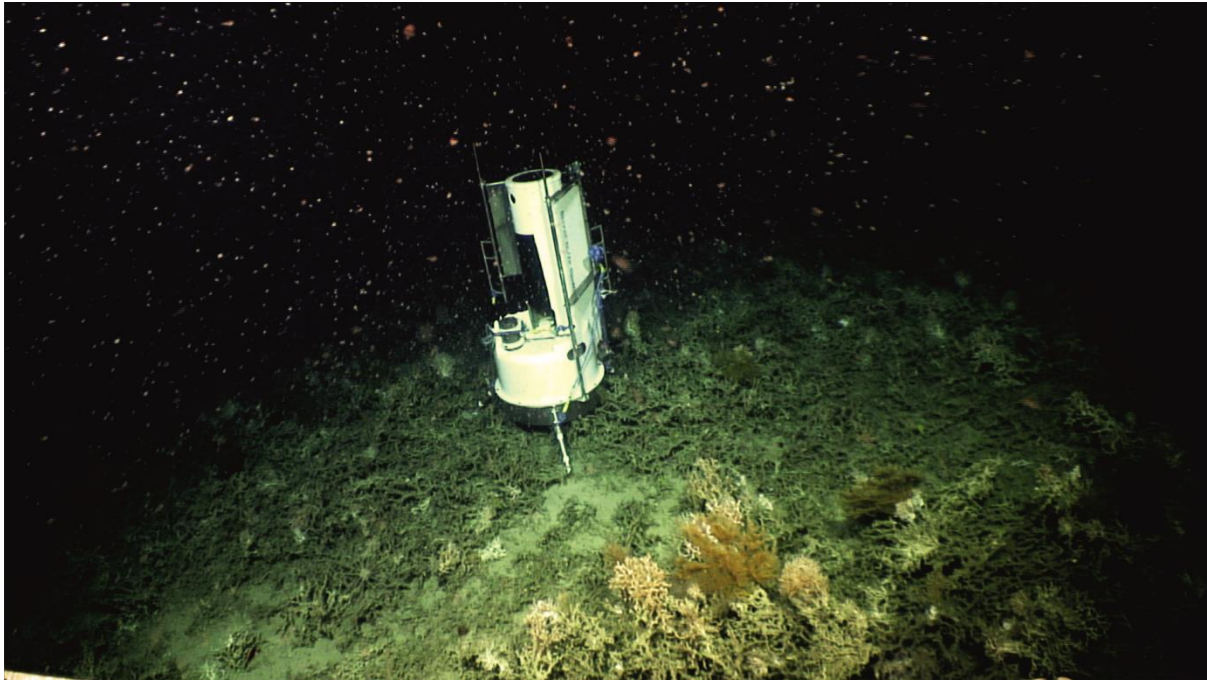


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Title	Monitoring changes in submarine canyon coral habitats - Leg 1 (MoCha_SCan)
Author(s)	Lim, Aaron; O'Reilly, Luke; Summers, Gerard; Harris, Kim; Shine, Andrew; Harman, Luke; Appah, John; Macedo, Larissa; Boyd, John; Anders, Bebhinn; Killeen, Orla; Conti, Luis; O'Brien, Martina
Publication date	2019-05
Original citation	Lim, A., O'Reilly, L., Summers, G., Harris, K., Shine, A., Harman, L., Appah, J., Macedo, L., Boyd, J., Anders, B., Killeen, O., Conti, L. and O'Brien, M. (2019) Monitoring changes in submarine canyon coral habitats - Leg 1 (MoCha_SCan). Available at: http://marinegeology.ucc.ie/wp-content/uploads/sites/87/2019/06/MoCha_SCan_Cruise_Report.pdf (Accessed: 11 September 2019)
Type of publication	Report
Link to publisher's version	http://marinegeology.ucc.ie/wp-content/uploads/sites/87/2019/06/MoCha_SCan_Cruise_Report.pdf Access to the full text of the published version may require a subscription.
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Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)



RV Celtic Explorer and Holland 1 ROV - Cruise Number CE19008

Galway - Porcupine Bank Canyon - Galway

13th May 2019 to 23rd May 2019

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Executive Summary

This survey focused on the maiden deployment of a number of novel, ROV-adapted lander systems in the Porcupine Bank Canyon (PBC) coral habitats, NE Atlantic. Cold water corals (CWCs) flourish on the Irish-Atlantic margin between 600 and 100 m water depth, where they form a number of structural habitat types (coral reefs, mounds and gardens). Recent research shows that deep water habitats, including CWC habitats on the Irish margin, may be impacted by recent environmental change. The main objectives of this survey are: a) to deploy 8 new lander systems within a range of coral habitats throughout the PBC; b) to complete mapping coverage within the PBC; c) to sample the coral, sediment and ambient watermass around the lander sites and; d) to sample particulate organic matter around key coral habitats. Data recorded via landers from each habitat will allow to determine the controls on habitat variability. Furthermore, this data can be used as a baseline to which later deployments at this site will be used to compare against. Completed canyon coverage will feed into a number of multiscale mapping 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. Video data will be used to characterise key coral habitat within the canyon and subsequently, HD DEM’s will be generated as a central dataset for the multiscale projects listed above.

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. The project adds to Irish seabed mapping capacity, develops a critical mass to generate large consortia, building further capacity and relationships with industrial (hydrocarbon)/international partners.

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Survey Objectives (and cruise track)

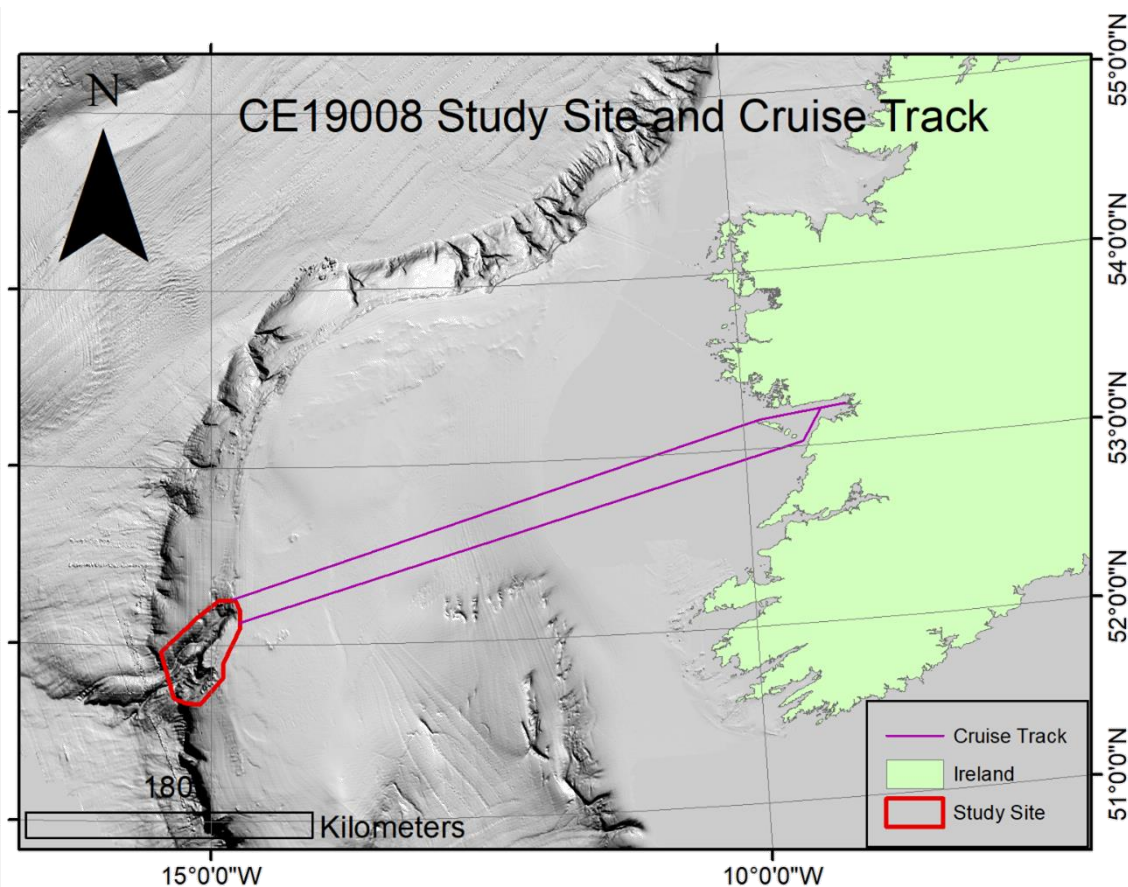


Fig. 1 Map showing main cruise track (excl. EEZ mapping area)

The MoCha_Scan research cruise (CE19008) has seven clearly defined objectives:

Task 1.1 - Maiden deployment of 8 ROV-adapted Landers

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 will be deployed, and continuously record data, for a period of approx. 2.5 months. Each lander will be deployed in a different coral habitat type throughout the canyon. Deployment via ROV allows to sample and image the area around the lander deployment site. Further, ROV pilots can 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 data recorded by the landers will allow to understand drivers of coral habitat variability. In addition, it will act as an important baseline dataset to which later, planned research cruises can be compared against to determine trends of change in allogenic environmental conditions. To this end, each lander will be set-up to record at the same time and interval. Sediment traps will continuously trap sediments for the deployment period within 24 X 500 ml separate sampling bottles. ADCP's will record a profile of data 25 m above the transducer for a period of 1 minute every 10 minutes. See the table below for target sites.

