Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL PROGRAMME

RV CEFAS ENDEAVOUR
Survey: C END 14 - 2017.

STAFF:

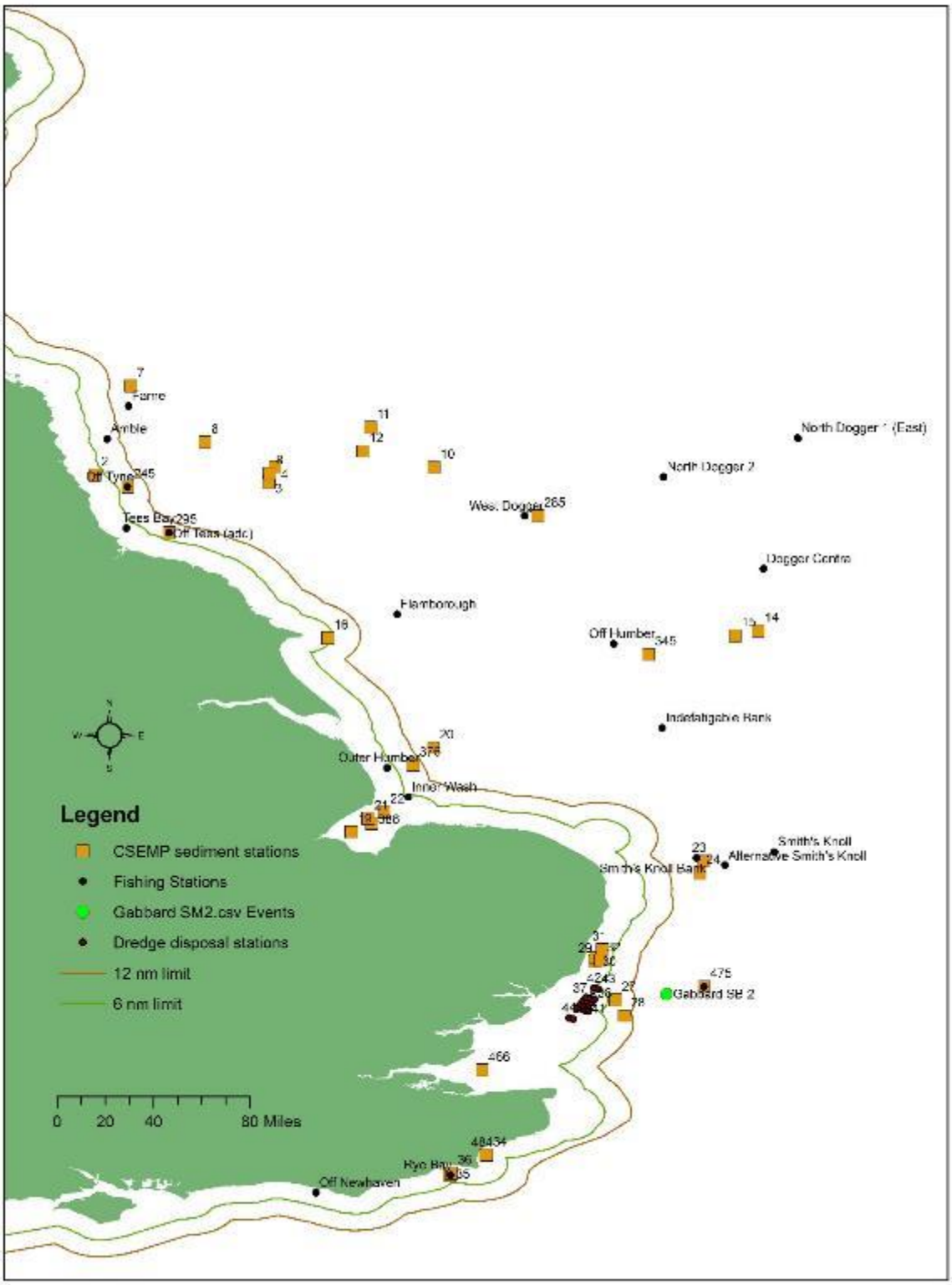
Name	Role	Shift
Manuel Nicolaus	SIC	Day
Alex Callaway	2IC	Overarching
John Bignell	Deck master	Day
Michelle Pond	Fish disease (FD)	Day
Sophie Hare	Data recorder; fish contaminant	Day
Chris Martin	Biological effects	Day
Paul Nelson	FD data and water	Day
Sara Stones	Benthic data	Overarching
Jon Barber	Chemistry	Overarching
Joanna Uzyczak	FD	Day
Stuart Ross	FD	Day
Craig Stenton	FD	Day
Fiona McNie	Marine Observer	Day
Alyce Lazenbury	Marine Observer	Day
Fahad Alajmi/ Alison Pettafor	Consultant/ MiST	Day/ Overarching
Dave Sivyer/ Tim Wilkinson	Consultant/ Litter	Day

DURATION: **Sail**: 5th July 2017 at ~7:36 from Lowestoft
Dock: 16th July in Portland at 16:40

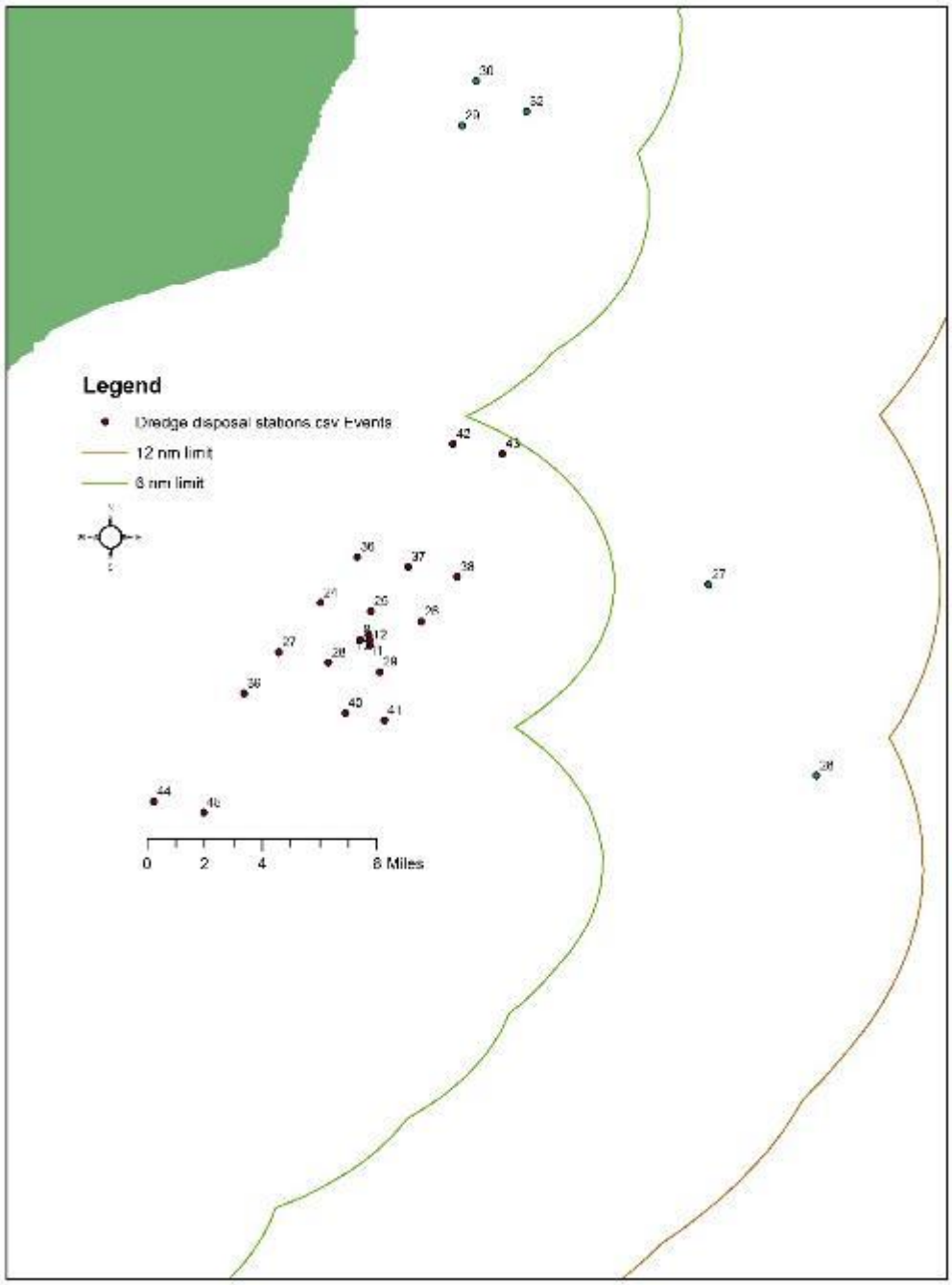
Grew change: 12th July at Lowestoft using a Pilot boat

LOCATION: North Sea and Eastern Channel

CSEMP fishing and, temporal/spatial sediment and dredge disposal stations



Harwich Dredge Disposal stations


Legend
Dredge disposal stations csv Events
12 nm limit
6 nm limit
0
2
4
8 Miles

A: CSEMP fishing stations and positions

Old 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
245fi	TyneTees_TTInter_fi02	Off Tyne	55.0083	-1.1333
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
288fi	ENorthSea_ENSOpenSea_fi01	North East Dogger (add)	55.504	4.1525
294fi	TyneTees_TTInter_fi03	Tees Bay	54.7597	-1.1397
295fi	TyneTees_TTInter_fi04	Off Tees (add)	54.7333	-0.8833
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
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
Smith's Knoll	ENorthSea_ENSOpenSea_fi02	Smith's Knoll	52.8111	2.7555
Alternative Smith's Knoll	Anglia_AnOpenSea_fi03	Alternative Smith's Knoll	52.7318	2.4585
Smith's Knoll Bank	Anglia_AnOpenSea_fi04	Smith's Knoll Bank	52.7746	2.2875

B: CSEMP sediment stations

Old NMMP No.	Sediment stations	Latitude	Longitude
245	**245**	**55.00830**	**-1.13330**
245 295 41	2	**55.08016**	**-1.32931**
East245 172	3	55.03647	-0.28368
East245 177	4	55.12906	-0.24673
295	**295**	**54.73330**	**-0.88330**
245 295 37	6	55.27639	-0.66774
245 295 38	7	55.61492	-1.11361
East245 178	8	55.09037	-0.27961
285	**285**	**54.83330**	**1.33330**
NorthWest285 47	10	55.12504	0.709716
NorthWest285 53	11	55.36638	0.327996
NorthWest285 57	12	55.22234	0.28162
345	**345**	**54.00000**	**2.00000**
345 26	14	**54.14151**	**2.659648**
345 29	15	54.11327	2.52067
West345 71	16	54.09909	0.071461
376	**376**	**53.33330**	**0.58330**
386	**386**	**52.98300**	**0.33470**
376 386 84	19	**52.93161**	**0.212574**
376 386 79	20	53.43713	0.705277
376 386 87	21	53.01238	0.312504
376 386 88	22	53.05071	0.408608
OffLowestoft 90	23	52.7562	2.330228
OffLowestoft 94	24	52.68425	2.308214
475	**475**	**52.00000**	**2.33330**
466	**466**	**51.49670**	**1.00000**
SouthWest475 105	27	51.92033	1.800022
SouthWest475 110	28	51.82437	1.854109
West475 125	29	52.15092	1.67608
West475 129	30	52.17334	1.683148
West475 133	31	52.224	1.721424
West475 134	32	52.15803	1.708337
484	**484**	**50.98330**	**1.01670**
484 187	34	50.98679	1.026147
South484 202	35	50.86562	0.801532
South484 208	36	50.87755	0.813552

C: Dredge disposal stations

Station	Longitude	Latitude
D8	1.624839	51.89254
D10	1.629047	51.8951
D11	1.629481	51.89248
D12	1.629542	51.88999
D24	1.604931	51.91131
D25	1.630242	51.90693
D26	1.655519	51.90174
D27	1.583954	51.88635
D28	1.608814	51.88116
D29	1.634795	51.87648
D36	1.623381	51.93425
D37	1.648947	51.92921
D38	1.673578	51.92421
D39	1.566353	51.8657
D40	1.617322	51.85575
D41	1.637036	51.85206
D42	1.671544	51.99097
D43	1.696325	51.98602
D44	1.521125	51.81129
D45	1.546111	51.80581

D: Plankton sample at West Gabbard Smart buoy 2 station

Station	y	x
Gabbard SB 2	51.95642	2.10703

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. After discussions with EA and NRW staff a coordinated approach is being taken to help deliver additional EQSD requirements for the EA and NRW.

