Centre for Environment Fisheries & Aquaculture Science

Cefas

RESEARCH VESSEL SURVEY REPORT

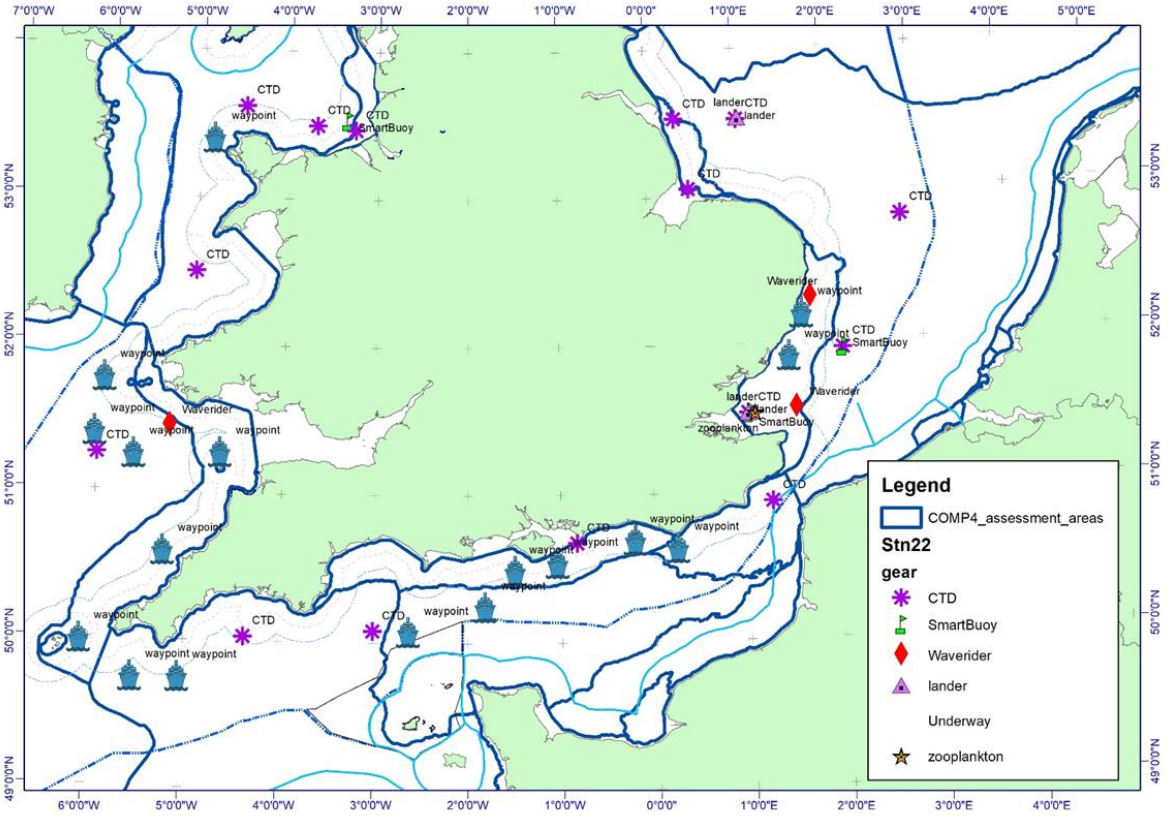
RV CEFAS ENDEAVOUR
Survey: C END 18-2022.

STAFF:

Name	Role	Name	Role
E. E. Manuel Nicolaus	SIC	Peter Hamstead	Water sampling
Izzy Lake	2IC	Danja Hoehn	Marine Litter
Axayacatl Molina-Ramirez	Deck lead	Karolina Klimaszewska	Water sampling
Tom Hull	Deck support/ Data manager	David Hughes	Water sampling
Camille Visinand	Shadowing all	Celia Marlowe	Shadowing
Charlotte Reeve	Marine Litter	Matt Eagle	Deck support

DURATION:
22nd November to 30th November 2022.
22nd November: boarding at 14:00 and induction at 16:00
22nd November: 22:30 sailing from Liverpool
30th November: docking in Lowestoft, and disembark and demob

LOCATION:



Station #	Latitude (N)	Longitude (E)	Sample Type
1	53° 31.413202	1° 2.4713072	CTD Rosette Dowsing
2	53° 31.733725N	1° 3.033509E	Dowsing Lander
3	53° 31.73373N	1° 3.03351E	Dowsing Lander clump
4	51° 57.189N	2° 6.838E	CTD rosette WG
5	51° 57.10N 51.951667	2° 6.69E 2.1115	West Gabbard SB
6	51° 32.027N	1° 3.145E	CTD rosette Warp
7	51° 31.998N 51.5333	1° 3.3498E 1.05583	Warp SB
8	51° 31.89N 51.5315	1° 02.8862E 1.04821	Warp Lander
9	51° 32.014	1°2.808	Warp Clump
10	51.4562	-5.2303	South Pembrokeshire WR
11	52.3118	1.7837	Southwold WR
12	53.5333	-3.3533	Liverpool Bay SB
13	51.907	1.523	TP1 UW
14	52.193	1.685	TP2 UW
15	50.0833	-3	Central Channel CTD
16	52.83392	2.832317	Southern Bight (395wa) CTD
17	50.9333	1.28	South Varne CTD
18	50.6783	-0.8267	Selsey Bill CTD
19	51°34.231N	1°34.720E	South Knock Waverider
20	51.5331	1.1265	East of Warp Zooplankton Haul
21	53.4715	-3.2597	705wa Liverpool Bay (Burbo Bight)
22	53.5	-3.6917	715wa Liverpool Bay
23	53.625	-4.5	775wa Irish Sea
24	53.401918	-4.847027	UW
25	52.5	-5	665wa Off Cardigan Bay
26	51.758991	-5.955552	UW
27	51.389998	-6.031064	UW
28	51.25	-6	605wa Celtic Deep
29	51.249406	-5.599578	UW
30	51.274007	-4.668003	UW
31	50.601891	-5.246452	UW
32	49.982368	-6.087768	UW
33	49.739083	-5.532085	UW
34	49.748594	-5.041479	UW
35	50.0333	-4.3667	585wa Off Plymouth Sound
36	50.076062	-2.619833	UW
37	50.246921	-1.805773	UW

38	50.493042	-1.48613	UW
39	50.542181	-1.035583	UW
40	50.689484	-0.201246	UW
41	50.632152	0.25349	UW
42	53.0583	0.475	385wa Wash
43	53.5333	0.333	375wa Humber

AIMS:

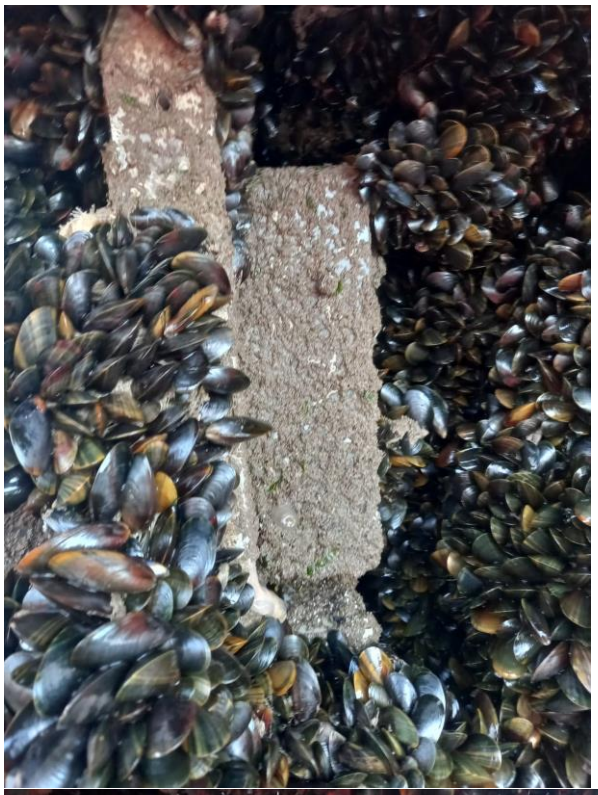
1. **Service Noise Landers at Dowsing and Warp (GIA6H) 2 days**
2. **Service SmartBuoys at Liverpool Bay, West Gabbard and Warp (GIA03D) 3 days**
3. **Continuous flow and CTD Rosette water sampling as required on various transects**
4. **Collection of zooplankton sample at Liverpool Bay, West Gabbard, Warp and East of Warp**
5. **Manta-trawling and catamaran trawling at 4-6knots and litter pump (C8374P; 1/2 day) on transects depending on weather**
6. **Collecting Waverider at Southwold. Grapple for clump at South Knock WR site (C6029A) 2.5 days**

