Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR
Survey: C END 10 – 2019

Clean Seas Environmental Monitoring Programme (CSEMP) Southern North Sea

STAFF:

Name	Role
Manuel Nicolaus	SIC
Alex Callaway	2IC
John Bignell	Deck master; FD
Caroline Daumich	Deck master; FD
Paul Nelson	fish data
Freya Goodsir	fish data
Oliver Twigge	Water, otoliths
Paula Milliken	Biological effects
Marta Vannoni	Biological effects, litter
Briony Silburn	Sediment with data; litter
Sara Losada	Sediment with data; otoliths; litter
Richard Hazelgrove	FD
Stuart Ross	FD
Peter Randall	Otoliths, stomach

DURATION: 5th July from Lowestoft (21:00 High Tide) - 13th July in Lowestoft 17:30.

LOCATION: **Southern North Sea**

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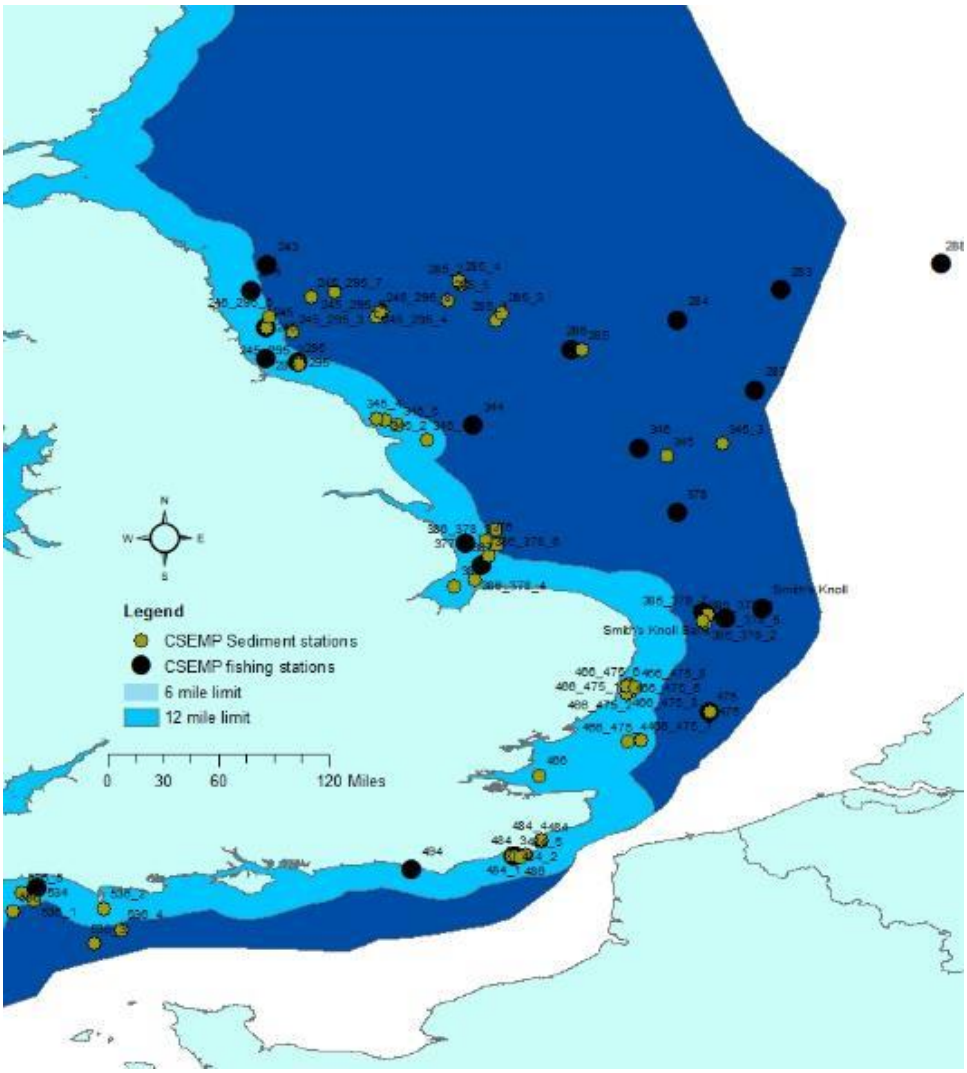
CSEMP fishing and, temporal/spatial sediment stations



A: CSEMP fishing station positions

CSEMP Station Code	New Station Code	New Station Name	Latitude	Longitude
243fi	TyneTees_TTOpenSeaS_fi02	Farne	55.4952	-1.1263
244fi	TyneTees_TTInter_fi01	Amble	55.2967	-1.255
283fi	HumWash_HWOpenSeaNE_fi01	North Dogger 1 (East)	55.3023	2.8972
284fi	HumWash_HWOpenSeaNE_fi02	North Dogger 2	55.068	2.09
286fi	HumWash_HWOpenSeaNE_fi03	West Dogger	54.8333	1.255
287fi	HumWash_HWOpenSeaNE_fi04	Dogger Central	54.5152	2.6905
294fi	TyneTees_TTInter_fi03	Tees Bay	54.7597	-1.1397
344fi	TyneTees_TTOpenSeaS_fi01	Flamborough	54.2417	0.4883
346fi	HumWash_HWOpenSeaS_fi01	Off Humber	54.0633	1.79
377fi	HumWash_HWInter_fi01	Outer Humber	53.3167	0.4283
378fi	HumWash_HWOpenSeaS_fi02	Indefatigable Bank	53.5567	2.082
387fi	HumWash_HWInter_fi02	Inner Wash	53.1417	0.555

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475fi	Anglia_AnOpenSea_fi01	Thames (Gabbard)	52	2.3333
486fi	EastChan_ECInterE_fi01	Rye Bay	50.8667	0.8083
494fi	EastChan_ECInterE_fi02	Off Newhaven	50.7598	0
Altern. Smith's Knoll	Anglia_AnOpenSea_fi03	Altern. Smith's Knoll	52.7318	2.4585

GREEN Additional 9 Fish need to be collected per site for the EA. Put 3 fish in one bag

B: CSEMP sediment stations (only bold stations need to be sampled in an ideal scenario) 2 replicas for metals and organics at the 3-numbered stations, and 1 replica for metals and organics at the other stations.

Site name	Lat (DD)	Long (DD)	ARC Name
245	**55.00830**	**-1.13330**	**245**
295	**54.73330**	**-0.88330**	**295**
285	**54.83330**	**1.33330**	**285**
345	**54.00000**	**2.00000**	**345**
376	**53.33330**	**0.58330**	**376**
386	**52.98300**	**0.33470**	**386**
475	**52.00000**	**2.33330**	**475**
466	**51.49670**	**1.00000**	**466**
East245_170	**55.1289773**	**-0.230435718**	**245_295_1**
245_295_34	**54.71469161**	**-0.880730986**	**245_295_2**
245_295_43	**54.97250451**	**-0.929696529**	**245_295_3**
East245_178	**55.09036966**	**-0.27960963**	**245_295_4**
245_295_39	**55.08808476**	**-1.119100998**	**245_295_5**
245_295_36	**55.28845053**	**-0.602117562**	**245_295_6**
NorthWest285_58	**55.06265309**	**0.656281769**	**285_1**
NorthWest285_45	**55.34621642**	**0.391292774**	**285_2**
NorthWest285_47	**55.12503728**	**0.709716228**	**285_3**
West345_66	**54.1234254**	**0.11516106**	**345_1**
West345_70	**54.28202832**	**-0.213494499**	**345_2**
345_19	**54.09805402**	**2.43086462**	**345_3**
376_386_78	**53.42151603**	**0.661556647**	**386_378_1**
OffLowestoft_96	**52.69487831**	**2.30267343**	**386_378_2**
376_386_85	**53.31027451**	**0.670741923**	**386_378_3**
376_386_86	**53.02451081**	**0.492234434**	**386_378_4**
OffLowestoft_98	**52.76236867**	**2.324006726**	**386_378_5**
376_386_80	**53.21660603**	**0.597390399**	**386_378_6**
West475_124	**52.19738164**	**1.689405973**	**466_475_1**
West475_120	**52.15262694**	**1.706260268**	**466_475_2**
West475_127	**52.14492332**	**1.685672364**	**466_475_3**
SouthWest475_107	**51.76483981**	**1.688129876**	**466_475_4**
West475_128	**52.20642004**	**1.705220423**	**466_475_5**
West475_130	**52.19944608**	**1.679155035**	**466_475_6**

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C: Plankton sample at Outer Gabbard (CSEMP 475) fishing station

Station	Latitude	Longitude
Gabbard CSEMP 475	52.0	2.2

Objectives and 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 UK indicator assessments (GES descriptors 1, 4, 5, 8, 9 & 10) under the UK Marine Strategy.