Specific aims:

1. To collect samples of demersal fish (mainly dab *Limanda limanda*)for chemical analysis from the North Sea and Eastern Channel in support of the Clean Seas Environmental Monitoring Programme (CSEMP)

2. To collect fish samples at CSEMP sites for fish disease and biochemical markers (e.g. EROD, AChE and bile metabolites analysis) from the North Sea and Eastern Channel in support of the Clean Seas Environmental Monitoring Programme (CSEMP)

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), benthic fauna and marine litter from the North Sea and Eastern Channel in support of the Clean Seas Environmental Monitoring Programme (CSEMP)

4. To conduct marine litter surveys by collecting benthic litter information from the trawls and collecting sediment samples for litter analysis from the North Sea and Eastern Channel in support of the Clean Seas Environmental Monitoring Programme (CSEMP)

5. To conduct passive sampler transects to analyse samples for performance reference compounds (PRCs), PAHs, PCBs, OCPs and PBDEs in the water column using the Ferrybox water sampling system.

6. To conduct marine mammal and bird observations.

7. To collect samples near Harwich at a dredge disposal site (18 sites for hamon grabbing) plus ~6 hours of multi-beaming.

8. To collect a zooplankton and phytoplankton sample using a 1m diameter ring-net at the Gabbard Smartbuoy 2 station

Narrative:

4th July

The Scientific staff boarded the Cefas Endeavour at 15:00 on the 4th July. After staff boarding the vessel an induction for staff which were not on the vessel in the last 6 months was carried out by the safety officer of the P&O crew. Everyone settled in their cabin and then the scientists started to load the ship and set up the labs for the next day. Everyone finished work at 19:00.

5th July

The day started with a great sun-rise over Lowestoft. The pilot came on board at 07:30. We then made our way out of Lowestoft with the morning tide and sailed towards 2 sediment sampling sites (Lowestoft 90 and Lowestoft 94). We arrived at Lowestoft 94 and 90 at 12:47 and 13:36, respectively. We then sailed a bit further east to our first fishing station (Alternative Smith's Knoll). We carried out 2 tows there. The first one was not successful as the trawl did not connect with the seafloor properly. For the second tow, we put out 4x water depth cable out (200m). This time the trawl connected very well with the seabed and we caught enough dab to get processing under way. We then moved further east to the close by Smiths Knoll site and fished there for another two trawls, giving us enough dab for chemical analysis (50), and for biomarker, fish disease assessment (50) and stomach content analysis. Then we

used a CTD to get an accurate bottom temperature measurement. We moved to the Inner Wash to collect sediments at 4 stations.

6th July

We reached the first sediment station at 04:17 (377_386_84) and collected one sample for Metals/PSA and Organics. We then moved to the sext sediment station (CSMEP 386) where we collected sediments for fauna and PSA analysis, 2 x replicas for Metals/PAS and Organics, Litter and RFA between 5:12 until 5:31. We then moved on to the next sediment station (376_386_87) and collected one sample for Metals/PSA and Organics at 06:36. This completed the grabbing activities for the morning and we moved swiftly to the Inner Wash (CSEMP 387) fishing station. During the steam, marine mammal and bird observations took place by our dedicated specialists from MarineLife and SeaWatch. We reached the Inner Wash fishing station at 08:00. We carried out 2 tows here and finished fishing at 10:02. We were liaising with the MMO and staff from 2 Guard boats to stay clear of a cable while fishing. We collected 25 dab for chemical analysis. Following from this, we sailed to the Outer Humber fishing station and started trawling there at 12:02. We finished trawling there an 14:55. We collected 25 dab for chemical analysis and sampled 50 for biomarker and fish disease, and 20 dab for stomach content analysis. In between we used the CTD to take a bottom water temperature measurement. This completed the fishing activities for the day. We promptly steamed to the 2 sediment stations (CSEMP 376 and 376_386_79). We collected samples for fauna/PSA, Metals/PSA, Organics, Litter and Rapid Fine Assessment (RFA) at CSEMP 376 at 16:20. The ground was not suitable at station 376_386_79 to collect any samples there. We then moved North to the sediment station West354_71 where we collected one sample for Metals/PSA and Organics analysis. During the steam, marine mammal and bird observations took place. After completing all the sediment grabbing for the day at 21:45, we sailed east to the Indefatigable Bank (CSEMP 378) fishing station.

7th July

We steamed overnight to the Indefatigable Bank (CSEMP 378) fishing station. During the steam, marine mammal and bird observations took place between dawn until 05:30. The first tow started at 05:56 and finished 30 minutes later. We caught the 50-required dab for chemical analysis. The second tow started at 09:33 and finished at 10:03. We caught 80 dab in the right size range to carry out an assessment for biomarkers and fish disease, and 20 dab for stomach content analysis. In between we used the CTD to take a bottom water temperature measurement at 08:16. We left the Indefatigable Bank at 10:00 and sailed to the Off Humber (CSEMP 346) fishing station. During the 33 NM steam, marine mammal and bird observations took place. We reached the Off Humber (CSEMP 346) fishing station at 13:00 and started trawling at 13:13. We carried out 2 trawls and finished fishing here at 15:15. After fishing, we used the CTD to take a bottom water temperature measurement at 15:29. This finished the fishing activities for the day. We caught 50 dab for chemical analysis and 80 dab for fish disease and biomarker assessment, and 20 dab for stomach content analysis. The processing of the 80-dab finished at 18:00. In between, we also collected sediments at the CSEMP 345 station at 16:32. 4 dips were undertaken to collect samples for PSA/Fauna, 2 for Metals/PSA and Organics, and one for Litter and RFA. During the steam, marine mammal and bird observations took place. After grabbing was finished, we sailed to the sediment station 345_29. Again, during the steam, marine mammal and bird observations took place. We reached the sediment station at 19:00. We collected one sample for Metals/PSA and organics at 19:02. Then steamed to the sediment station 345_26. During the steam, marine mammal and bird observations took place. We reached the sediment station at 19:47. This completed all the sampling operations for the day and we steamed to the Dogger Central (CSEMP 287) fishing station. During the steam, marine mammal and bird observations took place until dusk.

8th July

Fishing started at Dogger Central (CSEMP 287) station at 06:01 and finished at 9:56. We towed 3 times and caught 50 dab for chemical analysis and 80 dab for fish disease and biomarker assessment, and 20 fish for stomach content analysis. In between we took a CTD profile sample at 08:25, to measure the bottom seawater temperature. Following this we steamed for 45 NM to the North (East) Dogger 1 (CSEMP 283) station. During the steam, marine mammal and bird observations took place. The weather was very good to carry out the observations at a sea state of 2-3. We reached the North (East) Dogger 1 (CSEMP 283) station at 14:00. Fishing finished at 14:32. We caught all required dab in one tow, which means 50 dab for chemical analysis and 80 dab for fish disease and 20 for biomarker assessment, and 20

fish for stomach content analysis. The size ranges of dab include 50 dab at size range 20 to 23cm. 80 dab for fish disease are separated in 20 fish between 20 and 24cm; 30 fish over 20 cm and 30 fish between 15 and 19.9 cm. We left the North (East) Dogger 1 (CSEMP 283) station at 16:00 and made our way to the North Dogger 2 (CSEMP 284) station, which we reached at 19:00. The first trawl started at 19:01, putting us 12 hours ahead of schedule. The first trawl looked very promising and sample processing started. Fish were topped up at 21:20 with a short 15 min tow, to ensure we had the required dab numbers and we made our way to the West Dogger fishing station. All 50 dab for chemical analysis and 80 dab for fish disease and 20 for biomarker assessment, and 20 fish for stomach content analysis were collected from the North Dogger 2 (CSEMP 284) station. Sample processing finished at 22:00.

9th July

We arrived at the West Dogger fishing station in the morning and started trawling at 09:01. Two tows were sufficient to get our required dab numbers together for the various size classes. We carried out a CTD at 11:24, which was followed by a short steam to the CSEMP 285 grabbing station. Due to the rather shelly muddy sandy sediment type, it took 6 attempts to get our required samples for fauna/PSA, 2x metals/PSA, 2x organics, 1x litter and 1x FRA. This all happened between 12:40 and 12:56. We then sat sail to the Farne fishing station (CSEMP 243), around 100 NM away. On the way, we collected sediment samples at 8 stations (NorthWest285 47 at 15:34, NorthWest285 53 at 17:33, NorthWest285 57 at 18:29, East245 172 at 21:13, East245 178 at 21:48, East245 177 at 22:15, 245 295 37 at 23:58 and 245 295 38 at 03:00). During most of the transit (daylight hours), marine mammal and bird observations took place. The weather was very good to carry out the observations at a sea state of 2-3. All the scientists and crew were mesmerised by the beautiful full moon that lid up the sky and made us wonder who the werewolves were while playing one of our favourite past-time games called Werewolf. Another game many of us liked to play was the bean game.

10th July

As mentioned above we finished off some sediment grabbing work in the early morning hours at 03:00. We made our way straight to the next fishing station at Farne (CSEMP 243). We started trawling there at 06:00 with 430m warp out. We caught a good amount of dab to get fish disease, biological effects and stomach content sampling going. Another 2 tows with 440m warp out ensured we had enough dab to complete sampling there (50 dab for chemical analysis and 20 dab for fish disease and biomarker assessment, and 20 fish for stomach content analysis). We also caught some nephrops for gut content analysis. After fishing was complete we measured the bottom water temperature using a CTD and made our way to the next fishing station at Amble (CSEMP 244). We arrived there shortly after lunch at 12:25. 2 tows were sufficient to get us enough fish (50) for fish disease, biological effects and stomach content analysis. We also caught enough dab (50) for chemical analysis back at the Cefas headquarters in Lowestoft. This completed fishing for the day. We made our way to the sediment station (245 295 41) and arrived there at 16:20. One sample for Metals/PSA and Organics was collected. We then sailed to the next sediment station (CSEMP 245). We arrived there at 17:30 and collected sediments for fauna/PSA, 2x Metals/PSA, 2x Organics, 1x Litter and 1x RFA assessments. After this we made our way to the CSEMP 295 sediment station. During all the steams, today, marine mammal and bird observations took place.
After all the sediment collections were complete, we made our way to the Tees Bay (CSEMP 294) fishing station.

11th July

Fishing at Tees Bay (CSEMP 294) started at 07:27. We completed 3 tows at this site. Fishing finished at 10:24. We caught enough dab (50) for fish disease, biological effects, stomach content analysis and chemical analysis. A CTD dip was carried out to measure bottom water temperature. Following this the SiC attended the ship's Safety Committee Meeting to find out all new rule and regulations. It became apparent that no staff (crew or scientific) are allowed into the wet lab without safety boots on, non-regardless of the work carried out in there. It was suggested to put up new signs as this was a grey area and left room for interpretation. Controversially, safety boots are not required in the garage area. We started steaming to Flamborough (CSEMP 344) at 11:05. During the 5-hour steam, marine mammal and bird observations took place. Fishing started at Flamborough after dinner at 17:38. We completed 3 tows, of which the last one was only 20 min to get enough dab (80) for fish disease, biological effects, stomach content analysis and chemical analysis. Towing finished at 20:52. A CTD

dip was carried out between tow 2 and 3 at 20:09. Fish processing finished at 22:00. Following the last trawl, we started our transit to Lowestoft for a staff transfer.

12th July

During the transfer to Lowestoft, the weather picked up a bit (sea state 6-7), which put doubt on a safe transfer of staff using the ship's work boat or a pilot boat (08:00). Another option was to bring the Cefas Endeavour into port. I checked with the Cefas office if this was ok and it was signed off via email. Further discussions between the pilot and Master of the Cefas Endeavour revealed that this was not possible either due to the wind conditions. At 10:30 it was confirmed that a transfer with the pilot boat is the safest option. The pilot boat reached the Endeavour at 10:50. The first person disembarked safely. At 11:10, the second person disembarked safely. The pilot boat made its way back to Lowestoft port to pick up 2 Cefas scientists. The Cefas scientists boarded the ship safely at 11:55, just in time for dinner. After this, the pilot boat went back to port, to collect a new engineer. All staff were safely on board by 12:40, and we continued our voyage south to the Harwich dredge disposal site. On route, we collected 4 more spatial sediment stations (West475 133, West475 134, West475 129 and West475 125). We reached the dredge disposal site at 16:50, and started work there after each staff member went through a thorough induction to the hamon grab. Actual grabbing work started at 18:00. The first 9 stations were completed by midnight.

13th July

Between 00:00 and 06:00 the Dredge disposal site was characterised using a multibeam system (more details in the result section). This work finished at 06:00. Another 11 stations were grabbed, which finished at 12:45. At 11:20 the P&O safety officer informed scientific staff and crew that gloves need to be worn when operating the grabs. This was not mentioned in the Cefas SOPs or Risk Assessments. The SiC informed the Cefas H&S staff and the RV Cefas Endeavour representative back at Cefas about these developments. Both knew about this, but did not share this with the SiC of the survey, showing a lack of communication. Cefas staff on board tried different gloves on board on which none were ideal for the task in hand, as they caused more problems (skin irritation on the hand due to wetness and fine particles seeping through the fabric.