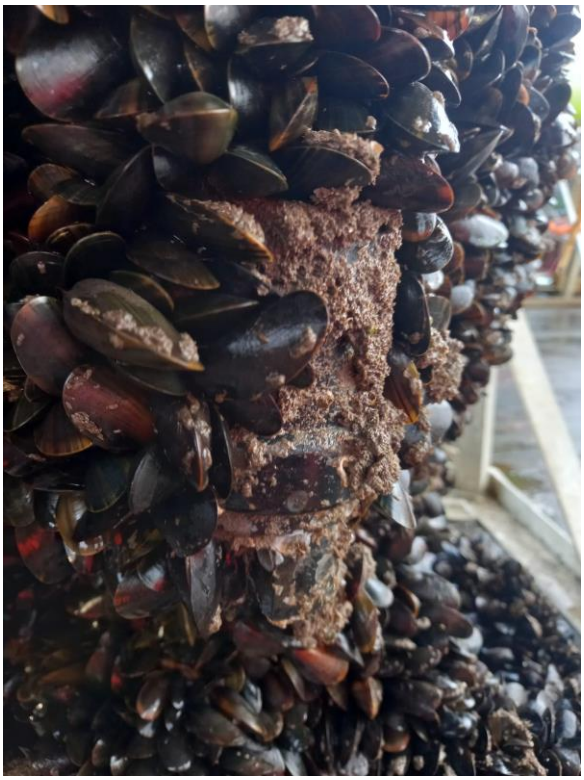
NARRATIVE:
21st – 22nd November
Cefas staff arrived at the vessel.

During the day on the 22nd of November, the equipment was set up and the three SmartBuoys we are planning to deploy were built by the Cefas scientists and engineers onboard. In the afternoon, staff participated in an induction talk, followed by a toolbox talk and cruise brief where we all discussed the scheduled cruise. In the evening the scientists gathered together to play some boardgames, including the well-liked Werewolf game.

The pilot boarded the vessel at 22:30 and we were clear of the Liverpool locks in the early morning hours of the 23rd of November.

23rd November
During the night, we steamed to the Liverpool Bay SmartBuoy station and firstly carried out a zooplankton ringnet dip (0.5 m, 200µm mesh) on arrival at 05:15. At first light we recovered the SmartBuoy at 08:40. The recovered SmartBuoy was heavily fouled with algae and mussels.





In addition, some of the mooring wires were frayed.

The newly assembled SmartBuoy was deployed at 09:55, followed by a CTD rosette dip at 10:00.

Seawater samples were collected from the CTD rosette from the surface and bottom of the water column to analyse for dissolved oxygen (3 x samples collected from surface, 3 x bottom); nutrients (1 x surface, 1 x bottom); chlorophyll (3 x surface); suspended particulate matter (SPM) (1 x surface, 1 x bottom); salinity (1 x surface, 1 x bottom); Coloured Dissolved Organic Matter (CDOM) (1 x surface, 1 x bottom); and phytoplankton (1 x surface). These samples can stand alone to contribute to eutrophication assessment but can also be used to calibrate sensors on the Ferrybox, increasing the valid spatial coverage of relevant assessment parameters autonomously measured throughout the survey.

After all the operations were complete, we made our way at best speed to cover the most possible ground before the bad weather catches up with us.

24th November

Hourly underway samples were taken overnight during transit. Seawater is collected from the underway flowthrough system and will be analysed in the lab for salinity, chlorophyll, SPM, salinity, CDOM and nutrient (phosphate, nitrate, nitrite, silicate and ammonia) concentrations. The flowcytometer was switched on to passively sample every hour, this is connected to our Ferrybox system onboard and measures algal concentrations within the seawater by counting the phytoplankton cells present.

We transited from Liverpool Bay to south Cardigan Bay where we anchored to wait out the bad weather.

Whilst anchored, we cleaned and dismantled the recovered Liverpool Bay SmartBuoy, which was also a training opportunity for new team members. The team watched a movie and played some games during the downtime.

At 20:00 there was a catch up with 2nd Navigator and Chief Mate for route planning. We discussed if it was possible to detour into the Bristol Channel for an underway sample, the decision would be made in the morning depending on weather conditions.

25th November

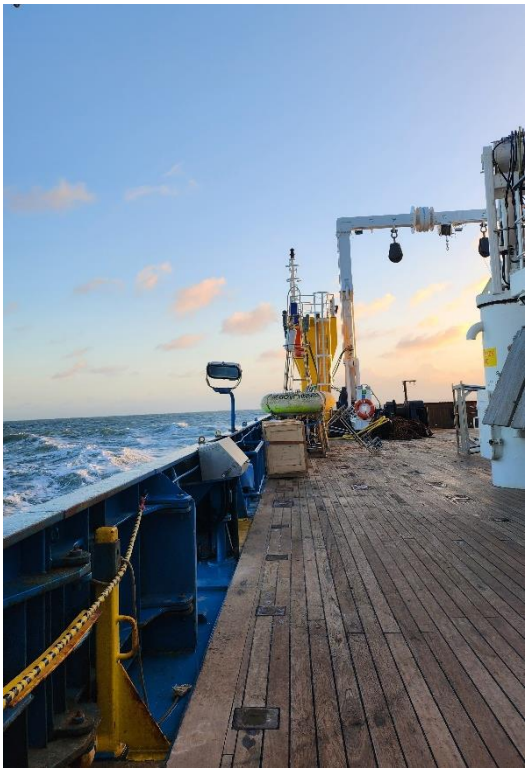
At 06:00 the RV Endeavour set off to transit south through the Celtic Sea towards the English Channel. Marine microplastic samples were collected via the CALPS system and underway water samples were collected every two hours during the transit.

At 10:10, the Master informed the SIC that the shortest route south was needed to ensure the crossing during the best weather window was achievable. Therefore, it was not possible to transit into the Bristol Channel to collect an underway sample. Instead, we steamed south collecting underway water samples and CALPS continuously through the night and throughout the English Channel.

26th November

The SIC writes daily report on the bridge every morning at 08:00 and catches up with the navigation officer about route planning.

The English Channel offered some much-needed calmer weather and we arrived at the Central Channel CTD station at 08:30 for water sampling of dissolved oxygen (3 x surface, 3 x bottom); nutrients (1 x surface, 1 x bottom); chlorophyll (3 x surface); suspended particulate matter (SPM) (1 x surface, 1 x bottom); salinity (1 x surface, 1 x bottom); and Coloured Dissolved Organic Matter (CDOM) (1 x surface, 1 x bottom).



Underways and CALPS were halted at 10:40 for one hour due to maintenance and therefore sampling did not occur. Hourly underway sampling and two hourly CALPS resumed at midday and sampling continued throughout the day until Selsey Bill CTD station at 18:00.

27th November

Hourly water samples and two-hourly marine litter CALPS continued until we reached South Verne CTD station, where the weather was too windy to deploy the CTD rosette, therefore the ESM2 profiler was deployed at 00:45. We collected bottom oxygen samples from the niskin attached, but all other samples were collected from the flowthrough system.

Water samples and CALPS resumed until we reached Warp at 06:15. The zooplankton ringnet was deployed at 06:30, followed by the pre-deployment CTD at 07:00. The Warp SmartBuoy was recovered at 09:00.

The new SmartBuoy was deployed at 10:50. Once operations were completed, the post-deployment Warp CTD occurred at 11:20 and seawater samples collected from the rosette niskin bottles. Dissolved oxygen (3 x surface, 3 x bottom); nutrients (1 x surface, 1 x bottom); chlorophyll (3 x surface); suspended particulate matter (SPM) (1 x surface, 1 x bottom); salinity (1 x surface, 1 x bottom); Coloured Dissolved Organic Matter (CDOM) (1 x surface, 1 x bottom); and phytoplankton (1 x surface) samples were collected.

The marine microplastic pump was deployed at Warp at 11:30 for 20 minutes and sampled around 4000 litres of seawater.