Specific aims:

1. To collect samples of demersal fish (dab plaice and whiting) for chemical analysis from the North Sea in support of the Clean Seas Environmental Monitoring Programme (CSEMP)

2. To collect dab samples at CSEMP sites for fish disease and biochemical markers (e.g. EROD-7-ethoxyresorufin O-deethlyation, AChE- Acetylcholinesterase and bile metabolites-1-hydroxypyrene equivalent analysis)

3. To sample representative CSEMP stations 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 (microplastics).

4. To conduct marine litter surveys by collecting benthic litter information from the trawls and collecting sediment samples for litter analysis.

5. To collect one CTD sample off Lowestoft

6. To collect a Plankton sample at Gabbard SB2.

7. To collect water nutrients samples and carry out oceanographic samples using a CTD rosette.

Narrative:

5th July

All the Scientific staff boarded the RV Cefas Endeavour during the day. Inductions were held at 14:30 UTC, for all scientific staff that did not sail over the last 6 months. This was followed by a toolbox talk at 15:30. During the afternoon, the survey details were discussed with the officers and the scientific staff. It became apparent that the fish hopper had been decommissioned, and the single net drum and the TRANSAS slave were not working. Those were three crucial pieces of equipment that were not available to us to carry out our work in the most efficient way. Instead of using the TRANSAS slave navigation computer, I used the life one at the front of the bridge, meaning I had to walk back and forth on the bridge to log the coordinates for the fishing tows. The alternative for the single net drum to reel

in the fishing net, was the double net drum, which was sitting above the single net drum. Also, as we did not have the fish hopper to sort fish, the fish were placed into boxes from the cod end and then the boxes had to be picked up and placed on to the fish sorting table. We left Lowestoft with the evening tide at ~21:00 and sailed to the first sediment station 466_475_5. Before we deployed the day grab, a toolbox talk was held, and we discussed the safe and most effective deployment of the day grab with the ship's and scientific crew. The day grab was deployed at 23:52 at station 466_475_5. The day grab is used to collect sediment samples from the seabed (picture below). The sediment samples are used to look for various chemicals. More information can be found under: https://moat.cefas.co.uk/pressures-from-human-activities/contaminants/.

Day grab used to collect sediment samples

6th July

Then we sailed towards 466_475_6 and deployed the day grab here at 00:25, followed by 466_475_1 (00:46); 466_475_3 (01:21) and 466_475_2 (02:03). Then we sailed to the Outer Gabbard (CSEMP 475) fishing and grabbing station. The sunrise at 03:45 was beautiful to watch. The day started very calm with only small ripples. We started work here at 04:40 with the deployment of the CTD rosette, after a toolbox talk was carried out. CTD stands for conductivity, temperature and depth. In detail it is a round frame that has multiple sensors on them to measure the salinity and water temperature at various water depths. It has also water cylinders attached to them that can be closed at any variable depth to take oceanographic measurements, like oxygen and you can also use the collected water to carry out nutrient analysis.
More information can be found under: https://moat.cefas.co.uk/pressures-from-human-activities/eutrophication/.

That was followed by a toolbox talk for the bongo-net and the consequential deployment of the bongo-net to assess the phyto- and zooplankton community, at 05:20. We carried out grabbing at CSEMP 475 between 05:55 and 06:20. The day grab numbered 006 was decommissioned as it has not been serviced properly. The buckets did not close properly as the hinges were tightened too much. We started fishing at CSEMP 475 at 07:40 after a toolbox talk was undertaken. We finished fishing after 4 tows at 13:38. After the second tow we had an Abandon Ship Drill, which was very well received by the scientific crew as it was presented in an interactive way (picture below shows staff wearing a survival suit). We only caught 15 fish for chemical analysis and 12 for fish disease (FD) and other biological effects screening. Just to give you a little bit more detail what tissues are

being analysed and sampled, I have provided an overview below. As you can see, there are 6 people that all have their dedicated station and task, including two FD experts, one data manger, one expert that collets the biomarker/biological effects samples, one benthic expert that analysis the stomach content and one expert that collects the otoliths for fish age determination. It takes around 1 hour to dissect 10 fish along the analytical line.

Staff wearing sea survival suit during Abandon Ship Drill

The boson noticed that the shackles along the wire connecting to the net were not the right kind and they were changed immediately. That was a very good and important observation as it could have caused the loss of the trawl. We then sailed 41nm north to sediment stations 386_378_2 and 386_378_5, which were sampled after a toolbox talk was carried out at 17:17 and between 17:49 and 18:20, respectively. The reason why the second station took so long was because the Officer of the Watch thought to get the ship into position without using the DP, but after being advised by the SiC to use DP, the sample collection went very well. Then we sailed to the Alternative Smith's Knoll fishing station. We fished here for 3 tows between 19:17 and 23:13. We caught 50 dab for fish disease (FD) and other biological effects analysis. We also caught 50 dab for chemical analysis. (Annex 2). Then we started steaming the 84nm to the Inner Wash.

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DATA MANAGER	FISH DISEASE 1	FISH DISEASE 2	BIOMARKERS	STOMACH	OTOLITHS
	Length	Kidney	Muscle (AChE)*	Stomach contents*	Age determination
	Weight	Gonad	Plasma (protein)*		
	Sex	Gonad weight*	Liver (EROD)*		
	External disease assessment	Gonad length*			
	Blood*	Micronucleus*			
	Bile*	Liver (Omics)			
	Liver (histology/electron microscopy)				
	Liver weight*				
	Spleen				
	*First 20 fish only (integrates with biological effects)				

Overview of the information/tissues that are being collected from the dab and set up

7th July

The steam was rather gentle across the rippled North Sea. The day shift awoke to a bright and sunny morning. The night shift went to bed with the knowledge of achievement after a delicious breakfast. We started collecting sediment samples at stations 386_378_6, 386_378_4 and 386 at 09:02, 11:14 and 12:10, respectively. Between 09:30 and 10:00 the RV Cefas Endeavour was on standby to assist the Humber Coastguard in a rescue mission of the vessel "The Old Cat". We started fishing the Inner Wash (CSEMP 387) at 13:46 and finished at 15:19. We caught 17 dab for chemical analysis and an additional 9 dab for an inter-calibration exercise with the Environment Agency (EA). Afterwards, we fished the Outer Humber (CSEMP 377) station between 16:55 and 19:27. We caught 25 dab for chemical analysis and 9 dab for the EA. Additionally, we screened 42 dab for FD including 20 for other biological effects. Then we collected sediment stations 376 and 386_378_1 between 21:28 and 23:25. At sediment station 386_378_3 which we sampled at 22:13, we did not get a valid sample and abandoned the station after three tries. As the weather forecast predicated relatively calm weather, we followed plan A of the survey programme and made our way to the Indefatigable Bank fishing station (CSEMP 378).

8th July

We reached the Indefatigable Bank (CSEMP 378) at 04:33 and deployed the CTD rosette under a light breeze of 10-15 knots wind and a slight swell of 1m. Afterwards we completed 2 fishing tows here between 05:04 and 08:38. We caught 50 dab for chemical analysis and 80 for FD including 20 for additional biological effects screening. After discussions with the Navigation Officer it was decided to go to the Off Humber (CSEMP 346) fishing station. We reached the station at 12:40 and carried out 2 tows between 13:04 and 14:37. The weather calmed over the day and the sun kept on shining over the afternoon. We analysed 50 dab for FD and collected 20 samples for biological effects assessments. Then, we sailed east to the sediment station 345 sampling at 16:47, followed by 345_3 at 19:07. Our scientific crew change at 19:00 was just before we finished grabbing and before we started the steam to Dogger Central (CSEMP 287). This was the first evening where the night shift did not have to go into work mode straight away, so it was nice that both shifts had a bit of time to reflect on the survey and discuss their experiences over a game of Werewolf. We reached Dogger Central (CSEMP 287) at 21:30 and started fishing here at 21:51.

9th July

Fishing was completed at 02:06. We caught 50 dab for chemical analysis and 80 for FD and 20 samples for biological effects assessments. We also carried out a CTD there at 02:41. Then we

steamed to the North (East) Dogger 1 (CSEMP 283) station 50nm away. We started here with a CTD at 07:16 under light winds and small waves. Finishing was carried out between 07:39 and 10:14 at the North (East) Dogger 1 (CSEMP 283). We caught 50 dab for chemical analysis and 80 for FD and 20 samples for biological effects assessments. Then, we sailed 30nm SE to North Dogger 2 (CSEMP 284). As soon as we got here, we carried out a CTD dip at 14:11. We started fishing here at 14:31 and finished at 15:56 after two tows. We caught 50 dab for chemical analysis and processed 80 dab for FD including 20 for other biological effects assessments during the steam to West Dogger (CSEMP 286). Before we started fishing at West Dogger, we collected sediment samples at CSEMP 285 at 19:11. As there was a newly laid gas pipeline, we could not collect our sample exactly at the predicted coordinates. We collected the sample slightly south of the temporal trend station 285. We collected 2 samples for metals and Particle Size Analysis, 2 samples for organics and pesticide analysis and one sample for microplastics analysis. Afterwards we collected oceanographic data with the CTD rosette (20:09). We finished fishing here at 22:58. Fishing took a bit longer than expected as the net had a small tear in it after the first tow. The competent ship's crew fixed it in less than 1 hour, getting fishing on the way again. Then we sailed to the sediment station 285_1.

10th July

We reached the sediment station 245_295_1 at 01:54 and collected the required sample for chemical analysis. Over the course of the morning we collected sediments at 245_295_4 at 07:50 and 245_295_6 at 09:34. Then we steamed to Farne (CSEMP 243) and fished here between 11:32 and 13:30. We caught 25 dab for chemical analysis back at the lab after 2 tows. Then we steamed to Amble (CSEMP 244) and fished here between 15:10 and 17:48. We caught 50 dab for chemical analysis by Cefas and an additional 9 dab for chemical analysis by the EA. We also processed 80 dab for FD including 20 for other biological effects assessments. We also collected sediment samples at station 245_295_5 at 21:01. The sun set beautifully while we steamed to the fishing and grabbing station 245. We could not fish Off Tyne (CSEMP 245) as there were too many shipwrecks around this station, and as it would have been an additional station, I did want to risk losing the fishing gear. Nevertheless, it was safe to collect a sediment sample there (CSEMP 245) at 21:50. Afterwards, we collected a sediment sample at 245_295_3 at 23:09. Then, we sailed to Tees Bay (CSEMP 294).

11th July

We reached the Tees Bay (CSEMP 294) fishing station at 00:45 and started fishing at 00:55 and finished at 04:46. We caught 50 dab for chemical analysis by Cefas and an additional 9 dab for the EA. We also caught 80 dab for FD including 20 for biological effects assessments. Then we steamed to the Off Tees (CSEMP 295) sediment station. Originally, I also wanted to fish here, but it has become an anchorage place, so fishing was not possible. Sediment grabbing took longer as expected as the day grab malfunctioned and needed repairing. All grabbing was done at 07:30. We collected 2 replicates for metals/PSA assessment, 2 replicas for organics assessment and one replica for microplastics screening. Then we steamed to 245_295_2. We collected one sediment sample there at 08:02. During the steam to the grabbing station 345_2 we completed the analysis of the 80 dab for fish diseases including 20 dabs for the other 20 biological effects from the Tees Bay fishing station. This was all completed at 09:30, giving everyone a break to enjoy a cup of tea and a Fruity Flapjack cookie. The officers of the watch were very focused on the bridge to manoeuvre the ship safely through the static fishing gear just off Whitby. We reached the sediment

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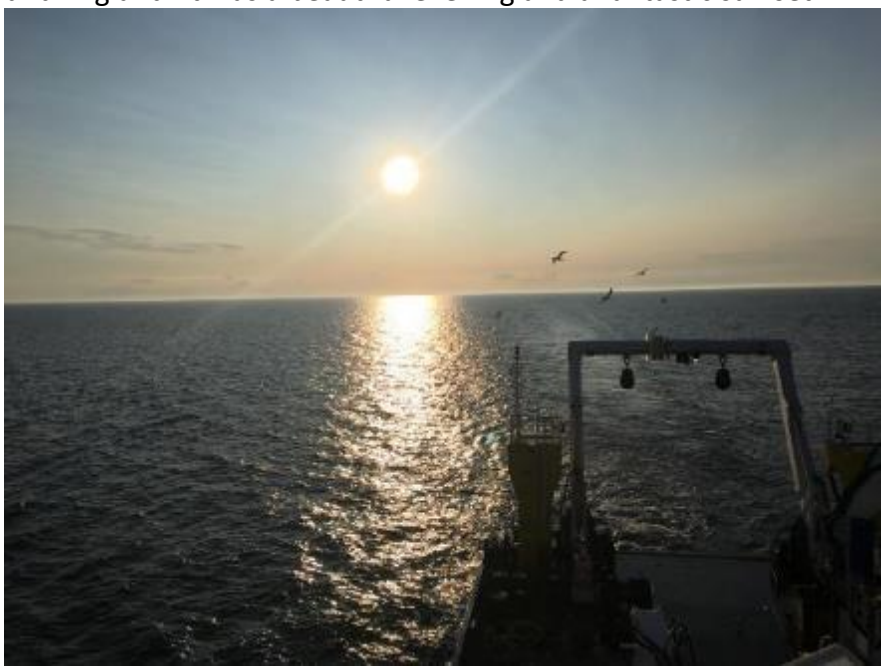
station 345_2 just after lunch at 11:30. The sample for chemical analysis was collected at 11:48, after 4 attempts. Then we steamed to the sediment station 345_1 and collected a sediment sample there at 13:14. Then we sailed to the Flamborough (CSEMP 344) fishing station and started operations there at 14:45. We trawled here 4 times giving us 25 dab for chemical analysis back at Cefas and 50 dab for FD including 20 for additional biological effects screening. All fishing operations for the day were completed at 19:32, only leaving the processing to do. After the fishing was finished a CTD rosette sample was collected at 20:07. As we did not catch enough fish at the Outer Gabbard fishing station on the 6th July we started steaming back there to collect more fish. During the transit we collected one CTD sample every hour to increase our knowledge on eutrophication around England. It was a beautiful evening and a fantastic sun set.



