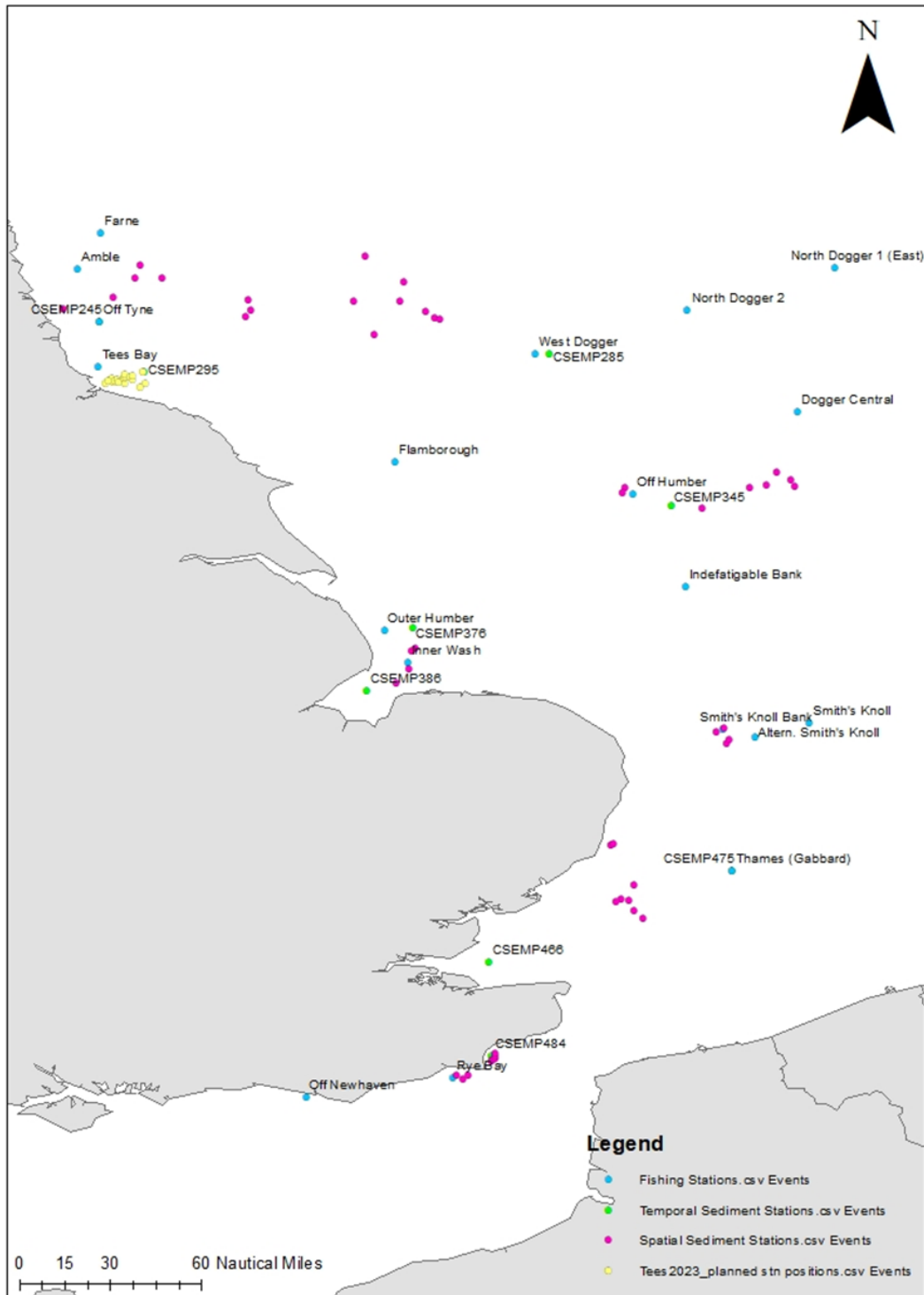


Figure 1: CSEMP fishing, temporal and spatial sediment stations.

## Stations

The survey plan included the following stations for sampling.

**Table 1: CSEMP fishing stations positions.**

Additional 9 fish collected per site for the EA.

CSEMP Number	Location	Mid tow Latitude/Longitude (Degrees Decimal Minutes)
244	Amble	55°16.01 N, 01°15.26 W
243	Farne	55°29.71 N, 01°07.59 W
283	North East Dogger	55°18.05 N, 02°53.82 E
284	North Dogger	55°04.08 N, 02°05.40 E
286	West Dogger	54°46.76 N, 01°17.69 E
287	Central Dogger	54°30.00 N, 02°42.53 E
294	Tees Bay	54°45.25 N, 01°08.31 W
344	Off Flamborough	54°14.72 N, 00°29.91 E
346	Off Humber	54°03.92 N, 01°47.46 E
377	Outer Humber	53°19.37 N, 00°25.47 E
378	Indefatigable Bank	53°33.40 N, 02°04.92 E
387	Inner Wash	53°08.50 N, 01°33.30 E
475	Outer Gabbard	52°01.86 N, 02°06.57 E
486	Rye Bay	50°46.74 N, 00°46.83 E
494	Off Newhaven	50°45.59 N, 00°00.00 E
Trend	Smith's Knoll	52°48.67 N, 02°45.33 E
Trend	AlternativeSmith' Knoll	52°43.91 N, 02°27.51 E
Trend	Smith's Knoll Bank	52°46.48 N, 02°17.25 E

**Table 2: CSEMP Temporal sediment stations.**

Temporal Stations	CSEMP	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
CSEMP245	245	55.0083	-1.1333
CSEMP295	295	54.7333	-0.8833

CSEMP285	285	54.8333	1.3333
CSEMP345	345	54	2
CSEMP376	376	53.3333	0.5833
CSEMP386	386	52.96773	0.3534
CSEMP475	475	52	2.3333
CSEMP466	466	51.4967	1
CSEMP484	484	50.9833	1.0167

**Table 3: CSEMP Spatial Sediment Stations.**

<b>Station ID</b>	<b>Latitude (Decimal Degrees)</b>	<b>Longitude (Decimal Degrees)</b>
245_1	55.12595	-0.31207
245_2	55.3192	-0.90372
245_3	55.13773	-1.05492
245_4	55.24667	-0.93207
245_5	55.24622	-0.78787
245_6	55.08015	-1.3293
245_7	55.07007	-0.29808
245_8	55.0356	-0.32775
285_1	55.11727	0.514
285_2	55.0307	0.709817
285_3	55.02025	0.737067
285_4	55.06265	0.656283
285_5	54.93537	0.377933
285_6	55.22665	0.5357
285_7	55.1191	0.261483
285_8	55.36638	0.328
345_1	54.09805	2.430867
345_2	53.98858	2.170967
345_3	54.09568	1.749933
345_4	54.1056	2.68055

345_5	54.14152	2.65965
345_6	54.11327	2.520667
345_7	54.18233	2.578483
345_8	54.06713	1.733583
376_386_1	52.75977	2.252617
376_386_2	52.78462	2.293733
376_386_3	52.69488	2.302667
376_386_4	52.71562	2.317867
376_386_5	53.10355	0.564083
376_386_6	53.02452	0.492233
376_386_7	53.20303	0.577783
376_386_8	53.2166	0.597383
474_1	51.8443	1.7284
474_2	51.83955	1.772067
474_3	51.7829	1.799933
474_4	51.73958	1.845167
474_5	51.83055	1.70205
474_6	51.92033	1.800017
474_7	52.1387	1.67305
474_8	52.14492	1.685667
484_1	50.88243	0.8243
484_2	50.85767	0.859467
484_3	50.87832	0.88675
484_4	50.95613	1.0132
484_5	50.96093	1.0259
484_6	50.96992	1.036967
484_7	50.98713	1.039
484_8	50.99712	1.040333

**Table 4: Tees disposal site sediment stations.**

<b>Station ID</b>	<b>Latitude (Decimal Degrees)</b>	<b>Longitude (Decimal Degrees)</b>
IND1	54.67967	-1.05783
IND2	54.6815	-1.03483
IND4	54.68133	-1.02783
IND5	54.683	-1.01383

IT1	54.7	-1.06
IT2	54.67	-1.10
IT3	54.68	-1.08
IT4	54.68	-1.05
IT5	54.68717	-1.03233
IT7	54.6735	-1.02617
IT8	54.67	-0.99
IT10	54.67167	-0.88167
OT1	54.69417	-0.9985
OT2	54.7035	-0.98983
OT3	54.71617	-0.9905
OT4	54.701	-0.9665
OT5_1	54.70847	-0.9151
OT6_1	54.68796	-0.91702
OT7	54.64767	-0.909
OT8	54.73183	-0.88983

# Survey Narrative

**18<sup>th</sup> July**

Scientific staff from Lowestoft and Weymouth arrived at the RV *Cefas Endeavour* in Portland Harbour for 08:00 (SIC and 2SIC already boarded). A visual risk assessment was carried out before the sampling equipment from Lowestoft and Weymouth was unloaded from the vans to the dockside. The vessel was then mobbed with all scientific equipment and chemicals. All staff carried out an induction of the vessel at 09:00, starting on the bridge, then the voyage briefing at 11:00 followed immediately by a muster drill at 11:30. Scientific staff set up the wet lab and dry lab, prepared the stations on Tower, got data logging procedures ready and secured equipment for sailing. We departed from Portland at 21:00 and steamed towards our first fishing site, Off Newhaven (Figure 2).