Following this, we made our way to the CSEMP sediment station 466 in the Thames estuary. We finished grabbing there at 15:28. We collected sampled for PSA/Fauna, 2xMetals/PSA, 2x Organics, Litter and RFA. After this, we made our way back NE to the Gabbard grabbing station (CSEMP 475), collecting 2 spatial sediment stations (South West475 105-and 110) on the way at 19:31 and 18:43, respectively. We also collected a plankton sample at the West Gabbard 2 Smartbuoy 2 station at 21:12, using a 1m diameter ring-net. The working day finished at 22:24 with grabbing at the CSEMP 475 sediment station. We collected sampled for PSA/Fauna, 2xMetals/PSA, 2x Organics, Litter and RFA.

14th July

The morning started very calm. The wind and waves were calm. I reached the bridge at 5:45 to get ready to shoot the trawl at the Thames Gabbard (CSEMP 475) fishing station. The net reached the bottom at 5:59. 30 minutes later we brought the trawl back up with a decent number of dab. We also caught a big fender tyre with a 1m diameter. We made our way back to the start of the trawl line to go again. We trawled here 4 times in total to get the required dab numbers for chemical analysis, fish disease, biological effects and stomach content analysis. Fishing was completed at 11:16. A CTD was deployed between tow 3 and 4 to measure the bottom water temperature at 45 m depth. Shortly after all trawling activities were finished (11:50), we started steaming to the first (484 187) of 4 sediment stations (CSEMP 484, South484 202 and South484 208) for the day. After having some discussions with the Captain earlier this morning it was agreed that we have a first aid drill at 11:00. I came up with the scenario. A scientist went to the net-store to pick up some buckets. He contacted another scientist saying he will be back in 5 min. Scientist one got trapped in a swinging door where the hook was blocked with a metal wire. The scientist injured its leg with an open flesh wound and a broken foot. As the second scientist, did not check on scientist one for 10 min, the captain informed me about this and I asked scientist two where scientist one is. The answer was net-store. I then went to the net-store and found scientist one with the above-mentioned injuries. Scientist two only appeared 20 min later to check on scientist one, by which I had already raised the alarm and the first aid team had already responded. The drill had demonstrated that everyone needs to be more vigilant and aware of staff's whereabouts to be able to respond quicker in emergency situations. As the 14th July was also the day of the Defra sports day, we carried out a CSEMP sports afternoon between 15:30 and 17:00.

Grabbing activities finished at 20:45 for the day. Then we steamed to the Rye Bay (CSEMP 486) fishing station.

15th July

Fishing at the Rye Bay (CSEMP 486) station started at 06:00 with the trawl on the bottom. Three tows were required to get the required dab numbers (50 dab for chemical analysis and 80 dab for fish disease and biomarker assessment, and 20 fish for stomach content analysis. We then steamed to the Off Newhaven (CSEMP 494) fishing station. During the 3-hr steam, marine mammal and bird observations were carried out. Fishing started after lunch at 12:44. 3 tows were required to collect the necessary dab. 50 dab for chemical analysis and 70 dab for fish disease and 20 for biomarker assessment, and 20 dab for stomach content analysis. Fishing finished at 15:25 and processing at 16:55. After tea, everyone started tidying away all the sampling equipment and consumables used for the survey. The labs and sampling equipment were cleaned thoroughly. This finished at 20:30. The evening finished with the research staff spending the evening together watching a film and playing the werewolf game.

16th July

We anchored the ship just outside Portland harbour at 09:00 as the pilot boat was booked for 15:00. At 12:30 we had a wash up meeting to get scientists and crew together for some final words by the master and myself. A few awards were also handed out to scientific staff and crew members. Ian Taylor (P&O) was awarded a Gold Star award for his dedication on the research vessel. Within the scientists, Paul Nelson received the Scientist of the survey award. The CSEMP sports award went to Alex for gaining the most point over the 5 different disciplines. John and Michelle received awards for the longest plank and side plank, respectively, and Sophie received her stage 1 otolithing certificate.

Overall, the voyage was a full success and I would like to thank all scientists and crew for their great commitment during the survey. We docked in Portland harbour at 16:30.

Results

Dab were caught at all 16 fishing stations, with 41 tows. From all 16 fishing stations, we could take at least 25 dab back to the Cefas Laboratory for chemical analysis (aim 1). Fish disease, biomarker and stomach content analysis could be carried out at 15 stations (aim 2). The Inner Wash station was the only one where we did not catch enough dab to carry out a Fish disease, biomarker and stomach content screen. In total, we sampled 1010 dab to screen for 14 different obvious fish diseases that can be detected by visual examination. 1148 times did they occur in the 1010 sampled dab. The most abundant occurrence was hyperpigmentation to the skin (518 times). A breakdown of the fish disease observations can be seen in table 2. Table 3 gives an overview of the 300 stomachs that were sampled at 15 fishing stations. We also collected the bottom water temperature at the same 15 fishing stations where we carried biomarker analysis.

Sediment samples were collected at 34 stations for the CSEMP programme (aim 3) and at 20 stations for the Harwich dredge disposal site (aim 7). A breakdown on what was collected where can be seen in table 4. Overall, 243 samples were collected for either Fauna/PSA, Metals/PSA, organics, litter or RFA. At 2 stations (376_386_79 and SouthWest475_110) the ground was not suitable to collect sediments for chemical analysis. Table 5 and 6 show the all the pictures that were taken of the grabs on the 1mm and 5mm sieve. A preliminary EUNIS categorisation was included as well.

Litter was also collected during each of the 41 fishing tows (aim 4). In total 33 litter items were collected. Figure 1 provides a percentage overview of the items collected.

Passive samplers were used during the entire survey to analyse the water quality around the English North Sea and Eastern Channel aim 5).

Marine mammal and bird observations took place during the entire survey when we were steaming between fishing and sediment stations (aim 6). Table 7 gives an overview of the different birds observed on a specific day. A quick summary provided by Fiona McNie can be read here. "The route crosses several areas of interest where certain species would be expected, and areas where less is understood. Survey periods were not pre-selected, and

although are not randomly generated, where done across the full range of conditions without any consideration of what may be expected. There were 30 individual sighting records, mainly of individuals, culminating in a total of 43 mammals spotted (Table 8). The column on the right shows numbers of mammal sightings with 2 Marinelife surveyors (one also does bird counts), from the North Sea CSEMP survey following similar routes and stations in 2015 for comparison. Larger numbers of seals were seen in 2015 pushing the total up significantly, as the random positioning of sampling stations for Cefas means the Endeavour was much further into the Wash last time, so large colonies of seals were picked up during the 2015 survey, but not the 2017 survey. Numbers are unlikely to be identical as conditions are not identical, route is not identical, and these numbers have not yet been "effort corrected". Further incidental sightings were noted in 2017, these were either seen by others during the survey, or were seen outside of an effort related survey period (Table 9)".

As part of the characterisation of the Harwich dredge disposal site, a 6 hr multibeam survey was conducted. In figure 2, the bathymetry can be seen. A separate report was compiled.

A plankton sample was collected at the West Gabbard 2 smartbuoy station (aim 8).

Table 1. Overview of stations and fish collected at each station for the various parameters.

New Station Name	Latitude Mid tow	Longitude Mid Tow	Date Fished	Station	Fish chemistry	Biomarker
Farne	55.48896389	-1.111341667	10/07/2017	10	2X25 dab	EROD; BILE; AChE; 20 FD
Amble	55.28654583	-1.2574375	10/07/2017	11	2X25 dab	EROD; BILE; AChE; 50 FD
North Dogger 1 (East)	55.29135833	2.900275	08/07/2017	7	2X25 dab	EROD; BILE; AChE; 80 FD
North Dogger 2	55.0646875	2.085354167	08/07/2017	8	2X25 dab	EROD; BILE; AChE; 80 FD
West Dogger	54.77510833	1.2964375	09/07/2017	9	2X25 dab	EROD; BILE; AChE; 80 FD
Dogger Central	54.53468056	2.680097222	08/07/2017	6	2X25 dab	EROD; BILE; AChE; 80 FD
Tees Bay	54.75516944	-1.135186111	11/07/2017	12	2X25 dab	EROD; BILE; AChE; 50 FD
Flamborough	54.231125	0.533766667	11/07/2017	13	2X25 dab	EROD; BILE; AChE; 80 FD
Off Humber	54.05391667	1.827366667	07/07/2017	5	2X25 dab	EROD; BILE; AChE; 80 FD
Outer Humber	53.32051389	0.416808333	06/07/2017	3	1X25 dab	EROD; BILE; AChE; 50 FD
Indefatigable Bank	53.55494583	2.083866667	07/07/2017	4	2X25 dab	EROD; BILE; AChE; 80 FD
Inner Wash	53.14619583	0.571283333	06/07/2017	2	1X25 dab	None
Thames (Gabbard)	52.04509375	2.093647917	14/07/2017	14	2x25 dab	EROD; BILE; AChE; 50 FD
Rye Bay	50.83013056	0.786944444	15/07/2017	15	2x25 dab	EROD; BILE; AChE; 80 FD
Off Newhaven	50.75606667	0.026466667	15/07/2017	16	2x25 dab	EROD; BILE; AChE; 70 FD
Smith's Knoll	52.801725	2.723641667	05/07/2017	1	2X25 dab	EROD; BILE; AChE; 50 FD

Table 2. Observed occurrences of 14 different fish disease

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
25	**30**	**18**	**518**	**20**	**1**	**150**	**160**	**12**	**150**	**48**	**3**	**2**	**11**

Table 3. Stomach content analysis at 20 fish from 15 sampling sites

LOCATION	Length (cm 1dp)	Weight (g)	SEX	STOMACH ANALYSIS
Smiths Knoll	21.4	95.1	M	Mysidea, sediment 0-1
Smiths Knoll	20.2	84.6	M	Pagarus, hydrozoa, amphipoda, lagi kaeri 1-2
Smiths Knoll	20.9	89	M	Hydrozoa, amphipoda, sand 1-2
Smiths Knoll	21.5	93	M	Echinocadium test, hydrozoa, amphipoda, polychaeta tube. Sand 2-3
Smiths Knoll	21.8	97.6	M	Oplinera albida, hydrooa, amphipoda, Echinocardium pusillus test, sand 3
Smiths Knoll	20	77.3	M	amphipoda, hydrozoa, caprellidae 1
Smiths Knoll	21	81.8	M	hydrozoa, sand 0-1
Smiths Knoll	21.8	89.6	M	lagis koreni, hydrozoa, cridaria 1-2
Smiths Knoll	21.5	104.4	M	decapoda, edinoderia spine, sediment, glyceridae frag 3
Smiths Knoll	21.8	95.2	M	sediment, edinoderia spines, mollusc shell frag 2
Smiths Knoll	21	89.8	F	cysts 0
Smiths Knoll	21.8	105.9	F	echinocyanus pusillus, mysidae, mollusc shell frag, sand 2
Smiths Knoll	22.1	94.8	F	empty 0
Smiths Knoll	23.9	132.2	F	hydrozoa nemertesia, ophura alpida, coprellidae, Echinocardium spines 2
Smiths Knoll	20.9	89.8	F	pagarus, liocarcinus leg, hydrozoa, amphipoda, sand & shell frag 3
Smiths Knoll	21.8	91.1	F	hydrozoa, Echinocardium test, liocarcinusjuv 1
Smiths Knoll	21.5	99.3	F	oweria fusillis, hydrozoa, decopoda, ophiuroidea, meatoda, sand 1
Smiths Knoll	21.4	87.3	F	ophiuroidea, hydrozoa, pagarus, amphipoda, sand &shell
Smiths Knoll	22	106.3	F	echinocyamus pusillus, litter, echinodera spines, brittlestar arms, sand 1
Smiths Knoll	20.9	85.5	F	Echinocardium test, hydrozoa, digested arthopoda, decapoda, sediment 1
Outter Humber	21	81.8	M	small amount of faecal matter 0
Outter Humber	21.3	81.8	M	liocarcirus juv 1