Off-mound current swept channel	Northern canyon
On-mound	Northern canyon
Coral Garden/Lip	Mid-canyon flank
Coral Lip	Mid-canyon flank
On-mound	Mid-canyon flank
Off-mound	Mid-canyon flank
On-mound	Southern Canyon branch
Deep Canyon Channel	Central canyon

Table 1. Target deployment sites for Lander systems.

Task 1.2 - ROV sampling

To use the ROV manipulator arms to collect coral frameworks from around a number of lander sites. Each coral sample must not touch other coral samples to avoid contamination and therefore will be stored within a separate ROB biobox during the ROV deployment. A sediment push core and ROV-mound Niskin bottle will also be used at each of these sites to collect water and sediment samples. Samples will be used to a) determine the impact of disease on the coral habitats and; b) determine the existence of microbial resistant bacteria within these habitats.

Task 1.3 - Hull-mounted EM302 and EM1002 multibeam mapping of the canyon

The EM302 and EM1002 (only in water depths less than 900 m) will be operated simultaneously at 30 and 100 kHz, at a survey speed of 8 knots to complete full canyon coverage. Acquisition will be managed via SIS (Seafloor Information System) and data will be stored as *.all files. Processing will be carried out using Fledermaus Qimera. Data will be used to complete the regional mapping data set required for the MMonKey_Pro research programme.

Task 1.4 - ROV Video

HD video will be recorded during ROV dives. 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 generate structure-from-motion 3D models at previously identified, key coral habitats.

Task 1.5 - Hull-mounted ADCP

The vessel mounted ADCP will acquire data pre-, during and post- lander deployment. This will allow to put the lander ADCP into context within the full-water column.

Task 1.6 - EEZ mapping

A depth contour-parallel survey grid of lines will be acquired to the west of the canyon (extended Irish EEZ) using the EM302 multibeam echosounder. The sounder will be operated at 30 kHz at a survey speed of 8 knots. Sound velocity profiles will be acquired using the CTD rosette. C-Nav precision positioning will be logged and applied to raw soundings. Acquisition will be managed via SIS and stored

as a series of *.all files. Data will be provided over to INFOMAR for processing and visualisation. Data will be made publically available in a GIS-friendly format.

Task 1.7 - CTD and water sampling

A series of CTD casts will be acquired with the CTD rosette and ROV CTD (both up and down cast and during dives). In addition, water samples will be collected both in the canyon and on transit back to Galway. Canyon water samples will be utilised to determine concentration of particulate organic matter (POM%) while remaining water samples will be used to determine the existence of microbial resistant bacteria.

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 rangefinders. It is also fitted with a CTD and 2 robotic arms for sampling (1X7F and 1X5F) as well as an aspirator.

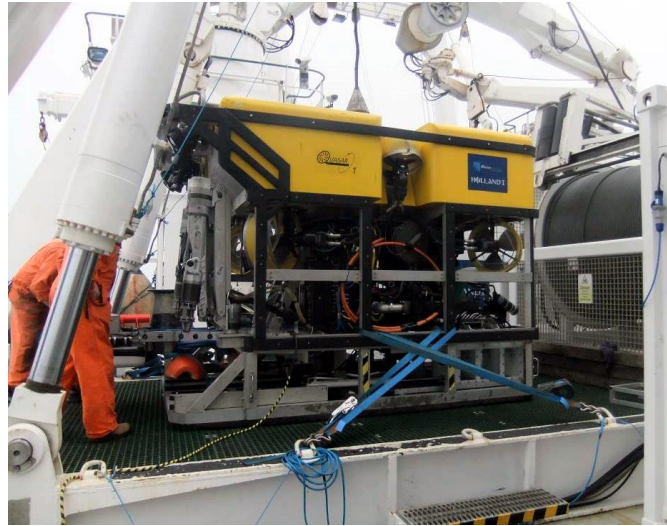


Fig. 3 The Holland I ROV on deck (portside view)



Fig. 4 The Holland 1 ROV. Note lights, cameras and manipulator arms.

Deep Water Lander Systems

Eight monitoring stations, referred to as “Landers”, have been designed specifically for this survey. Each Lander is equipped with an Acoustic 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.

Kongsberg EM302 Multibeam Echosounder

The *Kongsberg* EM302 multibeam echosounder is deep-water sonar which operates at 30 kHz achieving an 8000 m water depth range. It is mounted at the hull of the RV Celtic Explorer (not on the drop keel). It is integrated with a sound velocity probe, C-Nav navigation, a motion reference unit and a dedicated processing unit. All acquisition and planning is carried out in SIS.

CTD Rosette

A *Sea Bird Electronics* SBE 911 plus CTD was used to measure variations in a variety of parameters in the water column. The CTD was fitted with the following sensors: SBE 35 Digital Thermometer, a SBE44plus conductivity sensor, a Digiquartz pressure sensor, a SBE 43 dissolved oxygen sensor, altimeter, fluorometer and a nitrogen saturation sensor. A similar CTD probe is mounted on the Holland 1 ROV.



Fig. 6 The CTD rosette

Survey Log (UTC)

Monday 13th May, 2019

Scientists arrive on vessel for safety and familiarisation tour (1500). Scientific party liaise and discuss cruise plan and tasks (1805). Wet lab and landers start being prepared and set up for deployment (approx. 1900).

Tuesday 14th May, 2019

Vessel steams with Pilot boat at 0045. Trial USBL outside Galway bay and steam for the Porcupine Bank Canyon.

Wednesday 15th May, 2019

Arrive on site for **Dive 1** (Lander site #1; 0400). Attempt Lander deployment (0400) but ROV recovered to deck due to a kink in the line). Lander deployed successfully at 0527 (**52 14.6191, 14 52.7467, 839 m water depth**). Acquired video footage around the site before recovery to deck (0638). Transit and arrive at Lander site #2 (0820) for **Dive 2**. ROV on bottom at (0911). Lander Deployed on coral mound summit 0951 (**52 13.6371, 14 55.5389, 719.4 m water depth**). Sampled water (station 8), video footage, push cores (station 10) and *lophelia* (station 10). Recover to deck at 1214 and transit to next site. ROV in water for **Dive 3** at 1430 for lander deployment at coral garden (Lander #3). Seabed was very steep and unsuitable for lander. On inspection of the local area, a more suitable lander site was chosen at 17.30 (**52 00.25005, 14 59.37910, 697.4 m water depth**). ROV recovered to deck and steamed for the next site (Lander #4). ROV in water for **Dive 4** at 1935. Lander #4 on bottom at 2127 (**51 58.9911, 14 59.425, 645 m water depth**), on the summit of an isolated coral mound. ROV recovered to deck (2229) and steamed to the next site.

Thursday 16th May, 2019

ROV in water for **Dive 5** at 0000. Lander #5 (**Dive 5**) is deployed at 0058 (**51 59.0240, 15 01.1558 at 719.5 m water depth**) and put on the seabed at approx. 0100. ROV is recovered to deck (0226) and steam to the next site (Lander 6).

ROV in water for **Dive 6** at 0405. ROV on bottom at 0446 (coral lip). Topography was irregular. The ROV explored the area until a suitable flat, level surface was found. The leg of the lander became bent and eventually toppled over (0544). The ROV crew used the manipulator arms to fix the leg and stand it upright (0625). However, the lander was unsteady and fell over again (0806 and 0843). It was decided that the Lander would be brought back to surface and repaired after collecting coral and water samples. ROV recovered to deck at 1119. The ROV attempted **Dive 7** (1347) to redeploy the repaired Lander but due to an issue with its hydraulic pressure, the ROV needed to be brought back on deck before it entered the water (1351).

While the ROV was in repair, the EM302 was set up but had a storage issue. Issue resolved and started lines 0000 to 0008 (EM302) and 0611 (EM1002) from 1534 until 1849. CTD 1 (station 39) was deployed at 1909 to 600m water depth. 3 bottles were fired. ROV repaired and vessel steamed to Lander site 7 (**Dive 8**). ROV in water at 2045. ROV on bottom (2123) and HD video dive recorded at 2133 for photogrammetry. INS GPS working (Co-ordinates now correct on ROV overlay) (2200).