**Figure 2: RV Endeavour on Transit to Off Newhaven.**

**19<sup>th</sup> July**

The RV Endeavour completed the transit to the first fishing station of the survey, Off Newhaven. On arrival, a toolbox talk was held with the scientific staff and crew for the CTD rosette, before it was deployed to collect both bottom and surface water samples. Once the CTD was back on board, the

fishing activities with the Granton trawl was carried out. During the third tow, the AVANI trawl was deployed off the side gantry and towed in unison with the fishing trawl off the stern. By 13:00 4 successful tows were completed, collecting enough dab for chemistry, biomarkers and an additional 30 for fish disease. The vessel continued along the south coast, heading towards the next fishing station, Rye Bay, arriving just before 17:00. The CTD rosette was deployed before commencing the fishing activities. After another 4 good tows, once more deploying the AVANI during the third tow, all survey aims were completed for this station. Once fishing operations were complete, the vessel began the steam towards the temporal sediment station, CSEMP 484, arriving just before midnight.

## 20<sup>th</sup> July

We arrived at the first grab station of the survey, temporal station CSEMP 484, at midnight and conducted a thorough toolbox talk with both science staff and crew. Once the toolbox talk was complete, the Day grab was deployed multiple times to collect 3 valid sediment grabs, which were subsampled for an array of parameters. The vessel transited to the spatial sediment stations 484\_5, 484\_6 and 484\_7, where a single deployment of the Day grab was required at each. Once the grabbing was complete, the vessel transited for 7 hours towards the Thames Gabbard fishing station.



**Figure 3: deployment of the Granton Trawl.**

On arrival at around 10:00, a CTD rosette deployment was completed to collect both bottom and surface water. This was then followed immediately by the fishing activities. The Granton trawl was

deployed 4 times (Figure 3), with the AVANI net deployed in parallel during the third tow, collecting enough dab for chemistry, biomarkers and an additional 40 for fish disease.

After the fishing was completed, 3 replicate Day grabs were collected from the CSEMP 475 temporal sediment station. Once all complete, the vessel transited to the West Gabbard Smartbuoy site, however due to time constraints, an underway and a zooplankton sample (Figure 4) was collected rather than a full water calibration station with the CTD, which was agreed to be picked up on the next smart buoy trip instead. The vessel then transited to collect a single Day grab at the spatial sediment stations 474\_1, 474\_2 and 474\_3, after which the vessel commenced steaming towards the CSEMP fishing site Alternative Smith's Knoll.



**Figure 4: Plankton Ring net being deployed on side gantry.**

### **21<sup>st</sup> July**

The vessel continued towards the Alternative Smith's Knoll fishing station, arriving just before 5am. On arrival the CTD rosette was deployed to collect both bottom and surface water samples, after which fishing operations commenced, keeping a watch out at all times for lagan. A poor first tow contained only 7 dab, however the subsequent two tows were more successful. The AVANI surface trawl was deployed from the side gantry during the third tow to collect surface microplastics. As the schedule only allowed for a set amount of time at the site a shorter 4th 'top-up' tow of just 1nm was conducted, before transiting the 4.5 hours to Indefatigable Bank. The vessel arrived at 15:00 and

immediately a CTD was deployed. Fishing activities were delayed slightly by just over an hour, due to the need to re-position our tow lines resulting from a newly implemented no-fishing zone in the North Norfolk Sandbanks and Saturn Reef MPA. Once suitable new fishing ground was identified, by running 3 lines, fishing commenced and we performed 3 successful tows, with a shorter 4th tow and an AVANI during the third, in concurrence with earlier in the day. Once all survey aims were completed for this station, the vessel departed at just before 21:00 to steam towards the next spatial grab station (Figure 5).

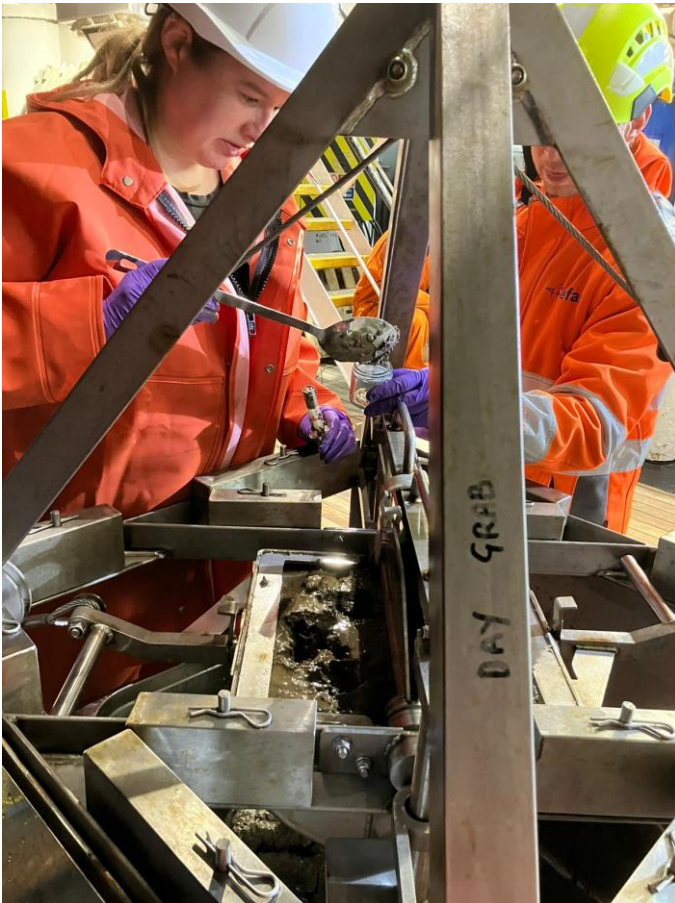


**Figure 5: Retrieval of the Day Grab at sunset.**

### **22<sup>nd</sup> July**

The vessel concluded the transit to spatial station 345\_1, arriving just after 01:00 and successfully completed a single deployment of the day grab before moving on to the next spatial station. However, on arrival the Dynamic Positioning (DP) was not responding, and an engineer had to be called to restart the system. With only 30 mins lost to downtime, once the DP was back up and running, grabbing activities continued, transiting to the next fishing station, Off Humber. However, another issue occurred after arrival, when the CTD rosette lost connection mid-deployment and the bottles would not fire. Upon recovery, it was found that frayed wires on the coms cable may have led to it shorting out. So as not to delay the fishing, the vessel transited to the start of line and completed 2 tows with the Granton, taking care now that the weather was picking up a little and fishing activities were in the hours of darkness, to ensure the newer deck crew remained aware of safe fishing practices and always stayed behind the safety line secured between 2 stations on the starboard aft deck when the wires were moving. During the time the net was in the water, the ESM2 logger and single Niskin were prepped and attached to the wire. After the second fishing tow, we performed a

full profile with the logger to collect bottom water, while accompanying surface water was collected from the Ferrybox. Two further deployments of the Granton were carried out, towing the AVANI alongside the fourth tow. Once fishing was completed the vessel transited the CSEMP 345 temporal sediment station and conducted 3 deployments of the day grab (Figure 6). After this the vessel transited to the Central Dogger fishing station, conducting an ESM2 logger and Niskin deployment on arrival around 16:30 , followed by another 3 deployments of the Granton. At just after 19:00 the vessel steamed to the next fishing station, North East Dogger.



**Figure 6: Scientist sampling sediment from the Day Grab.**

### **23<sup>rd</sup> July**

The vessel arrived at North East Dogger just after midnight and started operations by deploying the ESM2 logger and Niskin to collect bottom water, while sampling the surface water from the Ferrybox. Fishing activities commenced with large quantities of dab in both the first and second tow. Therefore, the third tow was just a ‘top-up’ tow of 10 minutes and the AVANI was deployed in tandem during the second 30 minute tow. The vessel transited to the North Dogger fishing station and again found good numbers and size ranges of dab, however we had to abort the AVANI as the weather has started to pick up and it was too choppy for it to remain stable at the surface. After 3 tows of the Granton trawl we moved on to the West Dogger fishing station. When reviewing the tow lines as West Dogger we found that new cable route channels meant re-locating the fishing tow lines. A

survey line was ran south as a potential new line using the EK80, and as this looked OK we then deployed the trawl. However, on recovery the net had sustained some damage. So as not to delay the remaining survey aims while repairing the net, it was decided to carry on to the nearest grab station, temporal CSEMP 285. Again, new cable lines meant we had to move the grab location by 500m, however after 3 unsuccessful attempts, the last of which resulted in the grab coming up upside-down wrapped in its own wire, we decided to abort the station and began the transit towards Farne, aiming to pick up some spatial grab stations along the way.

## 24<sup>th</sup> July

Along the steam towards the Farne fishing station, 6 of the spatial sediment stations: 285\_3, 285\_2, 285\_1, 245\_1, 245\_4 and 245\_2. At each location we performed a single deployment of the Day grab to collect sediment for an array of biogeochemical parameters. At site 285\_2 we also collected surficial water from the Ferrybox for some opportunistic eDNA sampling (Figure 7). At midday the vessel reached the Farne fishing site and performed a deployment of the ESM2 and Niskin to collect bottom water, with surface water collected again from the Ferrybox.



**Figure 7: Ferry box recording parameters in real time.**

Three tows of the Granton trawl were performed, keeping an eye on the soundings displayed by the EK80 at all times for potential obstructions on the seabed. However, poor numbers of dab were collected. An ESM2 and Niskin was performed at Amble, before starting the fishing operations shortly after. In three tows of the Granton there were enough dab for all the primary survey aims, as well as some Nephrops for some opportunistic biomarker sampling. Once fishing was completed, the vessel steamed to the next Temporal sediment station, CSEMP 245. Arriving just before

midnight, two deployments of the Day Grab were accomplished, before handing over to the next shift to complete the sampling.

## 25<sup>th</sup> July

The day started with the temporal sediment station with a third deployment of the Day grab. The vessel then transited to the Tees dredge disposal site area. Here there were 20 planned grab stations for the dredge disposal site monitoring programme, which were planned as part of the additional primary aim of this survey. The vessel arrived at the first grab station around 03:00 and completed Day grab operations at 6 of the 20 planned stations by 05:00 before moving towards the Tees Bay CSEMP fishing station. On arrival at around 06:00 we checked the site for static gear before completing an ESM2 profiler and Niskin then commencing fishing operations. Fishing activities went well and three tows of the Granton were completed with no issues. However, on recovery of the fourth tow, it was apparent that the gear has sustained some damage, with the belly of the net completely shredded and needing replacing (Figure 8).