Outter Humber	23.9	119.7	M	pagaras, nematoda, logis koreri, macropodia, amphipodia, sabella tube, sediment 3
Outter Humber	21.8	91.2	M	empty 0
Outter Humber	21.1	105.6	M	digested matter, sabella tube frag 1
Outter Humber	22.1	105	M	part ophiua albida, amphipoda 0-1
Outter Humber	21.8	93.4	M	sand, stone, sabella tube frag 2
Outter Humber	21	75.3	M	bivalue shell frag 0-1
Outter Humber	19	64.1	M	bivalue shell frag, disgested matter
Outter Humber	19	61.7	M	amphipoda, pagarus 1-2
Outter Humber	21.6	115.6	F	faecal matter 0-1
Outter Humber	21.5	109.4	F	faecal matter, stones 0-1
Outter Humber	24	122.7	F	faecal matter 0-1
Outter Humber	22.1	97.1	F	digested matter, faecal matter 1-2
Outter Humber	22.1	101.7	F	sand. faecal matter 0-1
Outter Humber	22	118.3	F	bivalue shell frag, faecal matter, sand 0-1
Outter Humber	23.9	123.1	F	pagarus, liocarcinus 1-2
Outter Humber	22	83.4	F	faecal matter 0-1
Outter Humber	21.5	98.6	F	sand, faecal matter, bivalue shell frag 1-2
Outter Humber	21	75.9	F	faecal matter, nucala sulcata 0-1
Indefatigable Bank	20.5	77.3	F	Sediment, amphoda well digested 2
Indefatigable Bank	23	125.5	F	whole tellinidae, Echinocardium test frag 2
Indefatigable Bank	23.5	117.1	F	Echinocardium test frab., brittle star arm frag 2
Indefatigable Bank	21.9	108.4	F	whole tellinidae disgest soft tissue, bittlestar arm farg 3
Indefatigable Bank	20.8	78.7	F	ophiura ophiura, tellimidae whole & frag, decapoda frag 2
Indefatigable Bank	23	92.3	F	decapoda leg frag, tellinidae whole & frag, brittlestar arm frag 0-1
Indefatigable Bank	20.4	65.9	F	sertallaria, sabella tube frag 1-2
Indefatigable Bank	22	102.5	F	tellinidae whole & frag, brittlestar arm frags 1-2
Indefatigable Bank	21.1	90.5	F	sertallaria, tellimidae whole & frag, brittlestar arm frag 1
Indefatigable Bank	21.9	100.1	F	empty 0
Indefatigable Bank	22.2	113.1	M	opicera albida, tellinidae shell frag 0-1
Indefatigable Bank	21	82.5	M	hydrozoa, amphipoda 0-1
Indefatigable Bank	20.5	79	M	liocarcirus hepuratr juv, bivalve whole specimen 0-1
Indefatigable Bank	21.5	103.6	M	tellinidae whole & frags 4
Indefatigable Bank	20.6	79.5	M	sediment, whelk drilled bivalve 1
Indefatigable Bank	22	101.5	M	bivalve frag, Echinocardium test frag 1
Indefatigable Bank	20.5	68.2	M	tellinidae whole & frag, decapoda 2
Indefatigable Bank	20	76.7	M	tellinidae whole, bivalve frag 1-2
Indefatigable Bank	20.3	79.3	M	tellinidae whole & frag
Off Humber	21.4	78	F	bivalve shell frag, decapoda, sediment 1-2
Off Humber	21.6	81.5	F	sabellidae, bivalve frag, small sediment 0-1

Off Humber	24	135.9	F	hydriod, faecal matter, decapoda frag, sediment 4
Off Humber	21.5	80.5	F	lagis koreni, sediment 2
Off Humber	20.8	84.5	F	sabellia tubes, crangon, amphipoda, lagis, sediment 1
Off Humber	21	84.7	F	sabellia tubes, echinocardium test frag, digested matter, tellimidae whole, sediment 1-2
Off Humber	22.8	115.4	F	hydrozoa diphasia, sabellid tube, decapoda frag, anthopodia, hiatella, bivalve cfrag, mysidae 4
Off Humber	21.9	89.8	F	bivalve frag, Echinocardium test frag 1
Off Humber	22.4	105	F	Echinocardium test frag, decapoda frag, sand 1-2
Off Humber	21	86.2	F	very large polychaete (parchent worm) 3
Off Humber	20.4	76.5	M	Echinocardium test frag, pagarus, sabellid tube 0-1
Off Humber	20.8	84	M	hommarus garmmarus, polychaete chaetae 2
Off Humber	19.6	65.7	M	bivalve shell frag, hydrozoa, sediment 0-1
Off Humber	20.5	74.3	M	hydrozoa, polychaete tubes, amphipoda, Echinocardium test frag, decapoda juv, lagis koreni, sediment 1
Off Humber	23.2	104.3	M	decapoda juv, Echinocardium test frag, hydrozoa, 0-1
Off Humber	21.4	86.8	M	amphipoda, sabellid tubes, Echinocardium m test frag, sand 0-1
Off Humber	19.5	69.4	M	bivalve frag, Echinocardium test frag 1-2
Off Humber	19.5	64	M	inscect wings & body (hover fly), amphipoda, small sabellia tubes, bivalve shell frag, decapoda juv, sediment 1-2
Off Humber	20.8	77	M	Echinocardium test frag, decapoda frag & juv, caprellidae, amphipoda 0-1
Off Humber	20	61.4	M	hydrozoa, amphipoda, small sabellua tubes, galathowenia, Echinocardium test frag, bivalve frag, sediment 2
Central Dogger	24	73.8	M	Ensis sp. fragments. Amphipoda sp. Decapoda juv. Digested matter 0-1
Central Dogger	21	86.9	M	Corystes juv. Faecal matter 0-1
Central Dogger	25	75.4	M	Ensis sp. fragments. Tellinidae - whole specimen, Amphipoda sp. Decapoda. Digested matter 0-1
Central Dogger	19.5	83.6	M	Polychaeta sp. Corystes juv. 0-1
Central Dogger	20	66.7	M	Bivalve shell fragments. 0
Central Dogger	19.9	79.5	M	Decapoda fragments. Liocarcinus & Pagarus spp. Polychaeta - Tentacled tubeworm 2
Central Dogger	20.2	82	M	Pagarus sp. Faecal matter 1-2
Central Dogger	20.5	77.9	F	Pagarus sp. Sabellidae, Polychaeta, Faecal matter, Bivalve shell fragments. 2
Central Dogger	20.7	78.4	M	Ensis sp. shell frag, Decapoda juv. Faecal matter 0-1
Central Dogger	25.2	153.5	F	Ensis sp. Liocarcinus sp. Gobidae, Mysidae, Echinocymus pusillus 4
Central Dogger	20.9	90.6	F	Pagarus sp. 2
Central Dogger	20.5	76.5	F	Nematoda, Decapoda juv. Ensis sp. shell fragments. Faecal matter 0-1
Central Dogger	25.5	154.6	F	Cnidaria - Anemone INDET. Pagarus sp. juv. Faecal matter 0-1
Central Dogger	21	88.6	F	Polychaeta. Echinoderm spine. 0
Central Dogger	20.5	80.5	F	Mollusc tissue 1
Central Dogger	24.2	116.6	F	Spionidae, Amphipoda sp. 0
Central Dogger	20	78.2	F	Amphipoda sp. Cumacean 0-1
Central Dogger	20	77.5	F	Fish tail - sandeel? Polychaeta spp. Decapoda juv. Sediment 1
Central Dogger	21.8	85.8	M	Crangon juv. Polychaeta sp. 0
Central Dogger	22.5	96.9	M	Pagarus sp. Digested matter, Echinocyamus pusillus, Polychaeta, Bivalve shell frag 0-1
North East Dogger	23.7	111.9	M	Empty 0
North East Dogger	21.2	76.7	M	Decapoda, Nuculidae, Bivalve shell fragments. Sediment 1
North East Dogger	24.4	129.7	M	Empty 0
North East Dogger	20.8	71.2	M	Empty 0

North East Dogger	21.8	106.5	M	Pagarus sp. Mollusc tissue 1
North East Dogger	20.3	74.3	M	Decapoda INDET, Ebalia sp. 1
North East Dogger	20.5	88.8	M	Bivalve - whole specimen, Bivalve shell fragments., Cumacean, Brittlestar arm fragments. Faecal matter 0-2
North East Dogger	23.3	116.4	M	Nematoda, Decapod eggs, Decapoda fragments. Faecal matter 1
North East Dogger	21.9	100.7	M	Brittlestar fragments. Decapoda fragments. Amphipoda sp. Sediment 3
North East Dogger	20.1	76.1	M	Fish INDET 1
North East Dogger	23.3	120.9	F	Astropecten irregularis arms, Bivalve shell fragments. Amphipoda 2
North East Dogger	20.5	65.9	F	Nematoda, Bivalve, Corystes sp. 3
North East Dogger	22.5	105.5	F	Bivalve shell fragments. Fish tissue 2-3
North East Dogger	24	145.2	F	Bivalve shell fragments. Echinocardium test fragments. Decapoda eggs 4
North East Dogger	23.5	120.2	F	Empty 0
North East Dogger	22.8	126.7	F	Pagarus sp. Faecal matter 3
North East Dogger	21.8	102.3	F	Mollusc tissue, Liocarcinus sp. Bivalve shell fragments. 2
North East Dogger	22.5	97.5	F	Brittlestar fragments. Decapoda fragments. Amphipoda sp. Sediment 2
North East Dogger	22.1	94.6	F	Pagurus sp. Ensis sp. fragments. Nematoda 0-1
North East Dogger	21	80.4	F	Pagurus sp. Bivalve shell fragments. 2-3
North Dogger	22.3	131.3	F	Nematoda - multiple, fish tissue - sandeel 1
North Dogger	23.2	137.5	F	Sandeel - multiple 2
North Dogger	20.5	72.6	F	Digested fish, Echinocardium test fragments 1
North Dogger	22.2	103	F	Echinocardium test fragments, Nuculidae, Nematoda 2
North Dogger	21.2	84.7	F	Echinocardium test fragments, Faecal matter 0-1
North Dogger	20.9	86.2	F	Sandeel 0-1
North Dogger	22.5	110.8	F	Sandeels - multiple, Decapoda fragments, Amphipoda sp. 2
North Dogger	21.2	75.5	F	Echinocardium test fragments, Ensis shell fragments 1
North Dogger	21.2	97.2	F	Faecal matter 0-1
North Dogger	20.3	68.8	F	Faecal matter 0
North Dogger	21.3	98.7	M	Sandeels - multiple 2
North Dogger	21.2	81.6	M	Faecal matter 0-1
North Dogger	20.6	88.7	M	Sandeels - multiple, faecal matter 1
North Dogger	22.8	121	M	Sandeels - multiple, faecal matter 4
North Dogger	20	66.1	M	Decapoda fragments, Echinocardium test fragments 1
North Dogger	20	69.6	M	Ensis sp. Fragments, Brittlestar fragments, Sabellidae 3
North Dogger	22	72.4	M	Sandeel, faecal matter 1
North Dogger	20	72.4	M	Sandeel, stones, faecal matter 2
North Dogger	20.4	69.2	M	Isopoda, Decapoda fragment 1
North Dogger	21	84.3	M	Pagarus fragments 0
West Dogger	21.5	93.4	M	Decapoda fragments 0-1
West Dogger	21	79.4	M	Decapoda fragments, Amphipoda, faecal matter 1
West Dogger	19.2	63.8	M	Echinocardium test fragments, Decapoda fragments 1-2
West Dogger	23	86.4	M	Nematoda, Decapoda fragments, Echinoderm spines 1