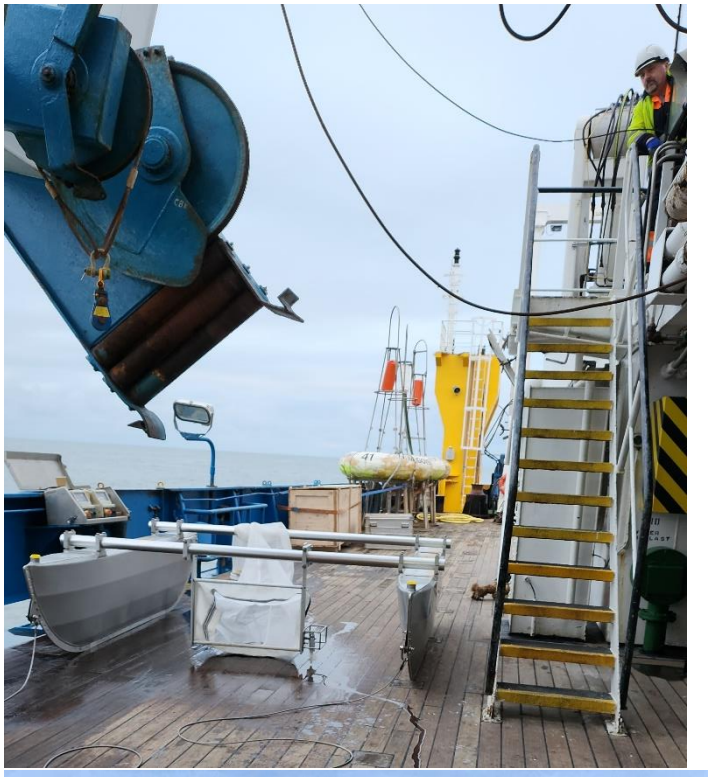
The marine litter catamaran trawl was tested at 15:20 and 16:30 as we transited North from Warp to TP1 for a CTD dip at 18:00. The catamaran trawls are carried out at 4 knots to sample for surface water plastics. Nutrients (1 x surface, 1 x bottom); chlorophyll (3 x surface); SPM (1 x surface, 1 x bottom); and salinity (1 x surface, 1 x bottom) samples were collected from the CTD Rosette. Overnight, underway water samples and CALPS were collected.

28th November

From TP1 we travelled Southeast, collecting an underway water sample and CALPS sample on the way until we reached West Gabbard at 05:30. The zooplankton ringnet was deployed at 05:30, shortly followed by marine litter microplastic pump at 05:50, and the CTD rosette at 06:45.

West Gabbard SmartBuoy operations started at 08:00 and the Buoy was recovered at 08:30. During recovery, it was observed that there was a torn side wire on the Buoy, this was the two-metre mooring wire which had parted at some point whilst the SmartBuoy was out. It was soon realised the issue occurred because all the weight was on the tether wire and frame. To ensure this would not happen again the mooring was slightly modified for the outgoing SmartBuoy. The new Buoy was deployed at 09:00, with the post-deployment CTD dip at 09:30. We left West Gabbard and headed North towards the Southwold Waverider station with hourly water samples and two-hourly CALPS during the transit.

At Southwold, the Waverider was recovered 13:30 and the new Waverider deployed at 14:00. We then steamed Northeast to Southern Bight CTD. During the steam, underway water samples, CALPS, and four catamaran trawls were conducted, the catamaran trawls took place at 15:00, 16:40, 18:20, and 19:10.