**Figure 8: RV Endeavour Crew members fixing the Granton net.**

Therefore, the vessel headed back to the Tees and Tyne dredge disposal site (which was close by ~1hr) to continue the Day grab sampling at the remaining 14 stations, plus the temporal sediment station CSEMP 295. Grabbing operations were completed with no issues, however not having a Tower screen at the front of the bridge did slow down operations when navigating setting up for station approaches DP. Once the grabbing operations were complete, we began steaming towards the next CSEMP fishing station, Flamborough, predicted to arrive not long after midnight and giving ample time to complete the net repair.

## 26<sup>th</sup> July

The vessel arrived at the Flamborough fishing station just after 00:30 and the ESM2 logger and Niskin was deployed, before commencing fishing activities. The numbers of dab were low, and at 06:00 after 4 tows of the Granton trawl we decided to move on from the site as we would not achieve our target number of fish for fish disease. We then began steaming back towards the coast, heading for the Outer Humber fishing station, arriving just after midday. At midday, the night shift scientific crew were sent off watch to enable them to switch back onto days for clean down and packing (Friday 28<sup>th</sup>). The day shift then commenced the Outer Humber fishing station, conducting multiple deployments of the ESM2 logger and Niskin to complete a water calibration station before moving on to the fishing activities and conducting 5 successful tows of the Granton trawl.



**Figure 9: Granton net being placed into the fish hopper.**

After fishing was complete, the vessel transited to the CSEMP 376 temporal sediment station to achieve 3 deployments of the Day Grab, followed by a single deployment at the 376\_386\_7 spatial station. At 22:00 the vessel anchored in the wash, pausing scientific operations until 09:00 the following day.

## 27<sup>th</sup> July

At 08:00 the vessel came off anchor and started heading towards the final fishing station Inner Wash, arriving shortly after. At 09:00 a first line was run to look for any static gear, before performing an ESM2 logger and Niskin profile, followed by the fishing activities. As the ground was suspected to be weed, we removed the tickler chain for the first tow, however, a very poor catch of dab, and a

lack of weed meant we re-attached it for the second tow. As the second catch was also poor, we decided to end the fishing effort and moved on to the final two spatial grab station, where a single deployment of the Day Grab was performed. After this the vessel moved to the final temporal grab station, CSEMP 386, to complete 3 deployments of the Day Grab. At 18:00 all survey operations were completed, and the scientific staff commenced data checks and clean down. The vessel began our transit back towards Lowestoft, with the pilot booked for 17:45 on the 28th July (Figure 10).



**Figure 10: RV Endeavour returning home to Lowestoft**

### **28<sup>th</sup> July**

We continued our transit overnight arriving at the South holm anchorage at 08:00 where we anchored to await pilot and continue wash down and demob preparations. At 16:00 we weighed anchor and proceeded to the inner pilot station, embarking the pilot as planned at 17:15, and arriving at the Quay at 18:00.

# Results

## Fishing Stations

Overall, this survey was very successful, where all primary and secondary survey aims were met. At all fishing stations, primary target species *limanda limanda* (dab) were collected for chemical contaminant analysis (Table 5). Additionally, during the fishing activities the microplastics surface trawl net called the AVANI was deployed in unison off the side gantry, usually during the second or third tow. At most survey stations 50 dab were collected, however Inner washed only resulted in five dab being collected, and limited numbers at West Dogger due to smaller sized dab.

The first few stations of the survey Off Newhaven and Rye Bay fished well, with larger number of dab observed at inner Rye Bay. Essential biomarkers samples were collected for each station, apart from West Dogger and Flamborough due to limited numbers and smaller sized dab (Table 5). In the majority of cases, male dab were in the smaller size range which meant that at several stations the size range for biomarkers had to be dropped to 19cm to collect the critical 10 male and 10 female data set. For the majority of the fishing stations additional dab were sampled for external and internal fish disease, sixty additional dab were collected for histopathology and Otoliths from Amble, North East Dogger, North Dogger, Central Dogger, Off Humber, Indefatigable Bank, Gabbard, Rye Bay and Alternative Smith Knoll. Thirty additional dab were collected from Off Newhaven, with forty dab collected from Thames Gabbard and Outer Humber (Table 5).

Dab were also collected for the Environment Agency, fulfilling one of our secondary aims. Nine dab were collected from each priority fishing station Amble, Tees Bay, Outer Humber. Thames Gabbard, Rye Bay and Off Newhaven.

In total, we sampled 830 dab for external and internal fish diseases that can be detected by visual examination. The most abundant occurrence was hyperpigmentation (198 occurrences), nematodes (151 occurrences) and *Glugea* sp. (102 occurrences). A breakdown of the fish disease observations can be seen in Table 6. Stomach contents analysis was also carried out as part of our analysis. Twenty stomach contents were assessed from each of the fishing stations. Table 7 provides an overview from 12 stations that were assessed for stomach content.

**Table 5: Fished Stations and number of fish caught for specific analysis.**

Date	Location	CSEMP code	Mid tow Lat. decimal	Mid tow Lon. decimal	time shot	time haul	Fish numbers for Chemical analysis	Dab numbers for Biomarker analysis; Fish Disease (FD)	Environment Agency
24/07/23	Farne	CSEMP 243	55.49173056	-1.120777778	11:45	12:15	2 x 25	10 (F) 10 (M)	-
24/07/23	Amble	CSEMP 244	55.28001944	-1.255977778	17:56	18:26	2 x 25	10 (F) 10 (M), + 60 FD	3 x 3
23/07/23	North East Dogger	CSEMP 283	55.29626667	2.905166667	23:22	23:52	2 x 25	10 (F) 10 (M), + 60 FD	-
23/07/23	North Dogger	CSEMP 284	55.05671111	2.063630556	07:24	07:54	2 x 25	10 (F) 10 (M), + 60 FD	-
23/07/23	West Dogger	CSEMP 286	54.729725	1.27825	17:08	17:38	1 x 25	-	-
22/07/23	Central Dogger	CSEMP 287	54.54591667	2.687425	16:16	16:46	2 x 25	10 (F) 10 (M), + 60 FD	-
25/07/23	Tees Bay	CSEMP 294	54.7463125	-1.135936111	05:22	05:52	2 x 25	All undersized	3 x 3
26/07/23	Flamborough	CSEMP 344	54.22922083	0.538729167	00:17	00:47	2 x 25	-	-
22/07/23	Off Humber	CSEMP 346	54.05269375	1.831183333	04:23	04:54	2 x 25	10 (F) 10 (M), + 60 FD	-
26/07/23	Outer Humber	CSEMP 377	53.32765667	0.408755	11:59	12:29	2 x 25	10 (F) 10 (M), + 40 FD	3 x 3
21/07/23	Indefatigable Bank	CSEMP 378	53.5921	2.074195833	15:39	16:09	2 x 25	10 (F) 10 (M), + 60 FD	-
27/07/23	Inner Wash	CSEMP 387	53.15163	0.5795625	09:11	09:41	1 x 5	-	-
20/07/23	Thames (Gabbard)	CSEMP 475	52.04945833	2.09589375	09:28	09:59	2 x 25	10 (F) 10 (M), + 40 FD	3 x 3
19/07/23	Rye Bay	CSEMP 486	50.8240375	0.7935875	16:02	16:32	2 x 25	10 (F) 10 (M), + 60 FD	3 x 3
19/07/23	Off Newhaven	CSEMP 494	50.74693125	0.0298625	07:52	08:22	2 x 25	10 (F) 10 (M), + 30 FD	3 x 3
21/07/23	Alternative Smiths Knoll	TREND	52.74625	2.474585417	04:34	06:04	2 x 25	10 (F) 10 (M), + 60 FD	-

Table 6: Observed occurrences of the fourteen recorded external and internal fish diseases.

Lymphocystis	Skin Ulcer	epidermal hyperplasia/papilloma	hyperpigmentation	liver disease - nodule/tumour	X-cell gill lesions	Stephanostomum sp.	Lepeophtheirus sp.	Acanthochoondria sp.	Nematodes	Glugea sp.	Lateral lipoidosis	Skeletal deformity	fin rot/erosion
2	28	14	198	12	0	29	81	1	151	102	6	3	38