West Dogger	21.4	72.7	M	Digested fish - sandeel? Cysts 1
West Dogger	23.7	135.5	F	Sandeel, dissolved fish 1
West Dogger	21.2	93.1	F	Echinocardium test fragments, Isopoda sp. 2
West Dogger	22.8	117	F	Faecal matter 0-1
West Dogger	21.5	97.7	F	Echinocardium test fragments, Bivalve test fragments, Polychaete 4
West Dogger	23.7	134	F	Sandeel, dissolved fish, faecal matter 3
West Dogger	24.2	134.1	F	Echinocardium test fragments 1-2
West Dogger	22.7	145.3	F	Sandeel, dissolved fish, Echinocardium test fragments, Nematoda 3
West Dogger	21.2	139.2	F	Nematoda, Decapoda fragments, Echinocardium test fragments, Amphipoda sp, Polychaeta 2
West Dogger	20.2	70.4	F	Pagarus sp. Echinocardium test fragments, faecal matter 3
West Dogger	21.2	102.5	F	Mollusc tissue, Sandeel, faecal matter 1
West Dogger	19.7	74.5	M	Nematoda, Ebalia sp., Decapoda fragments, Pagarus sp, Echinocardium test fragments 1
West Dogger	20.6	74.6	M	Fish bones, Amphipoda sp. 0
West Dogger	19.8	61.1	M	Echinocardium test fragments 1-2
West Dogger	19.4	67.5	M	Decapoda juv. Mysidae, Echinocardium test fragments, Polychaeta sp. 2
West Dogger	19.5	75.8	M	Echinocardium test fragments, Pagarus sp. Fragments, Decapoda sp., Sand, digested matter 2-3
Farne	20.7	88.8	M	Polychaete *sp.*Calocaris, Decapoda fragment - Ophiurudae, Nematoda, Eggs 1
Farne	22.5	103.7	M	Echinoderm fragments 0-1
Farne	19	58.5	M	Corystes, Spionidae, Myridae, faecal matter 1
Farne	20.7	73.1	M	Amphipoda *spp.,* Myridae, Decapoda fragments 1
Farne	20.2	70.6	M	Decapoda fragments, parasitic worms/ flukes 0-1
Farne	20.3	77.6	M	Calocaris, eggs, Polychaeta 2
Farne	19.5	63.2	M	Polychaeta, parasitic worms/ flukes 1
Farne	20	75	M	Hiatella sp., Calocaris, parasitic worm/fluke, eggs, faecal matter 1
Farne	19	64.5	M	Decapoda fragments, Sabellidae, Spionidae, faecal matter 1
Farne	19.6	60.7	M	Nematoda, bivalve, Amphipoda *spp*., faecal matter 1
Farne	21	77.5	F	Hiatella *sp*., Amphipoda *sp.,* parasitic worm/fluke, sediment, faecal matter 1
Farne	23.2	118.9	F	Decapoda fragments, eggs, Polychaeta, faecal matter 1
Farne	23.2	113.1	F	Hydrozoa, Caprellidae, parasitic worm /fluke, Amphipoda *spp.* 1
Farne	23.5	99.6	F	Empty 0
Farne	23.2	113	F	Amphipoda *spp.,* Polychaeta, shrimp indeterminate, faecal matter 1
Farne	22.2	93.3	F	Mysidae, Hiatella, faecal matter, Nematoda, polychaete fragment 1-2
Farne	20.8	89.1	F	Mysidae, decapoda fragments, polychaete fragments 1
Farne	22.6	87	F	Polychaete fragments, parasitic worm/fluke, faecal matter 1
Farne	22.8	126.7	F	Ploychaete fragments, faecal matter 1
Farne	19.7	71.8	F	Asteropectin irregularis juvenille, bivalve fragments, polychaete fragments 1
Amble	24.9	122.5	F	Faecal matter 1
Amble	20	70.3	F	Amphipoda spp., Pagarus sp., Polychaeta 1
Amble	23.7	108.2	F	Hydrozoa, Bivalve shell fragments, Hyas sp., Amphipoda sp., Sabellidae 1
Amble	23.6	116.7	F	Pagarus fragments, Amphipoda spp., Nudibranch 1
Amble	22	94.8	F	Nematoda, Hydrozoa, Parasitic worm/fluke, Bivalve shell fragments 1-2
Amble	21	86.7	F	Isopoda, Parasitic worm/fluke, Digested matter, Faecal matter 2-3
Amble	22.2	113.8	F	Nematoda, Parasitic worm/fluke, Philine sp., Decapoda juv. 0

Amble	21	80.8	F	Polychaeta sp. Bivalve shell fragments, Parasitic worm/fluke, Mysidae, Digested matter 2-3
Amble	23.6	112.4	F	Parasitic worm/fluke, Bivalve shell fragments, Polychaeta sp., Ophiuroidea juv., Digested matter 0-1
Amble	20.8	80.9	F	Nematoda, Crangon fragments, Bivalve fragments, Parasitic worm/fluke, Ophiuroidea juv. Decapoda fragments, Digested matter, Faecal matter 3-4
Amble	21	85.7	M	Decapoda fragments, Cysts, Digested matter, Faecal matter 4
Amble	21.7	83.9	M	Aphrodite, Pagarus sp., Decapoda fragments. 3
Amble	21.6	110.7	M	Polychaeta fragments, Amphipoda spp., Decapoda fragments, Digested matter 2
Amble	20.1	71.8	M	Parasitic worm/fluke, Amphipoda sp., Coal fragments, Sediment, Bivalve, Digested matter, Faecal matter 2
Amble	20.9	86.7	M	Echinocardium test fragments, Decapoda fragments, Pagarus sp., Faecal matter 3
Amble	20.1	78.5	M	Bivalve -whole specimen, Hydrozoa, Amphipoda spp., Bivalve shell fragments, Digested matter 2
Amble	20.2	76.2	M	Decapoda fragments, Pagarus sp., Amphipoda sp., Hydrozoa, Polychaeta sp., Echinocyamus pusillus, Digested matter, Sediment 2
Amble	20	76.4	M	Micaceous sediment, Faecal matter, Coal fragments, Decapodasp., Parasitic worm/fluke 3
Amble	20	76.4	M	Pandalus sp., Echinocyamus pusillus, Parasitic worm/fluke, Polychaeta, Digested matter 2
Amble	20.2	80.7	M	Hydrozoa, Polychaeta sp. Parasitic worm/fluke, Digested matter, eggs 1
Tees Bay	20.2	80.9	M	Parasitic worm/fluke, Decapoda fragments, Ophiuroidea sp., Pagarus juv., Nematoda, Squid pen, Digetsed matter 3
Tees Bay	21	97.2	M	Nematoda, Polychaeta, Gobidae, Decapoda juv., Sabellidae, Faecal matter 1-2
Tees Bay	20	73.8	M	Sabellidae, Decapoda fragments, Polinices shell, Shell framents, Pagarus sp., Turritela shell, Nucella sp., Echinocardium test fragments 2
Tees Bay	21.4	83.4	M	Pagarus sp. fragments, Bivalve shell fragments, Digested matter, Sand 3-4
Tees Bay	20.6	77	M	Nematoda, Pagarus sp., Bivalve shell fragments, fish bones, Polychaete, Faecal matter 2
Tees Bay	22.8	123.4	F	Gobidae, Nematoda, Polychaeta fragments, Digeste fish, Pagarus sp. 1
Tees Bay	21.1	85.8	M	Decapoda sp., Parasitic worm/fluke, Shell fragments, Polychaete, Nematoda, Digested matter 3
Tees Bay	20.9	78.5	F	Decapoda sp., Pagarus sp., Echinocardium test fragments, Shell fragments, Digested matter 1
Tees Bay	22	86.1	F	Bivalve shell fragments, Digested matter, Pagarus sp., Faecal matter 2-3
Tees Bay	21.6	89.1	F	Pagarus sp., Decapoda fragments, Polychaeta, Echinocardium test fragments 1-2
Tees Bay	22	99.1	F	Pagarus sp., Brittlestar fragments, Nematoda, Bivalve shell fragments, Echinocardium test fragments 3-4
Tees Bay	21	76.5	F	Shell fragments, Echinocardium test fragments, Pagarus sp. fragments, Parasitic worm/fluke, Faecal matter 1-2
Tees Bay	21.5	89.4	F	Nematoda, Ulva sp., Amphipoda sp., Digested matter, Decapoda 0-1
Tees Bay	21.1	88.8	M	Nematoda, Ulva sp., Pagarus sp., Brittlestar fragments, Digested fish, Faecal matter 1
Tees Bay	20.9	85.3	M	Aphrodite fragments, Pagarus fragments, Amphipoda sp., Digetsed matter, Brittlestar fragments 3-4
Tees Bay	21.3	92.6	F	Part-digested fish, Polychaeta fragments, Decapoda fragments, Bivalve shell fragments, Digested matter 1-2
Tees Bay	20.6	74	F	Nematoda, Pagarus sp., Echinocardium test fragments, Digested matter 1-2
Tees Bay	20.4	75.9	F	Pagarus sp., Decapoda juv., Nematoda, Brittlestar fragments, Polychaeta sp. 2
Tees Bay	21	94.2	M	Pagarus sp., Nematoda, Decapoda, Digested matter, Shell fragments 3
Tees Bay	19.6	63.2	M	Bivalve shell fragments, Amphipoda sp., Decapoda sp., Parasitic worm/fluke 2-3
Off Flamborough	22	105.6	M	Empty 0
Off Flamborough	20	77.4	M	Echinocardium test fragments, Amphapoda, faecal matter 1-2
Off Flamborough	20.1	81.6	M	Empty 0
Off Flamborough	20	70	M	Decapoda juvenilem Amphapoda spp. Fluke, Echinocyamis Pusilis 2-3
Off Flamborough	20	68.9	M	Polenicies, Nematoda, Liocarcinus fragments, decapoda juvinile, Echinocardium test fragments 1
Off Flamborough	23.9	114.2	M	Echinocardium test fragments, Nematoda 1
Off Flamborough	21	74.3	M	Nematoda, Bivalve shell fragments, Echinocardium test fragments, Amphapoda sp. 1
Off Flamborough	19.8	64.1	M	Faecal matter, nematoda, Echinocardium test fragments 1

Off Flamborough	19.6	68.3	M	Echinocardium test fragments 2
Off Flamborough	20.6	81.7	F	Faecal matter 0-1
Off Flamborough	20	57.5	M	Nematoda, faecal matter, fish bones, Cumacean 3
Off Flamborough	21	87.9	F	Nematoda, fish gills/digested fish, faecal matter 2-3
Off Flamborough	23	114.9	F	Echinocardium test fragments 1
Off Flamborough	23.5	134.1	F	Echinocardium test fragments, Mysidae 2-3
Off Flamborough	23.5	127	F	Echinocardium test fragments 3
Off Flamborough	24	126	F	Sabellidae, Nematoda 0-1
Off Flamborough	21.5	95.7	F	Echinocardium test fragments 1-2
Off Flamborough	20	67	F	Fish bones, eggs, Echinocardium test fragments 1
Off Flamborough	20.1	80.8	F	Echinocardium test fragments, digested fish, Nematoda 0-1
Off Flamborough	20.2	72	F	Echinocardium test fragments 3
Outter Gabbard	22.5	100.7	M	Ophiura ophirua, Brittle star fragments, Bile-like jelly, Polychaete tube, Bivalve shell fragments 2-3
Outter Gabbard	20.9	84.5	M	Ophiura albida, stone, Polychaete sp., Brittlestar fragments, Amphipoda sp. Decapoda juvenile. 1
Outter Gabbard	22.1	105.5	F	Amphipoda spp., Decapoda juvenile, Shell fragments, Brittlestar fragments 1
Outter Gabbard	24.1	131.1	F	Ophiura albida, Brittlestar fragments 1
Outter Gabbard	22	99.5	F	Brittlestar fragments, Polychaete sp., gravel, Bivalve shell fragments, Nematoda 4
Outter Gabbard	23.8	129.1	F	Ophiura albida, Bivalve shell fragments, Decapoda juvenile 1
Outter Gabbard	24.2	158.6	F	Ophiura albida, Brittlestar fragments, Bivalave shell fragments, Pisidia longicornis, Polychaeta 2
Outter Gabbard	24	150	F	Decapoda juvenile, Brittlestar fragments 2-3
Outter Gabbard	21.1	93.3	F	Brittlestar fragments, Bivalve shell fragments 2
Outter Gabbard	23.5	137	F	Brittlestar fragments, Bivalve shell fragments, Decapoda larvae, Gravel 3-4
Outter Gabbard	24	138.8	F	Ophiura albida, Brittlestar fragments, Polychaete sp., Faecal matter 1
Outter Gabbard	23.2	111.5	F	Gravel, Bivalve shell fragments, Brittlestar fragments, Polychaete sp., Amphipoda sp. 2
Outter Gabbard	20	74.2	M	Ophiura albida, Digetsed matter 0-1
Outter Gabbard	20.6	75.6	M	Ophiura albida, Brittlestar fragments, Gravel, Anemone INDET 1
Outter Gabbard	20.4	90.2	M	Brittlestar fragments, Gravel, Bivalve shell fragments, Polychaete sp. 1
Outter Gabbard	18.6	64.8	M	Brittlestar fragments, Bivalve shell fragments, Polychaete sp. Faecal matter 1
Outter Gabbard	18.6	63.1	M	Terribellidae sp., Ophiura albida, Decapoda fragments, Nematoda, Bivalve shell fragments, Bivalve - whole specimen 1-2
Outter Gabbard	17.5	52.8	M	Bivalve shell fragments, Brittlestar fragments, Ophiura albida, Decapoda fragments, Faecal matter 1
Outter Gabbard	22.5	125	F	Brittlestar fragments, Bivalve shell fragments, Echinocyamus pusillus, Polychaete sp., Gravel 2
Outter Gabbard	22.4	107.8	F	Ophiura albida, Pagarus sp., Brittlestar fragments, Bivalve shell fragments, Gravel. 3
Rye Bay	21	98.7	M	Decapoda fragments, faecal matter 0-1
Rye Bay	22.1	106.5	M	Faecal matter 0-1
Rye Bay	21.6	103.4	M	Empty 0
Rye Bay	21.6	109.3	M	Hydrozoa, bivalve spp whole specimin, bright green gloop 2
Rye Bay	23.4	129.2	F	Brittle star frag, decapoda juv, bright green gloop 2
Rye Bay	21.2	89.7	M	Juv fish, bivalve shell frag, faecal matter, green jelly lumps - jelly fish 0-2
Rye Bay	21.6	94.2	F	Brittle star frag, faecal matter 0-2
Rye Bay	21.5	95.7	F	Bivalve shell frag, faecal matter 2-3
Rye Bay	21.1	89	F	Decapoda juv, bivalve shell frag, green gloop 0-1
Rye Bay	23.4	107.1	F	Polychaete frag, brittlestar frag, bivalve frag, decapoda frag 1-2
Rye Bay	23	117.8	F	Empty 0