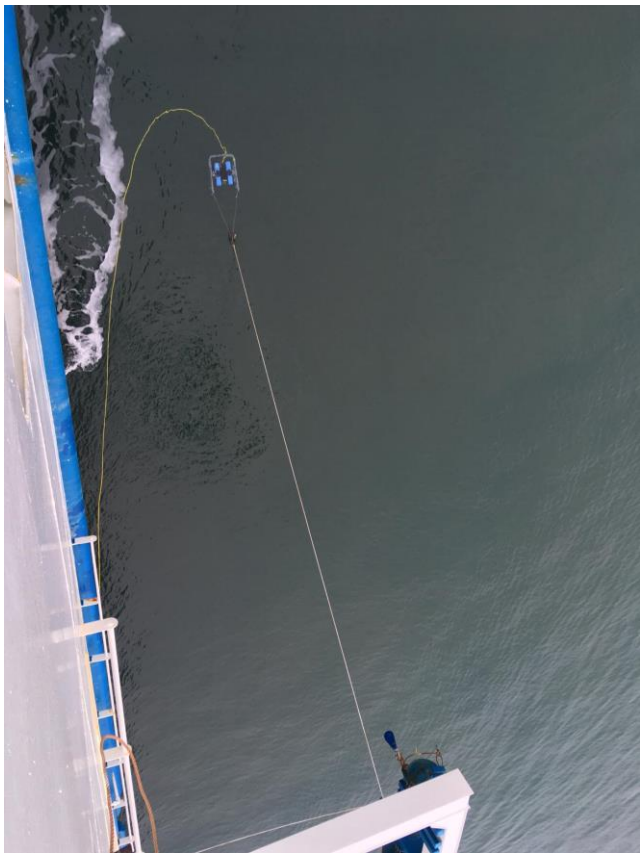


The Southern Bight CTD dip occurred at 22:30 collecting for surface and bottom nutrients, salinity, SPM, chlorophyll, dissolved oxygen and CDOM. We left Southern Bight and headed Northwest towards Dowsing for first light with underway water samples and CALPS collected on the way.

29th November

We arrived at Dowsing at 05:45 with a marine microplastic litter pump dip at 06:00 followed by a CTD deployment at 06:30. Dowsing Noise Lander operations began at 08:00 after breakfast. The buffs were not present, therefore we attempted to activate the acoustic release, but it did not respond, any other attempts to release did not work. At 09:30, after discussions between SIC and Bridge crew, it was decided we would grapple for the Noise Lander assembly.

At 10:30, after 3 unsuccessful grappling attempts, it was decided we would use the ROTV camera to scan the seabed.



This proved unsuccessful due to strong currents, poor visibility, and not being able to see the wire on the seabed. After a few more attempts with the acoustic release, the efforts were dropped. The new Noise Lander was deployed at 14:00.

Once finished at the Dowsing site, we steamed towards the Humber, with a catamaran marine litter trawl occurring at 15:30 on the way. We collected an extra member on board in the shape of a pink-footed goose. The goose stayed with us until the southern Norfolk coast, when it saw land and flew off after spending the night in the wet lab.

Goose arriving

Part of the crew! We need to find some goose sized PPE.

We arrived at the Humber CTD station, and it was completed by 18:30. Afterwards we transited towards the Wash. During the transit we stopped to deploy the marine microplastic pump at 19:45. Underway and CALPS samples were taken during the transits between stations. We arrived at the Wash CTD station and deployed the last CTD dip of the survey at 22:30.

30th November

On our transit back south along the coastline, we paused off Sheringham at 08:00 for catamaran trawls and the final underway water sample was collected.

The RV Cefas Endeavour arrived back into Lowestoft at 13:00 for demobilisation of staff, gear, and samples. Some of the scientific leads stayed on board for photos of their analysis and work for the new Cefas promotions.

RESULTS: In relation to the above-mentioned Aims:

1. Service Noise Landers at Dowsing and Warp: Achieved Dowsing NL deployment, not recovery, and operations at Warp successful.
2. Service SmartBuoys at West Gabbard and Warp: Achieved
3. Continuous flow and CTD Rosette water sampling as required on various transects: Achieved
4. Collection of zooplankton sample at West Gabbard, Warp and Liverpool Bay: Achieved

5. Collecting Waverider at Southwold. Grapple for clump at South Knock WR site (C6029A) 2.5 days: Southwold achieved, South Knock was not achieved as we did not have correct equipment.
6. Manta-trawling, catamaran trawling, and microplastic pump (C8374P) on transects depending on weather at 4-6knots: Achieved

The detailed breakdown of equipment deployed, and samples collected for analysis can be found in Table 1. In addition, we collected X CALPS alongside the underway stations.

Table 1. Summary of sample collections including deployments and recoveries of gear.

Station #	Date	Time	Latitude	Longitude	Sample Type	Analytic
1	23/11/2022	05:14	53.54325	-3.36459	Zoo-plankton	Plankton
2	23/11/2022	05:32	53.5451	-3.37073	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
5	23/11/2022	08:39	53.53335	-3.36386	Smartbuoy Recovery	
7	23/11/2022	09:55	53.53343	-3.36379	Smartbuoy Deployment	
8	23/11/2022	10:21	53.53172	-3.37303	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
9	23/11/2022	11:45	53.56742	-3.72582	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
10	23/11/2022	13:00	53.55751	-4.16591	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
11	23/11/2022	14:00	53.5587	-4.53769	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
12	23/11/2022	15:00	53.49799	-4.79023	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
13	23/11/2022	15:55	53.41708	-4.89486	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
14	23/11/2022	17:55	53.26852	-4.93841	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
15	23/11/2022	19:55	53.13733	-4.93122	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
16	23/11/2022	21:55	52.96791	-4.93013	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1

17	23/11/2022	23:04	52.82063	-4.92454	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
18	24/11/2022	00:32	52.6352	-4.91014	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
19	24/11/2022	01:30	52.51635	-4.912	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
20	24/11/2022	02:30	52.40766	-4.90873	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
21	24/11/2022	03:31	52.2919	-4.90717	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
22	24/11/2022	05:00	52.13737	-4.90078	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
23	24/11/2022	07:00	52.05318	-4.87202	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
24	25/11/2022	06:00	52.03602	-4.87692	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
25	25/11/2022	08:00	52.02371	-5.20645	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
26	25/11/2022	10:00	51.94461	-5.53847	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
27	25/11/2022	12:00	51.78872	-5.92609	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
28	25/11/2022	14:00	51.43364	-5.9925	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
29	25/11/2022	16:00	51.09275	-6.00153	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
30	25/11/2022	17:59	50.7797	-6.01235	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
31	25/11/2022	19:59	50.43453	-6.01896	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
32	25/11/2022	21:59	50.0351	-6.01609	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
33	26/11/2022	00:00	49.89307	-5.62098	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
34	26/11/2022	01:00	49.88732	-5.35181	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1; CDOM x1
35	26/11/2022	02:00	49.89659	-5.08445	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
36	26/11/2022	03:00	49.92109	-4.78469	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
37	26/11/2022	04:00	49.94707	-4.47515	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1

38	26/11/2022	05:00	49.97233	-4.15435	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
39	26/11/2022	06:00	49.99961	-3.81601	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
40	26/11/2022	07:00	50.04217	-3.46776	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
41	26/11/2022	08:31	50.06954	-2.992	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
42	26/11/2022	09:30	50.14256	-2.71535	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
43	26/11/2022	10:30	50.22457	-2.37816	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
44	26/11/2022	12:44	50.39939	-1.68804	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
45	26/11/2022	13:44	50.46044	-1.43163	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
46	26/11/2022	14:44	50.51861	-1.22027	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
47	26/11/2022	15:44	50.56524	-1.03719	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
48	26/11/2022	16:39	50.62912	-0.91884	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
49	26/11/2022	17:41	50.66459	-0.82459	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
50	26/11/2022	19:00	50.62687	-0.50766	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
51	26/11/2022	20:00	50.61327	-0.19653	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
52	26/11/2022	21:00	50.63537	0.138141	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
53	26/11/2022	22:00	50.67338	0.492134	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
54	26/11/2022	23:00	50.79123	0.799564	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
55	27/11/2022	00:42	50.98746	1.205937	ESM2	Dissolved oxygen x3 (3x bottom); Salinity x1 (surface); Nutrients x1 (surface); Chlorophyll x3 (surface); SPM x1 (surface); CDOM x1 (surface)
56	27/11/2022	02:00	51.14635	1.529421	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1

57	27/11/2022	03:00	51.3285	1.649486	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
58	27/11/2022	04:00	51.46108	1.422894	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
59	27/11/2022	05:00	51.48806	1.18523	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
60	27/11/2022	06:40	51.52705	1.041961	Zooplankton	Plankton
61	27/11/2022	06:54	51.5283	1.052731	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom); Phytoplankton x1 (surface)
65	27/11/2022	09:05	51.53332	1.046604	Warp SmartBuoy recovery	
68	27/11/2022	10:48	51.53313	1.049381	Warp SmartBuoy deployment	
69	27/11/2022	11:18	51.52669	1.029523	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom); Phytoplankton x1 (surface)
70	27/11/2022	11:45	51.52608	1.030495	Microplastic pump	Marine microplastics
71	27/11/2022	13:00	51.56331	1.114873	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
72	27/11/2022	14:00	51.6953	1.357387	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
73	27/11/2022	14:23	51.73114	1.402509	Catamaran Trawl	Marine litter
74	27/11/2022	15:20	51.77063	1.440553	UW	Salinity x1; Nutrients x1; Chlorophyll x1
75	27/11/2022	16:00	51.73791	1.404845	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
76	27/11/2022	16:31	51.76597	1.443998	Catamaran Trawl	Marine litter
77	27/11/2022	17:13	51.76054	1.430821	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
78	27/11/2022	18:16	51.90902	1.523895	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface &

						bottom); CDOM x2 (surface & bottom)
79	27/11/2022	20:00	52.03867	1.629706	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
80	27/11/2022	21:42	52.18276	1.679547	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
81	28/11/2022	00:45	52.07339	1.943381	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
82	28/11/2022	05:33	51.95506	2.122525	Zooplankton	Plankton
83	28/11/2022	05:48	51.96237	2.129304	Microplastic pump	Marine microplastics
84	28/11/2022	06:50	51.95345	2.124375	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom); Phytoplankton x1 (surface)
85	28/11/2022	08:22	51.95225	2.111673	West Gabbard SmartBuoy recovery	
86	28/11/2022	09:11	51.95228	2.111674	West Gabbard SmartBuoy deployment	
87	28/11/2022	09:27	51.95281	2.120242	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom); Phytoplankton x1 (surface)
88	28/11/2022	10:29	52.05983	2.046956	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
89	28/11/2022	11:30	52.1795	1.92197	UW	Salinity x1; Nutrients x1; Chlorophyll x1
90	28/11/2022	12:32	52.30035	1.794622	UW	Salinity x1; Nutrients x1; Chlorophyll x1
91	28/11/2022	13:26	52.31084	1.782853	Southwold Wave Rider recovery	
92	28/11/2022	13:56	52.31088	1.782979	Southwold Wave Rider deployment	

93a	28/11/2022	15:03	52.32187	1.797006	Catamaran Trawl	Marine litter
93	28/11/2022	16:33	52.43231	2.021222	UW	Salinity x1; Nutrients x1; Chlorophyll x1
94	28/11/2022	16:40	52.43857	2.032409	Catamaran Trawl	Marine litter
95	28/11/2022	18:19	52.55881	2.26373	Catamaran Trawl	Marine litter
96	28/11/2022	18:49	52.56397	2.312263	UW	Salinity x1; Nutrients x1; Chlorophyll x1
97	28/11/2022	19:07	52.54367	2.310801	Catamaran Trawl	Marine litter
98	28/11/2022	21:15	52.69809	2.553178	UW	Salinity x1; Nutrients x1; Chlorophyll x1
99	28/11/2022	22:36	52.82932	2.825499	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
100	28/11/2022	23:35	52.86279	2.593453	UW	Salinity x1; Nutrients x1; Chlorophyll x1
101	29/11/2022	01:29	53.02614	2.062385	UW	Salinity x1; Nutrients x1; Chlorophyll x1
102	29/11/2022	02:45	53.18053	1.710809	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
103	29/11/2022	04:01	53.34934	1.400211	UW	Salinity x1; Nutrients x1; Chlorophyll x1
104	29/11/2022	06:05	53.52742	1.066439	Microplastic pump	Marine microplastics
105	29/11/2022	06:25	53.52519	1.064225	Microplastic pump	Marine microplastics
106	29/11/2022	06:37	53.52353	1.063249	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom); CDOM x2 (surface & bottom)
107	29/11/2022	13:57	53.52943	1.052139	Noise Lander deployment	
108	29/11/2022	14:15	53.52887	1.050488	Noise Lander clump deployment	
109a	29/11/2022	15:27	53.58493	0.980044	Catamaran Trawl	Marine litter
109	29/11/2022	15:45	53.59508	0.952343	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
110	29/11/2022	17:12	53.55581	0.692865	UW	Salinity x1; Nutrients x1; Chlorophyll x1
111	29/11/2022	18:36	53.52331	0.380722	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface &

						bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom)
112	29/11/2022	19:46	53.46364	0.591922	Microplastic pump	Marine microplastics
113	29/11/2022	21:00	53.31215	0.635571	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
114	29/11/2022	22:19	53.13973	0.552509	CTD	Dissolved oxygen x6 (3 x surface, 3x bottom); Salinity x2 (surface & bottom); Nutrients x2 (surface & bottom); Chlorophyll x3 (surface); SPM x2 (surface & bottom)
115	30/11/2022	08:09	52.89439	1.67346	Catamaran Trawl	Marine litter
116	30/11/2022	08:50	52.84658	1.689024	Catamaran Trawl	Marine litter
117	30/11/2022	09:00	52.83575	1.692035	UW	Salinity x1; Nutrients x1; Chlorophyll x1; SPM x1
118	30/11/2022	09:30	52.79845	1.705888	Catamaran Trawl	Marine litter

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30/11/2022

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