Sunset over the back deck of the RV Cefas Endeavour

12th July

We continued steaming to the Outer Gabbard (CSEMP 475) fishing station. During the transit, we collected a CTD rosette sample every hour. We started fishing at Outer Gabbard (CSEMP 475) at 12:41 and completed two tows at 14:08. Sadly, we did not catch the required numbers and ceased all fishing operations. Then we steamed over to the two remaining grabbing stations 466_475_4 and 466, which were completed at 17:34 and 21:43, respectively. Then we steamed back towards Lowestoft.

13th July

We reached the Lowestoft area at 07:00 and anchored waiting for the evening tide. We collected one more CTD rosette sample at 15:00 for a study by the University of East Anglia in Norwich. At 17:00 the pilot boarded the ship and guided us into Lowestoft harbour. We were all tight up at 17:30 UTC.

A great thank you to all Cefas and P&O staff for a successful survey.

Results:

Dab were caught at all 14 fishing stations (Table 1), but not all stations provided us with all the required fish of a minimum of 25 dab for chemical analysis and at least 20 for biomarker analysis (aim 1 and 2). We also collected the required dab for a collaboration exercise with the Environment Agency at the required stations highlighted in table A. Stations Rye Bay and Newhaven will be fished next week as part of another survey.

We collected sediments from 31 stations (aim 3) for polycyclic aromatic hydrocarbons (PAHs), trace metal contaminants, organic contaminants (PCBs, PBDEs and HBCD), sediment particle size analysis (PSA) and marine litter (microplastics; aim 4). The exact breakdown of what was collected for which analysis can be seen in table 2. Table 3 also shows the separate images of the sediments in the day grab to assess the sediment type. Stations 484, 484_1, 484_2 and 484_3 will be sampled on the next survey.

In total, we sampled 734 dabs for 14 different obvious fish diseases that can be detected by visual examination (aim 2). 800 times did they occur in the 734 sampled dabs. The most abundant occurrence was hyperpigmentation to the skin (317 times). A breakdown of the fish disease observations can be seen in table 4.
We also collected the stomach contents of up to 20 sampled dabs from 12 stations. Table 5 provides an overview of the 212 dabs from 12 stations that were assessed for stomach content.
We also counted the litter items in each trawl (aim 4). In total we collected 43 litter items in 46 trawls. Plastics accounted for 37 of the 43 items accounting for 86%.

At 15:00, on the 13th July we collected one CTD rosette sample off Lowestoft for the University of East Anglia to assess water quality (aim 5). Additionally, we collected 25 CTD rosette samples for eutrophication assessments from most fishing stations and also from a transect between Flamborough and Outer Gabbard (aim 7).
We collected one plankton ringnet at 05:26 on the 6th July at 52.006 and 2.338 degrees (aim 6).

Table 1. Fished Stations and number of fish caught for specific analysis (aims 1 and 2)

CSEMP Station Code	Latitude Mid tow	Longitude Mid Tow	Date Fished	Fish chemistry	Biomarker
243fi	55.48449	-1.10553	10/07/2019	25 dab	None
244fi	55.28546	-1.25908	10/07/2019	50 dab; 9 dab EA	20 EROD, Bile, AChE; 50 FD
283fi	55.28579	2.9021	09/07/2019	50 dab	20 EROD, Bile, AChE; 80 FD
284fi	55.05988	2.07385	09/07/2019	50 dab	20 EROD, Bile, AChE; 80 FD
286fi	54.77447	1.29712	09/07/2019	50 dab	20 EROD, Bile, AChE; 60 FD
287fi	54.53554	2.68378	08/07/2019	50 dab	20 EROD, Bile, AChE; 80 FD
294fi	54.74951	-1.13687	11/07/2019	50 dab; 9 dab EA	20 EROD, Bile, AChE; 50 FD
344fi	54.23232	0.52687	11/07/2019	25 dab	20 EROD, Bile, AChE; 50 FD
346fi	54.05918	1.816	08/07/2019	25 dab	20 EROD, Bile, AChE; 50 FD
377fi	53.30393	0.41546	07/07/2019	25 dab; 9 dab EA	20 EROD, Bile, AChE; 62 FD
378fi	53.55508	2.08455	08/07/2019	50 dab	20 EROD, Bile, AChE; 80 FD
387fi	53.14958	0.57968	07/07/2019	17 dab; 9 dab EA	None

475fi	52.04283	2.09004	06/07/2019	16 dab	12 EROD, Bile, AChE; 12 FD
Alternative Smith's Knoll	52.74674	2.09004	06/07/2019	50 dab;Plaice size range 4-6	20 EROD, BILE AChE, 50 FD

Table 2. Sampled sediment stations and preliminary sediment description (aim 3)

Date	Time Sampled	Latitude DD	Longitude DD	Stn #	Station Name	ANALYSIS	Water Depth (m)	Sediment Description
05/07/2019	23:52	52.2064	1.7052	1	466_475_5	PSA/Metals	25	Mud
05/07/2019	23:52	52.2064	1.7052	1	466_475_5	Organics	25	Mud
06/07/2019	00:25	52.1994	1.6792	2	466_475_6	PSA/Metals	21	Sandy mud
06/07/2019	00:25	52.1994	1.6792	2	466_475_6	Organics	21	Sandy mud
06/07/2019	00:46	52.1973	1.6893	3	466_475_1	PSA/Metals	23	Mud
06/07/2019	00:46	52.1973	1.6893	3	466_475_1	Organics	23	Mud
06/07/2019	01:21	52.1449	1.6857	4	466_475_3	PSA/Metals	28	Mud
06/07/2019	01:21	52.1449	1.6857	4	466_475_3	Organics	28	Mud
06/07/2019	02:03	52.1526	1.7063	5	466_475_2	PSA/Metals	20	Mud
06/07/2019	02:03	52.1526	1.7063	5	466_475_2	Organics	20	Mud
06/07/2019	06:05	52.0001	2.3334	8	475	PSA/Metals	51	Sand
06/07/2019	06:05	52.0001	2.3334	8	475	Organics	51	Sand
06/07/2019	06:15	52.0001	2.3334	8	475	PSA/Metals	51	Sand
06/07/2019	06:15	52.0001	2.3334	8	475	Organics	51	Sand
06/07/2019	17:17	52.6950	2.3025	9	386_378_2	PSA/Metals	47.5	Muddy Sand
06/07/2019	17:17	52.6950	2.3025	9	386_378_2	Organics	47.5	Muddy Sand
06/07/2019	18:22	52.7625	2.3241	10	386_378_5	PSA/Metals	50.1	Sand
06/07/2019	18:22	52.7625	2.3241	10	386_378_5	Organics	50.1	Sand
07/07/2019	09:02	53.2166	0.5974	12	386_378_6	PSA/Metals	23	Gravely sand
07/07/2019	09:02	53.2166	0.5974	12	386_378_6	Organics	23	Gravely sand
07/07/2019	11:14	53.0245	0.4922	13	386_378_4	PSA/Metals	22	Gravely sand
07/07/2019	11:14	53.0245	0.4922	13	386_378_4	Organics	22	Gravely sand
07/07/2019	12:14	52.9831	0.3349	14	386	PSA/Metals	32.5	Gravely sand
07/07/2019	12:14	52.9831	0.3349	14	386	Organics	32.5	Gravely sand
07/07/2019	12:20	52.9831	0.3348	14	386	PSA/Metals	32.5	Gravely sand
07/07/2019	12:20	52.9831	0.3348	14	386	Organics	32.5	Gravely sand
07/07/2019	12:25	52.9831	0.3348	14	386	Microplastic	32.5	Gravely sand
07/07/2019	12:25	52.9831	0.3348	14	386	MicroPlBlank	32.5	Gravely sand
07/07/2019	21:28	53.3333	0.5833	16	376	PSA/Metals	29	Gravelly sand
07/07/2019	21:28	53.3333	0.5833	16	376	Organics	29	Gravelly sand
07/07/2019	21:34	53.3333	0.5833	16	376	PSA/Metals	29	Gravelly sand
07/07/2019	21:34	53.3333	0.5833	16	376	Organics	29	Gravelly sand
07/07/2019	23:25	53.4215	0.6617	18	386_378_1	PSA/Metals	77	Gravelly sand
07/07/2019	23:25	53.4215	0.6617	18	386_378_1	Organics	77	Gravelly sand
08/07/2019	16:47	54.0001	1.9999	21	345	PSA/Metals	76	Sandy mud
08/07/2019	16:47	54.0001	1.9999	21	345	Organics	76	Sandy mud
08/07/2019	16:53	54.0001	1.9999	21	345	PSA/Metals	76	Sandy mud
08/07/2019	16:53	54.0001	1.9999	21	345	Organics	76	Sandy mud

08/07/2019	19:07	54.0981	2.4306	22	345_3	PSA/Metals	74	Sandy mud
08/07/2019	19:07	54.0981	2.4306	22	345_3	Organics	74	Sandy mud
09/07/2019	19:11	54.8309	1.3351	26	285	PSA/Metals	33	Shelly sand
09/07/2019	19:19	54.8309	1.3351	26	285	Organics	33	Shelly sand
09/07/2019	19:26	54.8309	1.3351	26	285	PSA/Metals	33	Shelly sand
09/07/2019	19:34	54.8309	1.3351	26	285	Organics	33	Shelly sand
10/07/2019	01:54	55.0628	0.6564	28	285_1	PSA/Metals	80	Mud
10/07/2019	02:02	55.0628	0.6564	28	285_1	Organics	80	Mud
10/07/2019	02:45	55.1250	0.7097	29	285_3	PSA/Metals	83	Mud
10/07/2019	02:45	55.1250	0.7097	29	285_3	Organics	83	Mud
10/07/2019	04:23	55.3462	0.3913	30	285_2	PSA/Metals	90	Mud
10/07/2019	04:23	55.3462	0.3913	30	285_2	Organics	90	Mud
10/07/2019	07:06	55.1290	-0.2305	31	245_295_1	PSA/Metals	85	Muddy sand
10/07/2019	07:06	55.1290	-0.2305	31	245_295_1	Organics	85	Muddy sand
10/07/2019	07:50	55.0904	-0.2796	32	245_295_4	PSA/Metals	90	Sandy mud
10/07/2019	07:50	55.0904	-0.2796	32	245_295_4	Organics	90	Sandy mud
10/07/2019	09:34	55.2884	-0.6021	33	245_295_6	PSA/Metals	84	Muddy sand
10/07/2019	09:34	55.2884	-0.6021	33	245_295_6	Organics	84	Muddy sand
10/07/2019	21:01	55.0881	-1.1191	35	245_295_5	PSA/Metals	91	Mud
10/07/2019	21:01	55.0881	-1.1191	35	245_295_5	Organics	91	Mud
10/07/2019	21:50	55.0083	-1.1333	36	245	PSA/Metals	77	Mud
10/07/2019	21:50	55.0083	-1.1333	36	245	Organics	77	Mud
10/07/2019	21:56	55.0083	-1.1333	36	245	PSA/Metals	77	Mud
10/07/2019	21:56	55.0083	-1.1333	36	245	Organics	77	Mud
10/07/2019	22:04	55.0083	-1.1333	36	245	Microplastic	77	Mud
10/07/2019	22:04	55.0083	-1.1333	36	245	MicroPlBlank	77	Mud
10/07/2019	23:02	54.9725	-0.9297	37	245_295_3	PSA/Metals	80	Muddy sand
10/07/2019	23:09	54.9725	-0.9297	37	245_295_3	Organics	80	Muddy sand
11/07/2019	06:29	54.7334	-0.8833	39	295	PSA/Metals	57	Sandy mud
11/07/2019	07:00	54.7334	-0.8833	39	295	Organics	57	Sli. muddy sand
11/07/2019	07:07	54.7334	-0.8833	39	295	PSA/Metals	57	Sli. muddy sand
11/07/2019	07:24	54.7334	-0.8833	39	295	Organics	57	Sli. muddy sand
11/07/2019	07:30	54.7334	-0.8833	39	295	Microplastic	57	Sli. muddy sand
11/07/2019	07:30	54.7334	-0.8833	39	295	MicroPl Blank	57	Sli. muddy sand
11/07/2019	08:02	54.7147	-0.8807	40	245_295_2	PSA/Metals	56	Sli. muddy sand
11/07/2019	08:02	54.7147	-0.8807	40	245_295_2	Organics	56	Sli. muddy sand
11/07/2019	11:48	54.2821	-0.2135	41	345_2	PSA/Metals	56	Grav. muddy sand
11/07/2019	11:48	54.2821	-0.2135	41	345_2	Organics	56	Grav. muddy sand
11/07/2019	13:14	54.1234	0.1153	42	345_1	PSA/Metals	58	Sandy gravel
11/07/2019	13:14	54.1234	0.1153	42	345_1	Organics	58	Sandy gravel
12/07/2019	17:34	51.7649	1.6881	57	466_475_4	PSA/Metals	31	Sli. gravelly sand
12/07/2019	17:34	51.7649	1.6881	57	466_475_4	Organics	31	Sli. gravelly sand

12/07/2019	21:43	51.4967	1.0000	58	466	PSA/Metals	27	Grav. sandy mud
12/07/2019	21:43	51.4967	1.0000	58	466	Organics	27	Grav. sandy mud
12/07/2019	21:47	51.4967	1.0000	58	466	PSA/Metals	27	Grav. sandy mud
12/07/2019	21:52	51.4967	1.0000	58	466	Organics	27	Grav. sandy mud
12/07/2019	21:57	51.4967	1.0000	58	466	Microplastic	27	Grav. sandy mud
12/07/2019	21:57	51.4967	1.0000	58	466	MicroPl Blank	27	Grav. sandy mud

Sli.- Slightly; Grav.- Gravelly; MicroPl.- Microplastics; no sample was obtained at station 386_378_3.

Table 3. Sampled sediment stations for chemical analysis as part of the CSEMP (aim 3)

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_001_466_475_5_A1		Mud	15.5
STN_002_466_475_6_A1		Sandy mud	10
STN_003_466_475_1_A1		Mud	NOT RECORDED
STN_004_466_475_3_A1		Mud	11.5

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_005_466_475_2_A2		Mud	8
STN_008_475_A3		Sand	11
STN_008_475_B1		Sand	11
STN_009_386_378_2_A1		Muddy sand	14
STN_010_386_378_5_A3		Sand	11
STN_012_386_378_6	No Photo	Gravelly sand	8.5
STN_013_386_378_4_A2		Gravelly sand	5
STN_014_386_A2		Gravelly sand	7.5

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_014_386_B1		Gravelly sand	8
STN_014_386_C1		Gravelly sand	9
STN_016_376_A1		Gravelly sand	8
STN_016_376_B1		Gravelly sand	7
STN_017_386_378_3	NO SAMPLE	N/A	N/A
STN_018_386_378_1_A1		NOT RECORDED	13
STN_021_345_A1		Sandy mud	15
STN_021_345_B1		Sandy mud	12

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_022_345_3_A1		Sandy mud	15
STN_026_285_A1		Shelly sand	3
STN_026_285_A2		Shelly sand	3.5
STN_026_285_B1		Shelly sand	5
STN_026_285_B3		Shelly sand	3
STN_028_285_1_A1		Mud	3.5
STN_028_285_1_A1	No picture	Mud	5
STN_029_285_3_A1		Mud	12

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_030_285_2_A1		Mud	9
STN_031_245_295_1_A1		Muddy sand	12
STN_032_245_295_2_A1		Sandy mud	7.5
STN_033_245_295_6_A1		Muddy sand	9
STN_035_245_295_5_A1		Mud	15.5
STN_036_245_A1		Mud	14.5
STN_036_245_B1		Mud	13

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_036_245_C1		Mud	14
STN_037_245_295_3_A1		Muddy sand	6
STN_037_245_295_3_A2		Muddy sand	NOT RECORDED
STN_039_295_A2		Sandy mud	7.5
STN_039_295_A3		Slightly muddy sand	6
STN_039_295_B1		Slightly muddy sand	6.5
STN_039_295_B3		Slightly muddy sand	6

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_039_295_C1		Slightly muddy sand	6
STN_040_245_295_2_A1		Slightly muddy sand	13
STN_041_345_2_A4		Gravelly muddy sand	8
STN_042_345_1_A2		Sandy gravel	5.5
STN_057_466_475_4_A2		Slightly gravelly sand	9
STN_058_466_A1		Gravelly sandy mud	11
STN_058_466_B1	No Image	Gravelly sandy mud	6
STN_058_466_B2	No Image	Gravelly sandy mud	8

Station code	Sample image	Sediment Description	Sample depth (cm)
STN_058_466_C1	No Image	Gravelly sandy mud	7

Table 4. Observed occurrences of 14 different fish diseases

Lymphocystis	Skin Ulcer	epidermal hyperplasia/papilloma	hyperpigmentation	liver disease - nodule/tumour	X-cell gill lesions	Stephanostomum sp	Lepeophtheirus sp.	Acanthochondria sp.	NM	Glugea sp	Lateral lipoidosis	Skeletal deformity	fin rot/erosion
4	19	10	317	24	0	50	125	16	172	56	1	1	5

Table 5. Stomach content of up to 20 sampled dab per station

Sample Number	CSEMP ST. NO.	LOCATION	Length (cm 1dp)	Weight (g)	STOMACH ANALYSIS
1	475	Outer Gabbard	21.9	101.7	Ophuroridea, Hydroid, fullness 3
2	475	Outer Gabbard	23.5	114.9	Ophuroridea, fullness 4
3	475	Outer Gabbard	21.5	1115.5	Ophuroridea, fullness 1
4	475	Outer Gabbard	24.3	137.2	Ophuroridea, worm case fullness 2
5	475	Outer Gabbard	21.5	109.9	Ophuroridea, fullness 1
6	475	Outer Gabbard	23.6	134.1	Ophuroridea, fullness 3
7	475	Outer Gabbard	23.5	143.5	Ophuroridea, fullness 2
8	475	Outer Gabbard	24	141.4	Ophuroridea, fullness 2
9	475	Outer Gabbard	21.5	114.3	Ophuroridea, amphipoda, fullness 1
10	475	Outer Gabbard	22	102.4	Ophuroridea, fullness 3
11	475	Outer Gabbard	24	154.9	Ophuroridea, bivalve shell fragment fullness 1
12	475	Outer Gabbard	22.2	122.2	Ophuroridea, fullness 4
1		Smiths knoll	20.1	76.1	Hydroids, Echino cyamus pusillus,undigested matter, fullness 1
2		Smiths knoll	22.1	125.1	Digested fish, fullness 1
3		Smiths knoll	21.5	87.7	Hydroids, Amphipods, brittle star fragments, Decapoda, fullness 1
4		Smiths knoll	21	84.9	Hydroids, Lagis koreni, Amphipoda, brittle star fragments, fullness 3
5		Smiths knoll	22.5	105.6	Digestive matter, fullness 1

6		Smiths knoll	22.5	112.6	Hydroids, Amphipoda, polychaetes, shell fragments, fullness 2
7		Smiths knoll	22	123.1	Decapoda, Hydroids, Amphipoda, brittlestar fragments, e.puillus, fullness 3
8		Smiths knoll	23.1	114.5	Hydroids, Amphipoda, Ophiura albida, digested matter, fullness 2
9		Smiths knoll	20.4	80.8	Digested fish, O. albida,fullness 1
10		Smiths knoll	20.5	67.9	Empty, fullness 0
11		Smiths knoll	22.3	101	Brittlestar fragments, hydroids, amphipoda, fullness 1
12		Smiths knoll	21	86.6	Cysts, hydroids, amphipoda, shell fragments, fullness 3
13		Smiths knoll	20.2	91	Largis koreni, O,albida (multiple), decapoda fragments, E. pullilus, fullness 2
14		Smiths knoll	19.5	65.8	Amphipoda, decapoda, brittle star fragments,fullness 2
15		Smiths knoll	23.1	114.7	O.albida, hydroids,amphipoda, fullness 2
16		Smiths knoll	22	101.8	Largis koreni, o.albida, brittle star fragments. DM, fullness 2
17		Smiths knoll	21.6	104.5	Hydroids, amphipoda, nucula sp.Ophiuroidra, fullness 2
18		Smiths knoll	21.7	101	Hydroids, amphipoda, DM, fullness 3
19		Smiths knoll	21.9	111.3	Hydroids, amphipodia, brittle star fragments, fullness 2
20		Smiths knoll	23	119.2	Sand eel, amphipoda, hydroids, ammadyteo tobiarus, fullness 3
1	377	Outer Humber	21.2	87.5	Hydroids, fullness 0
2	377	Outer Humber	20.5	88	Empty, fullness 0
3	377	Outer Humber	20	68	Hermit crab, bivalve sipens, fullness 1
4	377	Outer Humber	21.5	85.6	Hydroids, worm, fullness 2
5	377	Outer Humber	20.9	90.1	Hydroids, bivalve shell fragment, fullness 1
6	377	Outer Humber	19.8	70.8	Hydroids, razor shell, fullness 1
7	377	Outer Humber	20.5	76.3	Hydroids, tellinindae, fullness 1
8	377	Outer Humber	23.5	111.3	empty, fullness 0
9	377	Outer Humber	20	73.5	Hydroids, hermit crab, gastropoda, fullness 2
10	377	Outer Humber	21.8	85.3	Hydroids, bivalve shell fragements, fullness 1
11	377	Outer Humber	20.2	82.2	Hydroids, fullness 1
12	377	Outer Humber	20.8	75.8	Bivalve shell (tellinindae, fullness 1
13	377	Outer Humber	20.6	73.6	No ID, fullness 1
14	377	Outer Humber	21.2	74	Hydroids, tube worm head, fullness 3
15	377	Outer Humber	21.6	96.5	Crab, fullness 1
16	377	Outer Humber	23.9	120.8	Shell fragments, fullness 1
17	377	Outer Humber	24	129	Bivalve sipens, fullness 1
18	377	Outer Humber	22.1	108	Macropodia sp, DM, fullness 2
19	377	Outer Humber	21.5	93.4	Largis Kerni, DM fullness 1
20	377	Outer Humber	22.5	115.2	Hydroids, pagarus sp, amphopodia, fullness 2
1	346	Off Humber	20.6	88.4	Sea potato, fullness 2
2	346	Off Humber	24	127.9	Unid matter, fullness 1
3	346	Off Humber	23.1	97	Aphrodite, fullness 1
4	346	Off Humber	21.9	97.6	Unid matter, fullness 2
5	346	Off Humber	21.5	84.6	Aphrodite, fullness 2
6	346	Off Humber	21.4	71.3	Shrimp, ophurodea, urchin?, fullness 2
7	346	Off Humber	23.5	114.4	Ophurodea, sea potato, fullness 3
8	346	Off Humber	21.5	80.3	Pluronectidae, bivalve, fullness 2
9	346	Off Humber	21.5	87.7	Ophurodea, copepoda, unid matter, fullness 2

10	346	Off Humber	21.8	88.6	Sea potato, fullness 2
11	346	Off Humber	20.6	75.7	Aphrodite, fullness 2
12	346	Off Humber	20.1	78.5	Ophuroidea, copepoda, bivalve fragments, fullness 2
13	346	Off Humber	18.6	55.4	Unidenttifiable, rectal end, fullness 1
14	346	Off Humber	19.6	64.1	Shrimp,bivalve, amelida, fullness 2
15	346	Off Humber	19.2	60.9	Amelida, fullness 2
16	346	Off Humber	19	60.8	Bivalve, unid matter, fullness 2
17	346	Off Humber	19	60.6	Ophridea, Amelida, shell, fullness 1
18	346	Off Humber	19.1	58.9	Amphipoda, unid matter, fullness 1
19	346	Off Humber	18.9	49.8	Ophuoridea, polychacta, fullness 2
20	346	Off Humber	19.6	62.9	Unidentifiable, fullness 2
1	287	Central Dogger	21.7	91	Digested matter (DM), fullness 1
2	287	Central Dogger	20.5	79.7	Bivalve siphens, nematoda, amphipoda, fullness 1
3	287	Central Dogger	21.6	96.3	Nematoda, Fullness 0
4	287	Central Dogger	20	72.4	Decapoda fragments, fullness 1
5	287	Central Dogger	19.5	63.3	Amphipoda, caprellid sp, fullness 1
6	287	Central Dogger	19.8	68.7	Decapoda fragments, polychate fragments, DM, fullness 2
7	287	Central Dogger	20.9	81.1	Ensis sp fragments, abra fragments, DM, fullness 1
8	287	Central Dogger	20.1	71.1	Pagarus sp, hydroids, fish fragments,bivalve shell fragments, DM, fullness 2
9	287	Central Dogger	20.1	70.2	Pagarus in polinices shell, fullness 1
10	287	Central Dogger	19.9	72.4	Decapoda fragments, fullness 1
11	287	Central Dogger	22.9	127.2	DM, fullness 1
12	287	Central Dogger	22.2	113.5	Decapod fragments, polinices sp, nematoda, fullness1
13	287	Central Dogger	23	114.2	Empty, fullness 0
14	287	Central Dogger	21	94.2	Hydroids, amphiropoda, shell fragments, DM, fullness 1
15	287	Central Dogger	21.4	91.7	Decapoda fragments and eggs, bivalve siphen, nematoda, fullness 3
16	287	Central Dogger	22.9	107.3	Decapoda fragments, fullness 1
17	287	Central Dogger	21.3	81.2	Decapoda fragmentsa, bivalve shells fragments, fullness 1
18	287	Central Dogger	21.1	83.9	Bivalve shell fragments,Aphrodite hairs, fullness 1
19	287	Central Dogger	21	96.7	Empty, fullness 0
20	287	Central Dogger	22.9	91.7	Bivalve foot, fullness 2
1	283	NE Dogger	20	64.3	None 0
2	283	NE Dogger	23.8	152.7	Liocarcinus depurator 4
3	283	NE Dogger	24	141.4	None 0
4	283	NE Dogger	24	142.4	Ammodytes sp. 2
5	283	NE Dogger	23.8	126.7	None 0
6	283	NE Dogger	21	89.7	None 0
7	283	NE Dogger	20	84.8	Small volume unidentifiable matter 1
8	283	NE Dogger	23.8	142.5	Ammodytes sp. 2
9	283	NE Dogger	23.8	119.3	None 0
10	283	NE Dogger	21	92.2	Ammodytes sp. 2
11	283	NE Dogger	22	101.1	None 0
12	283	NE Dogger	22.6	122.4	None 0
13	283	NE Dogger	22.2	103.8	Sea potato 1

14	283	NE Dogger	23.1	119.6	None 0
15	283	NE Dogger	22	103.9	Ammodytes sp. 1
16	283	NE Dogger	20.6	85.3	Ammodytes sp., unidentifiable matter 2
17	283	NE Dogger	21.5	89.7	None 0
18	283	NE Dogger	21.1	79.9	Ammodytes sp. x3 3
19	283	NE Dogger	20.5	79.3	Ammodytes sp. 1
20	283	NE Dogger	23.5	116	None 0
1	284	N Dogger	20.4	78.6	Mollusca shell 1
2	284	N Dogger	20	88	Unidentifiable urchin, Ensis sp. siphon 3
3	284	N Dogger	21.1	90.7	Polychaeta, Ensis sp. Siphon 2
4	284	N Dogger	20.2	71.6	N/A 0
5	284	N Dogger	23.6	146.5	Decapoda limb, 1
6	284	N Dogger	20.1	85.1	Echinocardium cardatum 1
7	284	N Dogger	20	70.5	Unidentifiable digestive matter 1
8	284	N Dogger	22.2	83.9	N/A 0
9	284	N Dogger	20.1	67.8	Echinocardium cardatum 1
10	284	N Dogger	20.1	78.6	Bivalve shell 1
11	284	N Dogger	20.9	73.2	Ammodytes sp. Head 1
12	284	N Dogger	20.8	86.2	Spisola sp. Shell fragments 1
13	284	N Dogger	20.6	83.5	Echinocardium cardatum fragments 1
14	284	N Dogger	23.1	113	Echinocardium cardatum fragments 1
15	284	N Dogger	20.4	71.5	Pagurus sp. Claw, bivalve siphon, digested matter 0
16	284	N Dogger	20.1	74.3	N/A 0
17	284	N Dogger	20.5	84.7	N/A 3
18	284	N Dogger	20.2	88.9	Ensis sp. Siphon, Echinocardium cardatum 2
19	284	N Dogger	20	70.1	Echinocardium cardatum 4
20	284	N Dogger	19.6	75.7	Bivalve siphon (Ensis sp.?) *2 4
1	286	West Dogger	19.1	61.8	Digested matter (DM), fullness 3
2	286	West Dogger	19.6	75.5	Nucula sp, echinocardium test, decapoda fragments, fullness 3
3	286	West Dogger	22.5	108.8	Liocarcinus, echinocardium test, nematoda, fullness 2
4	286	West Dogger	19.7	67.3	Nematoda, decapoda fragments, fullness 2
5	286	West Dogger	23	121.7	Nematoda, ensis sp, decapoda fragments, fullness 3
6	286	West Dogger	20.5	76.9	Decapoda fragments, fullness 1
7	286	West Dogger	21.2	91.1	Nucula sp, decapoda fragments, echinocardium, test, fullness 3
8	286	West Dogger	19.2	65.1	Bivalve foot, nematoda, fullness 2
9	286	West Dogger	19.2	71.3	Bivalve foot, shell fragments, fullness 2
10	286	West Dogger	19.3	64.7	Digested matter (DM), fullness 1
11	286	West Dogger	22.5	110.2	Bivalve shell fragments, digested matter, fullness 1
12	286	West Dogger	21.1	78.1	Nematoda, digested matter, fullness 3
13	286	West Dogger	22.4	107	Bivalve foot, digested matter, fullness 1
14	286	West Dogger	23.2	132	Nematoda, echinocardium test, fullness 2
15	286	West Dogger	24	140.3	Scald fish,echinocardium test, decapoda fragments, fullness 3
16	286	West Dogger	21.6	103.1	Nematoda, fullness 1
17	286	West Dogger	20.8	79.1	Nematoda, echinocardium test, fullness 1

18	286	West Dogger	22.2	106.5	Nematoda, digested matter, fullness 1
19	286	West Dogger	21.5	87.3	Enuis sp, nematoda, digested matter, fullness 1
20	286	West Dogger	23.5	132.4	Bivalve foot, digested matter, fullness 3
1	244	Amble	20.3	84.9	Crab limb, fullness 1
2	244	Amble	20.1	71.5	Crab limbs, clam,urchin spines, fullness 1
3	244	Amble	20.9	62.9	Spider crab, fullness 1
4	244	Amble	22.1	90.8	Ensis sp, shell x 2, fullness 1
5	244	Amble	21.6	96.7	Nephrops, fullness 1
6	244	Amble	24	125.5	Ensis sp, shell x 2, nephrops limb, fullness 1
7	244	Amble	23.1	116.2	Polychaeta, crab chela, fullness 1
8	244	Amble	22.2	113.6	Polychaeta, crab limb, fullness 1
9	244	Amble	20.8	84.3	Ammodytes sp, unid digestive matter, fullness 1
10	244	Amble	23.5	132.3	Pagarus sp, fullness 1
11	244	Amble	21.2	90.8	Crab claw, ensis sp shell, nephrop antenna, fullness 1
12	244	Amble	20.6	88.1	Spatangus spines (archia), crab limb and eggs, fullness 1
13	244	Amble	20.1	74.8	Amarodytes, digested matter, largis koreni, fullness 2
14	244	Amble	19.9	72.1	Alpheus sp, fullness 1
15	244	Amble	19.8	74.4	Decapoda fragments, digested matter, goby, fullness 2
16	244	Amble	18.9	62.4	Chlanuys sp, brittlestar fragments, polychaete fragments, digested matter, fullness 3
17	244	Amble	21.8	93.8	Polychaete fragments, digested matter, fullness 1
18	244	Amble	19.8	55.7	Digested matter, fullness 1
19	244	Amble	19.2	66.1	Hydroids, amphipoda, polychaete fragments, digested matter, fullness 3
20	244	Amble	19.5	66.9	Ensis, decapoda fragments, urchin spines, fullness 2
1	294	Tees Bay	20.4	74.7	Decapoda fragments, ophiuroida, bivalve shell fragments, digested matter (DM), fullness 2
2	294	Tees Bay	20	74.5	Pagarus sp, ophiuroidea, amphipoda, digested matter, fullness 2
3	294	Tees Bay	20.6	69	Ensis sp shell, decapoda fragments, digested matter, fullness 2
4	294	Tees Bay	20	73.1	Pagarus sp, digested matter, fullness 2
5	294	Tees Bay	20.7	74.5	Decapoda fragments, digested matter, fullness 2
6	294	Tees Bay	20.5	76.1	Ophiuroda fragments, amphipoda, digested matter, fullness 2
7	294	Tees Bay	20.1	71.5	Decapoda fragments, ophiuroidea fragments, digested matter, fullness 3
8	294	Tees Bay	20.2	67.8	Empty, fullness 0
9	294	Tees Bay	20.1	77.8	Decapoda fragments, digested matter, fullness 2
10	294	Tees Bay	20.9	85.3	Ophiuroidea fragments, decapoda fragments, digested matter, fullness 2
11	294	Tees Bay	21.5	80.8	Ophiuroidea fragments, digested matter, fullness 2
12	294	Tees Bay	20.2	74.6	Ophiuroidea fragments, pagarus sp, decapoda fragments, fullness 3
13	294	Tees Bay	20.9	90.4	Ophiuroidea fragments, decapoda fragments, nematoda, digested matter, fullness 2
14	294	Tees Bay	21.1	85.6	Pagarus sp, amphipoda, nematoda, digested matter, fullness 2
15	294	Tees Bay	20.5	75.6	Ophiuroidea fragments, digested matter, fullness 2
16	294	Tees Bay	21.2	91.3	Decapoda fragments, lagis kornei, digested matter, fullness 2
17	294	Tees Bay	20.5	65	Pagarus sp, digested matter, fullness 2
18	294	Tees Bay	20.2	79.6	Decapoda fragments, lagis kornei, digested matter, fullness 1
19	294	Tees Bay	20.4	72.3	Empty, fullness 0
20	294	Tees Bay	20	71.8	Decapoda fragments, fullness 1

1	344	Off Flamborough	22.6	124.3	3 X crab chela, shrimp, fullness 3
2	344	Off Flamborough	22.4	126.5	Liocarcinus depuvator, crab, bivalve, fullness 2
3	344	Off Flamborough	21.2	81.7	Empty, fullness 0
4	344	Off Flamborough	24	124.2	Unid matter rectal, fullness 1
5	344	Off Flamborough	20.9	79	Unid matter rectal, fullness 1
6	344	Off Flamborough	24	117.3	Ensis sp. Shell, fullness 1
7	344	Off Flamborough	23.2	118.6	Liocarcinus depuvator, fullness 1
8	344	Off Flamborough	22.7	125.7	Tellenidae, urchin spontangus, fullness 1
9	344	Off Flamborough	23	118.5	Empty, fullness 0
10	344	Off Flamborough	23.5	102.3	Empty, fullness 0
11	344	Off Flamborough	22.8	105.4	Hyroids, crab carapace, tustle shell, fullness 1
12	344	Off Flamborough	24.5	146.1	Empty, fullness 0
13	344	Off Flamborough	18.5	59.4	Ophuridea, unid matter, fullness 1
14	344	Off Flamborough	23.1	119.2	Liocarcinus depuvator, fullness 1
15	344	Off Flamborough	21.5	82.7	Unid fragments, decapoda fragments, digested matter, fullness 1
16	344	Off Flamborough	18.4	62.8	Decapoda fragments, digested matter, fullness 2
17	344	Off Flamborough	18.5	65.8	Digested mattter, fullness 1
18	344	Off Flamborough	18.5	64.5	Liocarcunis fragments, amphipoda, digested matter, fullness 1
19	344	Off Flamborough	18.5	66.4	Empty, fullness 0
20	344	Off Flamborough	18.5	61.6	Liocarcunius fragments, digested matter, fullness 1

Table 6. CTD rosette samples collected (aim 7)

Stn #	Date	Time	Latitude DD	Longitude DD	Station name	Water Depth (m)
6	06/07/2019	04:49	52.00274	2.340647	475	52
11	07/07/2019	01:33	52.78012	2.709139	Smiths Knoll	45
15	07/07/2019	20:19	53.29262	0.431898	377	21
19	08/07/2019	04:33	53.56715	2.075495	378	58
20	08/07/2019	15:10	54.03112	1.8345	346	78
23	09/07/2019	02:41	54.52297	2.701117	287	28
24	09/07/2019	07:16	55.262	2.89941	283	35
25	09/07/2019	14:11	55.07305	2.115196	284	36
27	09/07/2019	20:29	54.80215	1.282145	286	42
34	10/07/2019	19:44	55.24194	-1.25376	244	73
38	11/07/2019	03:58	54.77639	-1.13636	294	44
43	11/07/2019	20:07	54.22315	0.563884	344	63
44	11/07/2019	21:24	54.07654	0.512611	NUTRANS1	57
45	11/07/2019	22:30	53.92841	0.530919	NUTRANS2	31
46	11/07/2019	23:25	53.78373	0.554699	NUTRANS3	42
47	12/07/2019	00:23	53.61823	0.576916	NUTRANS4	27
48	12/07/2019	01:19	53.47427	0.747647	NUTRANS5	27
49	12/07/2019	02:24	53.34244	0.974069	NUTRANS6	31

50	12/07/2019	03:21	53.2331	1.137816	NUTRANS7	26
51	12/07/2019	04:19	53.10331	1.329727	NUTRANS8	29
52	12/07/2019	05:23	52.9557	1.528207	NUTRANS9	28
53	12/07/2019	06:26	52.83806	1.720967	NUTRANS10	45
54	12/07/2019	07:37	52.70397	1.795725	NUTRANS11	36
55	12/07/2019	08:47	52.57182	1.903954	NUTRANS12	33
56	12/07/2019	12:05	52.07118	2.111293	475	43

E. E. Manuel Nicolaus
Scientist in Charge
14/07/2019

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