Rye Bay	22.6	112.6	F	Decapoda frag 0-1
Rye Bay	21.3	96.6	F	Bivalve shell frag, digested matter 2
Rye Bay	23.1	126.7	F	Polychatea sp, bivalve shell frag, faecal matter, digested matter 1-2
Rye Bay	23	126.1	F	Bivalve shell fragment, decapoda fragment, liocaranus sp 2
Rye Bay	22	104	M	Echinocadium test frag, bivalve shell frag, echinocyanus pusillis, pagarus sp frag,enois sp frag, barnacles 3
Rye Bay	21.2	81	M	Pagarus sp, bivalve shell frag, bivalve whole specimen, sediment 3
Rye Bay	23	112.9	M	Hydrozoa, decapoda fragment 0
Rye Bay	21	93.1	M	Bivalve whole specimen, brittlestar fragents, enois sp shell frag, decapoda frag, echinocyarus pusiliis 1-2
Rye Bay	21	87.5	M	Decapoda frag, bivalave shell frag, bivalve whole specimen 1
Off Newhaven	21	94.8	M	Ophiuroidea fragments, Bivalve - whole specimen, Echinocyamus pusillus 4
Off Newhaven	22.9	113.1	M	Ophiuroidea fragments, Bivalve shell fragments, Polychaeta sp. 3-4
Off Newhaven	21	87	M	Ophiuroidea fragments, Corystes sp., Polychaeta spp., Hydrozoa 4
Off Newhaven	20.4	82	M	Ophiuroidea fragments, Aecquipecten opercularis, Mollusc tissue 3
Off Newhaven	21	96.7	M	Buccinum sp., Ophiuroidea fragments, Bivalve - whole specimen, Polychaeta sp., Amphiopoda sp. 2-3
Off Newhaven	20.1	87.7	M	Ophiuroidea fragments, Decapoda fragment, Polychaeta sp., Faecal matter 2
Off Newhaven	23.7	165.4	M	Bivalve shell fragments, Faecal matter 1
Off Newhaven	22.1	99.2	F	Herring juvenile, Ophiuroidea fragments, Digested fish, Hydrozoa 3-4
Off Newhaven	21	92	F	Bivalve shell fragments, Polychaeta fragments 2
Off Newhaven	21	93.5	F	Ophiuroidea fragments, Bivalve shell fragments, Crangon sp., Sabellaria spinulosa, Faecal matter 4
Off Newhaven	20.9	92.9	F	Ophiuroidea fragments, Bivalve - whole specimen, Decapoda fragments, Buccinum sp., Echinocyamus pusillus 3
Off Newhaven	21.8	105.9	F	Empty 0
Off Newhaven	23.2	114.2	F	Ophiuroidea fragments, Bivalve - whole specimen, Bivalve shell fragments, Opiura albida, Polychaeta sp. 0-1
Off Newhaven	21.5	101.9	F	Echinocyamus pusillus, Polychaeta sp., 0
Off Newhaven	24	135.3	F	Ophiuroidea fragments, Bivalve shell fragments, Amphipoda sp., Polychaeta sp., Decapoda fragments, Liocarcinus sp., Faecal matter 3-4
Off Newhaven	20.1	88.1	M	Aecquipecten opercularis, Pagarus sp., Bivalve shell fragments, Amphipoda sp., Buccinum sp. 1
Off Newhaven	21.2	93.3	M	Ophiuroidea fragments, Bivalve - whole specimen, Polychate sp. fragments, Decapoda fragments 2
Off Newhaven	20	88	M	Terribellidae sp., Digested matter 2
Off Newhaven	23.2	140.2	F	Buccinum sp., Nematoda, Bivalve - whole specimen, Bivalve shell fragments 1
Off Newhaven	24	138.2	F	Mollusc tissue, Disgested fish, Amphipoda sp., Bivalve shell frgaments 1-2

Table 4. Breakdown of samples collected at CSEMP and Harwich dredge disposal sites

STATION	GEAR	Sample Type	Date	Time Sampled	Latitude DD	Longitude DD
OFFLOWESTOFT_94	0.1m2 Day Grab	ORGANIC	05/07/2017	11:47	52.6842538	-0.2837932
OFFLOWESTOFT_94	0.1m2 Day Grab	METALS	05/07/2017	11:47	52.6842538	-0.2837932
OFFLOWESTOFT_90	0.1m2 Day Grab	ORGANIC	05/07/2017	12:36	52.7563111	-0.2837932
OFFLOWESTOFT_90	0.1m2 Day Grab	METALS	05/07/2017	12:36	52.7563111	-0.2837932
376_386_84	0.1m2 Day Grab	ORGANIC	06/07/2017	03:21	52.9356638	-0.2837932
376_386_84	0.1m2 Day Grab	METALS	06/07/2017	03:24	52.9356651	-0.2837932
386	0.1m2 Day Grab	RFA	06/07/2017	04:17	52.9830461	-0.2837932
386	0.1m2 Day Grab	PSA	06/07/2017	04:17	52.9830461	-0.2837932
386	0.1m2 Day Grab	MACROFAUNA	06/07/2017	04:17	52.9830461	-0.2837932
386	0.1m2 Day Grab	ORGANIC	06/07/2017	04:22	52.9830508	-0.2837932
386	0.1m2 Day Grab	METALS	06/07/2017	04:22	52.9830508	-0.2837932
386	0.1m2 Day Grab	ORGANIC	06/07/2017	04:27	52.9830496	-0.2837932
386	0.1m2 Day Grab	METALS	06/07/2017	04:27	52.9830496	-0.2837932
386	0.1m2 Day Grab	LITTER	06/07/2017	04:31	52.9830479	-0.2837932
376_386_87	0.1m2 Day Grab	ORGANIC	06/07/2017	05:06	53.0132222	-0.2796204
376_386_87	0.1m2 Day Grab	METALS	06/07/2017	05:06	53.0132222	-0.2796204
376_386_88	0.1m2 Day Grab	ORGANIC	06/07/2017	05:36	53.0507237	-0.2796204
376_386_88	0.1m2 Day Grab	METALS	06/07/2017	05:36	53.0507237	-0.2796204
376	0.1m2 Day Grab	RFA	06/07/2017	15:19	53.3332735	-0.2796204
376	0.1m2 Day Grab	PSA	06/07/2017	15:19	53.3332735	-0.2796204
376	0.1m2 Day Grab	MACROFAUNA	06/07/2017	15:19	53.3332735	-0.2796204
376	0.1m2 Day Grab	ORGANIC	06/07/2017	15:23	53.3332483	-0.2796204
376	0.1m2 Day Grab	METALS	06/07/2017	15:23	53.3332483	-0.2796204
376	0.1m2 Day Grab	ORGANIC	06/07/2017	15:29	53.333249	-0.2796204
376	0.1m2 Day Grab	METALS	06/07/2017	15:29	53.333249	-0.2796204
376	0.1m2 Day Grab	LITTER	06/07/2017	15:35	53.3332511	-0.2796204
WEST345_71	0.1m2 Day Grab	ORGANIC	06/07/2017	20:45	54.0991074	-0.2467592
WEST345_71	0.1m2 Day Grab	METALS	06/07/2017	20:45	54.0991074	-0.2467592
345	0.1m2 Day Grab	PSA	07/07/2017	15:32	53.9999936	-0.2796204
345	0.1m2 Day Grab	PSA	07/07/2017	15:32	53.9999936	-0.2796204
345	0.1m2 Day Grab	MACROFAUNA	07/07/2017	15:32	53.9999936	-0.2796204
345	0.1m2 Day Grab	ORGANIC	07/07/2017	15:38	53.9999963	-0.2796204
345	0.1m2 Day Grab	METALS	07/07/2017	15:38	53.9999963	-0.2796204
345	0.1m2 Day Grab	ORGANIC	07/07/2017	15:45	53.9999927	-0.2796204
345	0.1m2 Day Grab	METALS	07/07/2017	15:45	53.9999927	-0.2796204
345	0.1m2 Day Grab	LITTER	07/07/2017	15:51	53.9999961	-0.2796204
345_29	0.1m2 Day Grab	ORGANIC	07/07/2017	18:02	54.1133519	-0.2467592
345_29	0.1m2 Day Grab	METALS	07/07/2017	18:02	54.1133519	-0.2467592
345_26	0.1m2 Day Grab	ORGANIC	07/07/2017	18:47	54.1415324	-0.2467592
345_26	0.1m2 Day Grab	METALS	07/07/2017	18:47	54.1415324	-0.2467592
285	0.1m2 Day Grab	ORGANIC	09/07/2017	11:40	54.8332583	-0.2467592
285	0.1m2 Day Grab	METALS	09/07/2017	11:40	54.8332583	-0.2467592
285	0.1m2 Day Grab	ORGANIC	09/07/2017	11:50	54.8332098	-0.2467592

285	0.1m2 Day Grab	METALS	09/07/2017	11:50	54.8332098	-0.2467592
285	0.1m2 Day Grab	PSA	09/07/2017	11:57	54.8332564	-0.2467592
285	0.1m2 Day Grab	MACROFAUNA	09/07/2017	11:57	54.8332564	-0.2467592
285	0.1m2 Day Grab	RFA	09/07/2017	12:03	54.8332614	-0.2467592
285	0.1m2 Day Grab	LITTER	09/07/2017	12:03	54.8332614	-0.2467592
285_47	0.1m2 Day Grab	ORGANIC	09/07/2017	14:34	55.1250469	-0.6677336
285_47	0.1m2 Day Grab	METALS	09/07/2017	14:34	55.1250469	-0.6677336
285_53	0.1m2 Day Grab	ORGANIC	09/07/2017	16:33	55.3662972	-0.6677336
285_53	0.1m2 Day Grab	METALS	09/07/2017	16:33	55.3662972	-0.6677336
285_57	0.1m2 Day Grab	ORGANIC	09/07/2017	17:29	55.2223726	-0.6677336
285_57	0.1m2 Day Grab	METALS	09/07/2017	17:29	55.2223726	-0.6677336
East245_172	0.1m2 Day Grab	ORGANIC	09/07/2017	20:13	55.0365034	-0.6677336
East245_172	0.1m2 Day Grab	METALS	09/07/2017	20:13	55.0365034	-0.6677336
East245_178	0.1m2 Day Grab	ORGANIC	09/07/2017	20:48	55.0903675	-0.6677336
East245_178	0.1m2 Day Grab	METALS	09/07/2017	20:48	55.0903675	-0.6677336
East245_177	0.1m2 Day Grab	ORGANIC	09/07/2017	21:15	55.1290826	-0.6677336
East245_177	0.1m2 Day Grab	METALS	09/07/2017	21:15	55.1290826	-0.6677336
245_295_37	0.1m2 Day Grab	ORGANIC	09/07/2017	22:58	55.2763781	-0.6677336
245_295_37	0.1m2 Day Grab	METALS	09/07/2017	22:58	55.2763781	-0.6677336
245_295_38	0.1m2 Day Grab	ORGANIC	10/07/2017	02:05	55.6149219	-0.6677336
245_295_38	0.1m2 Day Grab	METALS	10/07/2017	02:05	55.6149219	-0.6677336
245_295_41	0.1m2 Day Grab	ORGANIC	10/07/2017	15:20	55.0801275	-0.6677336
245_295_41	0.1m2 Day Grab	METALS	10/07/2017	15:20	55.0801275	-0.6677336
245	0.1m2 Day Grab	PSA	10/07/2017	16:36	55.0082987	-0.6677336
245	0.1m2 Day Grab	MACROFAUNA	10/07/2017	16:36	55.0082987	-0.6677336
245	0.1m2 Day Grab	RFA	10/07/2017	16:42	55.0083008	-0.6677336
245	0.1m2 Day Grab	ORGANIC	10/07/2017	16:42	55.0083008	-0.6677336
245	0.1m2 Day Grab	METALS	10/07/2017	16:42	55.0083008	-0.6677336
245	0.1m2 Day Grab	ORGANIC	10/07/2017	16:48	55.0082979	-0.6677336
245	0.1m2 Day Grab	METALS	10/07/2017	16:48	55.0082979	-0.6677336
245	0.1m2 Day Grab	LITTER	10/07/2017	16:55	55.0083	-0.6677336
295	0.1m2 Day Grab	RFA	10/07/2017	18:41	54.7332642	-0.2467592
295	0.1m2 Day Grab	PSA	10/07/2017	18:41	54.7332642	-0.2467592
295	0.1m2 Day Grab	MACROFAUNA	10/07/2017	18:41	54.7332642	-0.2467592
295	0.1m2 Day Grab	ORGANIC	10/07/2017	18:47	54.7332979	-0.2467592
295	0.1m2 Day Grab	METALS	10/07/2017	18:47	54.7332979	-0.2467592
295	0.1m2 Day Grab	LITTER	10/07/2017	18:53	54.7333451	-0.2467592
295	0.1m2 Day Grab	ORGANIC	10/07/2017	18:57	54.7334017	-0.2467592
295	0.1m2 Day Grab	METALS	10/07/2017	18:57	54.7334017	-0.2467592
West475_133	0.1m2 Day Grab	ORGANIC	12/07/2017	13:32	52.2240347	-0.2837932
West475_133	0.1m2 Day Grab	METALS	12/07/2017	13:37	52.224028	-0.2837932
West475_129	0.1m2 Day Grab	ORGANIC	12/07/2017	14:09	52.1733593	-0.2837932
West475_129	0.1m2 Day Grab	METALS	12/07/2017	14:09	52.1733593	-0.2837932
West475_134	0.1m2 Day Grab	ORGANIC	12/07/2017	14:27	52.158085	-0.2837932
West475_134	0.1m2 Day Grab	METALS	12/07/2017	14:27	52.158085	-0.2837932