Friday 17th May, 2019

Initially carried out a encircling survey plan and later repeated with a gridded survey design (0218). Positioning of ROV faulty again at 0307. INS positioning amended (0324). INS position faulty again (0340). CTD upcast started and HD video stopped at 0502. ROV on deck at 0539. ROV in water for **Dive 9** (Lander 7) at 0811. ROV on bottom (0841) and completed sampling (coral, sediment and water). Noted that the wrong, inactivated ADCP was mounted on the lander frame. Decided to recover the lander to deck to change the ADCP to the right, activated ADCP. Thus, the lander was not deployed and recovered to deck (1450). The ADCP was swapped and samples processed. The ROV was back in the water for **Dive 10** at Lander site 7 (1630). ROV on bottom at 1713 and Lander deployed at 2002 (**51 52.20624, 15 02.01476, 605.9 m water depth**). ROV back on deck at 2055.

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CTD (station 72) was deployed at 2136 in the southern canyon branch. 6 bottles were fired (1242, 1093, 993.5, 845.3, 747.7 and 599.2) and water samples were filtered.

Saturday 18th May, 2019

ROV in water for **Dive 11** (0000) at the canyon flank (Lander site 6; 7/8) and on bottom 0032. Lander deployed on coral lip habitat at 0130 (**51 58.40933, 15 02.49959, 685.1 m water depth**). Niskin and push core taken (0158) and ROV back on deck at 0250. **Dive 12** to deploy the last lander (lander 8) commenced but was aborted at 0527. CTD cast taken at 0758 with 6 bottles fired (1044, 976, 849, 750, 620 and 560 m water depth). Short multibeam survey (station 82) conducted at 0904. CTD cast (station 83) taken (1003) with 6 bottles fired (892, 850, 750, 630, 580, 490 m water depth). Multibeam survey (station 84) (EM302 ad EM1002) at 1051 until 2317.

Sunday 19th May, 2019

ROV in water for **Dive 13** (station 85) (0017) and on bottom at 2123 m water depth (0146). Lander 8 deployed at 0303 (**52 01.20953, 15 05.27092, 2125.3 m water depth**), push core attempted (aborted) and back on deck at 0542.

Multibeam survey (station 92) at 0635 until 1424. ROV in water for **Dive 14** (1545). ROV on bottom (1622) and Lander 5 spotted at 1748 at 647 m water depth (51 58.97488, 14 59.9449). Photogrammetry commenced (1801) and surveyed mound flank with HD video. ROV back on deck at 2008. Multibeam survey (station 104) commenced at 2044.

Monday 20th May, 2019

Continue multibeam survey (station 104). Complete canyon mapping at 1358 and transit to EEZ mapping survey area to commence at 1528.

Tuesday 21st May, 2019

Continue EEZ mapping survey until 1414. Turn to steam towards Galway.

Wednesday 22nd May, 2019

CTD 8 (station 105) at 0911 on transit to Galway. CTD 9 (station 106) at 18:15 at 52 40.87, 10 45.75. Bottles fired at 110 m, 60 m and 2 m water depth.

Thursday 23rd May, 2019

Arrive outside Galway harbour and **survey ends** (0630).

Key Results Summary

Acquired Data

Data	Requested by	Data Owner
Lander ADCP	Aaron Lim, Andy Wheeler	Aaron Lim, Andy Wheeler
Lander Sediment Trap	Aaron Lim, Andy Wheeler	Aaron Lim, Andy Wheeler
Coral Frameworks/Polyps	John Appah	Aaron Lim
Sediment Push Cores	John Appah, Jean O' Dwyer, Luke O' Reilly	Aaron Lim
ROV niskin samples	John Appah, Jean O' Dwyer	Aaron Lim
CTD data	John Appah	Aaron Lim
CTD bottles	John Appah, Jean O' Dwyer	Aaron Lim
EM302/EM1002 canyon coverage	Aaron Lim	Aaron Lim
EEZ EM302 coverage	Fabio Sachetti	Aaron Lim
ROV HD video	Aaron Lim, John Appah,	Aaron Lim, Marine Institute
ROV composite video	Aaron Lim	Aaron Lim
ROV photogrammetric HD video	Aaron Lim, Luis Conti, Larissa Macedo	Aaron Lim
SCS	Aaron Lim	Aaron Lim
USBL data	Aaron Lim, Luis Conti, Larissa Macedo	Aaron Lim
HD Digistills	Aaron Lim	Aaron Lim

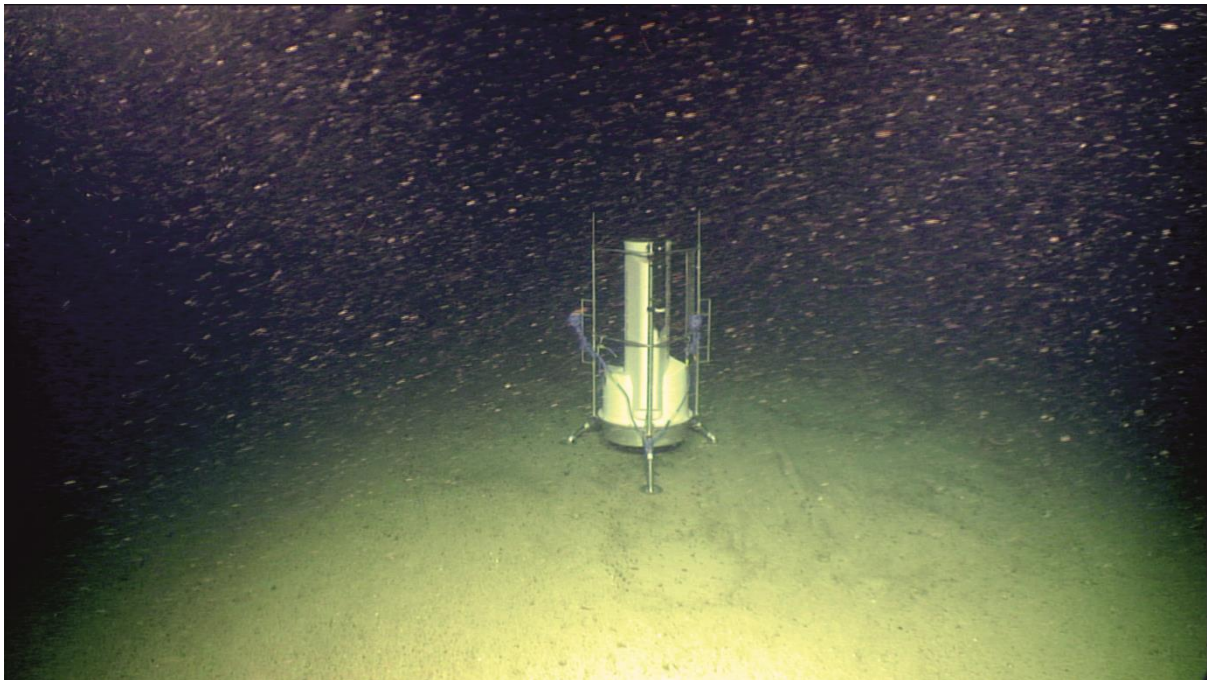
Table 2. List of data requested

Landers

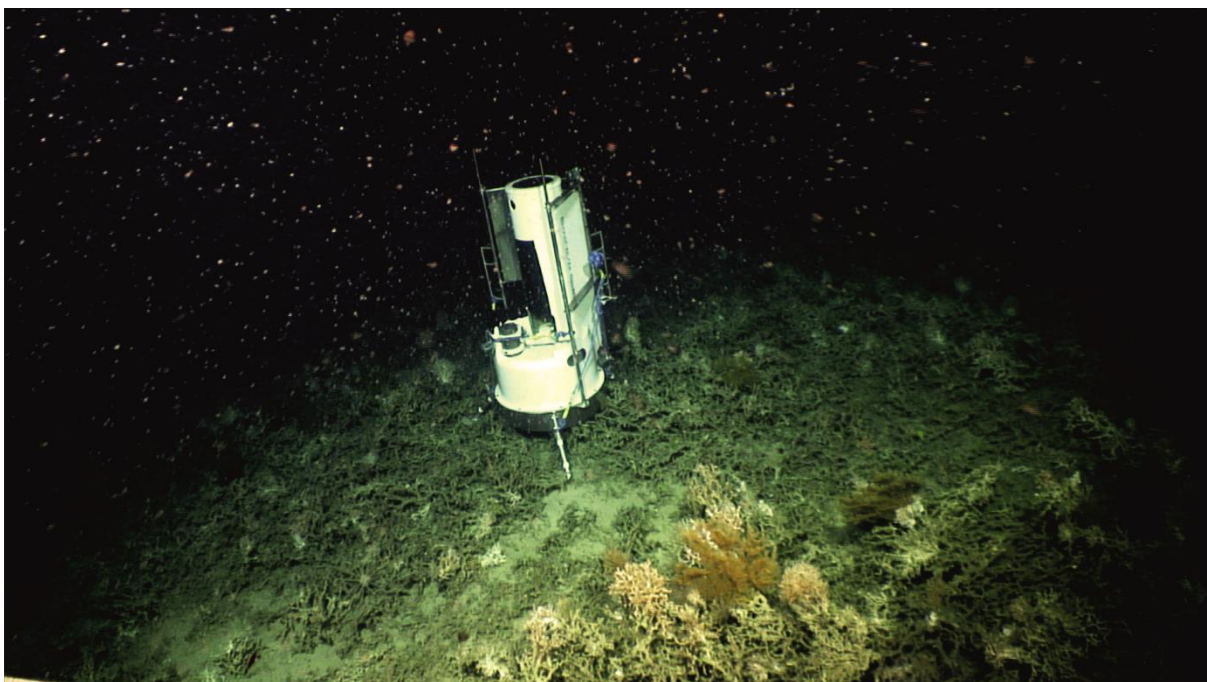
Lander_site	L_order	Dive	Lander_Code	Latitude	Longs	Depth
Lander 1	1	Dive 1	13_299_705	52.24396033	-14.87962033	839
Lander 2	2	Dive 2	13_300_703	52.227285	-14.92564953	719.4
Lander 4	3	Dive 3	13_302_709	52.00396042	-14.98886345	697.4
Lander 5	4	Dive 4	13_303_706	51.98318233	-14.999004	645
Lander 3	5	Dive 5	13_301_707	51.9837315	-15.01926833	719.5
Lander 7	7	Dive 11	13_305_704	51.87006383	-15.03355883	685.1
Lander 6	6	Dive 10	13_304_708	51.97348667	-15.041665	605.9
Lander 8	8	Dive 13	13_306_710	52.02015117	-15.08788717	2125.3

Table 3. List of lander names, codes, order of deployment (L_order), location and depth.

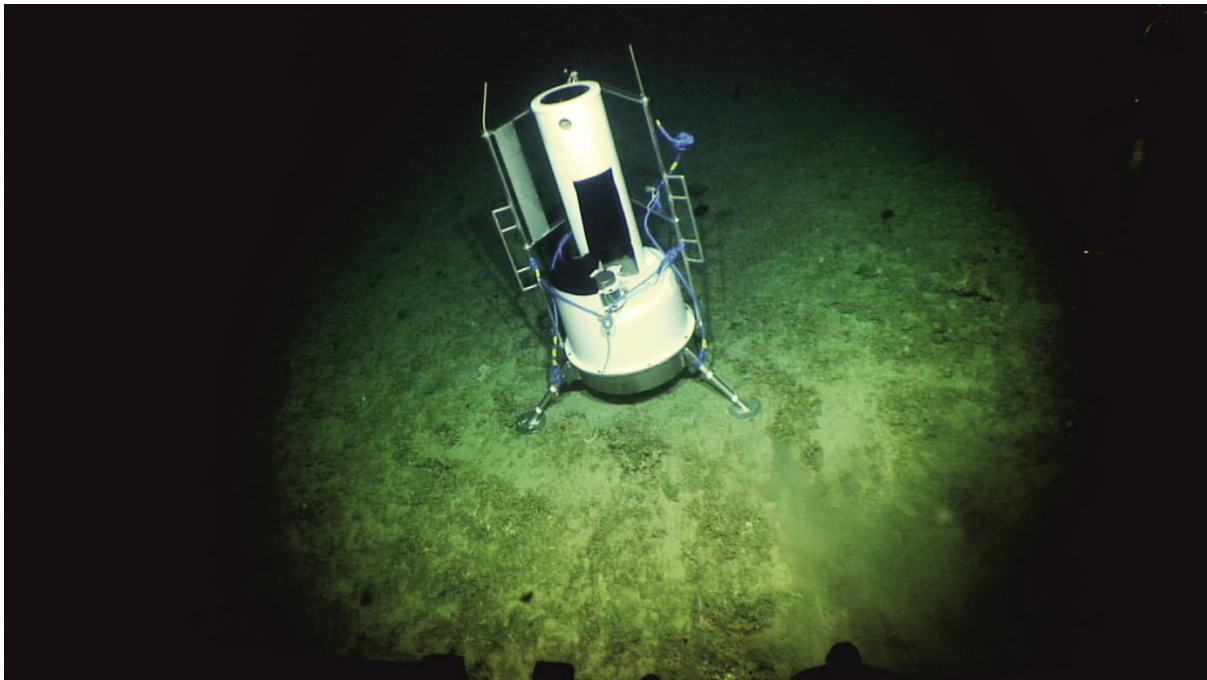
Lander 1 (1/8) – Dive 1 – 13_299_705 – Off mound channel; North Canyon



Lander 2 (2/8) – Dive 2 – 13_300_703 – On mound; North Canyon



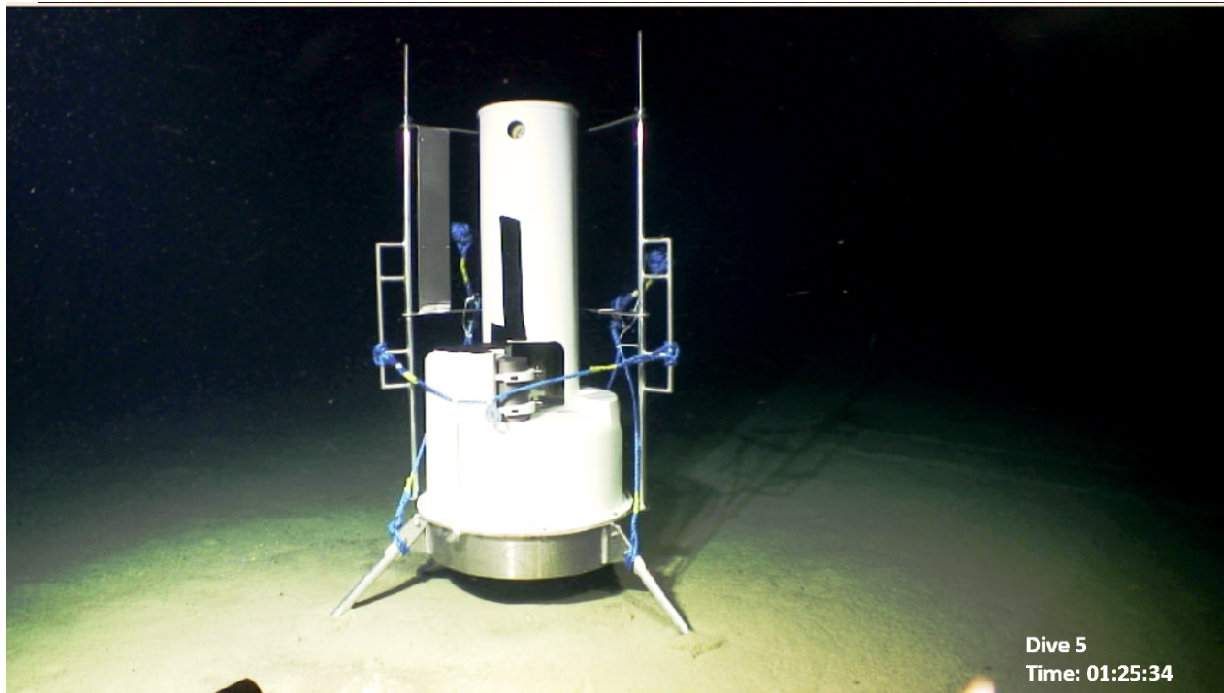
Lander 4 (3/8) - Dive 3 - 13_302_709 – Lip/Garden; Canyon Flank



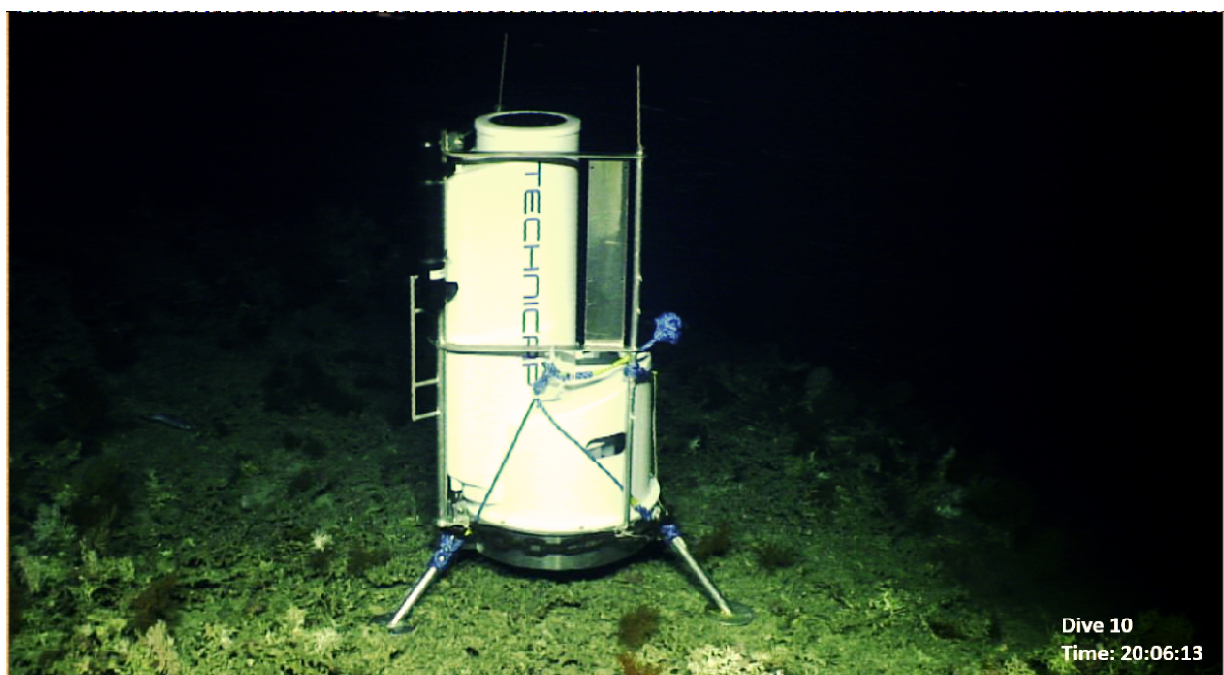
Lander 5 (4/8) – Dive 4 – 13_303_706 - Canyon Flank - Isolated Mound



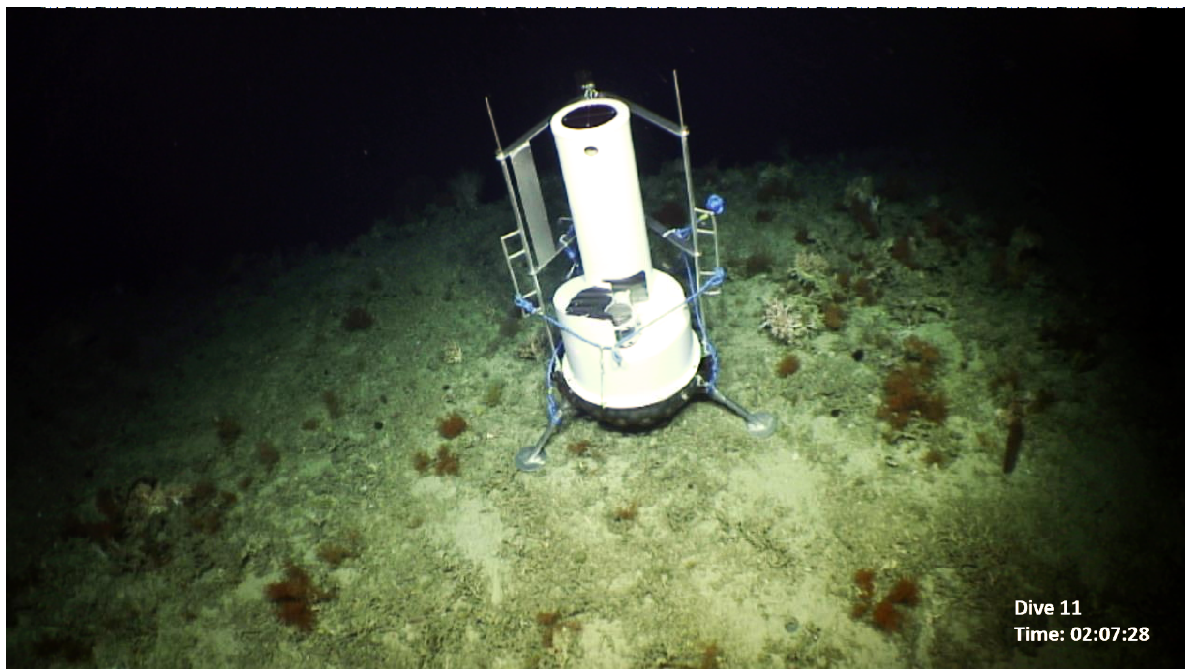
Lander 3 (5/8) – Dive 5 – 13_301_707 – Off-mound; Canyon Flank



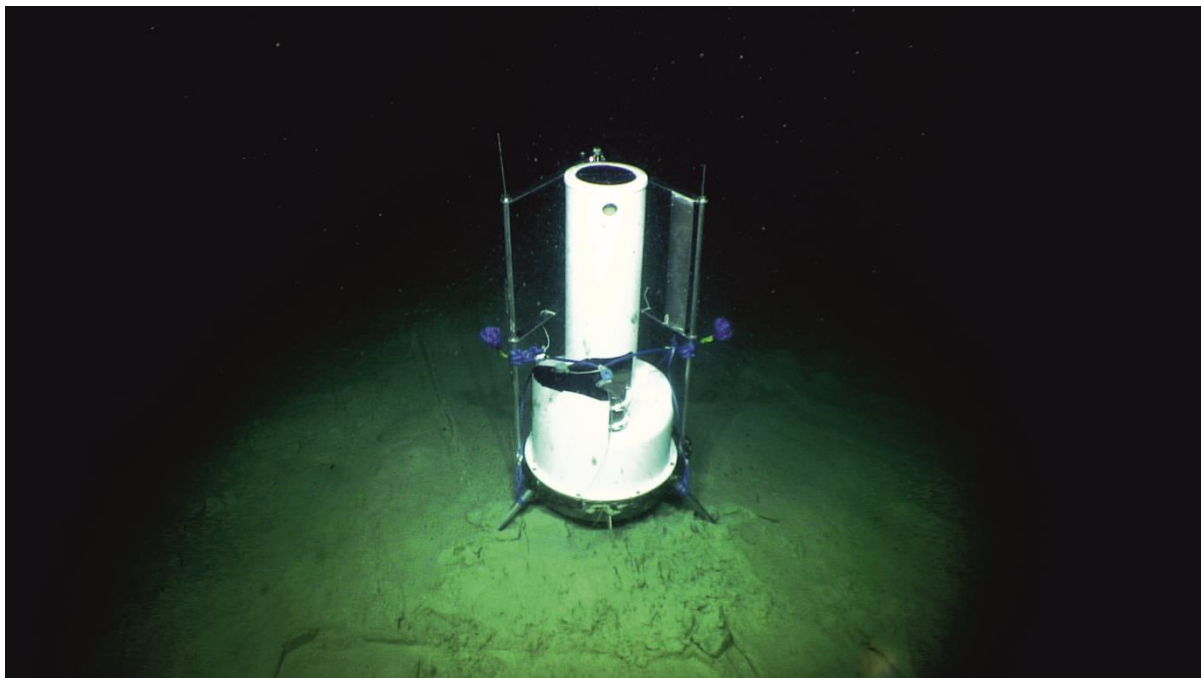
Lander 7 (6/8) – Dive 10 – 13_305_704 – Wilson site; Southern Canyon



Lander 6 (7/8) – Dive 11 – 13_304_708 – Lip mound; Canyon Flank



Lander 8 (8/8) – Dive 13 – 13_306_710 – Deep Canyon



Deployment : 299_1
Current time : 14/05/2019 21:17:33
Start at : 23/05/2019 12:00:00
Comment:
Sediment trap motor 13_299, ADCP no 41442-1-705, Site 1, North Canyon

Profile interval (s) : 600
Number of cells : 25
Cell size (m) : 1.00
Blanking distance (m) : 0.40
Measurement load (%) : 38
Average interval (s) : 60
Power level : HIGH
Wave data collection : DISABLED
Compass upd. rate (s) : 600
Coordinate System : ENU
Speed of sound (m/s) : MEASURED
Salinity (ppt) : 35
Analog input 1 : NONE
Analog input 2 : NONE
Analog input power out : DISABLED
File wrapping : OFF
TellTale : OFF
Acoustic modem : OFF
Serial output : OFF
Baud rate : 9600

Assumed duration (days) : 65.0
Battery utilization (%) : 78.0

Table 4 ADCP deployment file set up

```

System time: 2019/05/14 21:43:10.203 Tue
Sampling starts at: 2019/05/23 00:00:00
Number of jars: 24
Sampling (P)eriod per jar or (E)nd date/time? E
Sampling ends at: 2019/07/26 00:00:00
 0 waiting time ends at 2019/05/23 00:00:00
 1 2d 16:00:00 ends at 2019/05/25 16:00:00
 2 2d 16:00:00 ends at 2019/05/28 08:00:00
 3 2d 16:00:00 ends at 2019/05/31 00:00:00
 4 2d 16:00:00 ends at 2019/06/02 16:00:00
 5 2d 16:00:00 ends at 2019/06/05 08:00:00
 6 2d 16:00:00 ends at 2019/06/08 00:00:00
 7 2d 16:00:00 ends at 2019/06/10 16:00:00
 8 2d 16:00:00 ends at 2019/06/13 08:00:00
 9 2d 16:00:00 ends at 2019/06/16 00:00:00
10 2d 16:00:00 ends at 2019/06/18 16:00:00
11 2d 16:00:00 ends at 2019/06/21 08:00:00
12 2d 16:00:00 ends at 2019/06/24 00:00:00
13 2d 16:00:00 ends at 2019/06/26 16:00:00
14 2d 16:00:00 ends at 2019/06/29 08:00:00
15 2d 16:00:00 ends at 2019/07/02 00:00:00
16 2d 16:00:00 ends at 2019/07/04 16:00:00
17 2d 16:00:00 ends at 2019/07/07 08:00:00
18 2d 16:00:00 ends at 2019/07/10 00:00:00
19 2d 16:00:00 ends at 2019/07/12 16:00:00
20 2d 16:00:00 ends at 2019/07/15 08:00:00
21 2d 16:00:00 ends at 2019/07/18 00:00:00
22 2d 16:00:00 ends at 2019/07/20 16:00:00
23 2d 16:00:00 ends at 2019/07/23 08:00:00
24 2d 16:00:00 ends at 2019/07/26 00:00:00

8d 02:15:54.569 until start.
ok (as starting point, you can modify it afterwards)? Y
Timetable created.

(L) - List directory
(U) - View file contents
(F) - Format SD-card
(R) - Reload SD-card
(P) - Parameter menu
(C) - Create jars timetable
(M) - Modify jars timetable
(D) - Display deployment result
(T) - Test menu
(?) - Print help
(CTRL-A) - Start deployment
^A

Deployment started.
Resetting motor position.....ok
You may disconnect now.