**Table 7: Stomach content of 20 sampled dab from each CSEMP station**

CSEMP ST. NO.	Length (cm 1dp)	Weight (g)	SEX	STOMACH ANALYSIS
494	22.9	124	F	Brittlestar fragment Fullness2
494	21.9	103	F	N/A Fullness0
494	21.2	99.2	F	Lugworm Fullness4
494	21.5	116	F	Cockle Fullness1
494	21	100	F	Brittlestar Fullness3
494	24	140	F	N/A Fullness1
494	22.9	132	F	Jellyfish? Brittlestar Fullness2
494	20.9	92.4	F	Brittlestar Fullness1
494	20.4	110	F	N/A Fullness0
494	20.3	102	F	Scallop Fullness1
494	23.3	124	F	Sand, nothing whole, shell fragments. Fullness2
494	21.5	101	M	Sand, nothing visible Fullness1
494	20	73.4	M	Sand, amphipod Fullness1
494	19.7	75.7	M	Sand, portion of crab head and legs, brittlestar fragment Fullness2
494	21.5	99	M	Brittlestar fragments, work with operculmn Fullness1
494	19.6	70.4	M	Nothing Identifiable Fullness1
494	23.1	126	M	Squid, Lots of soft white circular items Fullness4
494	21.4	140	M	Whole crab Fullness2
494	22.8	86.8	M	Small scallop Fullness1
494	22.5	103	M	Brittlestar fragment Fullness2
486	23.7	112	F	1 amphipod, gastropod, crab fragments Fullness1
486	21.3	104	F	nothing identifiable Fullness1
486	24.6	128	M	2 whole hermit crabs, whole crab, gastropod Fullness3
486	20.9		F	crab claw fragments Fullness1
486	21	81.4	F	hermit crab, crab leg fragments Fullness1
486	22.7	105	F	5 hermit crab, bivalves, gastropd, crab leg fragments Fullness3
486	21.5	78.5	M	2 hermit crab, lots of crab fragments Fullness3
486	18.5	56.4	M	hermit crab without shell, crab fragments Fullness2
486	19.5	73	F	empty Fullness0
486	20.4	80.7	F	3 hermit crabs Fullness2
486	21.3	89.4	F	nothing identifiable Fullness1
486	20.5	71.6	M	Green, something with polychaete legs Fullness1
486	21.9	102	M	bivalve Fullness2
486	21	82.4	M	empty Fullness0
486	19.5	71.6	M	4 whole bivalves Fullness2
486	19.5	71.7	M	1 brittle star Fullness1
486	20.1	80.6	M	3 gastropods Fullness2
486	18.8	63.6	M	crab fragments, 2 whole bivalves Fullness3
486	21.4	99.1	F	2 lugworms Fullness2
486	20.2	73.1	F	1 bivalve Fullness1
475	22.3	116	F	Empty Fullness0
475	20.9	102	F	Aphrodite x1, digested matter Fullness4
475	22.8	136	F	Aphrodite x1, digested matter Fullness2
475	23	143	F	Aphrodite x1, digested matter Fullness3

475	22.8	119	F	Aphrodite x1, digested matter Fullness2
475	23.5	92.4	F	Brittlestar whole Fullness1
475	21.6	94.7	F	Whole lugworm (large) Fullness4
475	18.9	68.3	M	Whole lugworm (large) Fullness4
475	20.6	79	F	3 Brittlestar whole Fullness2
475	22.5	126	F	Whole lugworm (large) Fullness3
475	23.5	127	F	Digested lugworm (large) Fullness2
475	21.3	75.1	M	nothing identifyable Fullness1
475	19.6	65.1	M	nothing identifyable Fullness1
475	18.6	51.5	M	Brittlestar Fullness1
475	20.6	88.3	M	Whole lugworm (large) Fullness3
475	18.6	62.4	M	Brittlestar fragments Fullness2
475	17.7	56.7	M	Crab fragments Fullness2
475	23	118	M	nothing identifyable Fullness2
475	19	67	M	Digested matter Fullness1
475	15.8	34.7	M	Shell fragments, sediment Fullness2
Smiths Knoll	20.6	79.1	M	Decapod Fragments Fullness1
Smiths Knoll	19.8	64.8	M	Hermit Crab claw Fullness2
Smiths Knoll	21.3	95.3	M	Brittlestar fragments, shell fragments Fullness1
Smiths Knoll	21.3	88.1	M	Hermit crab, pagaros species, shrimp x1 Fullness2
Smiths Knoll	20	76.1	M	Brittlestar fragments, x3 cow shell fragments, hydroids, shrimp Fullness3
Smiths Knoll	19.9	84.8	M	Empty Fullness0
Smiths Knoll	21.5	83.8	M	Brittlestar fragments Fullness3
Smiths Knoll	19.5	151	M	Brittlestar fragments Fullness3
Smiths Knoll	20	74.7	F	Hydroids, brittlestar x2, discs & fragments, decapod fragments Fullness4
Smiths Knoll	20.7	85.9	F	Crab carapace, brittlestar fragement Fullness3
Smiths Knoll	20.4	84.3	F	Brittlestar fragments, red eggs, shellfish fragments Fullness1
Smiths Knoll	21.5	99.1	F	Brittlestar, disc green x1 Fullness1
Smiths Knoll	22.7	115	F	Brittlestar fragments, disc white x1, shell fragments Fullness2
Smiths Knoll	23.2	125	F	Brittlestar, shell fragments Fullness2
Smiths Knoll	22.6	95.9	F	Brittlestar fragments & green disc Fullness2
Smiths Knoll	20.8	95.4	F	Brittlestar fragments & green disc Fullness3
Smiths Knoll	23.7	136	F	Brittlestar fragments, sabellaria ? Fullness2
Smiths Knoll	19.7	73.6	F	Brittlestar fragments, shell fragments Fullness2
Smiths Knoll	20.4	76.9	M	Brittlestar fragments, shrimp, hydroid Fullness2
Smiths Knoll	20.7	82.7	M	Brittlestar, shell fragments, decapod leg Fullness1
378	21.3	88.6	F	Decapod Fragments Fullness1
378	20.6	82.3	F	Hermit Crab claw Fullness2

378	20.5	86.2	M	Brittlestar fragments, shell fragments Fullness1
378	19.8	78.5	M	Hermit crab, Pagaros species, shrimp x1 Fullness2
378	19.8	73	M	Brittlestar fragments, x3 cow shell fragments, hydroids, shrimp Fullness3
378	20.6	76.1	M	Empty Fullness0
378	21	92.6	M	Brittlestar fragments Fullness3
378	19.5	70.5	M	Brittlestar fragments Fullness3
378	20.4	77.2	M	Hydroids, brittlestar x2, discs & fragments, decapod fragments Fullness4
378	19.6	77.3	M	Crab carapace, brittlestar fragments Fullness3
378	19.8	69.4	M	Brittlestar fragments, red eggs, shellfish fragments Fullness1
378	19.5	73.5	M	Brittlestar, disc green x1 Fullness1
378	22.1	95.8	F	Brittlestar fragments, disc white x1, shell fragments Fullness2
378	22.4	108	F	Brittlestar, shell fragments Fullness2
378	21	95.5	F	Brittlestar fragments & green disc Fullness2
378	22	102	F	Brittlestar fragments & green disc Fullness3
378	21.3	98.7	F	Brittlestar fragments, sabellaria ? Fullness2
378	22.6	139	F	Brittlestar fragments, shell fragments Fullness2
378	21.6	94.3	F	Brittlestar fragments, shrimp, hydroid Fullness2
378	21.6	83.7	F	Brittlestar, shell fragments, decapod leg Fullness1
346	20.9	78.6	M	empty Fullness0
346	20.5	77.3	M	Aphroditii; digested matter Fullness2
346	22.8	111	M	brittlestar fragments Fullness1
346	23.6	122	M	digested matter; hydroids Fullness1
346	20.2	87.1	F	digested matter; shell fragments Fullness1
346	21.7	91.9	F	digested matter Fullness1
346	21.3	82.5	F	Echinocardium sp. Fullness2
346	21.2	101	F	Echinocardium sp. Fullness1
346	22.5	112	F	Pagarus sp.; digested matter Fullness2
346	21.2	96.4	F	empty Fullness0
346	23.2	116	F	Macropodia sp. Fullness2
346	21.3	94.1	F	Echinocardium sp. Fullness1
346	24.4	153	F	empty Fullness0
346	22.9	112	F	digested matter Fullness1
346	20.8	77.6	M	digested matter Fullness1
346	19	60	M	Pagarus sp.; digested matter Fullness1
346	18.7	53	M	1X Amphipod; 1X decapod leg; digested matter Fullness1
346	19.7	72.1	M	Sand eel (picture taken of otolith; Echinocardium sp. Fullness2
346	19.5	59	M	empty Fullness0
346	19.5	65	M	empty Fullness0
287	20.6	92.2	M	Empty Fullness0
287	18.5	58.6	M	Nothing identifiable Fullness1
287	19.8	71.9	M	Nothing identifiable Fullness1
287	19.6	68.3	M	digested shrimp, crustacean fragments Fullness3
287	19.5	57.9	M	Nothing identifiable Fullness2
287	19.3	67.6	M	Nothing identifiable Fullness1
287	22.5	106	F	Empty apart from 1 undigested crab claw Fullness2
287	19.3	60.6	M	Crab fragments Fullness3
287	19.3	68.3	M	Nothing identifiable Fullness1
287	20	63.8	M	Nothing identifiable Fullness1
287	18.6	52.4	M	Nothing identifiable Fullness1
287	23.5	125	F	Empty but with 8 alive parasitic worms Fullness1
287	22.5	105	F	Large crab/ crustacean fragments Fullness2
287	23.3	134	F	Nothing identifiable Fullness1

287	21	88.2	F	bivalve shell, razor clam foot, hydroid Fullness2
287	23	129	F	Empty Fullness0
287	21.1	89.3	F	Nothing identifiable Fullness1
287	21.3	91.7	F	Nothing identifiable Fullness1
287	20.8	75.6	F	Nothing identifiable Fullness1
287	22.5	108	F	Shell fragments Fullness1
283	20.6	78.5	M	Echinocadium Sp. Fullness2
283	19.7	66.7	M	Mollusc foot, digested matter Fullness2
283	20.3	73.1	M	Empty Fullness0
283	20.4	77.7	M	Mollusc foot Fullness2
283	21.5	97.7	M	Empty Fullness0
283	19.5	55.6	M	Digested matter, nematode Fullness2
283	20.3	76.5	M	Mollusc foot Fullness3
283	19.5	42.7	M	Empty Fullness0
283	19.5	60.7	M	Ensis sp. Digested matter Fullness1
283	19.5	62.6	M	Shell fragments Fullness1
283	24	135	F	Shell fragments, Echinocadium Sp. Fullness3
283	21.7	105	F	Empty Fullness0
283	23.5	120	F	Empty Fullness0
283	21.5	98.8	F	Empty Fullness0
283	23.5	125	F	Empty Fullness0
283	22.4	111	F	Empty Fullness0
283	23.6	133	F	bivalve abra sp., digested matter Fullness1
283	24	150	F	sand eel, digested matter Fullness3
283	21.7	111	F	digested sand eel Fullness2
283	24.4	163	F	Mollusc foot Fullness3
284	22.2	119	M	Sand eel x2 Fullness4
284	19.5	77	M	Empty Fullness0
284	19.5	66	M	Echinocadium Sp. Pagarus sp. With eggs Fullness3
284	19.5	71.2	M	Echinocadium Sp. Fullness2
284	19.5	56.6	M	Echinocadium Sp. Fullness1
284	21.7	110	F	Sand eel, Shell fragments Fullness3
284	23.9	138	F	Sand eel, digested matter Fullness3
284	19.5	48.8	M	Empty Fullness0
284	23.4	140	F	Echinocadium Sp., Eusis sp. Decapod leg Fullness3
284	20.6	88.2	F	Pagarus sp. Fullness2
284	23.7	143	F	Sand eel sp. X2 otolith tubes Fullness4
284	24.4	129	F	Empty Fullness0
284	21.8	110	F	Nephrops Fullness2
284	23.4	128	F	Empty Fullness0
284	23.2	127	F	Sand eel x2 Fullness4
284	22.3	120	F	Shell fragments, digested matter Fullness2
284	21.6	96.2	M	Empty Fullness0
284	19.6	69	M	Empty Fullness0
284	20.7	86.9	M	Echinocadium Sp. Decapod leg Fullness4
284	20	69.8	M	Sand eel x1 Fullness3
243	20.6	74.8	M	Brittlestar fragments Fullness3
243	19.3	72	M	digested matter Fullness2
243	19.6	66.4	M	nematodes Fullness1
243	19.4	63.6	M	amphipods; nematodes Fullness2
243	20	72.1	M	amphipods; nematodes Fullness2
243	22.5	109	F	amphipods; crab fragments; bivalve Fullness2
243	20.6	69	M	mostly digested matter; shrimp (tiny) Fullness2

243	22	117	F	nematodes; crab fragments; brittlestar fragments Fullness2
243	22.9	112	F	shrimp; digested matter Fullness2
243	20.5	73	M	amphipods; digested matter Fullness2
243	19.3	63.5	M	lots amphipods; digested matter Fullness2
243	19.5	58.5	M	amphipods; digested matter Fullness2
243	18.9	59	M	Brittlestar fragments; amphipods Fullness2
243	22.9	131	F	nematodes; amphipods Fullness1
243	21.4	87.2	F	nematodes; amphipods; fish eggs Fullness2
243	21.4	94	F	amphipods; digested matter Fullness2
243	21.5	87.4	F	large nematodes Fullness2
243	20.6	56	F	nematodes; amphipods; digested matter Fullness2
243	20.6	77	F	amphipods Fullness2
243	21.5	81.5	F	digested matter Fullness1
244	21	74	M	empty Fullness0
244	20	70.5	M	polychaete fragments Fullness1
244	19.5	60.7	M	digested matter Fullness2
244	19	63.1	M	digested matter; nematodes; bivalve Fullness2
244	19.7	65.1	M	Echinocardium fragments; amphipods Fullness2
244	19.9	61.1	M	digested matter Fullness2
244	20.6	83.5	M	10 nematodes Fullness1
244	20	64.7	M	digested matter; 7 nematodes Fullness2
244	21.5	102	M	digested matter Fullness1
244	20.7	81.4	M	digested matter; nematodes Fullness2
244	23.1	126	F	razor calm foot; nematodes Fullness4
244	21.7	94.5	F	fish; bivalve; worm Fullness3
244	21.5	114	F	nematodes; digested matter Fullness2
244	22.5	104	F	digested matter Fullness2
244	22.5	97.9	F	digested matter Fullness2
244	21.6	104	F	digested matter Fullness2
244	20.5	87.3	F	bivalve; digested matter Fullness2
244	21.7	116	F	nematodes; digested matter Fullness2
244	21.6	102	F	Pagarus sp.; nematodes Fullness4
244	20.9	72.2	F	crab claw; queen scallop; nematodes Fullness3
377	20.1	89.7	M	Digested matter Fullness2
377	20.5	94.3	M	lots of razor clam shells (small 1-2 cm) Fullness3
377	20.9	91.3	M	lots of razor clam shells (small 1-2 cm) Fullness3
377	22	103	F	lots of razor clam shells (small 1-2 cm) Fullness3
377	20.1	81	M	5 small crabs, amphipods Fullness3
377	20.3	67	M	amphipods Fullness2
377	23.2	109	F	worms Fullness1
377	21.3	93.3	F	lots of razor clam shells (small 1-2 cm) Fullness2
377	23	121	F	crab fragments Fullness4
377	20.4	90.3	F	crab fragments Fullness3
377	21.8	106	F	lots of razor clam shells (small 1-2 cm), crab fragments Fullness3
377	20.5	100	F	crab fragments Fullness2
377	20.4	77.6	M	Digested matter Fullness1
377	19.9	77.9	M	Nematodes, a couple razor clams shells Fullness2
377	22.3	102	M	Crab claw Fullness1
377	23.9	147	F	Hermit crab fragment, crab fragment Fullness2
377	23.5	119	F	Brittle star, crustacean fragments Fullness2
377	20	71.8	M	Digested matter Fullness1
377	20	72.2	M	Crab fragments, razor clam shells Fullness2
377	23.5	146	F	>100 razor clam shells Fullness4

## Sediment Sampling

Sediment samples were collected using the Day Grab, and subsampled for Organics, Metals, Particle Size Analysis (PSA), Porosity, Ecotoxicology (Microtox), Rapid Finds Assessment (RFA), Microplastics and eDNA fulfilling the primary and secondary survey aims (Table 8). At 7 CSEMP temporal stations, all sediment parameters were collected across three replicate deployments of the Day Grab (A, B and C), while at 18 CSEMP spatial stations, a reduced number of subsamples were collected from just a single deployment of the Day Grab. A further twenty sediment stations around the Inner Tees and Outer Tees dredged material disposal sites were sampled to collect subsamples for Organics, Metals, PSA and Ecotoxicology (Microtox) with a single deployment of the Day Grab. However, of the 20 stations sampled, only 17 recovered a successful grab sample. Sediment samples from station CSEMP466 were collected on the Smartbuoy survey immediately following the CSEMP survey. Table 9 and Table 10 illustrates sediment type and sample depths for the CSEMP sediment stations and Tees dredge disposal sediment stations. This year, the Microtox assay was not performed onboard the vessel due to lack of experienced scientific staff, with samples instead stored to analyse back at the lab.

Sediment samples collected for Organics, Metals, Particle Size Analysis (PSA), Porosity, Ecotoxicology (Microtox), Microplastics and eDNA were all placed in the freezer to be brought back to the Lowestoft and Weymouth Laboratories for later analysis. Where eDNA samples were collected from the grab, water samples were also collected from the nearest fishing station CTD from both the bottom and surface waters. For the 2 CSEMP spatial grab stations, CSEMP474\_3 and CSEMP285\_2 where no CTD was performed, associated surface water was collected from the Ferrybox while at the grab station. All associated eDNA water samples were also frozen. Where RFA samples were collected, the sediment was placed in an RFA tube, tumble with local seawater and left to settle for 24 hours before being photographed. Table 11 illustrates the RFA images collected, which now need to be analysed back at the lab using Adobe Photoshop to ascertain the final result which can be compared to the PSA results.








**Table 8: Overview of Sediment samples collected from CSEMP and Tees Dredge Disposal sites.**







Station Information			Sample Information			Grab Information		
Station Number	Station Code	Analysis Type	Replicate Attempt	Water Depth (m)	Date	Time	Lat DD	Long DD
3	CSEMP484	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	12	19/07/2023	23:25	50.98322	1.016837
3	CSEMP484	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	12	19/07/2023	23:34	50.98322	1.01684
3	CSEMP484	Microplastic/eDNA/Microtox	C1	12	19/07/2023	23:41	50.98322	1.016842
4	CSEMP484_5	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	22	20/07/2023	00:14	50.96125	1.025899
5	CSEMP484_6	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	24.5	20/07/2023	00:43	50.97017	1.037273
6	CSEMP484_7	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	19.5	20/07/2023	01:10	50.98742	1.038995
8	CSEMP475	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	46	20/07/2023	15:21	52.00011	2.333097
8	CSEMP475	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	46	20/07/2023	15:28	52.00009	2.333151
8	CSEMP475	Microplastic/eDNA/Microtox	C1	46	20/07/2023	15:37	52.00005	2.333222
11	CSEMP474_2	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A3	47	20/07/2023	19:15	51.83964	1.772448
12	CSEMP474_1	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	33	20/07/2023	19:43	51.84409	1.728307
13	CSEMP474_3	PSA/Metals/Organics/Porosity/Chlorophyll/RFA/eDNA	A2	28	20/07/2023	20:36	51.78282	1.799683
16	345_1	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	70	21/07/2023	23:44	54.09847	2.430936
17	345_2	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	60	22/07/2023	01:58	53.98866	2.171619
19	345_3	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	80	22/07/2023	10:42	54.09574	1.750042
20	CSEMP345	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	72	22/07/2023	13:09	53.99995	2.000662
20	CSEMP345	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B3	72	22/07/2023	13:20	53.99994	2.000648
20	CSEMP345	Microplastic/eDNA/Microtox	C1	72	22/07/2023	13:26	53.99993	2.000659
26	CSEMP285_3	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	73	23/07/2023	23:55	55.0202	0.736423
27	CSEMP285_2	PSA/Metals/Organics/Porosity/Chlorophyll/RFA/eDNA	A1	75	24/07/2023	00:23	55.0304	0.70925
28	CSEMP285_1	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	79	24/07/2023	01:49	55.11686	0.513658
29	CSEMP245_1	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	84	24/07/2023	05:12	55.12583	-0.31186
30	CSEMP245_4	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	94	24/07/2023	07:59	55.24651	-0.93203
31	CSEMP245_2	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	94	24/07/2023	09:03	55.319	-0.90308
34	CSEMP245	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	71	24/07/2023	22:50	55.00788	-1.13323
34	CSEMP245	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	71	24/07/2023	23:05	55.00792	-1.13332






34	CSEMP245	Microplastic/eDNA/Microtox	C1	71	24/07/2023	23:14	55.00793	-1.13341
35	IT2	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	22	25/07/2023	01:58	54.6703	-1.09988
36	IT3	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A3	27	25/07/2023	02:27	54.67989	-1.0798
38	IND1	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A3	35	25/07/2023	03:20	54.67956	-1.05842
39	IT4	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	21	25/07/2023	03:34	54.67972	-1.04958
40	IT5	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A2	33	25/07/2023	03:51	54.6872	-1.03181
42	IND2	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	30	25/07/2023	10:22	54.68142	-1.03448
43	IND4	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	33	25/07/2023	10:38	54.68129	-1.02769
44	IT7	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	32	25/07/2023	10:54	54.67341	-1.02622
45	IND5	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A3	36	25/07/2023	11:21	54.68267	-1.01356
46	OT1	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	39	25/07/2023	11:40	54.69394	-0.99832
47	OT2	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A3	41	25/07/2023	12:03	54.70313	-0.98979
48	OT3	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	45	25/07/2023	12:20	54.71506	-0.98527
50	IT8	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	37	25/07/2023	13:24	54.67002	-0.99003
52	IT10	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	47	25/07/2023	14:40	54.67161	-0.88188
53	OT6_1	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	47	25/07/2023	15:24	54.688	-0.91751
54	OT5_1	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	48	25/07/2023	15:44	54.70858	-0.91573
55	OT8	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox	A1	52	25/07/2023	16:10	54.73186	-0.89008
56	CSEMP295	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	54	25/07/2023	16:57	54.73336	-0.88324
56	CSEMP295	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	54	25/07/2023	17:05	54.73339	-0.88319
56	CSEMP295	Microplastic/eDNA/Microtox	C3	54	25/07/2023	17:25	54.73361	-0.88291
59	CSEMP376	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	21	26/07/2023	18:49	53.33337	0.583096
59	CSEMP376	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	21	26/07/2023	18:56	53.33338	0.583269
59	CSEMP376	Microplastic/eDNA/Microtox	C1	21	26/07/2023	19:02	53.33334	0.583352
62	CSEMP386	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	A1	22	27/07/2023	13:30	52.96814	0.353256
62	CSEMP386	PSA/Metals/Organics/Porosity/Chlorophyll/Microtox/RFA	B1	22	27/07/2023	13:35	52.96817	0.353095
62	CSEMP386	Microplastic/eDNA/Microtox	C1	22	27/07/2023	13:42	52.9681	0.353096
64	376_386_6	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	18	27/07/2023	14:48	53.02513	0.492776
65	376_386_5	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	22	27/07/2023	15:35	53.10359	0.564466
66	376_386_8	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A3	15	27/07/2023	16:48	53.21686	0.596855
48	CSEMP466	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	A1	17	02/08/2023	05:09	51.50389	1.011045








49	CSEMP466	PSA/Metals/Organics/Porosity/Chlorophyll/RFA	B1	17	02/08/2023	05:20	51.50389	1.011036
50	CSEMP466	Microplastic/eDNA/Microtox	C1	14	02/08/2023	05:27	51.50389	1.011033






**Table 9: Grab summary of CSEMP Sediment stations**





Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP_484_3_A1		Muddy Sand	15
Cend_10_23_CSEMP_484_3_B1		Muddy Sand	15
Cend_10_23_CSEMP_484_3_C1		Muddy Sand	15
Cend_10_23_CSEMP_484-5_4_A1		Muddy Sand	15
Cend_10_23_CSEMP_484-6_5_A1		Muddy Sand	16
Cend_10_23_CSEMP_484-7_6_A1		Slightly Sandy Mud	16
Cend_10_23_CSEMP_475_8_A1		Sand	12

Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP_475_8_B1		Sand	6
Cend_10_23_CSEMP_475_8_C1	No Picture Taken	Sand	10
Cend_10_23_CSEMP_474-2_11_A3		Muddy Sand and Gravel	11
Cend_10_23_CSEMP_474-1-12_A1		Shelly gravelly muddy sand	9
Cend_10_23_CSEMP_474-3_13_A2		Muddy with sand	11
Cend_10_23_CSEMP_345-1_16_A1		Slightly sandy mud	17
Cend_10_23_CSEMP_345-2_17_A1		Slightly sandy mud	11.5







Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP_345-3_19_A1		Slightly muddy sand	16
Cend_10_23_CSEMP_345_20_A1		Mud	14
Cend_10_23_CSEMP_345_20_B3		Mud	15
Cend_10_23_CSEMP_345_20_C1		Mud	16.5
Cend_10_23_CSEMP_285_25_A1 Cend_10_23_CSEMP_285_25_A2 Cend_10_23_CSEMP_285_25_A3	No Sample	-	-
Cend_10_23_CSEMP_285-3_26_A1		Slightly sandy mud	8
Cend_10_23_CSEMP_285-2_27_A1		Slightly sandy mud	10

Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP_285-1_28_A1		Sandy mud	14
Cend_10_23_CSEMP_245-1_29_A1		Slightly sandy mud	14
Cend_10_23_CSEMP_245-4_30_A1		Slightly sandy mud	17
Cend_10_23_CSEMP_245-2_31_A1		Slightly sandy mud	17
Cend_10_23_CSEMP_245_34_A1		Mud	15
Cend_10_23_CSEMP_245_34_B1		Mud	16
Cend_10_23_CSEMP_245_34_C1		Mud	17







Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP295_56_A1		Muddy Sand	7
Cend_10_23_CSEMP295_56_B1		Muddy Sand	8
Cend_10_23_CSEMP295_56_C3		Muddy Sand	7.5
Cend_10_23_CSEMP_376_59_A1		Shelly muddy sand	9
Cend_10_23_CSEMP_376_59_B1		Shelly muddy sand	11
Cend_10_23_CSEMP_376_59_C1	No Picture taken	Shelly muddy sand	10
Cend_10_23_CSEMP_387_60_A1 Cend_10_23_CSEMP_387_60_A2 Cend_10_23_CSEMP_387_60_A3	No Sample		



Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_CSEMP386_62_A1	No Picture Taken	Shelly muddy sand	8
Cend_10_23_CSEMP386_62_B1	No Picture Taken	Shelly muddy gravel sand	11
Cend_10_23_CSEMP386_62_C1		Shelly muddy gravel sand	11
Cend_10_23_376_386_6_64_A1		Shelly sand	14
Cend_10_23_386_5_65_A1		Shelly sand	11
Cend_10_23_386_5_66_A3		gravelly muddy sand	6.5

**Table 10: Grab summary of Tees and Tyne Dredge disposal site**


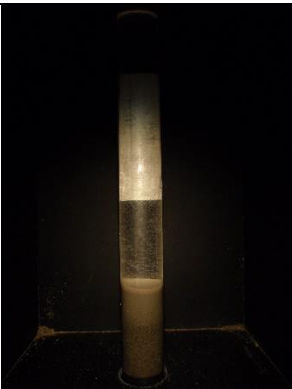

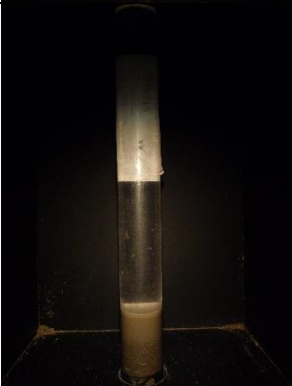
Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_IT2_35_A1		Sand	8
Cend_10_23_IT3_36_A3		Gravelly coarse sand	9
Cend_10_23_IT1_37_A1 Cend_10_23_IT1_37_A2 Cend_10_23_IT1_37_A3	No Sample		
Cend_10_23_IND1_38_A1		Slightly muddy sand	6
Cend_10_23_IT4_39_A1		Sand	9
Cend_10_23_IT5_40_A2		Slightly muddy sand	9
Cend_10_23_IND2_42_A1		Sand	5


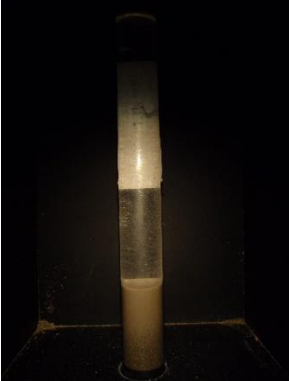

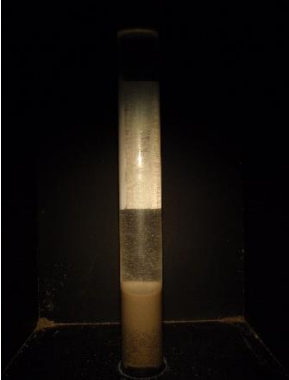

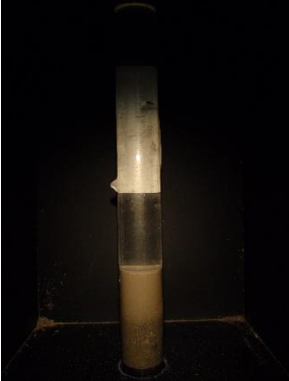

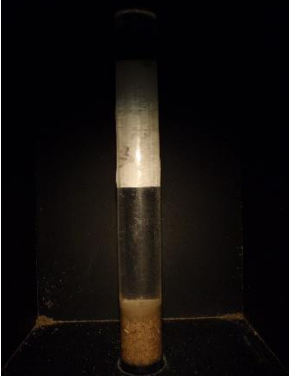
Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_IND4_43_A1		Slightly muddy sand	11
Cend_10_23_IT7_44_A1		Muddy sand	14
Cend_10_23_IND5_45_A3		Muddy sand	10
Cend_10_23_OT1_46_A1	No Picture Taken	Muddy sand	7.8
Cend_10_23_OT2_47_A3		Mud	11
Cend_10_23_OT3_48_A1		Mud	9.4
Cend_10_23_OT4_49_A1 Cend_10_23_OT4_49_A2 Cend_10_23_OT4_49_A3 Cend_10_23_OT4_49_A4	No Sample		