West475_125	0.1m2 Day Grab	ORGANIC	12/07/2017	14:45	52.1509344	-0.2837932
West475_125	0.1m2 Day Grab	METALS	12/07/2017	14:45	52.1509344	-0.2837932
D42	0.1m2 Hamon Grab	PSA	12/07/2017	16:47	51.9910014	0.2816106
D42	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	16:47	51.9910014	0.2816106
D42	0.1m2 Hamon Grab	PSA	12/07/2017	16:50	51.9909948	0.2816106
D42	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	16:50	51.9909948	0.2816106
D42	0.1m2 Hamon Grab	PSA	12/07/2017	16:53	51.9909897	0.2816106
D42	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	16:53	51.9909897	0.2816106
D43	0.1m2 Hamon Grab	PSA	12/07/2017	17:56	51.9860386	0.2816106
D43	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	17:56	51.9860386	0.2816106
D43	0.1m2 Hamon Grab	PSA	12/07/2017	17:59	51.9860388	0.2816106
D43	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	17:59	51.9860388	0.2816106
D43	0.1m2 Hamon Grab	PSA	12/07/2017	18:01	51.9860291	0.2816106
D43	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	18:01	51.9860291	0.2816106
D36	0.1m2 Hamon Grab	PSA	12/07/2017	18:40	51.9342788	0.2816106
D36	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	18:40	51.9342788	0.2816106
D36	0.1m2 Hamon Grab	PSA	12/07/2017	18:44	51.9342336	0.2816106
D36	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	18:44	51.9342336	0.2816106
D36	0.1m2 Hamon Grab	PSA	12/07/2017	18:46	51.9342388	0.2816106
D36	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	18:46	51.9342388	0.2816106
D37	0.1m2 Hamon Grab	PSA	12/07/2017	19:06	51.92921	0.2816106
D37	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:06	51.92921	0.2816106
D37	0.1m2 Hamon Grab	PSA	12/07/2017	19:11	51.9292077	0.2816106
D37	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:11	51.9292077	0.2816106
D37	0.1m2 Hamon Grab	PSA	12/07/2017	19:15	51.9292175	0.2816106
D37	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:15	51.9292175	0.2816106
D38	0.1m2 Hamon Grab	PSA	12/07/2017	19:34	51.9241715	0.2816106
D38	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:34	51.9241715	0.2816106
D38	0.1m2 Hamon Grab	PSA	12/07/2017	19:37	51.9241683	0.2816106
D38	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:37	51.9241683	0.2816106
D38	0.1m2 Hamon Grab	PSA	12/07/2017	19:40	51.9241778	0.2816106
D38	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	19:40	51.9241778	0.2816106
D24	0.1m2 Hamon Grab	PSA	12/07/2017	20:34	51.9113619	0.2816106
D24	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	20:34	51.9113619	0.2816106
D24	0.1m2 Hamon Grab	PSA	12/07/2017	20:37	51.9113732	0.2816106
D24	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	20:37	51.9113732	0.2816106
D24	0.1m2 Hamon Grab	PSA	12/07/2017	20:41	51.911382	0.2816106
D24	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	20:41	51.911382	0.2816106
D25	0.1m2 Hamon Grab	PSA	12/07/2017	21:12	51.9069298	0.2816106
D25	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:12	51.9069298	0.2816106
D25	0.1m2 Hamon Grab	PSA	12/07/2017	21:16	51.9069217	0.2816106
D25	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:16	51.9069217	0.2816106
D25	0.1m2 Hamon Grab	PSA	12/07/2017	21:20	51.9069344	0.2816106
D25	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:20	51.9069344	0.2816106
D26	0.1m2 Hamon Grab	PSA	12/07/2017	21:43	51.9017219	0.2816106

D26	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:43	51.9017219	0.2816106
D26	0.1m2 Hamon Grab	PSA	12/07/2017	21:47	51.9017444	0.2816106
D26	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:47	51.9017444	0.2816106
D26	0.1m2 Hamon Grab	PSA	12/07/2017	21:50	51.9017319	0.2816106
D26	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	21:50	51.9017319	0.2816106
D10	0.1m2 Hamon Grab	PSA	12/07/2017	22:10	51.8950529	0.2816106
D10	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	22:10	51.8950529	0.2816106
D10	0.1m2 Hamon Grab	PSA	12/07/2017	22:20	51.8950779	0.2816106
D10	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	22:20	51.8950779	0.2816106
D10	0.1m2 Hamon Grab	PSA	12/07/2017	22:29	51.8951249	0.2816106
D10	0.1m2 Hamon Grab	MACROFAUNA	12/07/2017	22:29	51.8951249	0.2816106
D8	0.1m2 Hamon Grab	PSA	13/07/2017	05:17	51.8925276	0.2816106
D8	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	05:17	51.8925276	0.2816106
D8	0.1m2 Hamon Grab	PSA	13/07/2017	05:24	51.8925156	0.2816106
D8	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	05:24	51.8925156	0.2816106
D8	0.1m2 Hamon Grab	PSA	13/07/2017	05:27	51.8925064	0.2816106
D8	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	05:27	51.8925064	0.2816106
D11	0.1m2 Hamon Grab	PSA	13/07/2017	05:58	51.8924996	0.2816106
D11	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	05:58	51.8924996	0.2816106
D11	0.1m2 Hamon Grab	PSA	13/07/2017	06:01	51.8924996	0.2816106
D11	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	06:01	51.8924996	0.2816106
D11	0.1m2 Hamon Grab	PSA	13/07/2017	06:05	51.8925037	0.2816106
D11	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	06:05	51.8925037	0.2816106
D12	0.1m2 Hamon Grab	PSA	13/07/2017	06:16	51.8899748	0.2816106
D12	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	06:16	51.8899748	0.2816106
D12	0.1m2 Hamon Grab	PSA	13/07/2017	06:20	51.8899842	0.2816106
D12	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	06:20	51.8899842	0.2816106
D12	0.1m2 Hamon Grab	PSA	13/07/2017	06:26	51.8900181	0.2816106
D12	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	06:26	51.8900181	0.2816106
D27	0.1m2 Hamon Grab	PSA	13/07/2017	07:01	51.8863603	0.2816106
D27	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:01	51.8863603	0.2816106
D27	0.1m2 Hamon Grab	PSA	13/07/2017	07:04	51.8863537	0.2816106
D27	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:04	51.8863537	0.2816106
D27	0.1m2 Hamon Grab	PSA	13/07/2017	07:07	51.8863629	0.2816106
D27	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:07	51.8863629	0.2816106
D28	0.1m2 Hamon Grab	PSA	13/07/2017	07:28	51.8811652	0.2816106
D28	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:28	51.8811652	0.2816106
D28	0.1m2 Hamon Grab	PSA	13/07/2017	07:33	51.8811534	0.2816106
D28	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:33	51.8811534	0.2816106
D28	0.1m2 Hamon Grab	PSA	13/07/2017	07:41	51.8811523	0.2816106
D28	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:41	51.8811523	0.2816106
D29	0.1m2 Hamon Grab	PSA	13/07/2017	07:58	51.8764786	0.2816106
D29	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	07:58	51.8764786	0.2816106
D29	0.1m2 Hamon Grab	PSA	13/07/2017	08:01	51.8764822	0.2816106
D29	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	08:01	51.8764822	0.2816106

D29	0.1m2 Hamon Grab	PSA	13/07/2017	08:07	51.8764736	0.2816106
D29	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	08:07	51.8764736	0.2816106
D39	0.1m2 Hamon Grab	PSA	13/07/2017	08:48	51.8657109	0.2816106
D39	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	08:48	51.8657109	0.2816106
D39	0.1m2 Hamon Grab	PSA	13/07/2017	08:51	51.8657025	0.2816106
D39	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	08:51	51.8657025	0.2816106
D39	0.1m2 Hamon Grab	PSA	13/07/2017	08:53	51.8657095	0.2816106
D39	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	08:53	51.8657095	0.2816106
D40	0.1m2 Hamon Grab	PSA	13/07/2017	09:38	51.8557931	0.2816106
D40	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	09:38	51.8557931	0.2816106
D40	0.1m2 Hamon Grab	PSA	13/07/2017	09:43	51.8558034	0.2816106
D40	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	09:43	51.8558034	0.2816106
D40	0.1m2 Hamon Grab	PSA	13/07/2017	09:50	51.8558052	0.2816106
D40	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	09:50	51.8558052	0.2816106
D41	0.1m2 Hamon Grab	PSA	13/07/2017	10:12	51.8520446	0.2816106
D41	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	10:12	51.8520446	0.2816106
D41	0.1m2 Hamon Grab	PSA	13/07/2017	10:16	51.8520373	0.2816106
D41	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	10:16	51.8520373	0.2816106
D41	0.1m2 Hamon Grab	PSA	13/07/2017	10:20	51.8520524	0.2816106
D41	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	10:20	51.8520524	0.2816106
D44	0.1m2 Hamon Grab	PSA	13/07/2017	11:00	51.8112165	0.2816106
D44	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:00	51.8112165	0.2816106
D44	0.1m2 Hamon Grab	PSA	13/07/2017	11:02	51.8112875	0.2816106
D44	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:02	51.8112875	0.2816106
D44	0.1m2 Hamon Grab	PSA	13/07/2017	11:04	51.8112955	0.2816106
D44	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:04	51.8112955	0.2816106
D45	0.1m2 Hamon Grab	PSA	13/07/2017	11:39	51.8058022	0.2816106
D45	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:39	51.8058022	0.2816106
D45	0.1m2 Hamon Grab	PSA	13/07/2017	11:43	51.805808	0.2816106
D45	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:43	51.805808	0.2816106
D45	0.1m2 Hamon Grab	PSA	13/07/2017	11:45	51.8057999	0.2816106
D45	0.1m2 Hamon Grab	MACROFAUNA	13/07/2017	11:45	51.8057999	0.2816106
D45	0.1m2 Hamon Grab	LITTER	13/07/2017	11:48	51.805802	0.2816106
466	0.1m2 Day Grab	RFA	13/07/2017	14:13	51.4966798	0.2816106
466	0.1m2 Day Grab	PSA	13/07/2017	14:13	51.4966798	0.2816106
466	0.1m2 Day Grab	MACROFAUNA	13/07/2017	14:13	51.4966798	0.2816106
466	0.1m2 Day Grab	ORGANIC	13/07/2017	14:49	51.4966785	0.2816106
466	0.1m2 Day Grab	METALS	13/07/2017	14:49	51.4966785	0.2816106
466	0.1m2 Day Grab	ORGANIC	13/07/2017	14:23	51.4966761	0.2816106
466	0.1m2 Day Grab	METALS	13/07/2017	14:23	51.4966761	0.2816106
466	0.1m2 Day Grab	LITTER	13/07/2017	14:28	51.4966798	0.2816106
SouthWest475_105	0.1m2 Day Grab	ORGANIC	13/07/2017	18:31	51.9204177	0.2816106
SouthWest475_105	0.1m2 Day Grab	METALS	13/07/2017	18:31	51.9204177	0.2816106
475	0.1m2 Day Grab	RFA	13/07/2017	21:07	52.0000005	-0.2837932
475	0.1m2 Day Grab	PSA	13/07/2017	21:07	52.0000005	-0.2837932