```

Fig. 7 Screen shot of Sediment Trap deployment file

Canyon Mapping

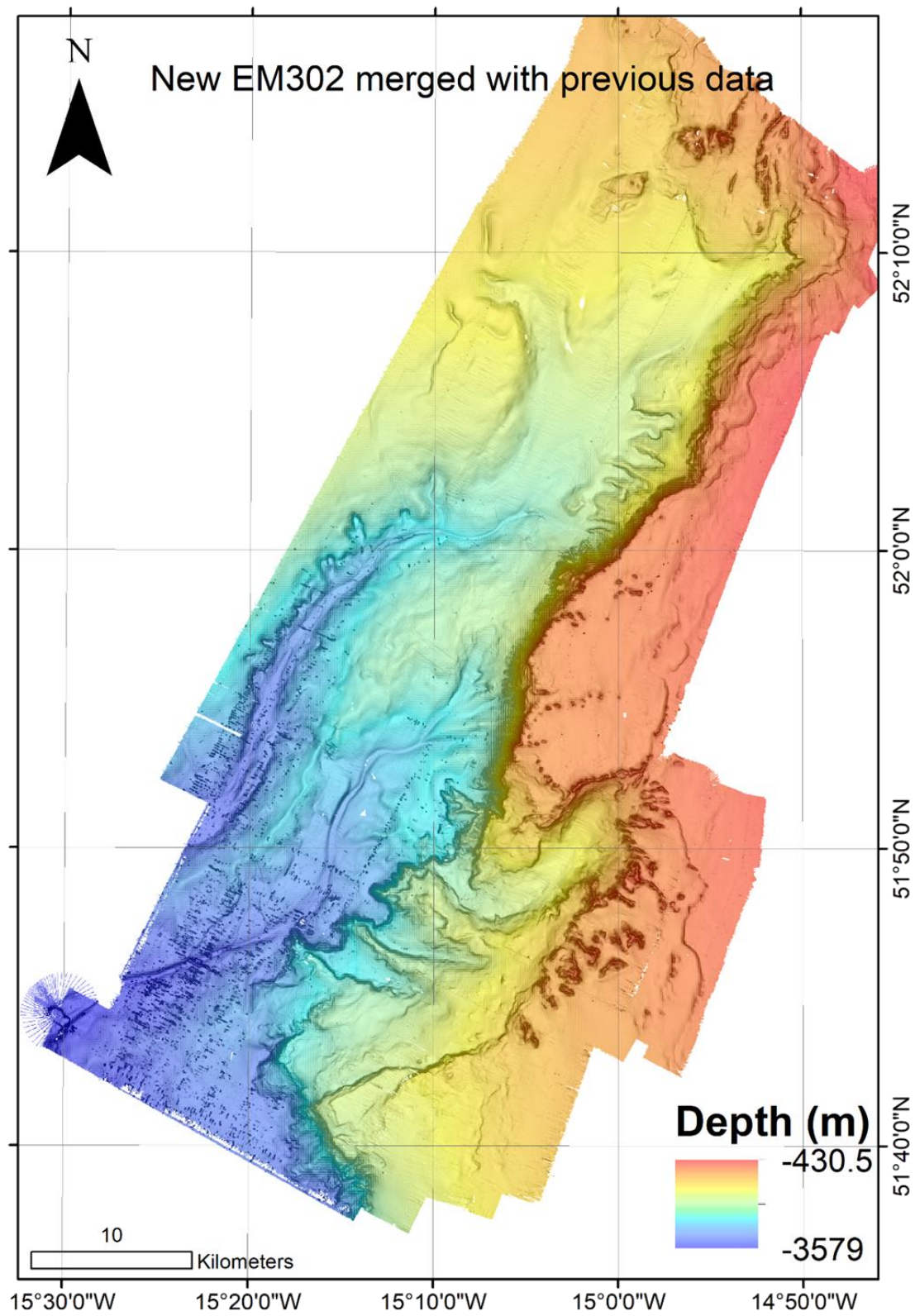


Fig. 8 Map of updated, merged MBES coverage

ROV Dives

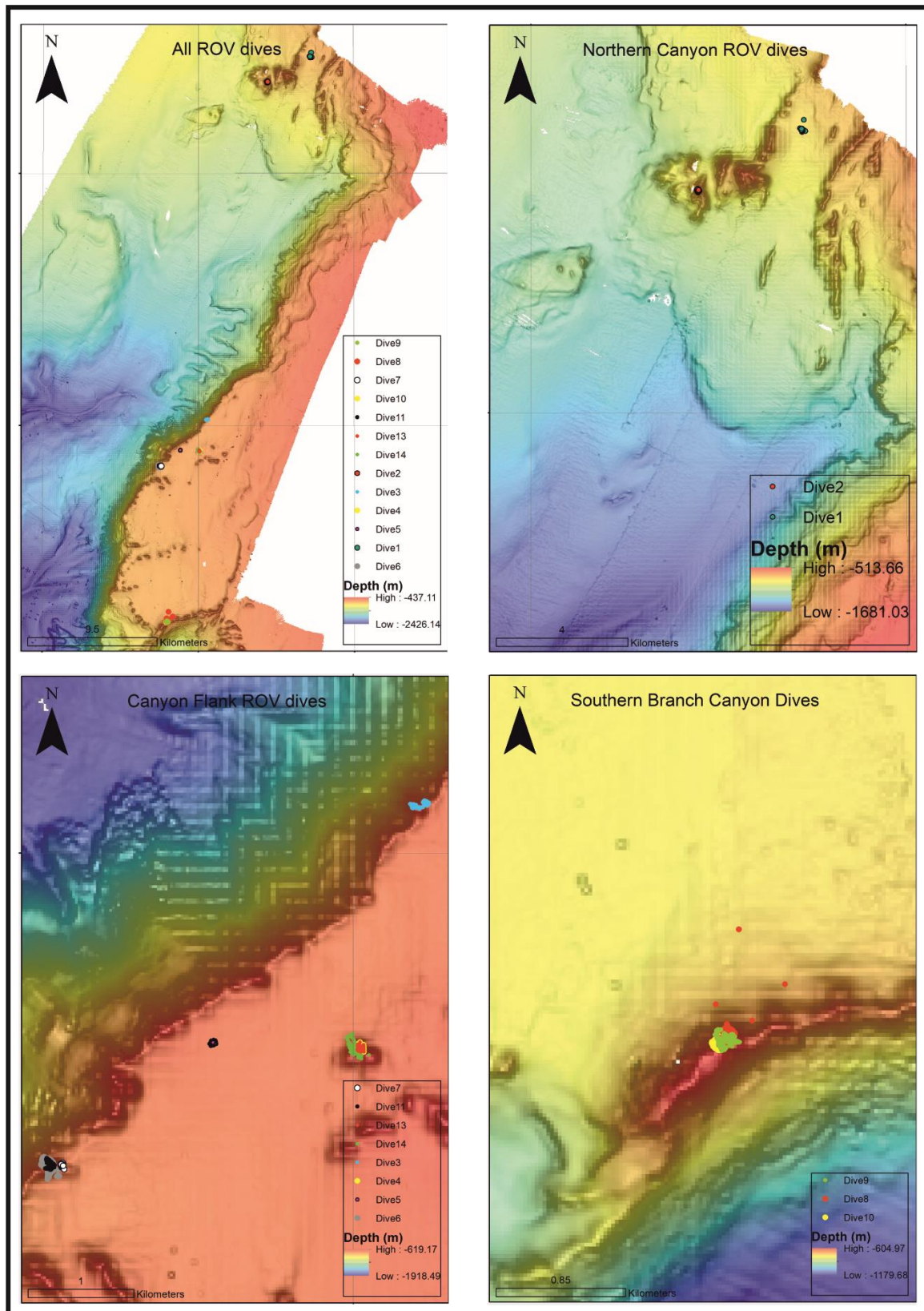
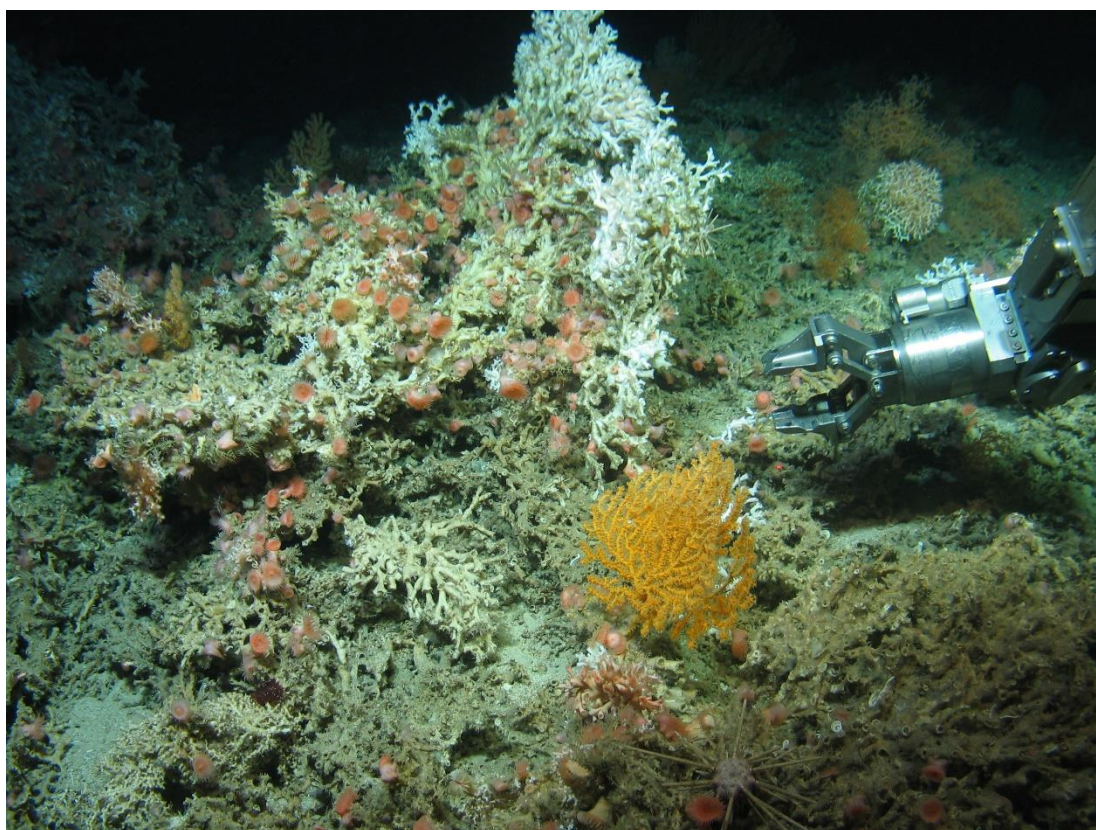


Fig. 9 Plate showing location of ROV dives

Video Dives and Bio-sampling

Cold water corals in the Porcupine Bank Canyon study site, generally occur between a depth of 600 - 1000 m water depth. *Lophelia pertusa* is the dominant coral species in the PBC. The PBC can be divided into 3 sub-regions based on geomorphological features: canyon head, flank and southern branch. Five coral frameworks were collected from each of the 3 sub-regions. Eight lander stations were recorded at these sub-regions. HD video data were collected around the lander stations to characterise the organisms at these stations. Commonly observed organisms around the lander stations includes *L. glaberrima*, *Parantipathes larix*, *Paramuricea* sp., *Cidaris cidaris*, Cerianthids, and Actinaria sp. At 2000 m depth, sparsely growing *L. glaberrima*, and an Octopus sp. were observed. Generally, the summit and the upper slopes of the mounds teemed with actively growing, large *Lophelia* colonies while the lower part of the flanks supported small-sized *Lophelia*.

During sampling, three lander stations were selected and five coral frameworks were collected within 100 m of these underwater stations. Healthy looking *Lophelia pertusa* and *Madrepora oculata* frameworks were purposefully collected for further studies in the UCC marine geology laboratory. Coral branches were sub-sampled from each framework for histology and molecular work. Furthermore, ambient seawater and sediment samples were collected. Attached to the sampled *Lophelia* and *Madrepora* frameworks were the following organisms: *Leiopathes glaberrima*, *Acanthogorgia armata*, *Desmophyllum dianthus*, *Actinaria* sp., *Ophiuroid* sp., gastropod sp., squat lobster and *Eunice norvegicus*.



CTD data and water sampling

A total of 9 CTD casts were acquired from the canyon, the EEZ area and on transit to Galway. Bottles were fired from the CTD rosette to collect water samples at specific depths. Samples were filtered on board for total particulate organic matter content. Other samples were sub-samples and either stored at 4 degrees or -40 degrees.

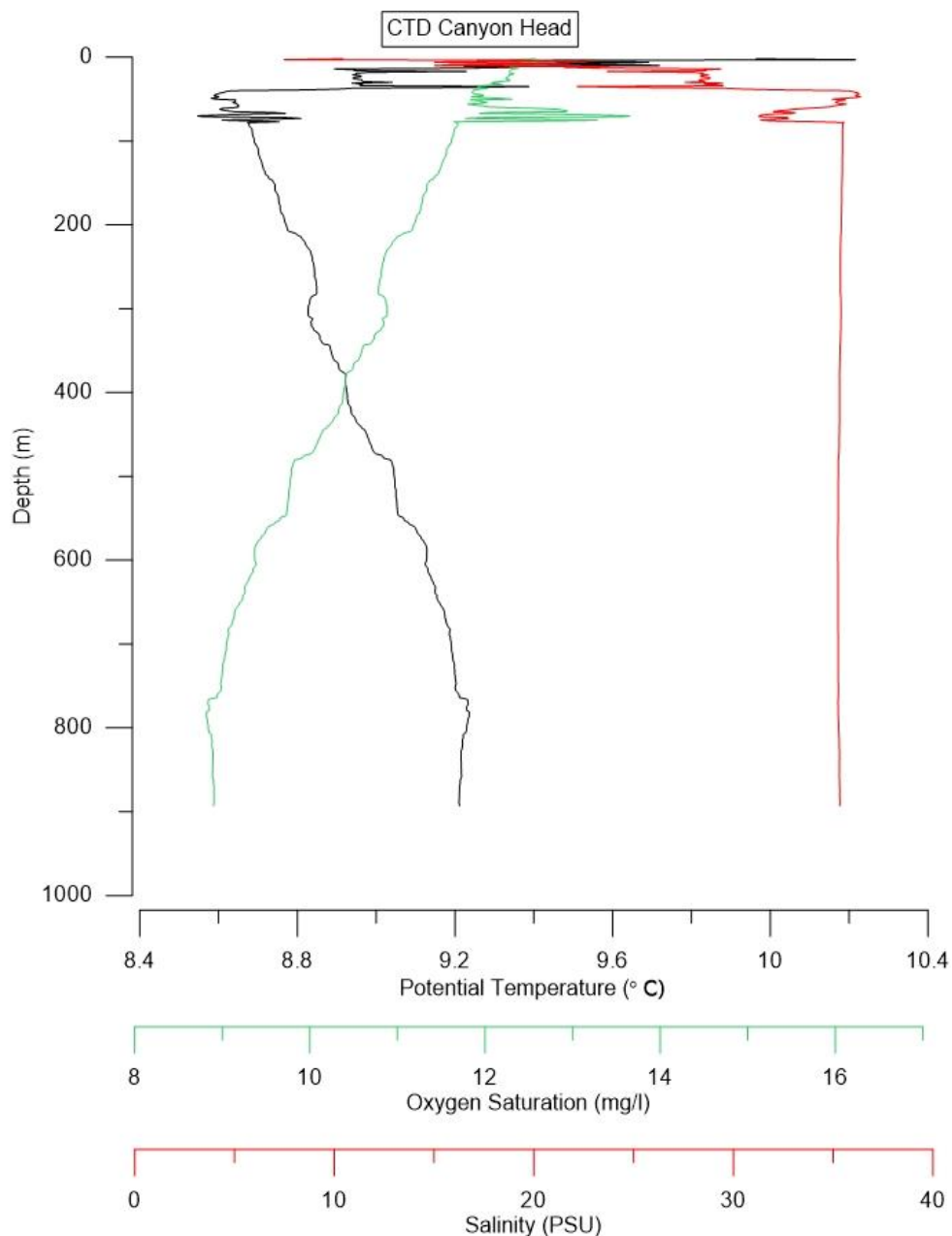


Fig. 10 example CTD from the northern canyon

Appendices

Personnel

Scientific complement

Dr Aaron Lim	Chief Scientist	Cruise management, scientific direction reporting and GIS	UCC
Mr Luke O' Reilly	Shift Leader	Shift management and scientific direction – Night operations	UCC
Mr Ger Summers	Shift Leader	Shift management, GIS and scientific direction – Day operations	UCC
Ms Kim Harris	Scientist	Outreach, logging, Lander set-up and programming Lead	UCC
Mr John Appah	Scientist	Marine biological and ecological operations Lead	UCC
Prof Luis Conti	Scientist	Watches	USP
Mr John Boyd	Scientist	Watches	GMIT
Mr Bebhinn Anders	Scientist	ROV watches, lander set-up, sample processing, logging	NUIG
Mr Luke Harman	Scientist	ROV watches, lander set-up, sample processing, logging	UCC
Ms Orla Killeen	Scientist	ROV watches, lander set-up, sample processing	UCC
Ms Larissa Macedo	Scientist	ROV watches, lander set-up, sample processing, logging	UCC
Mr Andrew Shine	Scientist	MMO, ROV watches, lander set-up, sample processing, logging	IWDG
Martina O' Brien	Artist		

