

RESEARCH VESSEL SURVEY REPORT

RV CEFAS ENDEAVOUR
Survey: C END 18 - 2018.

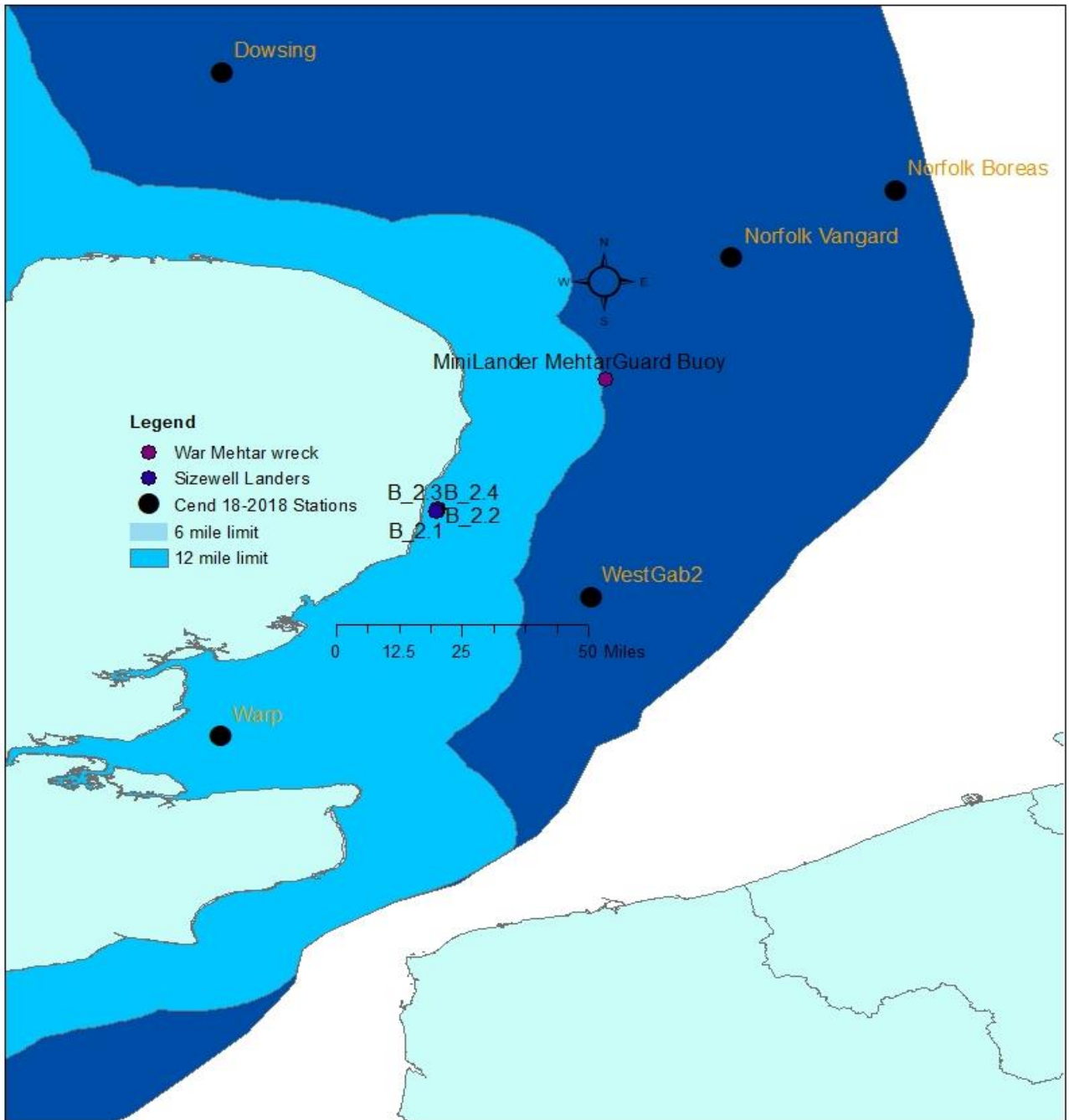
STAFF:

Name	Role
E. E. Manuel Nicolaus	SIC
Eric Fitton	2IC Vattenfall
David Pearce	Deck Master-Moorings/Vattenfall
Naomi Greenwood	Nutrient sampling Night lead
Andrew Bodle	Nutrient sampling/ Moorings/Vattenfall
Axayacatl Molina-Ramirez	Nutrient sampling/ Moorings/Vattenfall
Nathan Merchant	Noise work
Isabel Seguro	General support
Paul Nelson	Nutrient sampling lead

DURATION: 12th to 16th November

LOCATION: North Sea between Warp and Dowsing

Dowsing:	53° 31.8727	1° 03.3601	53.531	1.056
Warp	51° 32.081	1° 03.141	51.535	1.052
WestGab2	51°57.1804	2° 06.6597	51.953	2.111
Norfolk Boreas	53°10.647	2° 59.10294	53.177	2.985
Norfolk Vanguard	52° 58.5200	2° 30.9289	52.975	2.515
Sizewell A – MiniLander 1	52° 13.1658'	1° 40.2445'	52.21943	1.671
Sizewell A – MiniLander 1	52° 13.2506'	1° 40.1205'	52.2208	1.6687
Sizewell A – MiniLander 1	52° 13.2424'	1° 40.3826'	52.2207	1.673
Sizewell A – MiniLander 1	52° 13.0809'	1° 40.3693'	52.218	1.6718
Sizewell A – MiniLander 1	52° 13.0891'	1° 40.1063'	52.2182	1.6684
Sizewell B – MiniLander 2	52° 12.6744'	1° 40.0264'	52.2111	1.6671
Sizewell B – MiniLander 2	52° 12.7585'	1° 39.9077'	52.2126	1.6651
Sizewell B – MiniLander 2	52° 12.7499'	1° 40.1662'	52.2125	1.6694
Sizewell B – MiniLander 2	52° 12.5885'	1° 40.1503'	52.2098	1.6692
Sizewell B – MiniLander 2	52° 12.5989'	1° 39.8867'	52.2099	1.6648
Mehtar - MiniLander	52° 36.54	2° 8.94	52.609	2.149
Mehtar - Guard Buoy	52° 36.54	2° 9.06	52.609	2.151



Survey Aims

1. Service SmartBuoys at Dowsing, Warp and West Gabbard2 (2 days)
2. Service noise landers at Dowsing and Warp (0.5 day)
3. Vattenfall Norfolk Vanguard: lander service and water sampling (0.5 day)
4. Vattenfall Norfolk Boreas: lander service and water sampling (0.5 day)
5. War Mehtar lander deployment (0.5 day)
6. Collection of zooplankton sample at West Gabbard for community composition analysis
7. Sizewell MiniLander deployments
8. Testing of the Ferrybox software for controlling the water sampler – collection of samples for nutrients and phytoplankton analysis.
9. Collection of large volumes (~400L) of surface seawater for DOM (Dissolved Organic Matter) extraction for use in experiments at UEA (part of the REMAIN project).

NARRATIVE:

12th November: All 9 scientists boarded the RV Cefas Endeavour by 15:00. At 15:30, there was a safety induction for 6 of the scientists who have not had one on this vessel for the last six months. At 16:10 there was a tool box talk that highlighted the upcoming work over the next 4 days. The master explained the key safety points everyone should be aware of, while the SiC, 2iC and Deck Master explained what will be collected where and highlighting the various method statements and SOPs everyone needs to be familiar with before the relevant work can be carried out. We also discussed the route of the survey. Due to strong winds offshore (25-30knots), it was decided to sail to the Warp first (shallow and sheltered).

The pilot was booked for 22:30.

13th November: After the pilot left, we made our way to the Warp Smartbuoy station. On the ~70nm transit, we collected 7 water samples for salinity, chlorophyll, SPM and nutrients, on an hourly basis. We arrived at warp at 07:05 for a CTD deployment. Then we recovered the smartbuoy and lander. Afterwards, we deployed a noise lander and a smartbuoy (10:00). Sampling at Warp was completed with a CTD at 10:14 (Survey aim 1 and 2). We then set course towards the Sizewell B lander site (~60nm away). We arrived at Sizewell B (SZ2) and Sizewell A (SZ1) at 16:00 and 16:37, respectively and completed sampling here at 18:00 with the CTDs (Survey aim 7 achieved). Then we steamed to the 25nm away West Gabbard 2 Smartbuoy station. On transit we carried out one additional set of sampling for salinity, chlorophyll, SPM and nutrients. On arrival at the West Gabbard 2 station, we deployed a ring net at 22:07 for zooplankton analysis (Survey aim 6 achieved). Afterwards, we started the collection of water using the CTD rosette for DOM analysis (Survey aim 9).

14th November: Overnight, we filtered 200 L of water for DOM analysis. Then we used the CTD rosette to collect water for bottom and surface analysis of salinity, chlorophyll, SPM oxygen and nutrients, twice. Once at 01:30 and again at 06:20. In between the above-mentioned water filtration took place. At 07:57 we recovered the Smartbuoy at West Gabbard 2 and deployed a new one at 08:30. We then took a sample with the CTD rosette at 08:40. All sampling was completed at 08:55. We then steamed to the 62nm away Vattenfall Vanguard site. On transit, we collected 2 water samples for salinity, chlorophyll, SPM and nutrients from the continuous water flow system. At Vattenfall Vanguard we firstly had a toolbox talk, where we discussed relevant H&S requirements including the method statement and RAs. Then we carried out a CTD at 14:20. We triggered the acoustic release on the mini-lander, to release two marker buoys, but they did not surface. Then we tried to recover the mini-lander-clump, but the tide changed against our favour (waves hitting the vessel strongly while backing up towards the marker buoys) and we had to abandon the recovery (15:10). Then we steamed to the 23nm away War Mehtar site. We arrived there at 17:45, carried out a detailed toolbox talk, just like the one

at the Vattenfall site. We deployed a mini-lander here at 18:26, followed by the clump and Guardbuoy at 18:42 (Survey aim 5 completed). Then we set course to the 62nm away Dowsing Smartbuoy station. On transit, we collected 2 water samples for salinity, chlorophyll, SPM and nutrients from the continuous water flow system. We arrived at Dowsing at 23:45.

15th November: Just after midnight, we started to collect seawater for the analysis of DOM using the CTD rosette (Survey aim 9 completed) at Dowsing. In total, we collected another 200L. This was completed at 05:00. Then we got into position to collect water using the CTD rosette for salinity, chlorophyll, SPM, dissolved oxygen and nutrients (05:30) at Dowsing. Then we deployed the mini-noise-lander (Survey aim 2 completed) at 06:03, followed by the clump at 6:22 (Survey aim 2) at Dowsing. Between 06:29 and 06:58, the engines kept on tripping out, but this was fixed. Then we recovered the Smartbuoy and clump at 07:17 and 07:21, respectively. Then we deployed a Smartbuoy and clump at 08:02 (Survey aim 1 completed). We completed the dowsing site at 08:20 with a water sample from the CTD rosette. We steamed from Dowsing to the 72nm away Vattenfall Boreas site to carry out the mini-lander recovery and deployment there. On transit, we collected two more water samples from the continuous flow system for salinity, chlorophyll, SPM and nutrients. We also carried out tests of the Ferrybox software for controlling the water sampler, but there was no battery power in the water sampler. A new one will be installed in December (Survey aim 8 achieved). Before arrival at Vattenfall Boreas, we carried out a toolbox talk, where we discussed relevant H&S procedures for this site. Then we carried out a CTD at 14:45, followed by the min-lander recovery (15:18 for lander and 15:29 clump) and deployment (16:06 for lander and 16:19 for clump). Then we finished at the site with a CTD at 16:36 (Survey aim 4 achieved). Then we sailed to the 21nm away Vattenfall Vanguard site. On transit, we collected a water sample from the continuous flow system for salinity, chlorophyll, SPM and nutrients.

16th November: We reached Vattenfall Vanguard in the early morning. We had a toolbox talk refresher, reminding everyone on the various H&S and deployment steps to be aware of. As we already collected a CTD here on the 14th, we did not have to collect another one before lander recovery. Then we got into position for clump and mini-lander recovery. The clump was recovered first at 07:13 followed with the lander at 7:26. This was because the buffs in the lander bucket did not surface after triggering the acoustic release. This was because they were jammed. Then we deployed the lander at 8:29 followed with the clump at 8:39. Then we completed the site at 09:01 with a CTD (Survey aim 3 achieved). Then we sailed back towards Lowestoft to meet the Pilot at 15:00. On transit, back to Lowestoft, we collected one more sample from the continuous flow system for salinity, chlorophyll, SPM and nutrients.

RESULTS: In relation to the above-mentioned Aims:

1. Service SmartBuoys at Dowsing, Warp and West Gabbard2: **Achieved**
2. Service noise landers at Dowsing and Warp: **Achieved**
3. Vattenfall Norfolk Vanguard: lander service and water sampling: **Achieved**
4. Vattenfall Norfolk Boreas: lander service and water sampling: **Achieved**
5. War Mehtar lander deployment: **Achieved**
6. Collection of zooplankton sample at West Gabbard for community composition analysis; **Achieved**
7. Sizewell MiniLander deployment: **Achieved**
8. Testing of the Ferrybox software for controlling the water sampler – collection of samples for nutrients and phytoplankton analysis: **Achieved**
9. Collection of large volumes of surface seawater for DOM (Dissolved Organic Matter) extraction for use in experiments at UEA (part of the REMAIN project): **Achieved**

Table 1. Overview of various deployments during C End 18 - 2018 at the various sites

Sample Type	Gear	Station Code	LAT DEG	LAT MIN	LON DEG	LON MIN	Date	TIME
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	28.844	1	46.813	12/11/2018	23:34
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	19.314	1	47.811	13/11/2018	00:32
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	10.477	1	46.403	13/11/2018	01:31
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	1.076	1	44.806	13/11/2018	02:30
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	51	52.382	1	41.765	13/11/2018	03:30
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	51	47.063	1	30.113	13/11/2018	04:29
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	51	41.013	1	18.943	13/11/2018	05:23
SPM; CHL; NUT; SAL; OXY	CTD	WARP	51	31.733	1	2.873	13/11/2018	07:05
RECOVERY	SMARTB	WARP	51	32.113	1	3.195	13/11/2018	07:57
RECOVERY	SB_CLUMP	WARP	51	32.107	1	3.183	13/11/2018	08:04
RECOVERY	NOISE-LAND_M	WARP	51	32.045	1	2.985	13/11/2018	08:24
RECOVERY	NOISE-LAND_CL	WARP	51	32.033	1	2.959	13/11/2018	08:34
RECOVERY	NOISE-LANDER	WARP	51	31.968	1	2.927	13/11/2018	08:46
DEPLOYMNET	NOISE-LANDER	WARP	51	31.969	1	2.924	13/11/2018	09:14
DEPLOYMNET	SB_W_CLUMP	WARP	51	32.091	1	3.161	13/11/2018	09:58
SPM; CHL; NUT; SAL; OXY	CTD	WARP	51	31.978	1	3.301	13/11/2018	10:14
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	51	46.189	1	28.462	13/11/2018	12:30
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	51	59.555	1	47.812	13/11/2018	14:30
DEPLOYMNET	LANDER	SIZEWELL 2	52	12.695	1	40.043	13/11/2018	16:00
DEPLOYMNET	CLUMP- GBUOY	SIZEWELL 2	52	12.625	1	40.006	13/11/2018	16:17
DEPLOYMNET	LANDER	SIZEWELL 1	52	13.185	1	40.249	13/11/2018	16:37
DEPLOYMNET	CLUMP-GDBUOY	SIZEWELL 1	52	13.118	1	40.227	13/11/2018	16:54
SPM; CHL; NUT; SAL; OXY	CTD	SIZEWELL 1	52	13.442	1	41.092	13/11/2018	17:38
SPM; CHL; NUT; SAL; OXY	CTD	SIZEWELL 2	52	12.582	1	40.644	13/11/2018	18:02
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	3.989	1	57.567	13/11/2018	19:30
DOM	CTD	WEST GAB 2	51	57.325	2	7.471	13/11/2018	21:02
ZOOPLANKTON	RINGNET	WEST GAB 2	51	57.076	2	7.52	13/11/2018	22:07
DOM	CTD	WEST GAB 2	51	57.034	2	7.321	14/11/2018	01:24
SPM; CHL; NUT; SAL; OXY	CTD	WEST GAB 2	51	57.09	2	7.313	14/11/2018	06:16
RECOVERY	SMARTB	WEST GAB 2	51	57.221	2	6.688	14/11/2018	07:48
RECOVERY	SMARTB_CLUMP	WEST GAB 2	51	57.219	2	6.685	14/11/2018	07:57
DEPLOYMNET	SMARTB_CLUMP	WEST GAB 2	51	57.249	2	6.653	14/11/2018	08:30
SPM; CHL; NUT; SAL; OXY	CTD	WEST GAB 2	51	57.3716	2	7.041	14/11/2018	08:46
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	17.613	2	14.864	14/11/2018	10:29
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	39.94	2	25.614	14/11/2018	12:29
SPM; SAL	CTD	Vattenf.Vanguard	52	58.075	2	31.636	14/11/2018	14:17
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	49.399	2	17.727	14/11/2018	16:27
DEPLOYMNET	Mini_Lander	War Mehtar	52	36.517	2	8.42	14/11/2018	18:26
DEPLOYMNET	GBUOY_Clump	War Mehtar	52	36.517	2	9.047	14/11/2018	18:42
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	42.16	1	59.12	14/11/2018	19:29
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	53	1.835	1	29.448	14/11/2018	21:31

SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	53	22.679	1	9.605	14/11/2018	23:31
DOM	CTD	Dowsing	53	31.769	1	4.206	15/11/2018	00:35
DOM	CTD	Dowsing	53	31.717	1	3.964	15/11/2018	03:45
SPM; CHL; NUT; SAL; OXY	CTD	Dowsing	53	31.668	1	3.971	15/11/2018	05:37
DEPLOYMNET	NOISE-LANDER	Dowsing	53	31.7	1	3.206	15/11/2018	06:03
DEPLOYMNET	BUFFS Clump	Dowsing	53	31.735	1	3.314	15/11/2018	06:22
RECOVERY	SMARTB	Dowsing	53	31.824	1	3.386	15/11/2018	07:17
RECOVERY	SB-Clump	Dowsing	53	31.828	1	3.391	15/11/2018	07:21
DEPLOYMNET	SB and Clump	Dowsing	53	31.892	1	3.4	15/11/2018	08:02
SPM; CHL; NUT; SAL; OXY	CTD	Dowsing	53	32.039	1	3.37	15/11/2018	08:13
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	53	26.038	1	42.616	15/11/2018	10:30
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	53	15.138	2	19.136	15/11/2018	12:25
SPM; CHL; NUT; SAL	CTD	Vattenf. Boreas	53	10.402	2	58.481	15/11/2018	14:35
RECOVERY	LANDER-AWAC	Vattenf. Boreas	53	10.607	2	58.721	15/11/2018	15:18
RECOVERY	L-AWAC-CLUMP	Vattenf. Boreas	53	10.562	2	58.779	15/11/2018	15:29
DEPLOYMNET	LANDER-AWAC	Vattenf. Boreas	53	10.606	2	58.721	15/11/2018	16:06
DEPLOYMNET	L-AWAC-CLUMP	Vattenf. Boreas	53	10.613	2	58.848	15/11/2018	16:19
SPM; CHL; NUT; SAL; OXY	CTD	Vattenf. Boreas	53	10.531	2	58.202	15/11/2018	16:36
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	53	2.74	2	42.601	15/11/2018	19:33
RECOVERY	L-AWAC-CLUMP	Vattenf.Vanguard	52	58.474	2	31.025	16/11/2018	07:13
RECOVERY	LANDER-AWAC	Vattenf.Vanguard	52	58.488	2	31.115	16/11/2018	07:26
DEPLOYMNET	LANDER-AWAC	Vattenf.Vanguard	52	58.489	2	31.131	16/11/2018	08:29
DEPLOYMNET	L-AWAC-CLUMP	Vattenf.Vanguard	52	58.468	2	31.027	16/11/2018	08:39
SPM; SAL	CTD	Vattenf.Vanguard	52	58.732	2	30.438	16/11/2018	09:01
SPM; CHL; NUT; SAL	CON. WAT	TRANSIT	52	45.857	2	13.926	16/11/2018	11:30

E. E. Manuel Nicolaus (Cefas)
Scientist in Charge

Date: 16/11/2018

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