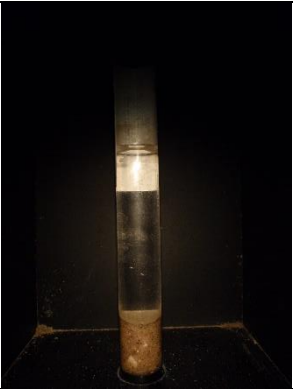

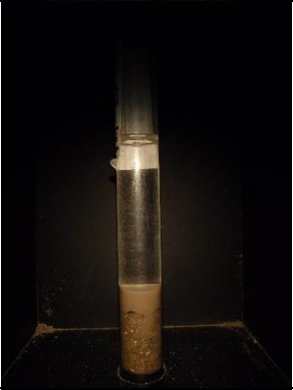




Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_10_23_IT8_50_A1		Muddy sand	11.5
Cend_10_23_OT7_51_A1 Cend_10_23_OT7_51_A2 Cend_10_23_OT7_51_A3 Cend_10_23_OT7_51_A4	No Sample		
Cend_10_23_IT10_52_A1		Sandy mud	8.7
Cend_10_23_OT6_1_53_A1		Sandy mud	13
Cend_10_23_OT5_1_54_A1		Sandy mud	13
Cend_10_23_OT8_55_A1		Sandy mud	8
Cend_11_23_CSEMP466_48_A1		Gravelly shelly sandy mud	13


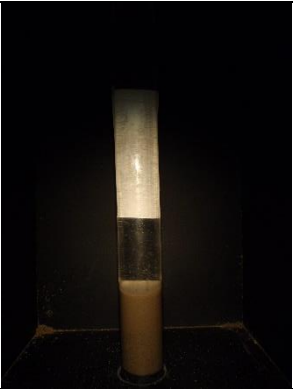

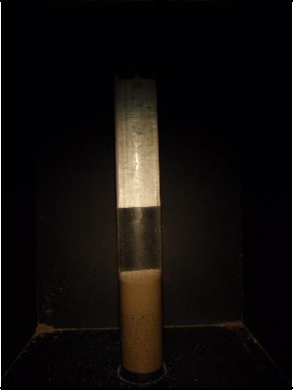
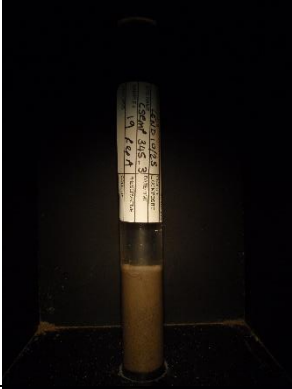
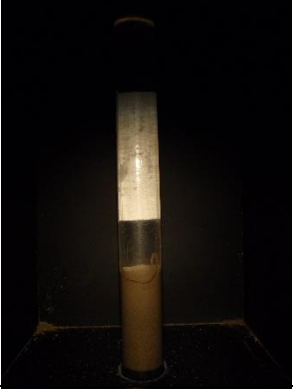

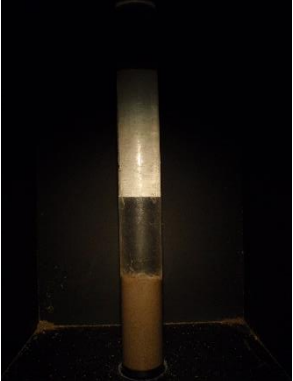
Station Code	Picture	Sediment Description	Sediment Depth (cm)
Cend_11_23_CSEMP466_49_B1		Gravelly shelly sandy mud	14
Cend_11_23_CSEMP466_50_C1		Gravelly shelly sandy mud	14


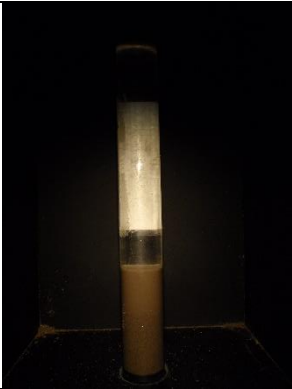

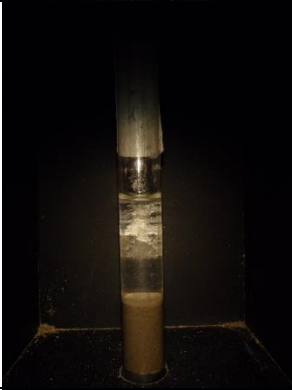




**Table 11: RFA imagery of CSEMP Sediment stations**


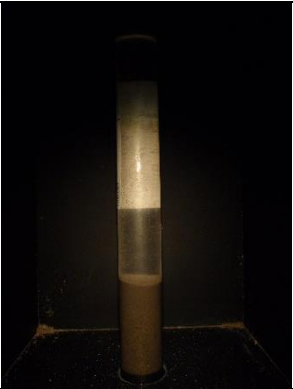

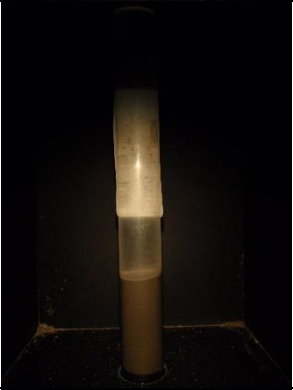
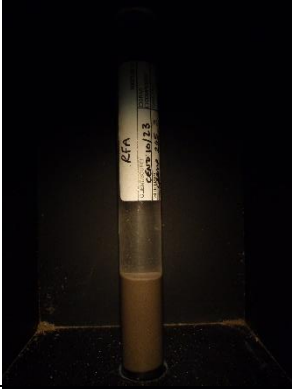
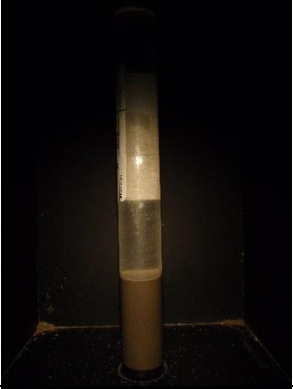

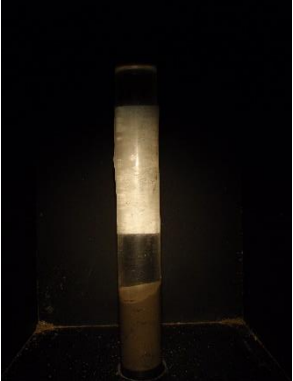
Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_484_3_A1		
Cend_10_23_CSEMP_484_3_B1		


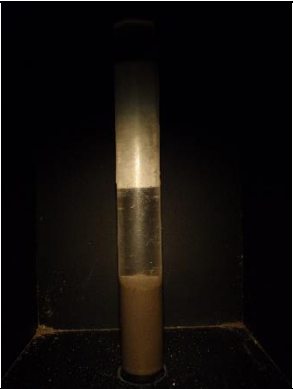

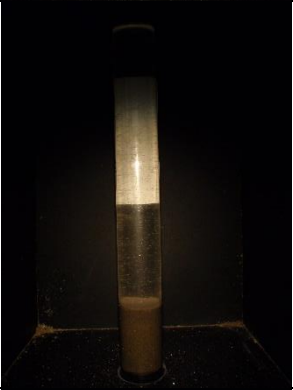
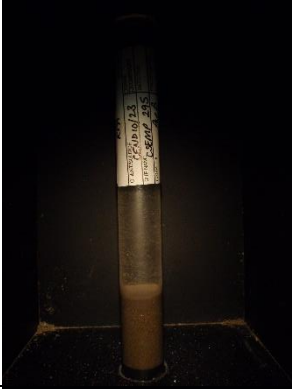
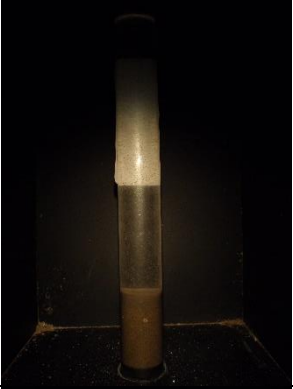


Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_484-5_4_A1		
Cend_10_23_CSEMP_484-6_5_A1		
Cend_10_23_CSEMP_484-7_6_A1		
Cend_10_23_CSEMP_475_8_A1		









Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_475_8_B1		
Cend_10_23_CSEMP_474-2_11_A3		
Cend_10_23_CSEMP_474-1_12_A1		
Cend_10_23_CSEMP_474-3_13_A2		


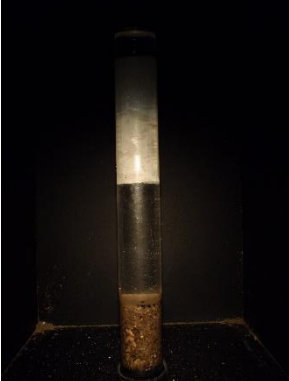

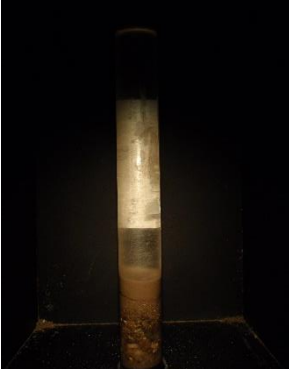
Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_345-1_16_A1		
Cend_10_23_CSEMP_345-2_17_A1		
Cend_10_23_CSEMP_345-3_19_A1		
Cend_10_23_CSEMP_345_20_A1		

Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_345_20_B3		
Cend_10_23_CSEMP_285-3_26_A1		
Cend_10_23_CSEMP_285-2_27_A1		
Cend_10_23_CSEMP_285-1_28_A1		

Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_245-1_29_A1		
Cend_10_23_CSEMP_245-4_30_A1		
Cend_10_23_CSEMP_245-2_31_A1		
Cend_10_23_CSEMP_245_34_A1		

Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_245_34_B1		
Cend_10_23_CSEMP_295_56_A1		
Cend_10_23_CSEMP_295_56_B1		
Cend_10_23_CSEMP_376_59_A1		

Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_376_59_B1		
Cend_10_23_CSEMP_386_62_A1		
Cend_10_23_CSEMP_386_62_B1		
Cend_10_23_CSEMP_376-386-6_64_A1		

Station Code	Picture – Side A	Picture – Side B
Cend_10_23_CSEMP_376-386-5_65_A1		
Cend_10_23_CSEMP_376-386-8_66_A3		

## CTD Profiles

At each fishing station, an ESM2 logger and 10 L Niskin was deployed to establish a full profile of salinity, temperature, oxygen, fluorescence and turbidity in the water column (Table 12). Water samples were collected using the Niskin from bottom waters and analysed for oxygen (3 x replicates), salinity (1 x replicate), and chlorophyll (1 x replicate). Additionally, surface water (~4m) samples were collected from the Ferry box continuous flow and analysed for salinity (1 x replicate) and chlorophyll (3 x replicates). At the additional SmartBuoy water sampling stations, the ESM2 logger and Niskin were deployed twice to collect both the bottom and surface waters, and each deployment was analysed for oxygen, salinity, chlorophyll, nutrients and SPM (Figure 11: Left - Scientists filtering seawater. Right - Deployment of the CTD Rosette.. A trio of 1 litre water samples were collected at a subset of chosen sites for eDNA analysis.



**Figure 11: Left - Scientists filtering seawater. Right - Deployment of the CTD Rosette.**

**Table 12: Overview of CTD/EMS2 Logger samples collected, along with plankton ring net.**

CSEMP Station Name	CSEMP Station ID	Event Number	Fix Number	Date	Time Sampled	Gear Code	Sample Water Depth	Water Depth (m)	LatitudeDD	LongitudeDD
Off Newhaven	494	1	1	19/07/2023	07:22	CTD	14.61	17.5	50.751	0.08329
Off Newhaven	494	1	1	19/07/2023	07:25	CTD	2.15	17.5	50.751	0.08329
Rye Bay	486	2	2	19/07/2023	15:37	CTD	33.19	35	50.7608	0.73883
Rye Bay	486	2	2	19/07/2023	15:41	CTD	5.47	35	50.7608	0.73883
Thames Gabbard	475	7	9	20/07/2023	09:01	CTD	30.4	32	52.0077	2.07414
475 Thames Gabbard	475	7	9	20/07/2023	09:05	CTD	1.55	32	52.0077	2.07414
West Gabbard	-	9	13	20/07/2023	16:58	Underway	4	43	51.9595	2.1248
West Gabbard	-	10	14	20/07/2023	17:04	Plankton Ringnet		42	51.9612	2.12516
474_3		13	20	20/07/2023	20:36	Underway	4	28	51.7828	1.79968
Smiths Knoll	Trend	14	21	21/07/2023	04:08	CTD	44.23	47	52.7648	2.46187
Smiths Knoll	Trend	14	21	21/07/2023	04:13	CTD	2.69	47	52.7648	2.46187
Indefatigable Bank	378	15	22	21/07/2023	14:18	CTD	26.97	30	53.5475	2.06631
Indefatigable Bank	378	15	22	21/07/2023	14:21	CTD	4.08	30	53.5475	2.06631
Off Humber	346	18	25	22/07/2023	07:18	CTD	77	79	54.036	1.85346
Off Humber	346	18	25	22/07/2023	07:18	Underway	4	79	54.036	1.85346
Central Dogger	287	21	33	22/07/2023	15:55	CTD	21	25	54.5047	2.70051
Central Dogger	287	21	33	22/07/2023	15:55	Underway	4	25	54.5047	2.70051
North East Dogger	283	22	34	22/07/2023	22:52	CTD	29	31	55.2507	2.89505
North East Dogger	283	22	34	22/07/2023	22:52	Underway	4	31	55.2507	2.89505
North Dogger	284	23	35	23/07/2023	07:04	CTD	30	32	55.0722	2.11074
North Dogger	284	23	35	23/07/2023	07:04	Underway	4	32	55.0722	2.11074
West Dogger	284	24	37	23/07/2023	16:37	CTD	31	37	54.7965	1.30577
West Dogger	284	24	37	23/07/2023	16:37	Underway	4	37	54.7965	1.30577

285_2	-	27	42	24/07/2023	00:23	Underway	4	75	55.0304	0.70925
Farne	243	32	47	24/07/2023	10:58	CTD		100	55.4471	-1.0776
Farne	243	32	47	24/07/2023	10:58	Underway	4	100	55.4471	-1.0776
Amble	244	33	48	24/07/2023	17:08	CTD	70	72	55.3232	-1.2466
Amble	244	33	48	24/07/2023	17:08	Underway	4	72	55.3232	-1.2466
Tees Bay	294	41	64	25/07/2024	05:03	CTD	39	42	54.7762	-1.1388
Tees Bay	294	41	64	25/07/2025	05:05	Underway	4	42	54.7762	-1.1388
Flamborough	344	57	96	25/07/2023	23:47	CTD	58	63	54.2196	0.57862
Flamborough	344	57	96	25/07/2023	23:48	Underway	4	63	54.2196	0.57862
Outer Humber	377	58	97	26/07/2023	11:16	CTD	16	18	53.301	0.43864
Outer Humber	377	58	98	26/07/2023	11:33	CTD	4	18	53.2984	0.44513
Inner Wash	378	61	105	27/07/2023	08:24	CTD	28	31	53.1291	0.5468
Inner Wash	378	61	106	27/07/2023	08:48	CTD		31	53.1274	0.54638
Inner Wash	378	61	107	27/07/2023	08:50	CTD	4	31	53.1272	0.54629
CSEMP 386	-	63	112	27/07/2023	13:54	CTD	19	21	52.9682	0.35401
CSEMP 386	-	63	112	27/07/2023	13:54	Underway	4	21	52.9682	0.35401
Underway_1	-	64	118	27/07/2023	19:07	Underway	4	NA	53.1088	0.95673
Underway_2	-	65	119	27/07/2023	23:03	Underway	4	NA	52.892	1.54733
Underway_3	-	66	120	28/07/2023	07:21	Underway	4	NA	52.4061	1.77886

## Seafloor Litter

During our trawling activities, and as part of our survey objectives, we conducted analysis of any collected seafloor litter (see Figure 12 for examples). In total, 69 litter items were collected over 54 trawls, weighing a total of 13.64217 kg. Of the 54 trawls conducted, just 20 of them contained no litter. Of these litter items, 65 items were plastics, accounting for 94.2% of all litter collected. The highest abundance of litter items came from station Rye Bay and Thames Gabbard with 10 items each. Figure 13 shows a breakdown of all litter collected by count, split by material type, as well as a breakdown of the plastic categories as these made up the majority of all litter collected. In addition, 3 items of seafloor litter with substantial attached organisms have been kept for further analysis in the lab, feeding into the gathering evidence towards non-native species settling on seafloor litter.



**Figure 12: Examples of marine litter caught in the Granton trawl at a) Tees Bay, b) Off Humber, c) Thames Gabbard and d) Outer Humber.**

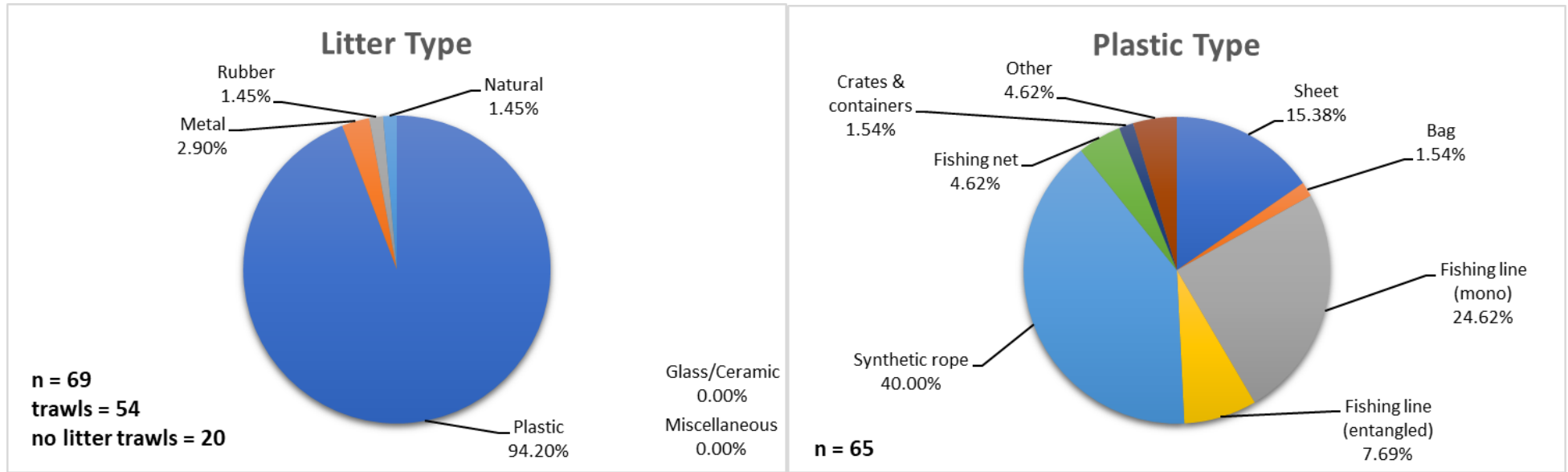


Figure 13: Pie charts showing marine litter composition (%) by count for all litter and for plastic litter only.

Freya Goodsir, Briony Silburn

Scientist in Charge, 2SIC

29/07/2023

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