475	0.1m2 Day Grab	MACROFAUNA	13/07/2017	21:07	52.0000005	-0.2837932
475	0.1m2 Day Grab	ORGANIC	13/07/2017	21:12	52.0000009	-0.2837932
475	0.1m2 Day Grab	METALS	13/07/2017	21:12	52.0000009	-0.2837932
475	0.1m2 Day Grab	ORGANIC	13/07/2017	21:20	51.9999953	0.2816106
475	0.1m2 Day Grab	METALS	13/07/2017	21:20	51.9999953	0.2816106
475	0.1m2 Day Grab	LITTER	13/07/2017	21:24	52.0000089	-0.2837932
484_187	0.1m2 Day Grab	ORGANIC	14/07/2017	17:45	50.9880577	0.3280293
484_187	0.1m2 Day Grab	METALS	14/07/2017	17:45	50.9880577	0.3280293
484	0.1m2 Day Grab	RFA	14/07/2017	17:59	50.9794984	0.3280293
484	0.1m2 Day Grab	PSA	14/07/2017	17:59	50.9794984	0.3280293
484	0.1m2 Day Grab	MACROFAUNA	14/07/2017	17:59	50.9794984	0.3280293
484	0.1m2 Day Grab	ORGANIC	14/07/2017	18:03	50.9794721	0.3280293
484	0.1m2 Day Grab	METALS	14/07/2017	18:03	50.9794721	0.3280293
484	0.1m2 Day Grab	ORGANIC	14/07/2017	18:09	50.9794703	0.3280293
484	0.1m2 Day Grab	METALS	14/07/2017	18:09	50.9794703	0.3280293
484	0.1m2 Day Grab	LITTER	14/07/2017	18:13	50.979471	0.3280293
484_208	0.1m2 Day Grab	ORGANIC	14/07/2017	19:37	50.8754735	0.3280293
484_208	0.1m2 Day Grab	METALS	14/07/2017	19:37	50.8754735	0.3280293
484_202	0.1m2 Day Grab	ORGANIC	14/07/2017	19:56	50.8657419	0.3280293
484_202	0.1m2 Day Grab	METALS	14/07/2017	19:56	50.8657419	0.3280293

Table 5. Sampled sediment stations for Fauna as part of the CSEMP

Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
CSEMP2017_CEND1417_386_STN_005_A2				Sand and muddy sand	9.5	5
CSEMP2017_CEND1417_376_STN_009_A1				Mixed	8	2.5
CSEMP2017_CEND1417_345_STN_014_A1				Mud and sandy mud	14	0.5
CSEMP2017_CEND1417_285_STN_021_C1				Sand and muddy sand	7	1

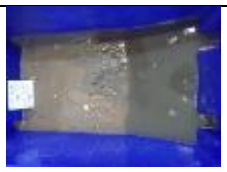
Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
CSEMP2017_CEND1417_245_STN_033_A1				Mud and sandy mud	13	0.25
CSEMP2017_CEND1417_295_STN_034_A1				Mud and sandy mud	8.5	0.125
CSEMP2017_CEND1417_466_STN_061				Mixed	10.3	5
CSEMP2017_CEND1417_475_STN_065				Mud	10	0.125
CSEMP2017_CEND1417_484_STN_068				Mud		0.25

Table 6. Sampled sediment stations for Fauna as part of the Harwich dredge disposal site

Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
D42_STN_41 A1						
D42_STN_41 B1						
D42_STN_41 C1						
D43_STN_42 _A1						

Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
D43_STN_42 _B1						
D43_STN_42 _C1						
D36_STN_43 _A1						
D36_STN_43 _B1				5mm is correct, just in 1mm sieves for photo		
D36_STN_43 _C1						
D37_STN_44 _A1						
D37_STN_44 _B1						
D37_STN_44 _C1						
D38_STN_45 _A1						
D38_STN_45 _B1						

Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
D38_STN_45_C1						
D24_STN_46_A1						
D24_STN_46_B1						
D24_STN_46_C1						
D25_STN_47_A1						
D25_STN_47_B1						
D25_STN_47_C1						
D26_STN_48_A1						
D26_STN_48_B1						
D26_STN_48_C1						

Station code	Sample image	5mm	1mm	Preliminary EUNIS Category	Sample depth (cm)	Container size (l)
D10_STN_49 _A1						
D10_STN_49 _B2						
D10_STN_49 _C2						

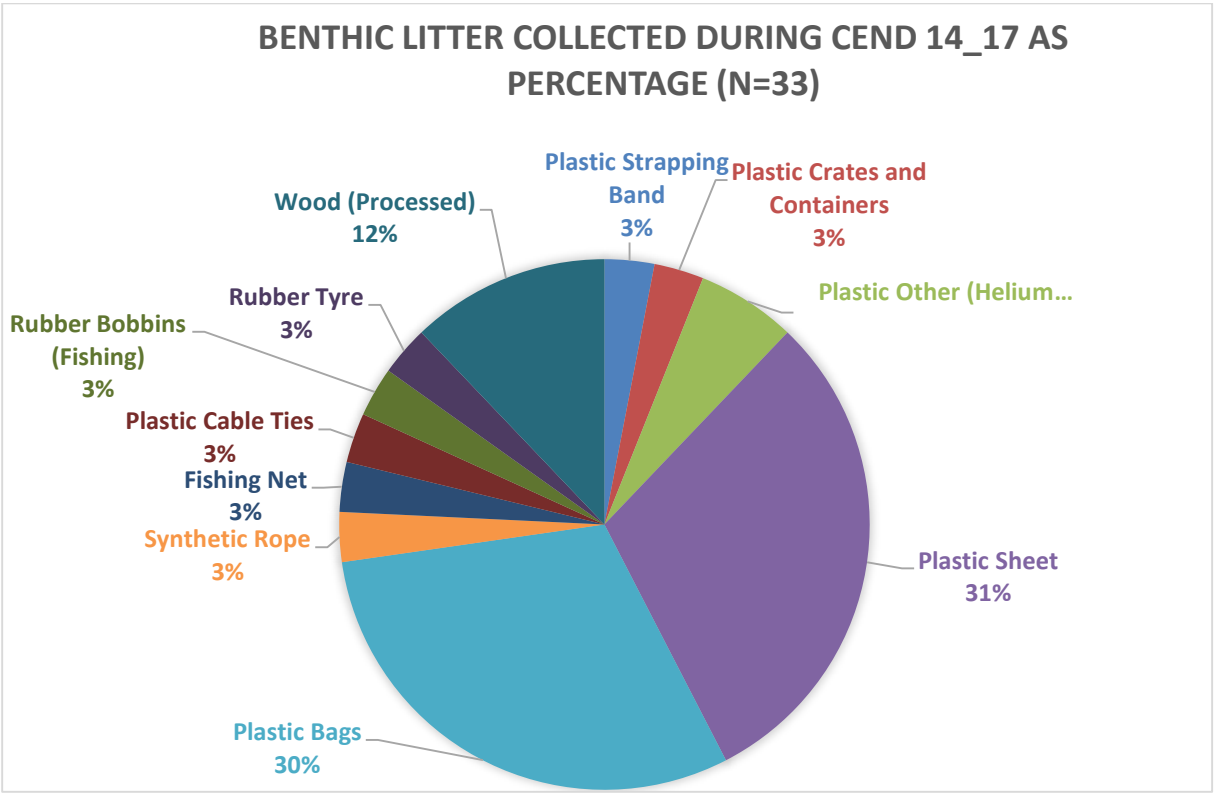


Figure 1. Benthic litter collected during 41 fishing tows using a Granton trawl

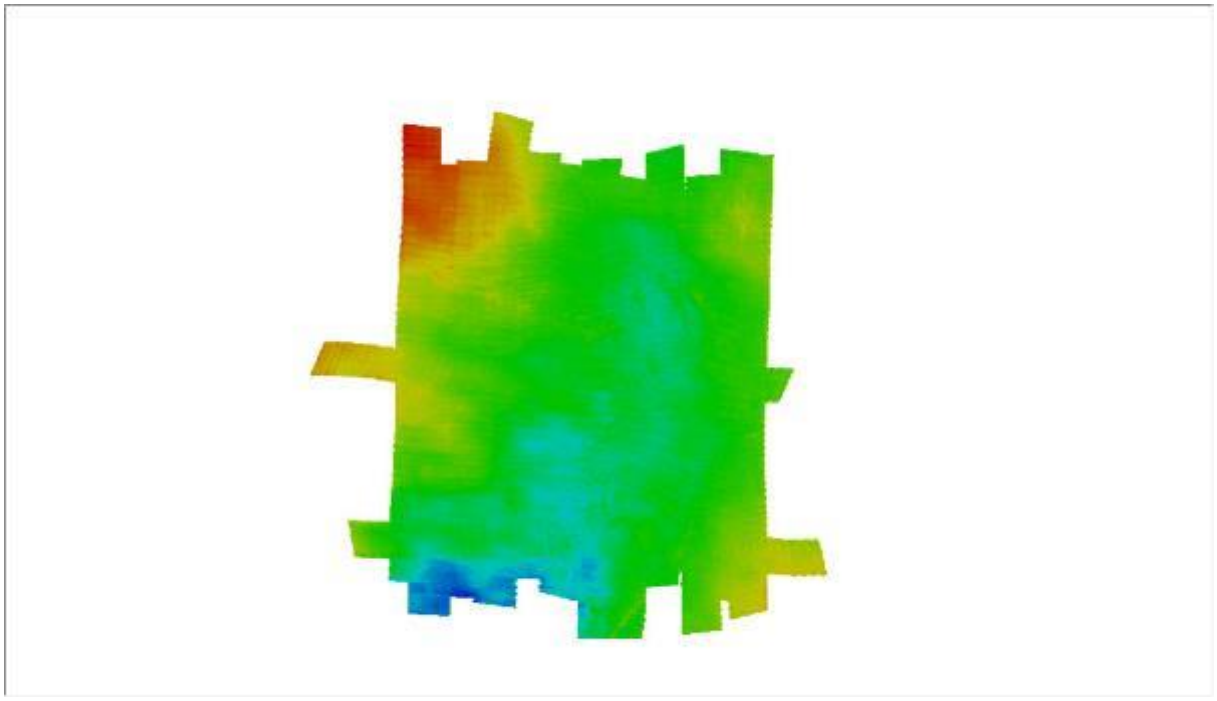


Figure 2. Bathymetry of the dredge disposal site

Table 7. Birds observed during steams between stations by a dedicated SeaWatch observer

05/07/2017	**06/07/2017**	**07/07/2017**	**08/07/2017**
Northern gannet	Northern gannet	Common guillemot	Northern fulmar
Common guillemot	Black-legged kittiwake	Northern fulmar	Lesser black-backed gull
Lesser black-backed gull	Auk sp.	Northern gannet	Northern gannet
Northern fulmar	Razorbill	Black-legged kittiwake	Black-legged kittiwake
Black-legged kittiwake	Common guillemot	Lesser black-backed gull	Black-headed gull
Herring gull	Atlantic puffin	Atlantic puffin	Common guillemot
Manx shearwater	Lesser black-backed gull	Tern sp.	Arctic skua
	Sandwich tern		

09/07/2017	**10/07/2017**	**11/07/2017**	**13/07/2017**	**14/07/2017**
Common guillemot	Northern fulmar	Atlantic puffin	Black-headed gull	Lesser black-backed gull
Northern gannet	Common guillemot	Black-legged kittiwake	Large gull sp.	Northern fulmar
Black-legged kittiwake	Great black-backed gull	Northern gannet	Northern gannet	Northern gannet
Northern fulmar	Black-legged kittiwake	Common guillemot		Black-legged kittiwake
Lesser black-backed gull	Northern gannet	Manx shearwater		Black-headed gull
Great black-backed gull	Atlantic puffin	Razorbill		
Seal sp.	Auk sp.	Large gull sp.		
	Herring gull	Black-headed gull		
	Razorbill	*Harbour porpoise*		
	Manx shearwater	*Minkie whale*		
	Harbour porpoise			
	White-beaked dolphin			

Table 8. Marine mammals observed by a dedicated MarineLife observer during steams

Species		2017 Total	2015 Total
Harbour Porpoise	*Phocoena phocoena*	26	13
Minke whale	*Balaenoptera acutorostrata*	5	3
White-beaked dolphin	*Lagenorhynchus albirostris*	6	5
Grey Seal	*Halichoerus grypus*	1	46
Harbour Seal	*Phoca vitulina*	0	121
Risso's Dolphin	*Grampus griseus*	3	0
Humpback Whale (probable)	*Megaptera novaeangliae*	1	1 incidental
Unidentified Whale sp. (Rorqual)		1	1
Grand Total		**43**	**189**

Table 9. Incidental sightings observed during the survey outside of an effort related survey period

Species	
Grey Seal	1
Harbour Porpoise	22
Mediterranean Gull (near Scroby Island Lowestoft)	8
Risso's Dolphin	3
Unidentified Seal s (seen on Scroby sandbank near Lowestoft)	101
White-beaked dolphin	11

E. E. Manuel Nicolaus
Scientist in Charge
20/07/2017

INITIALLED:

DISTRIBUTION: