CE19014 - Monitoring Changes in Submarine Canyon Coral Habitats - Leg 2 (MoCha_Scan II)

RV Celtic Explorer and Holland 1 ROV - Cruise Number CE19014

Galway - Porcupine Bank Canyon - Cork

25th July 2019 to 31st July 2019

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Executive Summary

Cold-water corals generate lush, structurally complex habitats in otherwise barren parts of the deep seabed. They trap particulates including particulate organic matter (POM) and sediment enabling them to develop bathymetric structures called reefs and mounds. This survey focuses on the maiden retrieval of 8 novel, ROV-adapted lander systems in the Porcupine Bank Canyon (PBC) coral habitats, NE Atlantic.

CWC habitats have been mapped on the Irish margin over the past 20 years to progressively higher resolutions. In recent years, repeat mapping at consistently higher resolutions show that these habitats are dynamic and change has been quantified (sediment types, coral status and biodiversity). However, this drivers controlling this change has yet to be quantified or characterised. The main objective of this survey is to retrieve 8 lander systems that have been deployed in the PBC during CE19008 (MoCha_Scan Leg 1). These landers have been deployed for a period of approx. 2.5 months within a range of coral habitats throughout the PBC. They have been sampling particulates continuously and binned into 2.7 day bins. Current speed and direction have been measured in 20 m profiles from the lander for a period of 2 minutes every 10 minutes. Data recorded via landers from each habitat will allow to determine the controls on habitat variability and process thresholds. Furthermore, this data can be used as a baseline to which later deployments at this site will be used to compare against. Data will feed into a number of projects including: the H2020 project "Integrated Assessment of Atlantic Marine Ecosystems in Space & Time" (*iATLANTIC*) and the SFI-, GSI- and MI-funded "Mapping, Modelling and Monitoring Key Processes and Controls on Cold Water Coral Habitats in Submarine Canyons" (MMMonKey_Pro) programme.

Background

CWC's are common on the Irish-Atlantic margin between 600 and 1000 m water depth (Wheeler et al., 2007). Here, they form 3D structural habitats, commonly referred to as CWC mounds. These mounds occur as clusters forming mound provinces (e.g. the Hovland Mound Province and the Belgica Mound Province) made up of numerous coral mound structures (Dorschel et al., 2005; 2010; Huvenne et al., 2005). Beyer et al. (2003) imaged one of these mound provinces with multibeam sonar and revealed that these mound structures are over 100 m in height, several kilometres in length and have a conical morphology. With more recent, higher resolution ROV-mounted multibeam mapping, Lim et al. (2018a) reveal that there are hundreds of densely-spaced, smaller, incipient coral mounds around these larger coral mound structures, ranging between 4 and 15 m in height. ROV HD video imaging and subsequent photogrammetry show that these reefs are heterogeneous and change over time (Conti et al., 2019; Lim et al., 2017; Lim et al., 2018b).

Annual surveys between 2014 and 2018 to the Porcupine Bank Canyon, NE Atlantic (Wheeler and Shipboard party, 2014; 2015; 2016; 2017 and Lim and Shipboard party, 2018) have generated a large database of ROV HD video, core samples, CTD data, coral samples, regional- (hull-mounted EM302) and local- (ROV-mounted EM2040) scale multibeam sonar data. Preliminary results show that the

canyon has a near-vertical, bedrock-exposing, approx. 750 m tall cliff face which is predominantly colonised by cold water corals. Along the top of this cliff face, there is a 32 km-long and 30 m continuous "lip" of coral mound (Lim and Shipboard party, 2018).

Data from this survey feeds directly into a UCC Marine Geology Research Group, SFI-, GSI- and MI-funded project entitled Mapping, Modelling and Monitoring Key Controls and Processes on cold water coral habitats in Submarine Canyons (MMMonKey_Pro; www.marinegeology.ucc.ie). The project aims to explore and monitor the PBC-CWC habitats and relate to ocean-climate environmental dynamics. Time series lander data plays a central role in this project allowing to relate and contextualise the spatial and temporal components of the project. Results from these data will reveal the process thresholds defining coral sub-habitats' limits, in space and time, and allow predictive CWC and habitat sensitivity models to assist marine spatial planning.

References

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Wheeler, A.J., Beyer, A., Freiwald, A., de Haas, H., Huvenne, V.A.I., Kozachenko, M., Olu-Le Roy, K., Opderbecke, J., 2007. Morphology and environment of cold-water coral carbonate mounds on the NW European margin. International Journal of Earth Sciences 96, 37-56

Survey Objectives (and cruise track)
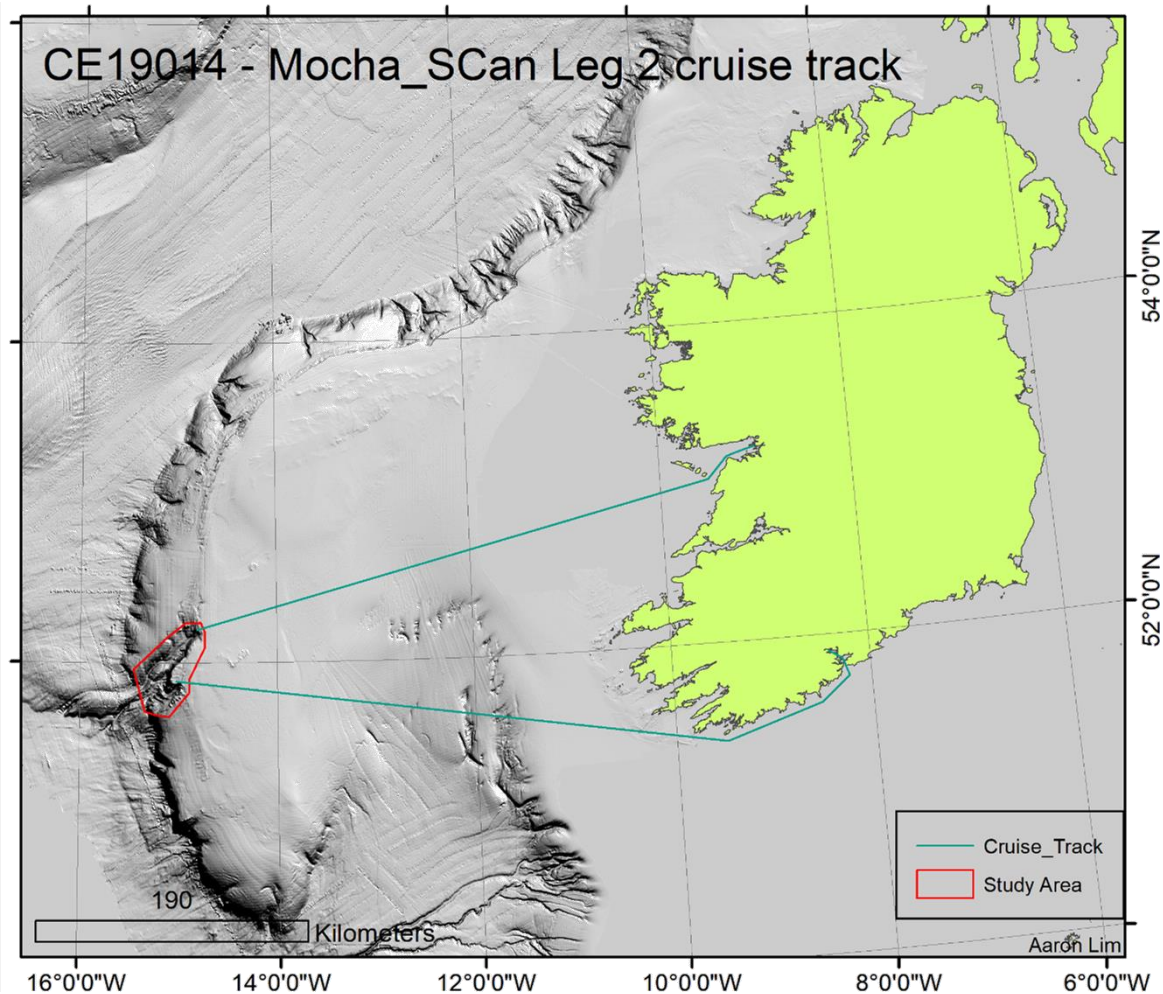
Fig. 1 Map showing main cruise track

The MoCha_Scan II research cruise (CE19014) has one clearly defined objective and 3 sub-objectives:

Task 1.1 - Retrieval of 8 Benthic Lander systems

8 Lander frames, each equipped with an upward-facing Acoustic Doppler Current Profiler (ADCP) and Sediment Trap have been adapted specifically for deployment via the Holland 1 ROV. The landers have previously been deployed, and continuously recorded data, for a period of approx. 2.5 months (23rd May, 2019 to 27th July 2019). Each lander was be deployed in a different coral habitat type throughout the canyon. Deployment via ROV allowed to sample and image the area around the lander deployment site. Further, ROV pilots were able to exact the bottom position of the Lander to record on and around smaller seabed targets (small reefs, scour pits, mound summits and flanks, gullies etc.) in deep water. The objective on this survey is to locate these 8 lander systems, recover them to the vessel, retrieve sediment trap samples and backup their digital datasets.

Area	Type
Northern Canyon	On-mound
Northern Canyon	Off-mound
Canyon Flank	On-mound
Canyon Flank	Off-mound
Canyon Flank	Coral Garden
Canyon Flank	Lip mound
Southern Canyon	On-mound
Canyon Deep	Channel

Table 1. Lander site description

Task 1.2 - ROV Video

HD video will be recorded during Lander retrievals. This data will be acquired with time-stamped USBL and INS data. This data will be used for: a) characterisation of the lander deployment sites and; b) to refer to changes in the habitat during the deployment period.

Task 1.3 - Hull-mounted ADCP

The vessel mounted ADCP will acquire data during lander retrieval. This will allow to put the lander ADCP into context within the full-water column and to compare against any changes since the hull-mounted ADCP data during deployment.

Task 1.4 - ROV CTD

A series of CTD casts will be acquired with the ROV CTD (both up and down cast and during dives). This will be used to a) calibrate the USBL systems sound velocity profile at each dive site and; b) to compare against changes in the watermass since the deployment of the systems.

Equipment

RV Celtic Explorer

The RV Celtic Explorer is a 65.5 m multi-purpose research vessel. The vessel has wet, dry and chemical laboratories, which are permanently fitted with standard scientific equipment and can accommodate 20-22 scientists along with 13-15 crew who are highly-skilled with the handling and deployment of scientific equipment. It has a maximum endurance of 35 days. The Celtic Explorer is equipped with two Trimble 300-D GPS' and has Dynamic Positioning. The aft deck has a 25 tonne "A-frame" with a 4 m outward and inward reach in addition to a 3 m, 10 tonne starboard T-frame. The ship also comprises of a midship, forward and aft crane as well as a 6 tonne CTD winch.

Fig. 2 The RV Celtic Explorer

Holland 1 ROV

The Holland 1 3000m depth ROV (remote operated vehicle) is a platform for capturing underwater footage of the seabed and transmitting the video as a live-feed to the scientists aboard the vessel. It has 100 hp with a maximum speed of 3 knots. An EM2040 multi-beam echo sounder is mounted on the vehicle for high resolution bathymetry imagery & precision mapping of the seabed. The EM2040 operates at 200 - 400 kHz and is effective to 600m. The Holland I also has a HDTV camera, low resolution cameras and a HD digital stills with laser rangers. It is also fitted with a CTD and 2 robotic arms for sampling (1X7F and 1X5F) as well as an aspirator.

Fig. 3 The Holland I ROV on deck (portside view)

Deep Water Lander Systems

Eight monitoring stations, referred to as "Landers", have been designed specifically for this survey. Each Lander is equipped with an Acousitc Doppler Current Profiler (ADCP) and Sediment Trap. The ADCP is a 1 Hz *Nortek* Aquadopp, depth-rated to 3000 m water depth. It's powered by battery and can continually measure data from 0-25 m from the transducer for up to three months. The ADCP is mounted vertically, pointed upwards.

The sediment trap is a *Technicap* sediment trap, depth-rated to 6000 m water depth. It is made up of a streamline (teardrop-shaped) carbon fibre housing for minimal disturbance to the local hydrodynamic regime. The housing has a funnel which allows particles (e.g. sediment, POM, microplastics) to settle into the trap. The sediment is stored within 24 X 500 ml bottles, which open at defined intervals to trap particulates during each period. The titanium motor is battery operated and can continuously record for up to 3 months. The motor controls the rotation of the bottle carousel.

Fig. 5 left: lander; top right: lander mounted on the ROV and; bottom right: lander internal sampling bottles.

Survey Log (UTC)

Thursday 25th July, 2019

Scientists arrive on vessel for safety and familiarisation tour (1400). Scientific party liaise and discuss cruise plan and tasks (1600). Pilot arrives onboard (2100). Arrive at wet test site (2200). Wet test showed that ROV deploy recovery/procedure will take approx. 15 minutes longer for each dive during survey. Wet lab and landers start being prepared and set up for deployment (approx. 1800).

Friday 26th July, 2019

Steam for Porcupine Bank Canyon after wet test. Course altered towards northern segment of the study site.

Saturday 27th July, 2019

Arrive on site for **Dive 1 - North Canyon, Off-mound** (Lander 13_299_705; 0000). ROV enters water at 0036 and reaches bottom at 0117. Lander 13_299_705 in view at 0250, secured to the ROV (0319) and recovered to deck at 0403. Steamed to next site (0430) and onsite at 0500 for **Dive 2 - North**

Canyon, On-mound. ROV in water at 0506 and on bottom at 0536. Lander 13_300_703 in view (0614), secured to ROV (0644) and recovered to deck (0724). Vessel steamed to next site (0730).

ROV in water for **Dive 3 - Canyon Flank, Coral Garden** (0921). ROV commences descent (0930). ROV on bottom at 0955 and hull-mounted ADCP started. ROV CTD cast converted to SVP profile and input to USBL system. Lander 13_301_707 found on its side (1016). Lander retrieved and begin recovery to deck (1050). Hull-mounted ADCP off. ROV on deck (1130). On site for **Dive 4 - Canyon Flank, On-mound** (1215) and ROV in water at 1245. **Lander 13_** in view (1315), secured and recovery begins (1336). ROV back in water for **Dive 5 - Canyon Flank, Off-mound** at the off-mound canyon flank lander (1455). Lander 13_303_706 in view at (1530). Lander secured and leaves bottom (1540). ROV on deck (1621) and steam for next site.

On station for **Dive 6 - Canyon Flank, Lip mound** at 1658. ROV in water (1712) and starts decent (1725). ROV on bottom at 1751. Lander 13_304_708 found on its side. Lander secured to ROV (1819). ROV begins ascent (1820) and arrives on surface (1841) for transit to next site.

Arrive at the site for deep canyon Lander 13_306_710, **Dive 7 - Deep Canyon** (1932). ROV descends (1956) and arrives on bottom at 2108. Lander 13_306_710 found at 2230 and recovers to deck at 2245.

Sunday 28th July, 2019

Arrive at southern canyon on-mound site for **Dive 8 - Southern Canyon, On-mound** and ROV off deck at 0143, arriving on bottom at 0216. Lander 13_305_704 found at 0224. Lander secured at 0235. ROV recovered to surface and on deck at 0306. Steam for Cork.

Key Results Summary

Landers - retrieval sites

Each lander was set-up to record at the same time and interval. Sediment traps continuously trapped sediments for the deployment period within 24 X 500 ml separate sampling bottles (binned every 2.7 days). ADCP's recorded a profile of data 25 m above the transducer for a period of 1 minute every 10 minutes. All bottles from the sediment traps fired. See example of sediment trap motor results below:

```
Jar  Actual start        Ok/delta-t         Duration       Ok/delta-t
 1   2019/05/23 00:00:10 ok                 2d 16:00:00     ok
 2   2019/05/25 16:00:10 ok                 2d 16:00:00     ok
 3   2019/05/28 08:00:10 ok                 2d 16:00:00     ok
 4   2019/05/31 00:00:10 ok                 2d 16:00:00     ok
 5   2019/06/02 16:00:10 ok                 2d 16:00:00     ok
 6   2019/06/05 08:00:10 ok                 2d 16:00:00     ok
 7   2019/06/08 00:00:10 ok                 2d 16:00:00     ok
 8   2019/06/10 16:00:10 ok                 2d 16:00:00     ok
 9   2019/06/13 08:00:10 ok                 2d 16:00:00     ok
10   2019/06/16 00:00:10 ok                 2d 16:00:00     ok
11   2019/06/18 16:00:10 ok                 2d 16:00:00     ok
12   2019/06/21 08:00:10 ok                 2d 16:00:00     ok
13   2019/06/24 00:00:10 ok                 2d 16:00:00     ok
14   2019/06/26 16:00:10 ok                 2d 16:00:01     ok
15   2019/06/29 08:00:11 ok                 2d 16:00:00     ok
16   2019/07/02 00:00:11 ok                 2d 16:00:00     ok
17   2019/07/04 16:00:11 ok                 2d 16:00:00     ok
18   2019/07/07 08:00:11 ok                 2d 16:00:00     ok
19   2019/07/10 00:00:11 ok                 2d 16:00:00     ok
20   2019/07/12 16:00:11 ok                 2d 16:00:00     ok
21   2019/07/15 08:00:11 ok                 2d 16:00:00     ok
22   2019/07/18 00:00:11 ok                 2d 16:00:00     ok
23   2019/07/20 16:00:11 ok                 2d 16:00:00     ok
24   2019/07/23 08:00:11 ok                 2d 16:00:00     ok
```

Lander 13_299_705 (1/8) – Dive 1 – 27.07.2019 – 03:16 UTC – 52°14.6660, 14°52.7344
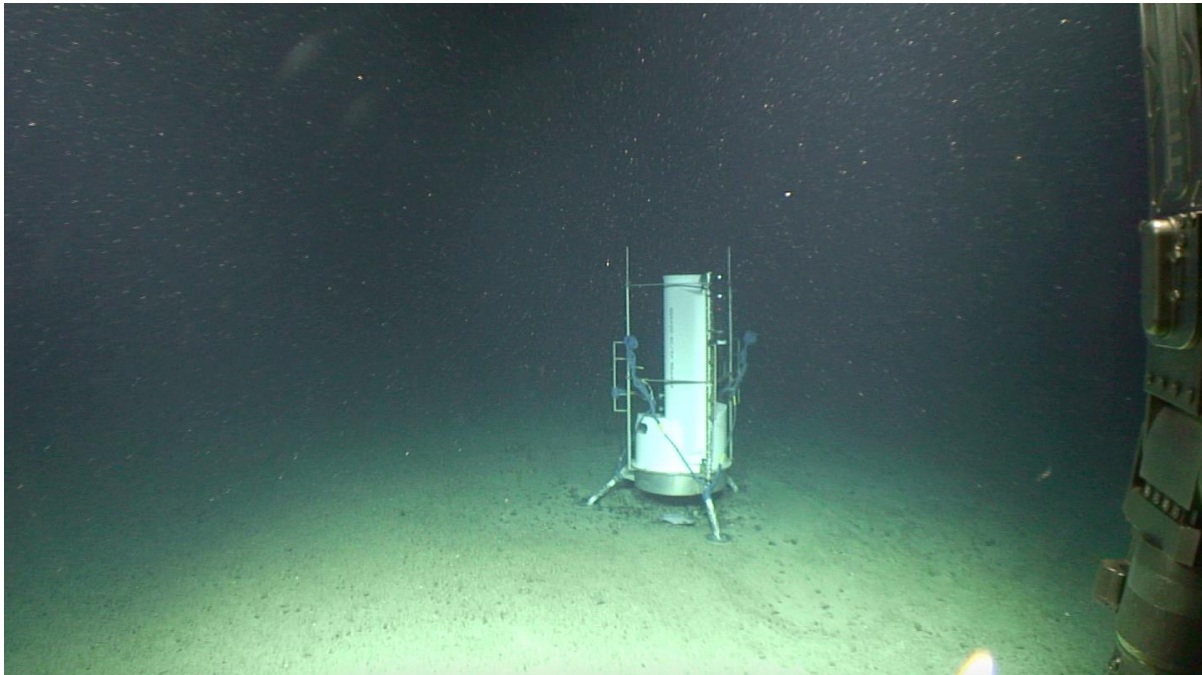
Image of lander 705 when found during recovery
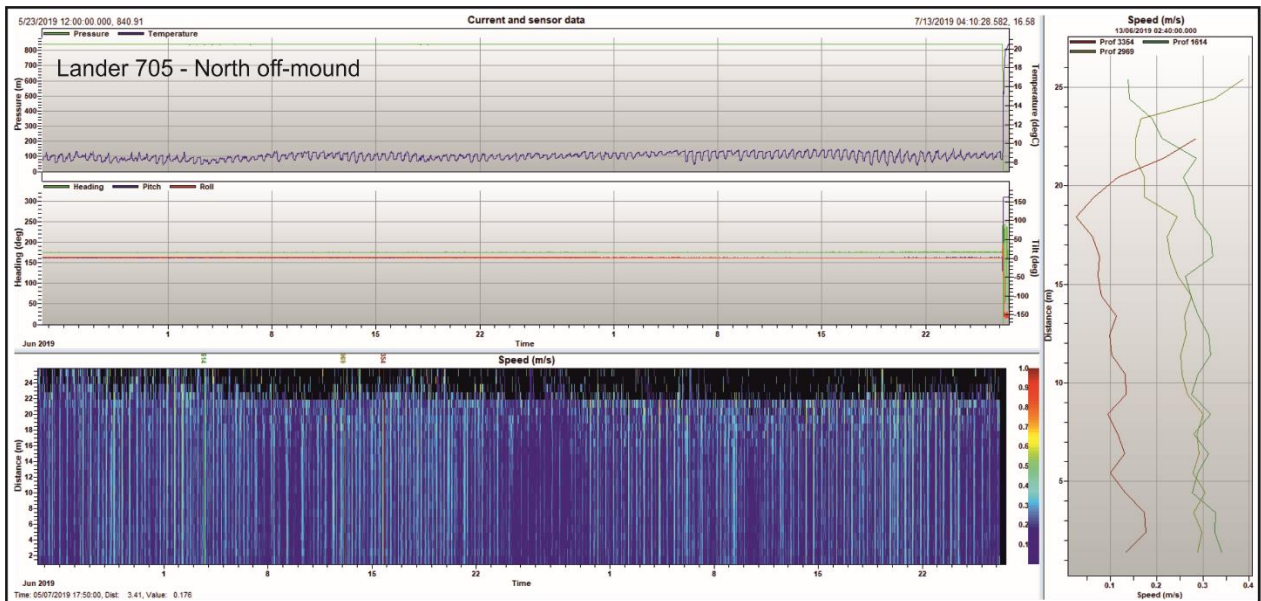
Example of raw ADCP data

Lander 13_300_703 (2/8) – Dive 2 – 27.07.2019 – 06:44 UTC – 52°13.6490, 14°55.4889
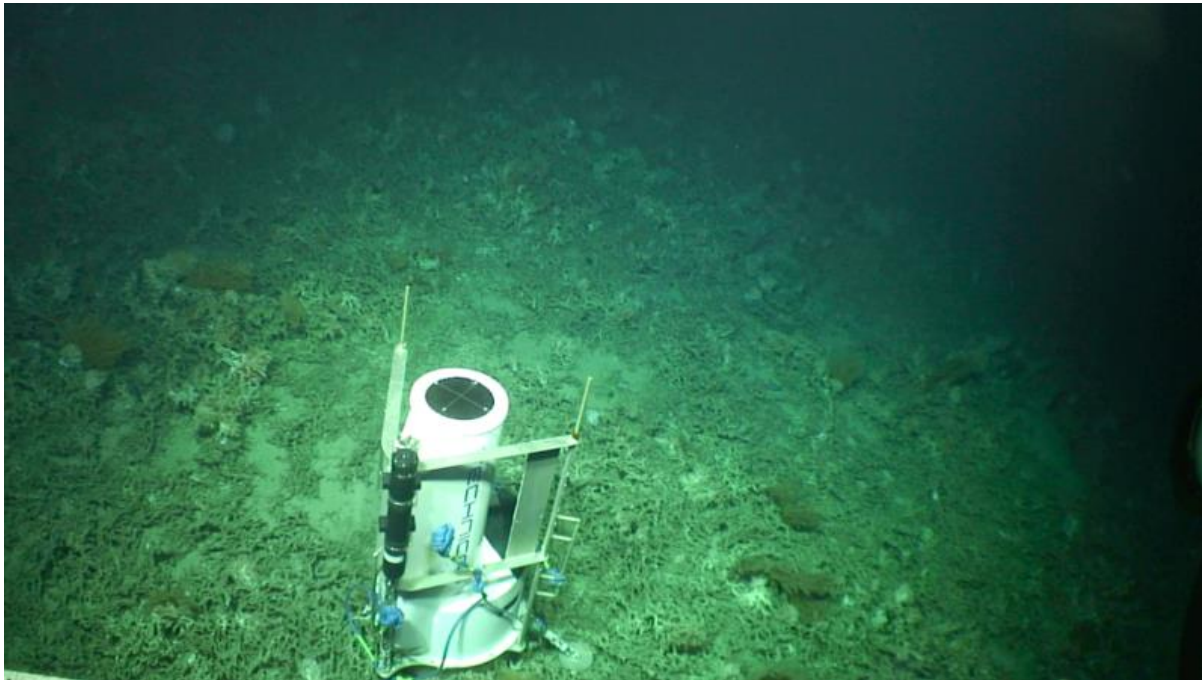
Image of lander 703 when found during recovery

Example of raw ADCP data

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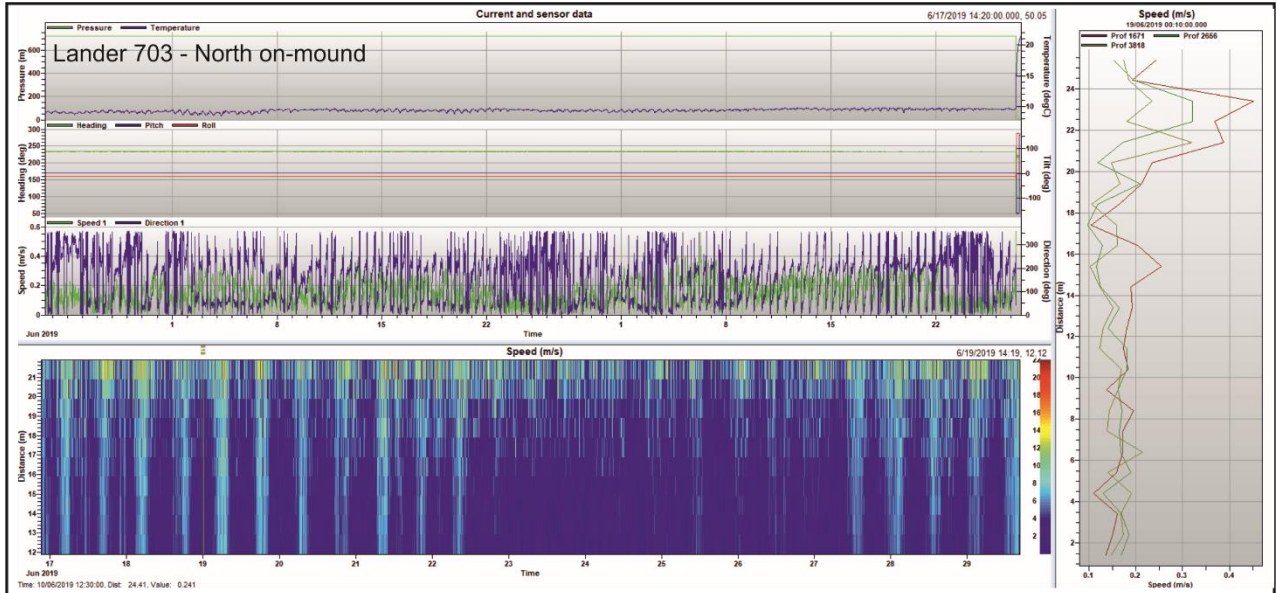
Lander 13_301_707 (3/8) – Dive 3 – 27.07.2019 – 10:49 UTC – 52°00.15645, 14°59.20136

Image of lander 707 when found during recovery

Example of raw ADCP data

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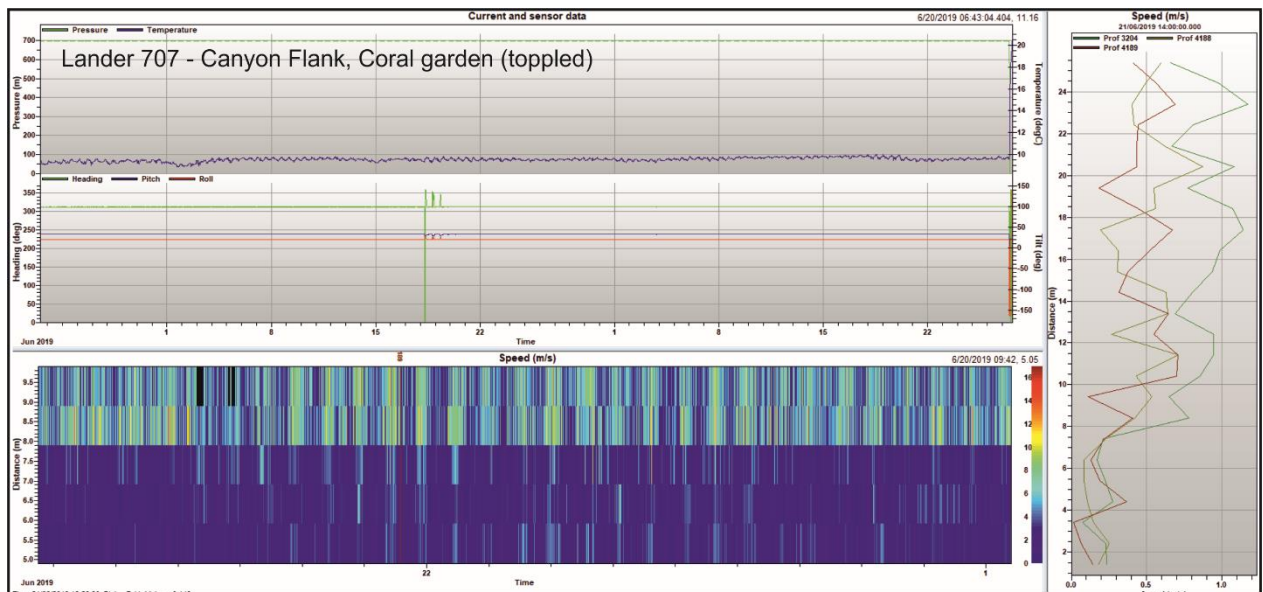
Lander 13_302_709 (4/8) – Dive 4 – 27.07.2019 – 13:13 UTC – 51°58.99513, 14°59.91110
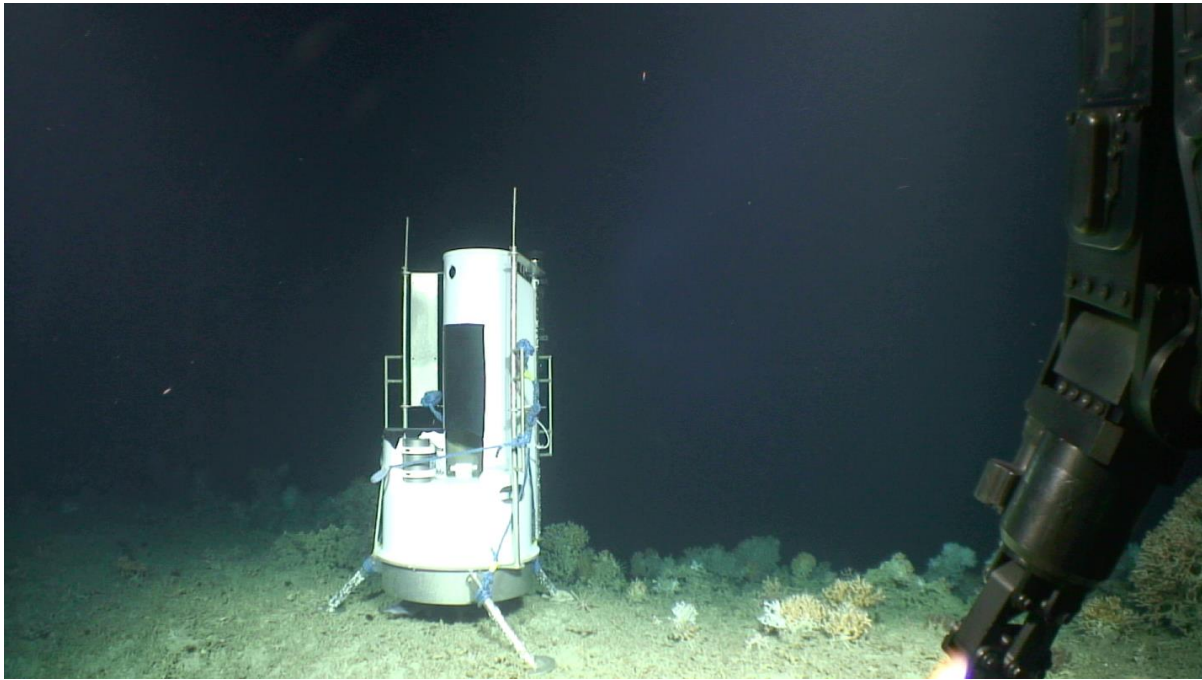
Image of lander 709 when found during recovery

Example of raw ADCP data

13
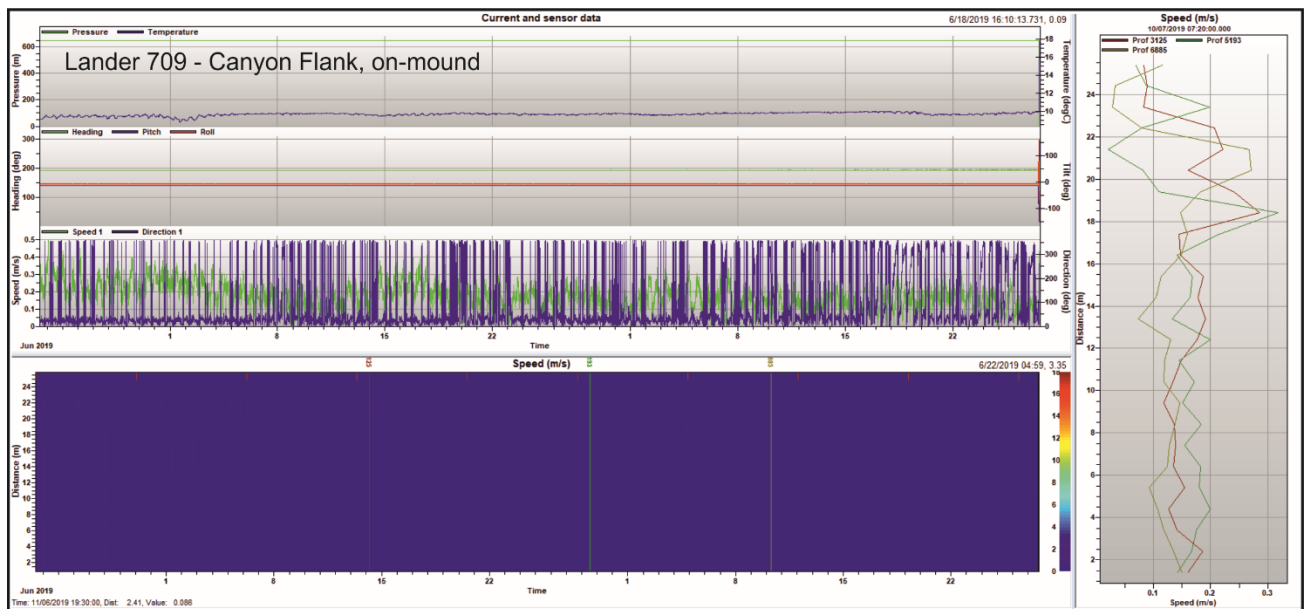
Lander 13_303_706 (5/8) – Dive 5 – 27.07.2019 – 15:40 UTC – 51°59.01550, 15°01.09180
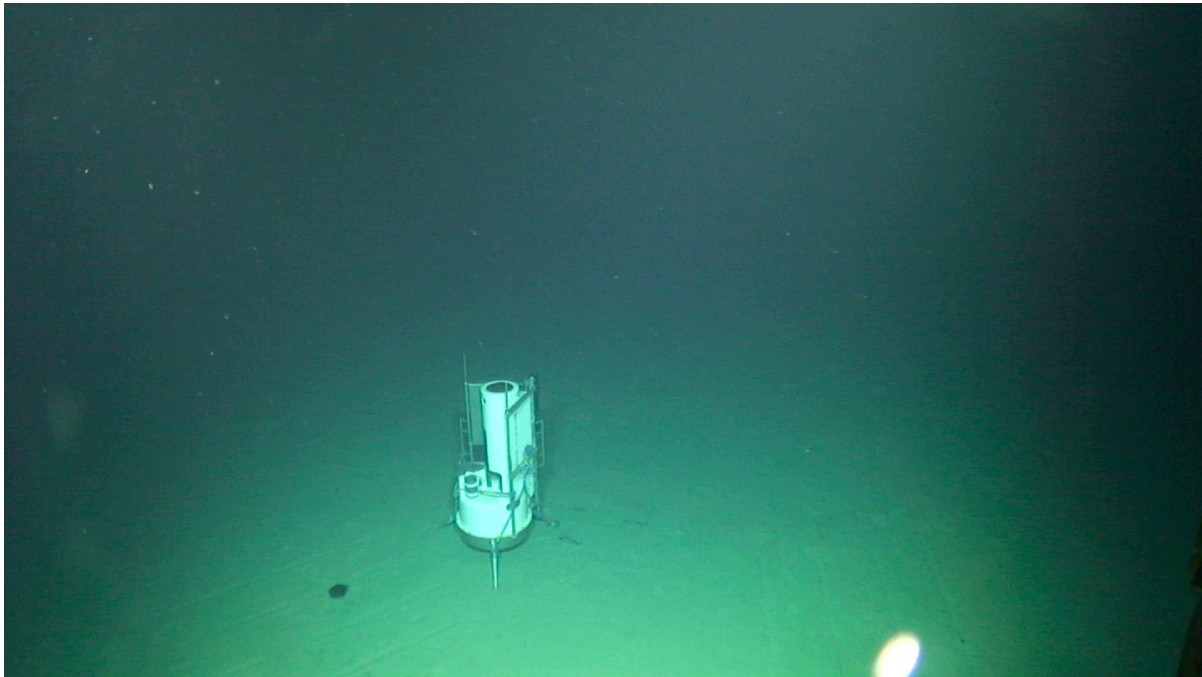
Image of lander 706 when found during recovery

Example of raw ADCP data

14
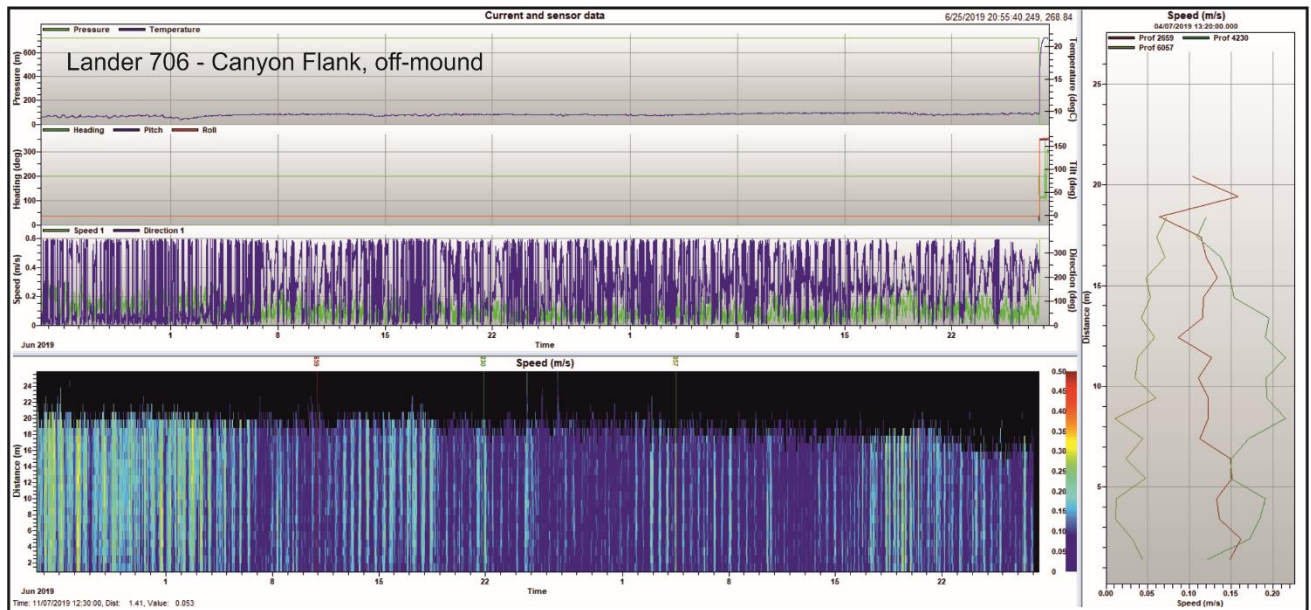
Lander 13_304_708 (6/8) – Dive 6 – 27.07.2019 – 18:19 UTC – 51°58.24837, 15°02.30453

Image of lander 708 when found during recovery
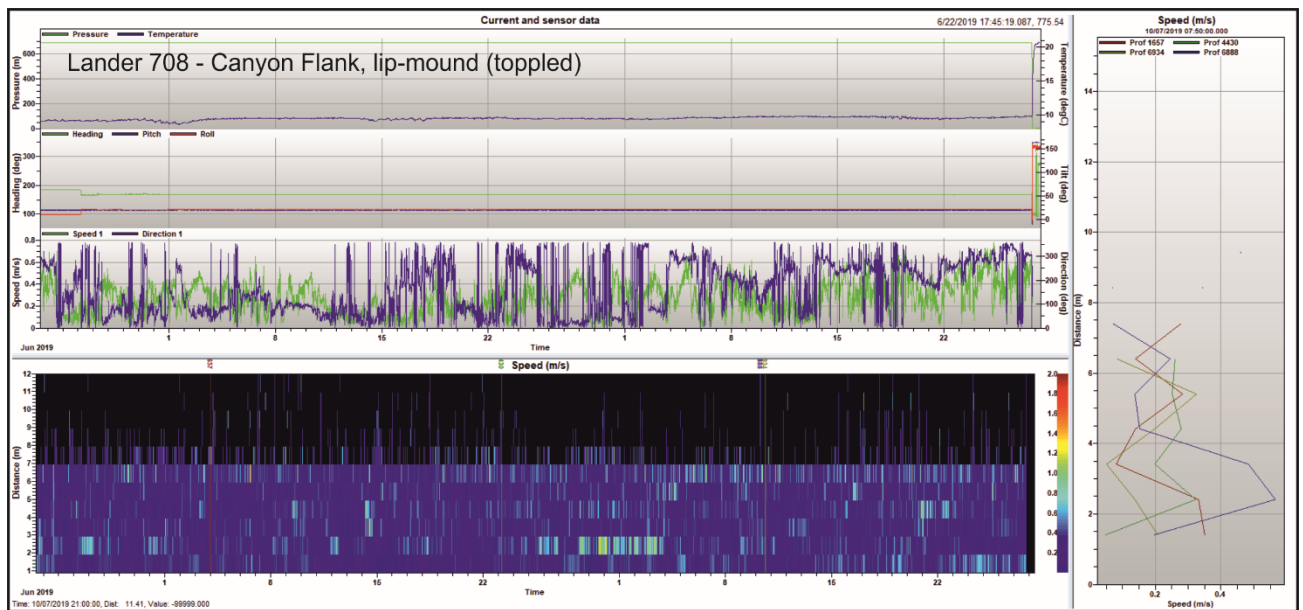
Example of raw ADCP data

Lander 13_306_710 (7/8) – Dive 7 – 27.07.2019 – 22:48 UTC – 52°01.2226, 15°05.1283
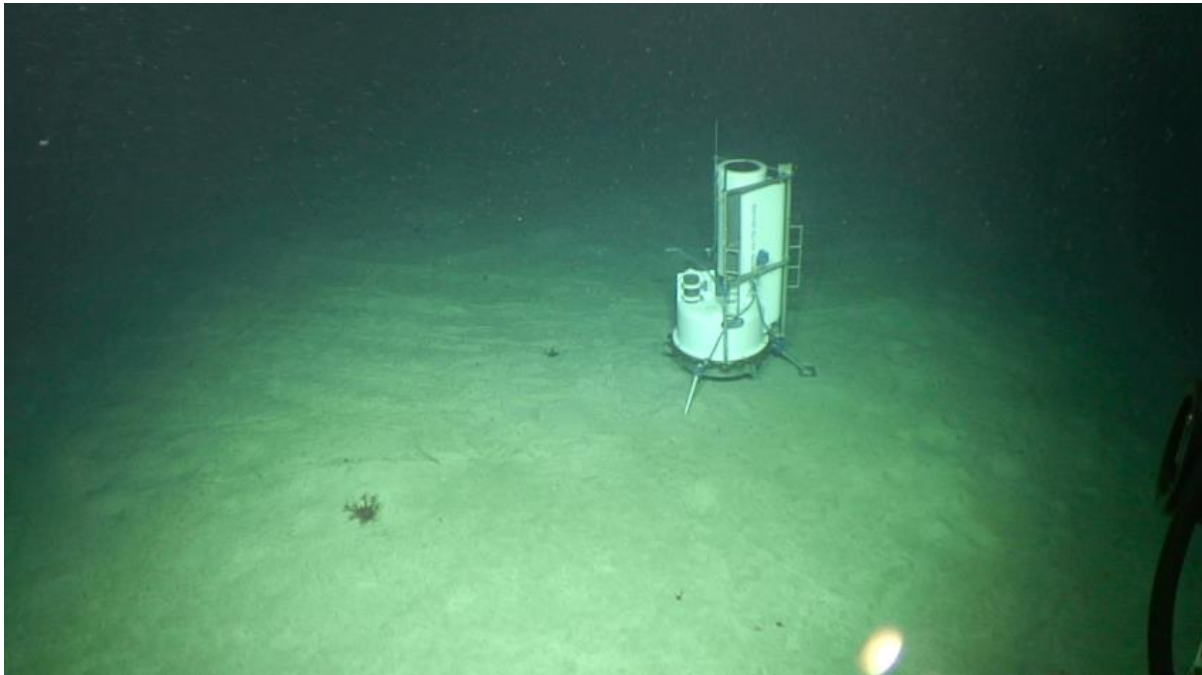
Image of lander 710 when found during recovery

Example of raw ADCP data

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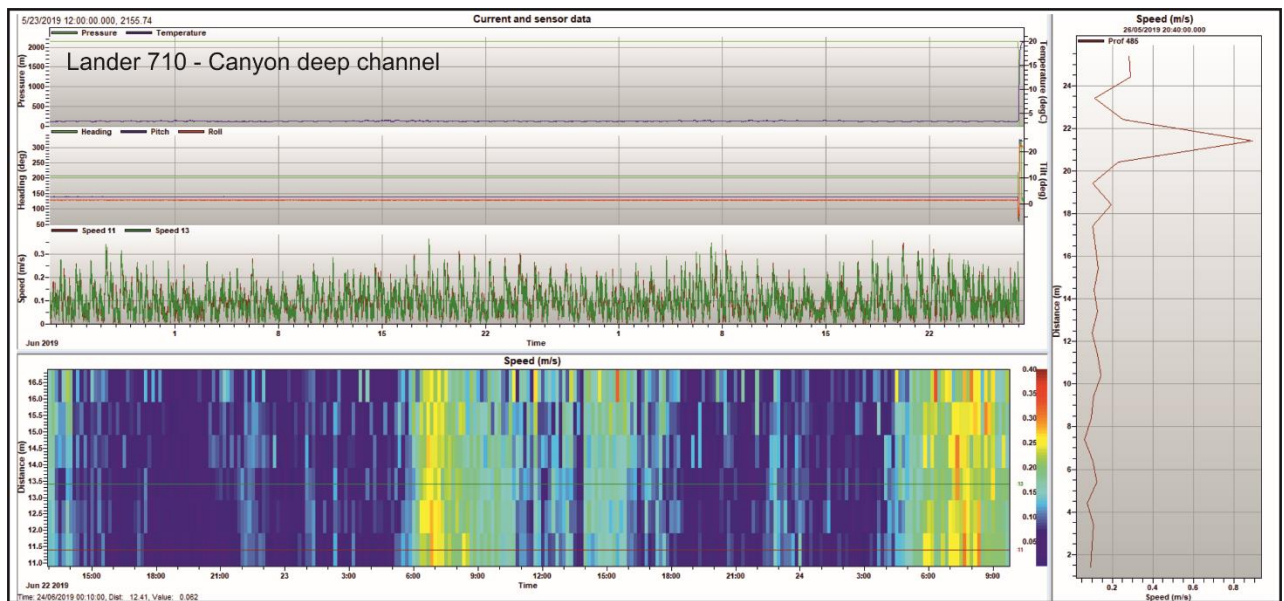
Lander 13_305_704 (8/8) – Dive 8 – 28.07.2019 – 02:40 UTC – 51°52.2041, 15°02.0034
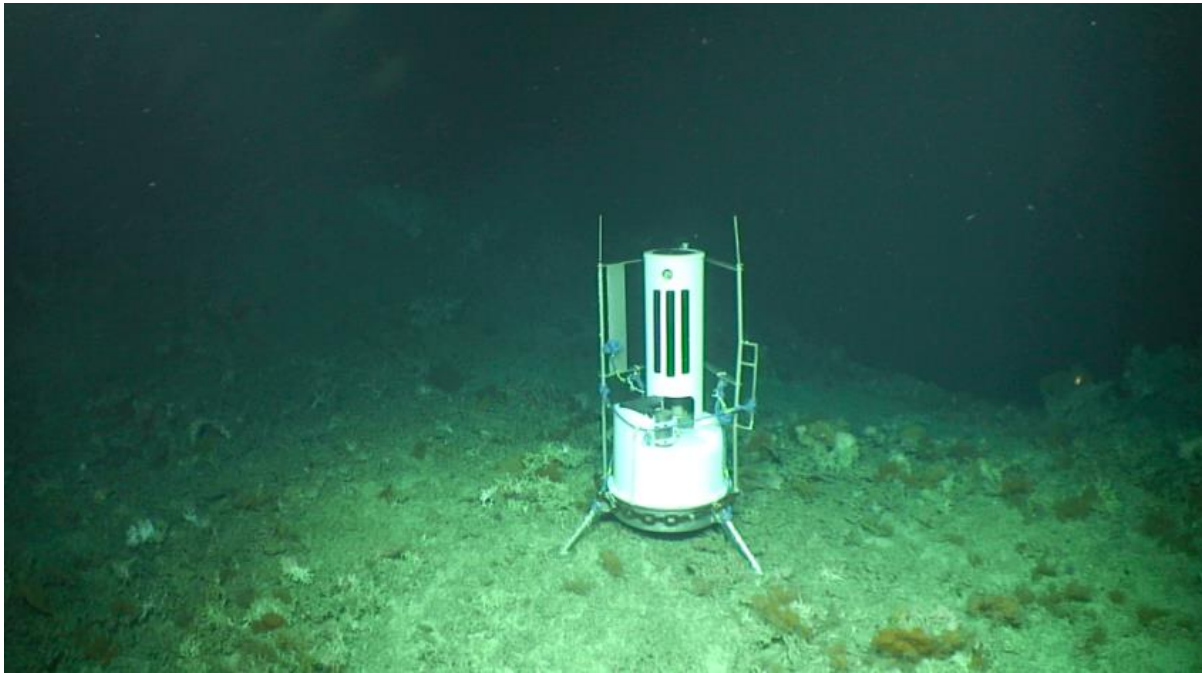
Image of lander 704 when found during recovery

Example of raw ADCP data

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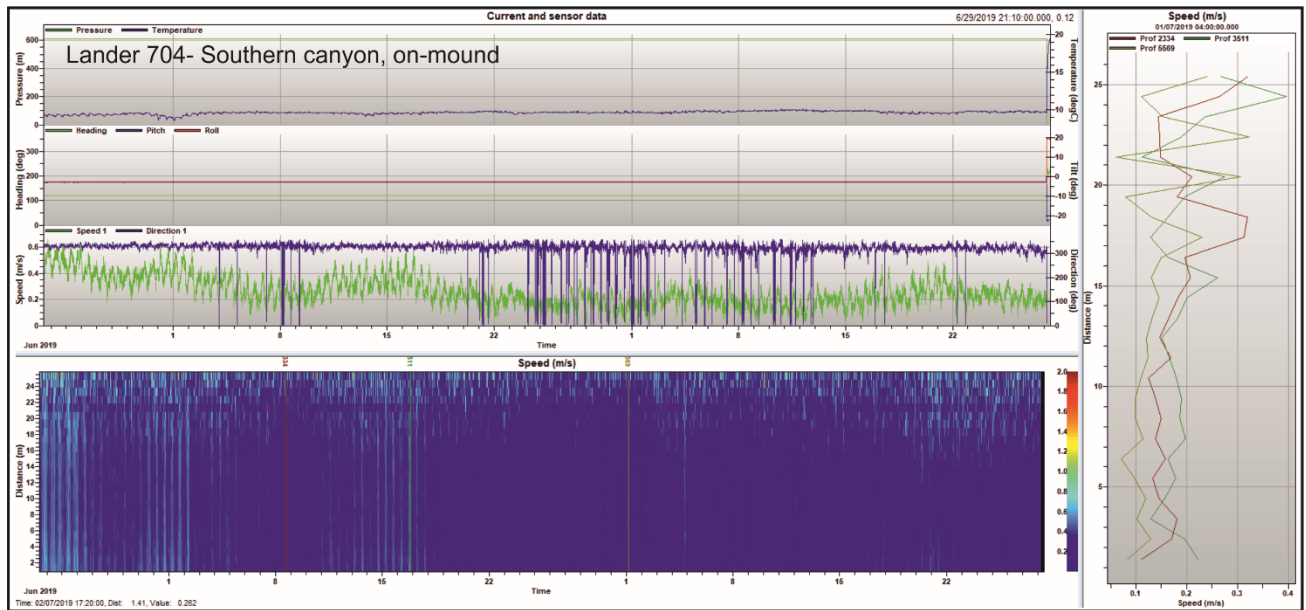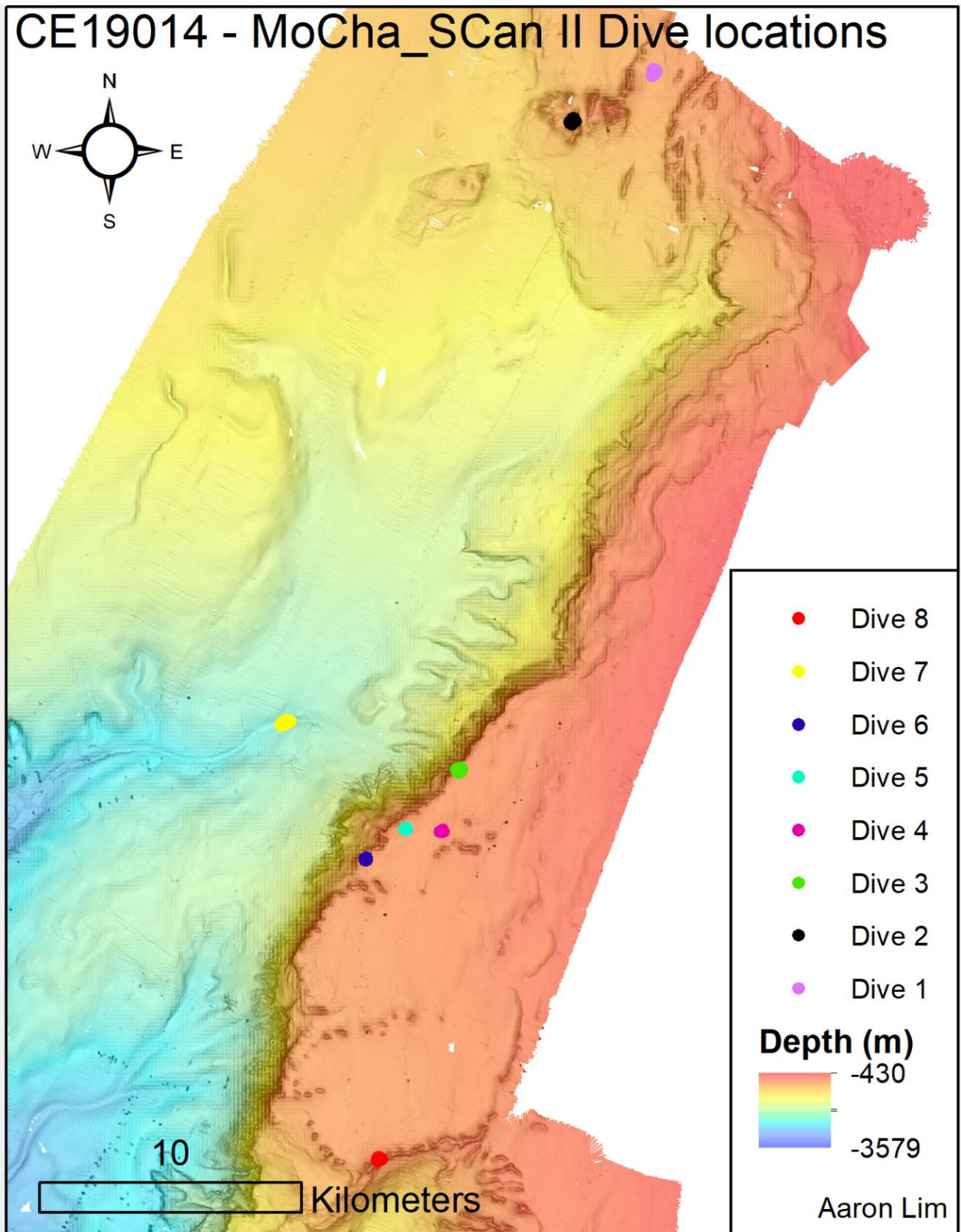
ROV Dives

Fig. 9 Map showing location of ROV dives

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Appendices

Personnel

Scientific complement

Dr Aaron Lim	Chief Scientist	Cruise management, scientific direction reporting and GIS	UCC
Mr Ger Summers	Shift Leader	Shift management, GIS and scientific direction – Day operations	UCC
Mr Luke O' Reilly	Shift Leader	Shift management and scientific direction – Night operations	UCC
Ms Kim Harris	Scientist	Outreach, logging, Lander set-up and programming Lead	UCC
Prof Andy Wheeler	Scientist	ROV watches	UCC
Zoe O' Hanlon	Scientist	Logging, ROV watches, sample processing	UCC
Mr John Appah	Scientist	Logging, ROV watches, sample processing	UCC
Ms Phoebe Walsh	Scientist	Logging, ROV watches, sample processing	UCC
Mr Ruaihri Strachan	Scientist	Logging, ROV watches, sample processing	NUIG
Mr Evan O' Mahony	Scientist	Logging, ROV watches, sample processing	UCC
Ms Larissa Macedo	Scientist	Logging, ROV watches, sample processing	UCC
Gareth Kennedy	Artist		
Sarah Browne	Artist		

Holland 1 ROV pilots

Mr Paddy O' Driscoll (ROV Superintendent)	Mr Karl Bredendieck
Mr William Hanley	Mr Kevin Forrest
Mr Colin Ferguson	Mr George Findlay

Officers and Crew of RV Celtic Explorer

Captain Anthony Hobin	Master
Mr Kenny Downing	Chief Officer
Mr Paul Murphy	2nd Officer
Mr John Sommon	Chief Engineer
Mr Dave Stack	2nd Engineer
Mr Paul Wrog	ETO
Mr Shane Horan	Bosun
Mr James Moran	Cook
Mr Michelin Flaherty	Bosuns Mate
Mr Jimmy Burke	AB Deckhands
Mr Philip Gunnip	AB Deckhands
Mr Marc O' Connor	Technician
Mr Declan Horan	AB Deckhand
Mr Jason Reynolds	AB Deckhand
Mr Maurice Murphy	Asst. Cook
Mr Daragh Duffy	Technician

Left to right: Sarah Browne, Gareth Kennedy, Andy Wheeler, Ruaihri Strachan, John Appah, Aaron Lim, Larissa Macedo, Kim Harris, Gerald Summers, Zoe O' Hanlon, Evan O' Mahony, Phoebe Walsh, Luke O' Reilly

Stations (Logs and maps)

Cruise Track

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Master Log Sheet

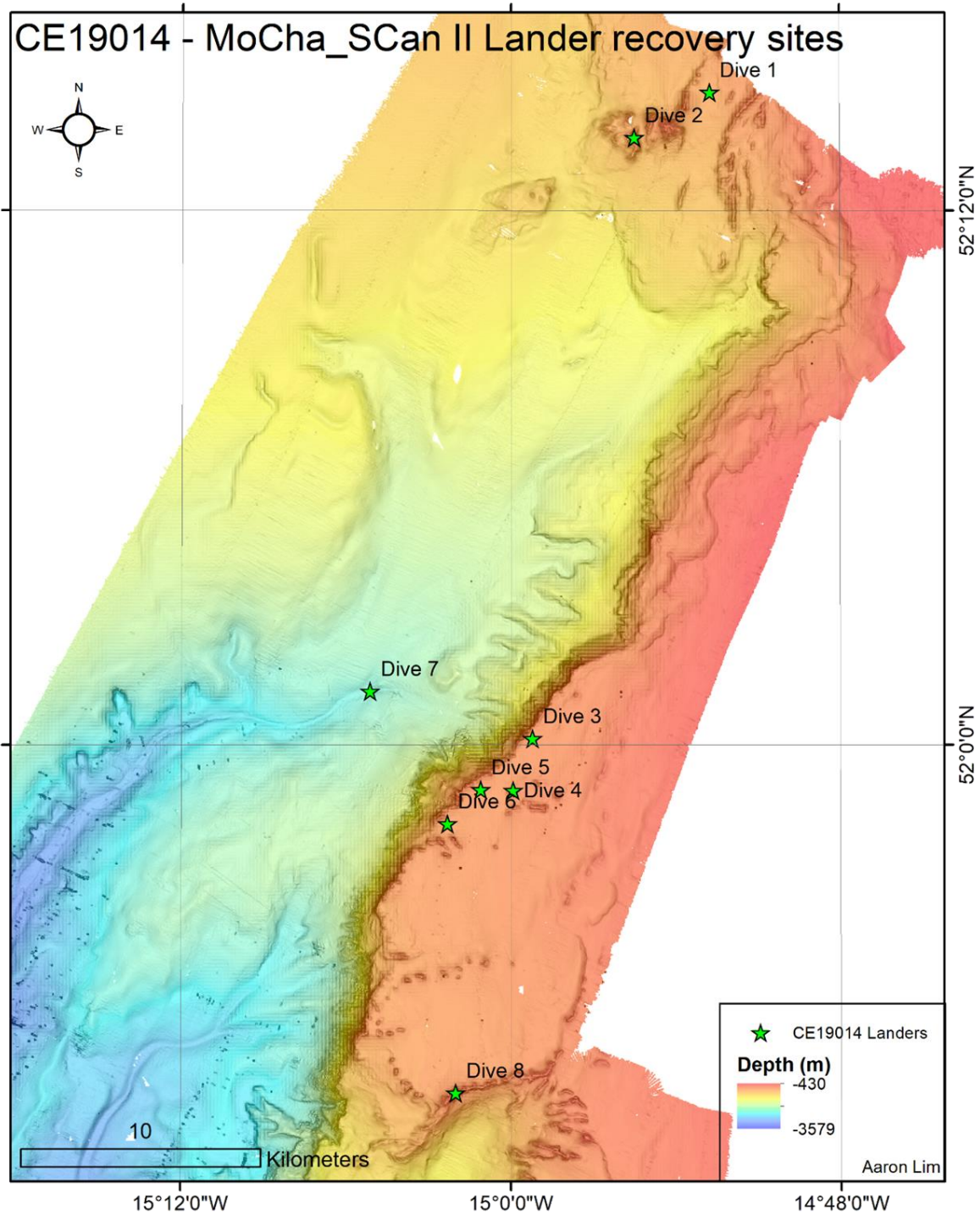| Station Number	Dive #	Date	Time (UTC)	Lat (dd)	Long (dd)	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Hull MBES	Note	Initials
1	1	27/07/2019	00:28	52° 14.35073	14° 52.50051	0							ROV on deck	EOM
1	1	27/07/2019	00:31	52° 14.35266	14° 52 .5081	0							ROV still on deck	EOM
1	1	27/07/2019	00:31	52° 14.136	14° 52.066	0							ROV still on deck	EOM
1	1	27/07/2019	00:36	52° 14.6505	14° 52.7819	0							ROV in water	EOM
1	1	27/07/2019	00:52	52° 14.3514	14° 52.5010	136	X				X		ROV CTD "downcast" started	EOM
1	1	27/07/2019	01:17	52° 14.6137	14° 52.8008	840.1							ROV on bottom	EOM
2	1	27/07/2019	01:18	52°14.59	14°52.84	839	X						ADCP on	JA
2	1	27/07/2019	01:21	52° 14.6141	14° 52.8043	840.2					X		ROV CTD DIVE1_during" starts.	EOM
2	1	27/07/2019	01:28	52° 14.6187	14° 52.9007	837			X				ROV video was not recording	JA
2	1	27/07/2019	02:29	52° 14.6397	14° 52.7820	837			X				ROV video recording started	JA
3	1	27/07/2019	03:16	52° 14.6660	14° 52.7345	834				X			Lander 13_299_705 retrieved	JA
3	1	27/07/2019	03:18	52° 14.662	14° 52.7327	834			X				ROV video recording stopped	JA
3	1	27/07/2019	03:18	52° 14.662	14° 52.7327	833							ROV off bottom	JA
3	1	27/07/2019	03:22	52°14.65	14°52.76	834							ADCP off	JA
4	1	27/07/2019	03:18	52° 14.662	14° 52.7327	833	X				X		ROV CTD DIVE1_up started	JA
4	1	27/07/2019	04:00	52° 14.6664	14° 52.7557	0							ROV at surface	JA
4	1	27/07/2019	04:00	52° 14.6664	14° 52.7557	0					X		ROV CTD 'upcast' stopped	JA
4	1	27/07/2019	04:02	52° 14 38.990	14° 52 45.501	0							ROV on deck	JA
4	2	27/07/2019	05:03	52° 13 36.017	14° 55 36.698	0							ROV in water. Coordinates from Ranger	JA
5	2	27/07/2019	05:15	52° 13.6112	14° 55.5661	20					X		CTD DIVE2_down started	JA
6	2	27/07/2019	05:33	52°13.6116	14°55.5704	640					X		ROV CTD changed to DIVE2a_down	PW
7	2	27/07/2019	05:34	52°13.6116	14°55.5704	629					X		ROV CTD changed to DIVE2b_down	PW
7	2	27/07/2019	05:38	52°13.6092	14°55.5599	746							ROV on bottom	JA
7	2	27/07/2019	05:38	52°13.61	14°55.61	746	X						ADCP on	JA
8	2	27/07/2019	05:39	52°13.6093	14°55.5576	743					x		ROV CTD changed to DIVE2_during	JA
8	2	27/07/2019	05:39	52°13.6093	14°55.5576	743			X				ROV video recording on	PW
9	2	27/07/2019	06:03	52°13.6614	14°55.5481	718					X		ROV CTD changed to DIVE2a_during	PW
9	2	27/07/2019	06:14	52°13.6459	14°55.4927	719				X			Lander 13_300_703 located	PW
10	2	27/07/2019	06:44	52°13.6513	14°55.4866	718.7				X			Lander 13_300_703 secured. Retrieving process started	PW
10	2	27/07/2019	05:38	52°13.61	14°55.61	746							ROV off bottom. CTD 'upcast' delayed	JA
11	2	27/07/2019	06:46	52°13.6395	14°14.5256	718.7					X		ROV CTD DIVE2_upcast started with delay	PW
11	2	27/07/2019	06:47	52°13.64	14°55.55	720	X						ADCP off	JA
11	2	27/07/2019	07:16	52°13.3794	14°55.3257	10					X		ROV at surface. ROV CTD stopped	PW
11	2	27/07/2019	07:24	52°13.37971	14°55.32543	0							ROV on deck	KM
11	3	27/07/2019	09:21	52°0.11713	14°59.23408	0							ROV in water	ZH
12	3	27/07/2019	09:31	52°0.11727	14°59.23407	30					X		ROV CTD DIVE3_down started	ZH
12	3	27/07/2019	09:55	52°0.13907	14°59.199974	704.6							ROV on bottom	ZH
13	3	27/07/2019	09:57	52°0.13907	14°59.19974	704.6					X		ROV CTD DIVE3_during started	ZH
14	3	27/07/2019	09:58	52°0.14009	14°59.19823	704			X				ROV video recording started	ZH
14	3	27/07/2019	10:05	52°0.15190	14°59.17369	708.9							Lasers on	ZH
14	3	27/07/2019	10:18	52°0.15578	14°59.19709	697.3				X			Lander 13_301_707 spotted at 06:14	ZH
15	3	27/07/2019	10:49	52°0.15645	14°59.20136	695				X			Lander 13_301_707 secured. Retrieving process started	ZH
16	3	27/07/2019	10:50	52°0.15467	14°59.19741	692.5					X		ROV video stopped. ROV CTD DIVE3_up started	ZH
16	3	27/07/2019	11:17	52°13.3271	14°59.20703	0							ROV at surface	ZH
16	3	27/07/2019	11:17	52°13.3271	14°59.20703	0					X		ROV CTD off	ZH
16	3	27/07/2019	11:30	52°13.3271	14°59.20703	0							ROV on deck	ZH
16	4	27/07/2019	12:40	51°58.82108	14°59.58817	0							ROV in water	LOR
17	4	27/07/2019	12:47	51°58.82109	14°59.58818	0					X		ROV CTD DIVE4_Down on	LOR
17	4	27/07/2019	12:50	51°58.82110	14°59.58819	1					X		ROV descending	LOR
18	4	27/07/2019	12:56	51°58.85401	14°59.53608	120							ROV CTD 4 'down' restarted - new file DIVE4b_Down	LOR
19	4	27/07/2019	13:10	51°58.98931	14°59.98243	647			X				ROV video recording started	LOR
20	4	27/07/2019	13:10	51°58.98832	14°59.98244	643					X		ROV on bottom. CTD DIVE4_during started	LOR
21	4	27/07/2019	13:13	51°58.99513	14°59.91110	647				X			Lander 13_302_709 spotted	LOR
22	4	27/07/2019	13:37	51°58.99432	14°59.91128	647					X		ROV CTD DIVE4_up started	LOR
22	4	27/07/2019	14:01	51°58.57418	14°54.57342	0							ROV at surface. CTD off	LOR
22	4	27/07/2019	14:14	51°58.57482	14°59.57533	0							ROV on deck	LOR
22	5	27/07/2019	14:45	51°58.58824	15°01.12154	0							ROV in water	LOR
23	5	27/07/2019	14:51	51°58.58824	15°01.12154	0					X		CTD DIVE5_down started	LOR
23	5	27/07/2019	15:20	51°59.01550	15°01.09180	717							ROV on bottom.	LOR
23	5	27/07/2019	15:20	51°59.01551	15°01.09181	717					X		CTD DIVE5_during Started	LOR
23	5	27/07/2019	15:21	51°59.01552	15°01.09182	717			X				ROV video recording started	LOR
24	5	27/07/2019	15:22	51°59.0201	15°01.07120	717				X			Lander 13_303_706 spotted	LOR
24	5	27/07/2019	15:40	51°59.02065	15°01.07496	720				X			Lander 13_303_706 secured. Retrieving process started	LOR
25	5	27/07/2019	15:40	51°59.02065	15°01.07496	720					X		CTD DIVE5_Up started	LOR
25	5	27/07/2019	15:41	51°59.02065	15°01.07496	720			X				ROV video recording stopped	LOR
26	5	27/07/2019	16:00	51°59.01966	15°01.06083	118							CTD5 'upcast' restarted as Dive5b_Up	LOR
26	5	27/07/2019	16:06	51°58.00046	15°01.11078	0					X		ROV on surface	LOR
26	5	27/07/2019	16:06	51°58.00046	15°01.11078	0					X		CTD DIVE5B off	LOR
26	5	27/07/2019	16:06	51°58.00046	15°01.11078	0							ROV on deck	LOR

Master Log sheet				dd	dd		Tick appropriate							Initials
Station Number	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Hull MBES	Note	
26	6	27/07/2019	17:18	51°58.2233	15°02.32283	0							ROV in water	RS
27	6	27/07/2019	17:19	51°58.2233	15°02.32283	0					X		CTD Dive6_downstarted	RS
28	6	27/07/2019	17:22	51°58.2232	15°02.3217	0							CTD Downcast Crashed CTD turned off	RS
28	6	27/07/2019	17:27	51°58.2352	15°02.3217	0					X		CTD DIVE 6_down2 started	RS
28	6	27/07/2019	17:27	51°58.2227	15°02.3217	0					X		ROV Descending	RS
28	6	27/07/2019	17:32	51°58.2352	15°02.3226	160					X		CTD Crashed. New file started as CTD DIVE 6_down3	RS
29	6	27/07/2019	17:49	51°58.23047	15°02.3473	685					X		ROV on the seafloor, CTD DIVE 6_down3 off, CTD DIVE6_during started.	RS
29	6	27/07/2019	17:51	51°58.22312	15°02.30546	684							Lander 13_304_708 located	RS
30	6	27/07/2019	17:52	51°58.22312	15°02.30546	684			X				ROV HD video recording on	RS
31	6	27/07/2019	18:01	N/A	N/A	685.5							CTD crashed. New file started as CTD DIVE6_during2	RS
32	6	27/07/2019	18:01	N/A	N/A	685.6					X		CTD crashed. New file started as CTD DIVE 6_during3	RS
33	6	27/07/2019	18:19	51°58.24837	15°02.30453	685				X	X		Lander 13_304_708 secured. Retrieving process started.	RS
33	6	27/07/2019	18:19	51°58.24837	15°02.30453	685					X		CTD DIVE6_upcast started	RS
33	6	27/07/2019	18:19	51°58.24837	15°02.30453	685			X				ROV HD video recording off	RS
34	6	27/07/2019	18:20	51°58.24795	15°02.30390	685					X		ROV ascending. CTD Upcast started	RS
35	6	27/07/2019	18:30	51°58.25527	15°02.28240	380					X		CTD crashed. New file started as DIVE6_upcast2	RS
35	6	27/07/2019	18:44	51°58.24019	15°02.30321	1							CTD Upcast_2 off	RS
35	6	27/07/2019	18:55	NA	NA	0							ROV on deck	RS
35	7	27/07/2019	19:50	52°01.1778	15°05.3482	1.8					X		ROV in water	GS
36	7	27/07/2019	19:50	52°01.1778	15°05.3482	1.8							CTD Dive7_downcast on	GS
36	7	27/07/2019	21:04	52°52.17	15°05.33	2186							ADCP on	JA
37	7	27/07/2019	21:08	52°01.2035	15°05.2477	2127.8			X				ROV HD Video on	EOM
38	7	27/07/2019	21:08	52°01.2234	15°05.1284	2126					X		CTD DIVE7 _during started	EOM
38	7	27/07/2019	21:10	52°01.2165	15°05.2094	2125.6			X		X		ROV on bottom	EOM
38	7	27/07/2019	21:29	52°01.21	15°05.19	2186							ROV off of bottom ADCP off	GS
38	7	27/07/2019	22:21	52°01.13290	15°05.7703	2126.4			X				Lander 13_306_710 located	JA
39	7	27/07/2019	22:21	52°01.13290	15°05.7703	2126.4					X		DIVE7_during1 started	JA
40	7	27/07/2019	22:45	52°01.1226	15°05.1283	2126				X			Lander 13_306_710 secured. Retrieving process started	JA
40	7	27/07/2019	22:45	52°01.2226	15°05.1283	2126							HD video recording stopped	JA
40	7	27/07/2019	22:47	52°01.2283	15°05.1145	2126							ROV off bottom	JA
41	7	27/07/2019	22:50	52°01.2363	15°05.0722	2043.6					X		CTD DIVE7_upcast started	JA
41	7	28/07/2019	00:04	52°01.12411	15°05.11430	20					X		CTD 7 upcast stopped	JA
41	7	28/07/2019	00:20	52°01.12411	15°05.11430	0							ROV on Deck	JA
41	8	28/07/2019	01:43	51°52'11.434	15°02'4.778	0							ROV off Deck	PW
41	8	28/07/2019	01:46	51°52'11.376	15°02'4.773	1.45							ROV in water, coordinates not being displayed for ROV, using Ranger ship data	PW
42	8	28/07/2019	01:58	51°52.2127	15 02.0350	70					X		CTD Dive8_downcast started	PW
42		28/07/2019	02:16	51°52.20	15°02.05	620	X						ROV on bottom. ADCP on	PW
42	8	28/07/2019	02:17	51°52.2112	15°02.0400	626					X		CTD 8 Downcast stopped	PW
43	8	28/07/2019	02:19	51°52.2118	15°02.02037	625					X		CTD Dive8_during started	PW
44	8	28/07/2019	02:21	51°52.2076	15°02.0261	617			X				ROV HD Video on	PW
44	8	28/07/2019	02:24	51°52.2034	15°02.0077	605			X				Lander 13_305_704 located	PW
44	8	28/07/2019	02:35	51°52.2041	15°02.0034	606			X	X			Lander 13_305_704 retrieved.	PW
45	8	28/07/2019	02:39	51°52.20	15°02.05	615	X						ADCP off	PW
45	8	28/07/2019	02:39	51°52.2034	15°02.0023	606			X		X		ROV HD Video off	PW
45	8	28/07/2019	02:40	51°52.2034	15°02.0026	606							CTD during stopped. ROV off bottom	PW
46	8	28/07/2019	02:42	51°52.2156	15°02.0045	596							CTD DIVE8_Upcast started	PW
46	8	28/07/2019	03:04	51°52.2148	15°02.0087	27					X		CTD upcast stopped	PW
46	8	28/07/2019	03:09	51°52'11.742	15°02'02.803	0							ROV on surface	PW
46	8	28/07/2019	03:23	51°52.11742	15°02.02803	0							ROV on deck	PW

Video Logs

ROV Video log Dive Number	Station	Lat	Long	Depth	time ROV IN	# + time CTD downcast ON	time ROV ON BOTTOM	y/n Lasers on	# + time Video Recording	# + time CTD change (on bottom/leaving)	# + time Lander retrieved	# + time Video changed	time Video stopped	time ROV OFF BOTTO	# + time CTD upcast	time ROV on deck	Who and which HD? Data backed up? By Who?	Observation/note
1	1	52° 14' 35.078	14° 52' 50.051	0														Coordinates from Ranger nav
1	1	52° 14' 35.266	14° 52' 50.81	0														ROVon deck again 00:31 Coordinates from Ranger nav for ship as nav was not displaying for the ROV.
1	1	52° 14' 35.136	14° 52' 50.066	0														ROV off deck again 00:32 Coordinates from Ranger nav for ship as nav was not displaying for the ROV.
1	1	52° 14.6505	14° 52 .7819	0	00:36													ROV in water
1	1	52° 14.6057	14° 52.8074	140		00:52												CTD DIVE1_Down started
1	1	52° 14.6133	14° 52.8020	839			01:17											CTD DIVE1_Down off
1	2	52° 14.6137	14° 52.9007	839					01:18									CTD DIVE1_During started, ROV Video started Video actually did not start at 1:18h. Started at 02:29h
1	2	52° 14.6397	14° 52.7820	837				02:29	02:29									ROV HD Video recording started
1	2	52° 14.6664	14° 52.7345	834.7														Lander 13_299_705 located. Retrieving process started.
1	3	52° 14.6660	14° 52.7345	834.5							03:16							Lander 13_299_705 Retrieved
1	3	52° 14.662	14° 52.7327	833									03:18					ROV Video recording stopped
1	4	52° 14.662	14° 52.7327	833										03:18	03:18			CTD DIVE1_up started
1	4	52° 14.6664	14° 52.7557	0														CTD DIVE1_up stopped ROV at surface 3:44
1	4	52° 14' 38.990	14° 52' 45.501	0												04:02	Yes. LOR	ROV on deck ship coordinates from ranger used for the rov as display was switched off
2	4	52° 13' 36.97	14° 55' 36.69	0	05:06													ROV in water Coordinates from Ranger nav for ship as nav was not displaying for the rov.
2	5	52° 13.6112	14° 55.5661	20		05:15												CTD DIVE2_ down started
2	6	52° 13.101	14° 55.5754	244		05:28				05:20								CTD Change to DIVE2a_down
2	7	52° 13.6116	14° 55.5704	629		05:34				05:33								CTD Change DIVE2B_down'
2	7	52° 13.6092	14° 55.5599	748			05:36											ROV on Bottom CTD 'DIVE2B_down' stopped
2	8	52° 13.6093	14° 55.5576	743					05:39	05:39								ROV Video on and CTD DIVE2_During'
2	8	52° 13.6396	14° 55.55390	726.9				05:43										Lasers switched on
2	9	52° 13.6614	14° 55.5481	718						06:03								CTD Changed to new file CTD DIVE2a_during
2	9	52° 13.6459	14° 55.4927	716														Lander 13_300_703 located at 6:14
2	10	52 13.6513	14 55.4866	718							06:44							lander 13_300_703 retrieved
2	10	52 13.6513	14 55.4866	718										06:44				ROV off bottom CTD DIVE2a_during stopped
2	11	52 13.6395	14 55.5256	278											06:46			ROV CTD DIVE2_upcast started with delay
2	11	52° 13.3794	14° 55.3257	0.1														ROV on surface/ CTD stop
2	11	52°13.37971	14°55.32543	0												07:24	Yes. LOR	ROV on deck
3	11	52° 0.11713	14° 59.23408	0	09:21													ROV in water
3	12	52° 0.11727	14° 59.23407	30		09:31												CTD DIVE3_Down started
3	12	52° 0.14009	14° 59.19974	704.6			09:55											ROV on bottom
3	12	52° 0.13907	14° 59.19974	704.6						09:53								CTD DIVE3_down stop
3	13	52°0.13907	14°59.19974	704.6						09:53								CTD DIVE3_during started
3	14	52° 0.14009	14°59.19823	704					09:58									ROV HD video recording on
3	14	52° 0.15190	14° 59.17369	708				10:06										Lasers on (forgot)
3	14	52° 0.15578	14° 59.19709	697.3														Lander 13_301_707 spotted (On it's side)
3	15	52° 0.15645	14° 59.20136	695							10:49							Lander 13_301_707 Retrieved
3	15	52°0.15645	14°59.20136	692.5										10:50				HD video recording off
3	16	52° 0.15467	14° 59.19741	692.5						10:50								CTD upcast started
3	16	52° 13.3271	14° 59.2070	0												11:30	Yes. LOR	ROV on Deck

Dive Number	Station	Lat	Long	Depth	time ROV IN	# + time CTD downcast ON	time ROV ON BOTTOM	y/n Lasers on	# + time Video Recording	# + time CTD change (on bottom/leaving)	# + time Lander retrieved	# + time Video changed	time Video stopped	time ROV OFF BOTTO	# + time CTD upcast	time ROV on deck	Who and which HD? Data backed up? By Who?	Observation/note
3	11	52° 0.11713	14° 59.23408	0	09:21													ROV in water
3	12	52° 0.11727	14° 59.23407	30		09:31												CTD DIVE3_Down started
3	12	52° 0.14009	14° 59.19974	704.6			09:55											ROV on bottom
3	12	52° 0.13907	14° 59.19974	704.6						09:53								CTD DIVE3_down stop
3	13	52°0.13907	14°59.19974	704.6						09:53								CTD DIVE3_during started
3	14	52° 0.14009	14°59.19823	704					09:58									ROV HD video recording on
3	14	52° 0.15190	14°59.17369	708				10:06										Lasers on (forgot)
3	14	52° 0.15578	14° 59.19709	697.3														Lander 13_301_707 spotted (On it's side)
3	15	52° 0.15645	14° 59.20136	695							10:49							Lander 13_301_707 Retrieved
3	15	52°0.15645	14°59.20136	692.5									10:50					HD video recording off
3	16	52° 0.15467	14° 59.19741	692.5						10:50								CTD upcast started
3	16	52° 13.3271	14° 59.2070	0												11:30	Yes. LOR	ROV on Deck
4	16	51° 58.82108	14° 59.58817	0	12:40													ROV in water
4	17	51° 58.82109	14° 59.58818	0		12:47												CTD DIVE4_Down started
4	17	51° 58.82110	14° 59.58819	N/A														ROV descending
4	18	51° 58.85401	14° 59.53608	120		12:56												CTD 4 Down restarted - New file named DIVE4b_Down
4	18	51° 58.98829	14° 59.98241	643			13:10											ROV on seafloor.
4	18	51° 58.98830	14° 59.98242	643				13:10										Lasers on
4	19	51° 58.98831	14° 59.98243	643					13:10									ROV HD video recording on
4	20	51° 58.98832	14° 59.98244	643						13:10								CTD DIVE4_during
4	21	51° 58.99513	14° 59.91110	647							13:13							Land 13_302_709 found
4	21	51° 58.99432	14° 59.91128	647									13:37					Lander 13_302_709 retrieved
4	21	51° 58.99432	14° 59.91128	647										13:37				ROV off seafloor
4	21	51° 58.99432	14° 59.91128	647											13:37			CTD DIVE4_up started
4	22	51° 58.57418	14° 59.57342	0											14:01			CTD4 up off
4	22	51° 58.57482	14° 59.57533	0												14:14		ROV on deck
5	22	51° 58.58824	15° 01.12150	0	14:45													ROV in water
5	23	51° 58.58824	15° 01.12150	0		14:51												CTD DIVE5_down started
5	23	51° 58.58824	15° 01.12150	0		14:58												ROV descending
5	23	51° 59.01550	15° 01.09180	717			15:20											ROV on floor
5	23	51° 59.01551	15° 01.09181	717						15:20								CTD DIVE5 _during started
5	23	51° 59.01552	15° 01.09182	717					15:21									ROV HD video recording on
5	24	51° 59.0201	15° 01.07120	718														Lander 13_303_706 found
5	24	51° 59.02065	15° 01.07496	720							15:40							Lander 13_303_706 retrieved
5	25	51° 59.02065	15° 01.07496	720											15:40			CTD DIVE5_Up started
5	25	51° 59.02065	15° 01.07496	720									15:41					ROV HD video recording off
5	25	51° 59.02065	15° 01.07496	720										15:42				ROV ascending
5	26	51° 59.01966	15° 01.06083	118											16:03			CTD5 up restarted as Dive5b_Up
5	26	51° 58.00046	15° 01.11078	0														ROV on surface
5	26	51° 58.00046	15° 01.11078	0											16:06			CTD5b Up off
5	26	51° 58.00046	15° 01.11078	0												16:16		ROV on deck

ROV Video log Dive Number	Station	Lat	Long	Depth	ROV in water and descent — time ROV IN	ROV in water and descent — # + time CTD downcast ON	ROV on bottom — time ROV ON BOTTOM	ROV on bottom — y/n Lasers on	ROV on bottom — # + time Video Recording	ROV on bottom — # + time CTD change (on bottom/leaving)	ROV on bottom — # + time Lander retrieved	ROV on bottom — # + time Video changed	ROV leaving bottom — time Video stopped	ROV leaving bottom — time ROV OFF BOTTO	ROV leaving bottom — # + time CTD upcast	ROV leaving bottom — time ROV on deck	Who and which HD? Data backed up? By Who?	Observation/note
6	26	51° 58.2233	15° 02.32283	0	17:18													ROV in water
6	27	51° 58.2233	15°02.32283	0		17:19												CTD Dive6_down started
6	28	51°58.2232	15°02.3217	1.5		17:27												CTD crashed/. New file CTD DIVE6_Down2 started
6	28	51°58.2352	15°02.3226	160.5		17:32												CTD crashed/ New file CTD DIVE6_Down3 started
6	29	51°58.24040	15°02.30553	685			17:49			17:49								CTD DIVE6_during started
6	29	51°58.22312	15°02.30546	684														Lander 13_304_708 located
6	30	51°58.22312	15°02.30546	684					17:51									HD ROV video started
6	31	n/a	n/a	685.5						18:01								Had to restart computer SBE crashed, Re-started at 18:01- missed lat/long. DIVE6_during2 started and crashed
6	32	51°58.23047	15° 02.3473	685.6						18:16					18:19			New CTD file named DIVE6_during 3 started
6	33	51°58.24837	15°02.30453	685							18:19							Lander 13_304_708 retrieved
6	33	51°58.24837	15°02.30453	685									18:19					HD ROV video off
6	34	51°58.24837	15°02.30453	685											18:17			CTD DIVE6_upcast started. Crashed. New file started.
6	35	51°58.25827	15°02.28240	n/a											18:27			CTD DIVE6_upcast2 started
6	35	51 °58.24019	15°02.30821	1.2														CTD off
6	35	N/A	N/A	0												18:55		ROV on deck (no co-ords)
7	35	52°01.1778	15°05.3482	1.8	19:50													ROV in Water
7	36	52°01.1778	15°05.3482	1.8		19:50												CTD Dive7_downcast on
7	36	52°01.2165	15°05.2074	2126			21:10											ROV on bottom
7	37	52°01.2234	15°05.1284	2126					21:10									ROV HD video on
7	38	52°01.2234	15°05.1284	2126						21:10								CTD DIVE7 _during started
7	38	52°01.13290	15°05.7703	2126														Lander 13_306_710 located at 22:23h.
7	39	52°01.13290	15°05.7703	2126						22:26								CTD changed to DIVE7_during1
7	40	52°01.2196	15°05.1276	2126							22:26							Lander 13_306_710 secured. Retrieving process started
7	40	52°01.2226	15°05.1283	2126									22:45:00					ROV video recording stopped
7	40	52°01.2226	15°05.1283	2085										22:48				ROV off bottom
7	41	52°01.2363	15°05.0722	2044											22:50			CTD DIVE7_upcast started
7	41	52°01.12411	15°05 11430	20											00:04			CTD DIVE7_upcast stopped
7	41	52°01.12411	15°05 11430	0												00:20		ROV on deck
8	41	51°52 11.434	15°02 4.778	0														ROV off Deck 01:42 ROV Coordinates not being displayed so used Ranger ship data
8	41	51°52 11.376	15°02 4.773	0	01:45													Rov in water ROV Coordinates not being displayed so used Ranger ship data
8	42	51°52.2127	15°02.0350	70		01:58												CTD Dive8_downcast started
8	42	51°52.2112	15°02.0400	626			02:17											ROV on bottom
8	43	51°52.2118	15°02.02037	625						02:19								CTD Dive8_during started
8	44	51°52.2067	15°02.0231	619				02:21	02:21									ROV video started, lasers on
8	44	51°52.2034	15°02.058	605														Lander 13_305_704 Spotted in footage 2:23
8	44	51°52.2034	15°02.038	606														Lander 13_305_704 secured 2:29
8	44	51°52.2034	15°02.0026	606									02:40					ROV Video Stopped
8	45	51°52.2034	15°02.0026	606						02:40	02:40							Lander 13_305_704 retrieved. CTD during stopped
8	46	51°52.2156	15°02.0106	596										02:42	02:42			ROV off bottom. CTD DIVE8_Upcast on
8	46	51°52.215	15°02.0045	27														CTD Upcast off 03:04
8	46	51°52.11742	15°02.830	0														ROV at surface 03:09
8	46	51°52.11742	15°02.02803	0												03:23		ROV on deck

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Lander Logs

Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
705	299	705	1	Y	<1/4	Marine Particulate Thick	Mainly within last 1/10	GS
705	299	705	2	Y	<1/4	Marine Particulate Matter	Mainly last tenth less than number 1	GS
705	299	705	3	Y	<10%	Similar composition to 1 & 2	Much lower amount than previous 2	GS
705	299	705	4	Y	<1/22	POM	A minute layer above bottom	GS
705	299	705	5	Y	<1/4	POM & Seds	Higher amount than 3 or 4	GS
705	299	705	6	Y	<1/22	POM	Equal to 4	GS
705	299	705	7	Y	<5%	Mainly seds	Very thin layer at bottom	GS
705	299	705	8	Y	<5%	Sed dominated	Thin layer at bottom	GS
705	299	705	9	Y	<2%	Seds dominated	Thin layer at bottom	GS
705	299	705	10	Y	<2%	Seds	Less than previous 2	GS
705	299	705	11	Y	<5%	Sandy Particulate	Less than previous	GS
705	299	705	12	Y	<2%	Sandy Particulate	Poorly sorted	GS
705	299	705	13	Y	<2%	Coarser seds, sands etc.		GS
705	299	705	14	Y	<1%	Sandy material		GS
705	299	705	15	Y	<2%	Coarse sand with POM		GS
705	299	705	16	Y	<2%	POM with sand		GS
705	299	705	17	Y	<2%	Sand		GS
705	299	705	18	Y	<1%	Some POM not as strong as before mainly sed		GS
705	299	705	19	Y	<1%	Few samples of POM		GS
705	299	705	20	Y	<0.5%	POM with some coarse sed	Much less than 18 and 19	GS
705	299	705	21	Y	<1%	Some POM with sands	Slightly more than previous	GS
705	299	705	22	Y	<1%	Sands with small portions of POM		GS
705	299	705	23	Y	<1%	POM with minute amounts of sed		GS
705	299	705	24	Y	<0.5%	Sandy seds with POM		GS

Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
703	13_300	703	1	Y	<2%	Small amount of fine sand	Less than 2% full of sed	KH
703	13_300	703	2	Y	<1%	Tiny amount of fine sand		KH
703	13_300	703	3	Y		Suspended particles		KH
703	13_300	703	4	Y		Fluffy sediment suspended at bottom		KH
703	13_300	703	5	Y		Fluffy fine sand particles		KH
703	13_300	703	6	Y	<2%	Dark, settled fluffy		KH
703	13_300	703	7	Y	<0.5%	Little or no visible sediment		KH
703	13-300	703	8	Y	<1%	Suspended particles, <1% fluffy sed		KH
703	13_300	703	9	Y	<1%	Very little fluffy sediments		KH
703	13_300	703	10	Y	<2%	Sand, fluffy settled - not as much suspended		KH
703	13_300	703	11	Y	<0.5%	Little sand settled on bottom		KH
703	13_300	703	12	Y		Suspended fluffy sed - none on bottom		KH
703	13_300	703	13	Y	<1%	Floating fluffy sed - none on bottom		KH
703	13_300	703	14	Y	<2%	Large amount of suspended sed		KH
703	13_300	703	15	Y		Some settled/some suspended		KH
703	13_300	703	16	Y		Large worm, larger particles		KH
703	13_300	703	17	Y	<2%	Small amount of settled sediment		KH
703	13_300	703	18	Y		Large particles		KH
703	13_300	703	19	Y	<1%	Settled sediment		KH
703	13_300	703	20	Y		Small amount of sediment		KH
703	13-300	703	21	Y		Large settled particles, some floating		KH
703	13_300	703	22	Y		Large settled, very little suspended		KH
703	13_300	703	23	Y		Round medium particles settled		KH
703	13_300	703	24	Y		Very little /no sediment floating		KH

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Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
707	13_301	707	1	Y		Minute amount of sediment		ZH
707	13_301	707	2	Y		Minute amount of sediment		ZH
707	13_301	707	3	Y		Minute amount of sediment		ZH
707	13_301	707	4	Y		No sediment/suspended particles		ZH
707	13_301	707	5	Y		No sediment/suspended particles		ZH
707	13_301	707	6	Y		Minute amount of sediment		ZH
707	13_301	707	7	Y		Minute amount of sediment		ZH
707	13_301	707	8	Y		Minute amount of sediment		ZH
707	13_301	707	9	Y		Minute amount of sediment		ZH
707	13_301	707	10	Y		Minute amount of sediment		ZH
707	13_301	707	11	Y		Minute amount of sediment		ZH
707	13_301	707	12	Y		Minute amount of sediment		ZH
707	13_301	707	13	Y		Minute amount of sediment		ZH
707	13_301	707	14	Y		Minute amount of sediment		ZH
707	13_301	707	15	Y		Minute amount of sediment		ZH
707	13_301	707	16	Y		Minute amount of sediment		ZH
707	13_301	707	17	Y		Minute amount of sediment	Damage to bottle side	ZH
707	13_301	707	18	Y		Minute amount of sediment	Damage to bottle side	ZH
707	13_301	707	19	Y		Minute amount of sediment		ZH
707	13_301	707	20	Y		Minute amount of sediment		ZH
707	13_301	707	21	Y		Minute amount of sediment		ZH
707	13_301	707	22	Y		Minute amount of sediment		ZH
707	13_301	707	23	Y		Minute amount of sediment		ZH
707	13_301	707	24	Y		Minute amount of sediment		ZH

Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
709	13_302	709	1	Y	<2%	Fine silts		ZH
709	13_302	709	2	Y	<2%	Fine silts		ZH
709	13_302	709	3	Y	<1%	Fine silts with suspended particles		ZH
709	13_302	709	4	Y	<1%	Fine silts with suspended particles		ZH
709	13_302	709	5	Y	<2%	Settled silts with increased suspended particles		ZH
709	13_302	709	6	Y	<2%	Fine sediment with polychaetes		ZH
709	13_302	709	7	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	8	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	9	Y	<3%	Fine sediment with suspended sediment		ZH
709	13_302	709	10	Y	<3%	Fine sediment with suspended sediment		ZH
709	13_302	709	11	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	12	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	13	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	14	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	15	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	16	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	17	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	18	Y	<0.5%	Fine sediment with suspended sediment		ZH
709	13_302	709	19	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	20	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	21	Y	<0.5%	Fine sediment with limited suspended sediment	Bottle fallen over so limited intake	ZH
709	13_302	709	22	Y	<2%	Fine sediment with suspended sediment		ZH
709	13_302	709	23	Y	<1%	Fine sediment with suspended sediment		ZH
709	13_302	709	24	Y	<1%	Fine sediment with suspended sediment		ZH

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Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
706	13_303	706	_1	Y	<4%	Fine sandy sediment		RS
706	13_303	706	_2	Y	<3%	Fluffy		RS
706	13_303	706	_3	Y	<4%	Fine sand with organic matter		RS
706	13_303	706	_4	Y	<5%	Silts and sands		RS
706	13_303	706	_5	Y	<5%	Silts and sands		RS
706	13_303	706	_6	Y	<4%	Silts and sands		RS
706	13_303	706	_7	Y	<2%	Silts and sands		RS
706	13_303	706	_8	Y	<5%	Silts and sands		RS
706	13_303	706	_9	Y	<8%	Silts and sands		RS
706	13_303	706	_10	Y	<6%	Silts and sands		RS
706	13_303	706	_11	Y	<3%	Fine sand with suspended sediment		RS
706	13_303	706	_12	Y	<3%	Fine sand with suspended sediment		RS
706	13_303	706	_13	Y	<2%	Fine sand with suspended sediment		RS
706	13_303	706	_14	Y	<2%	Fine sand with suspended sediment		RS
706	13_303	706	_15	Y	<2%	Sand with fluff		RS
706	13_303	706	_16	Y	<2%	Sand with fluff		RS
706	13_303	706	_17	Y	<2%	Sandy fluff with polychaetes		RS
706	13_303	706	_18	Y	<2%	Sand with suspended sediment		RS
706	13_303	706	_19	Y	<2%	Fluffy		RS
706	13_303	706	_20	Y	<2%	Fine grit with organic matter		RS
706	13_303	706	_21	Y	<2%	Fine grit with organic matter		RS
706	13_303	706	_22	Y	<2%	Fine grit with organic matter		RS
706	13_303	706	_23	Y	<2%	Fine grit with organic matter	Tiny shrimp inside <3mm	RS
706	13-303	706	_24	Y	<1%	Fluffy sand		RS

Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
6	304	708	1	Y	0%	No visible matter		EOM
6	304	708	2	Y	0%	No visible matter		EOM
6	304	708	3	Y	0%	No visible matter		EOM
6	304	708	4	Y	<1%	Particulate organic matter		EOM
6	304	708	5	Y	0%	No visible matter		EOM
6	304	708	6	Y	0%	No visible matter		EOM
6	304	708	7	Y	0%	No visible matter		EOM
6	304	708	8	Y	0%	No visible matter		EOM
6	304	708	9	Y	0%	No visible matter		EOM
6	304	708	10	Y	0%	No visible matter	Particularly bubbly	EOM
6	304	708	11	Y	0%	No visible matter		EOM
6	304	708	12	Y	0%	No visible matter		EOM
6	304	708	13	Y	<1%	Particulate organic matter		EOM
6	304	708	14	Y	0%	No visible matter		EOM
6	304	708	15	Y	<1%	Particulate organic matter	Hardly visible	EOM
6	304	708	16	Y	<1%	Particulate organic matter	Possibly marine snow	EOM
6	304	708	17	Y	0%	No visible matter		EOM
6	304	708	18	Y	0%	No visible matter		EOM
6	304	708	19	Y	0%	No visible matter		EOM
6	304	708	20	Y	<1%	Minute (POM)	Hardly visible	EOM
6	304	708	21	Y	<1%	Minute (POM)	Slightly visible	EOM
6	304	708	22	Y	<1%	Minute (POM)	Hardly visible	EOM
6	304	708	23	Y	0%	No visible matter		EOM
6	304	708	24	Y	<1%	Minute (POM)	Hardly visible	EOM

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Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
7	306	710	1	Y	15%	10% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	2	Y	10%	5% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	3	Y	15%	10% graded sediment 5% POM	Sediment very fine	EOM
7	306	710	4	Y	45%	10% POM 35% graded sediment	Sediment very fine	EOM
7	306	710	5	Y	80%	30% POM 50% graded sediment	Sediment very fine	EOM
7	306	710	6	Y	80%	30% POM 50% graded sediment	Sediment very fine	EOM
7	306	710	7	Y	70%	40% POM 30% graded sediment	Sediment very fine	EOM
7	306	710	8	Y	40%	35% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	9	Y	80%	60% POM 20% graded sediment	Sediment very fine	EOM
7	306	710	10	Y	85%	70% POM 15% graded sediment	Sediment very fine	EOM
7	306	710	11	Y	20%	15% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	12	Y	20%	10% POM 10% graded sediment	Sediment very fine	EOM
7	306	710	13	Y	50%	30% POM 20% graded sediment	Sediment very fine	EOM
7	306	710	14	Y	65%	45% POM 20% graded sediment	Sediment very fine	EOM
7	306	710	15	Y	70%	50% POM 20% graded sediment	Sediment very fine	EOM
7	306	710	16	Y	85%	45% POM 40% graded sediment	Sediment very fine	EOM
7	306	710	17	Y	30%	20% POM 10% graded sediment	Sediment very fine	EOM
7	306	710	18	Y	20%	10% POM 10% graded sediment	Sediment very fine	EOM
7	306	710	19	Y	25%	15% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	20	Y	30%	20% POM 10% graded sediment	Sediment very fine	EOM
7	306	710	21	Y	40%	15% POM 5% graded sediment	Sediment very fine	EOM
7	306	710	22	Y	10%	7.5% POM 2.5% graded sediment	Sediment very fine	EOM
7	306	710	23	Y	10%	8% POM 2% graded sediment	Sediment very fine	EOM
7	306	710	24	Y	7-8%	7% POM 1% graded sediment	Sediment very fine	EOM

Site	Motor #	ADCP #	Bottle #	Retreived (y/n)	How much approx	Description	Notes	Noted by?
8	305	704	1	Y	<5%	Biogenic organic matter	Black	EOM
8	305	704	2	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	3	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	4	Y	<1%	Biogenic organic matter	Black	EOM
8	305	704	5	Y	<1%	POM	White	EOM
8	305	704	6	Y	<2%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	7	Y	<1%	POM	White	EOM
8	305	704	8	N				EOM
8	305	704	9	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	10	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	11	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	12	Y	<1%	Biogenic organic matter	Grey-white	EOM
8	305	704	13	Y	<2%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	14	Y	<2%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	15	Y	<1%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	16	Y	<1%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	17	Y	<1%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	18	Y	<1%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	19	Y	<2%	Biogenic organic matter and POM	Increased suspend	EOM
8	305	704	20	Y	<2%	Biogenic organic matter and POM	Grey-white	EOM
8	305	704	21	Y	<1%	Biogenic organic matter and POM	White-Black	EOM
8	305	704	22	N				EOM
8	305	704	23	N				EOM
8	305	704	24	N				EOM

Weather Report
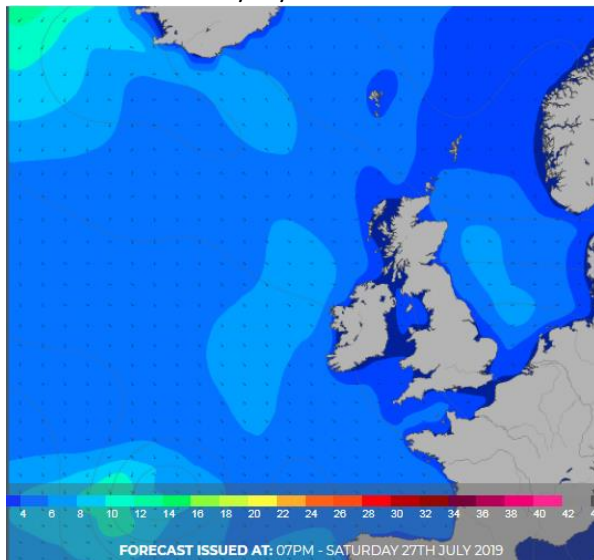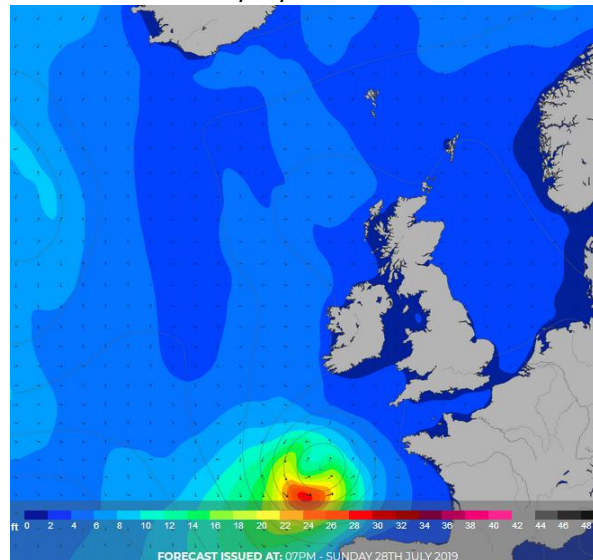
26/07/19 3am
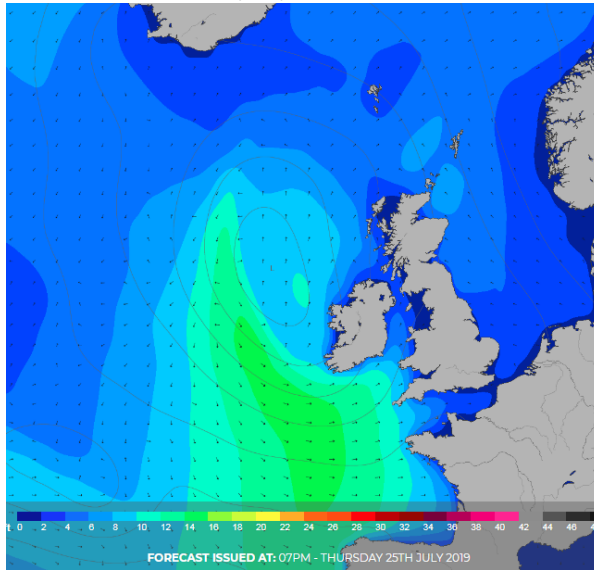
27/07/19 3am
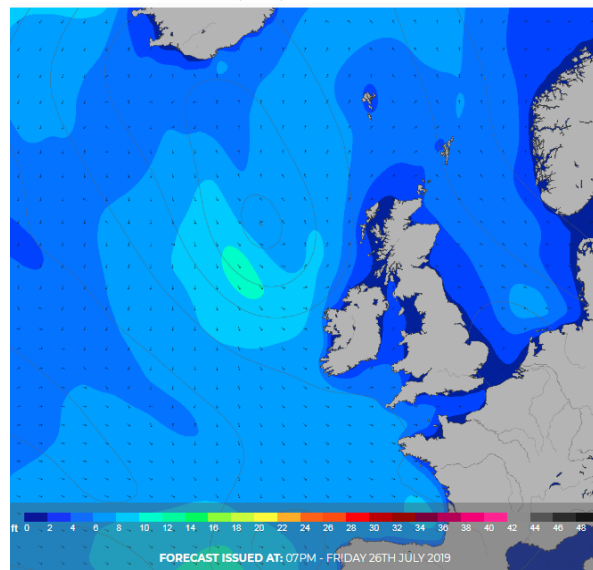
28/07/19 3am

29/07/19 3am

26th July 2019 – Porcupine Bank Canyon

03.00 – Wind S, Force 3, calm seas, slight swell, good visibility

04.00 – Wind S, Force 4, calm seas, slight swell, good visibility

08.00 – Wind S, 25 kts, calm seas, moderate sea and swell

16.00 - Wind WSW, Force 5, moderate sea and swell, good visibility

20.00 - Wind W, Force 4, slight/moderate sea, good visibility

27th July 2019 – Porcupine Bank Canyon

04.00 – Wind W, Force 3, calm seas, good visibility

08.00 – Wind NW, Force 5, moderate sea and swell, occasional rain

08.00 – Wind NW, Force 5, moderate sea and swell, occasional rain

16.00 - Wind WNW, Force 3

19.53 – Wind W, Force 3, low swell, calm sea

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28th July 2019 – Porcupine Bank Canyon to Cork
04.00 – Wind light, calm sea, very good visibility
08.00 – Wind light variable, calm seas, cloudy, good visibility
14.00 – Wind light variable, calm seas, cloudy, good visibility
16.00 – Wind light variable, calm seas, some rain, good visibility
20.00 – Wind N, Force 4, slight sea, good visibility
29th July 2019 – Western Shelf to Cork
04.00 – Wind N, Force 3, calm sea, good visibility
08.00 – Light airs, calm, sheltered

Outreach, Press Releases and Media

https://www.irishexaminer.com/breakingnews/ireland/researchers-from-ucc-find-plastic-on-seafloor-where-even-light-has-never-penetrated-940174.html

https://www.irishtimes.com/news/environment/going-deep-plastics-found-2-100m-under-the-sea-off-co-kerry-coast-1.3971828?mode=amp

https://www.siliconrepublic.com/innovation/plastic-waste-irish-coast-porcupine-bank

https://www.thejournal.ie/plastic-found-ocean-floor-ucc-4744346-Jul2019/

https://www.breakingnews.ie/ireland/researchers-from-ucc-find-plastic-on-seafloor-where-even-light-has-never-penetrated-940174.html

https://www.echolive.ie/corknews/UCC-study-finds-plastic-in-deep-submarine-canyon-6824baa1-8040-49be-9128-bc5046ef4c68-ds#.XT81iY34Yl8.twitter

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