Holland 1 ROV pilots

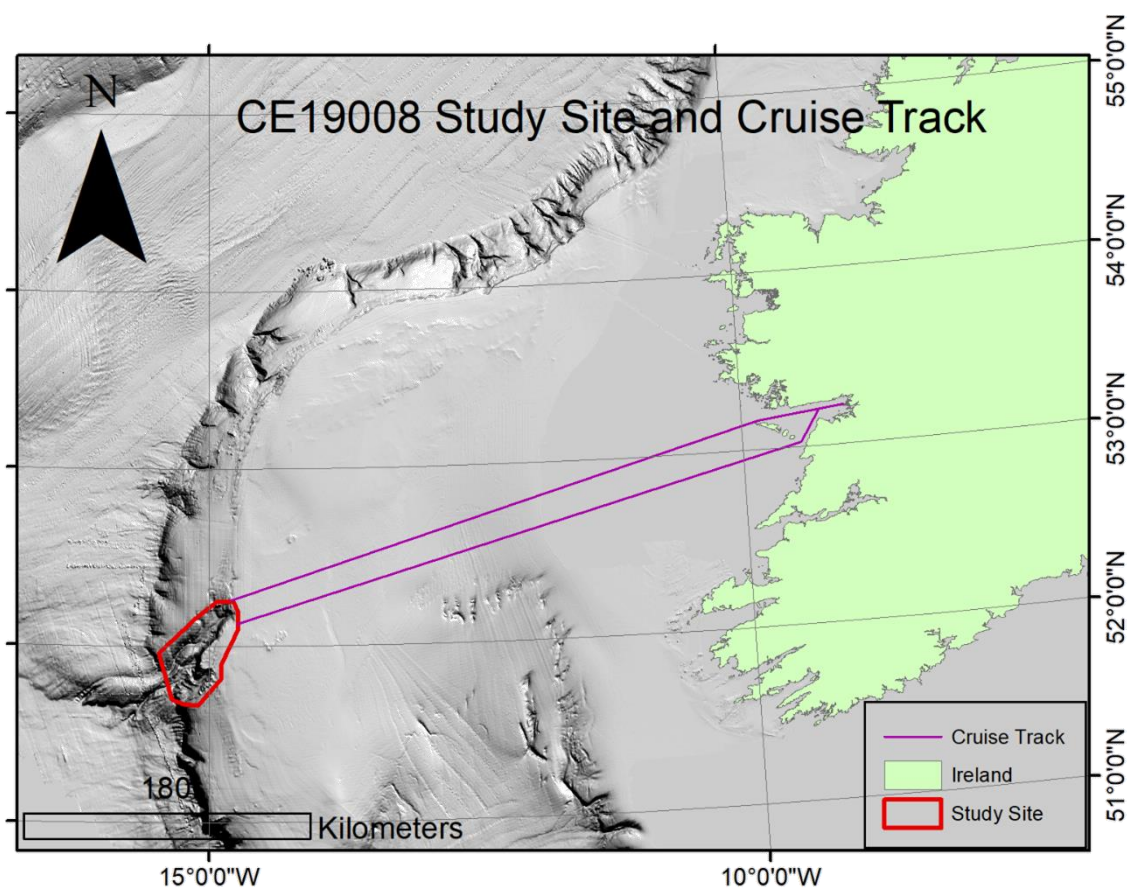
Mr Paddy O' Driscoll	Mr Karl Bredendieck
Mr Carl Johns	Mr Rob Carpenter
Mr Colin Ferguson	Mr George Findlay

Officers and Crew of RV Celtic Explorer

Captain Anthony Hobin	Master
Mr Basil Murphy	Chief Officer
Mr Paddy Kenny	2 nd Officer
Mr Damian Mc Callig	Chief Engineer
Mr Dave Stack	2 nd Engineer
Mr Paul Taylor	ETO
Mr Ken O' Neil	Bosun
Mr Gavin Cunningham	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 Slawomir Tuchewicz	Asst. Cook
Mr Tim O' Sullivan	Technician

Stations (Logs and maps)

Cruise Track



Lander and Video Dives

Lander_site	L_order	Dive	Lander_Code	Latitude	Longs	Depth
Lander 1	1	Dive 1	13_299_705	52.24396033	-14.87962033	839
Lander 2	2	Dive 2	13_300_703	52.227285	-14.92564953	719.4
Lander 4	3	Dive 3	13_301_707	52.00396042	-14.98886345	697.4
Lander 5	4	Dive 4	13_302_709	51.98318233	-14.999004	645
Lander 3	5	Dive 5	13_303_706	51.9837315	-15.01926833	719.5
Lander 7	7	Dive 11	13_304_708	51.87006383	-15.03355883	685.1
Lander 6	6	Dive 10	13_305_704	51.97348667	-15.041665	605.9
Lander 8	8	Dive 13	13_306_710	52.02015117	-15.08788717	2125.3

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

Dive Station	Lat	Long	Depth	ROV IN	# + time	CTD ON	time	ROV ON BOTTOM	Lasers on	# + time	Video Recording	# + time	CTD change	# + time	Lander deployed	# + time	Water sample	# + time	Coral sample	# + time	Push core	# + time	Video changed	time	ROV OFF BOTTOM	time	ROV on deck	time	Data backed up?	Observation/note
2	7 52°13.6325	14°55.5175	0	08:20																										ROV in water
2	8 52°13.6364	14°53.5521	19.6		08:29																									CTD turned on at 19.6 water depth
2	8 52°13.6321	14°55.5174	729.3				09:11																							ROV on bottom (41 mins)
2	8 52°13.6329	14°55.5365	717.6																											Original site, was relocated
2	8 52°13.6337	14°55.5164	730.1								09:17																			Video recording
2	9 52°13.6329	14°55.5164	730.6									09:17																		CTD change
																														Lander 2 deployed at 9:51 (UTC), slightly different from original co-ordinates as it was on a slope
2	10 52°13.6371	14°55.5389	719.4												09:51															Lander 2 deployed at 9:51 (UTC), slightly different from original co-ordinates as it was on a slope
2	10 52°13.6329	14°55.5365	717.6						09:52																					Lasers on
2	10 52°13.6329	14°55.5365	717.6																											Bottle fired at 717.9m water depth
2	11 3	52°13.6292	14°55.5395	717.9													10:11													Framework 1
2	11 0	52°13.6298	14°55.5356	720.4																										Framework 2
2	11 5	52°13.6369	14°55.5376	720.4																										Framework 3
2	11 5	52°13.6282	14°55.5396	716.6																										Framework 4
2	11 6	52°13.6289	14°55.5457	718.6																										Framework 5
2	11 5	52°13.6289	14°55.5418	715.8																										Video hard drive changed
2	11 1	52°13.6289	14°55.5418	716.9																										HD video stopped
2	11 1	52°13.6271	14°55.5422	717.8																										Video hard drive changed
2	11 9	52°13.6261	14°55.5425	721.3																										Framework 5
2	11 6	52°13.6266	14°55.5427	721.3																										Push core at lander site 2
2	12 6	52°13.6266	14°55.5427	726.7																										HD video stopped
2	12 52°13.63	14°55.49	667																											CTD upcast started
2	13 53°13.63	14°55.49	668																											CTD upcast crashed/ changed to upcast2
2	14 53°13.6329	14°55.5362																												CTD upcast crashed/ changed to upcast3
2	15 53°13.6230	14°55.5363	139.7																											CTD programme crashed. Unable to redeploy on upcast. ROV back on deck
2	16 N/A	N/A	125																											CTD programme crashed. Unable to redeploy on upcast. ROV back on deck
2	16 52°13.6325	14°55.4365	0																											CTD programme crashed. Unable to redeploy on upcast. ROV back on deck

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

	ROV Video log			time	# + time	time	y/n	# + time	# + time	# + time	# + time	# + time	# + time	# + time	time	time	time	Data backed up?	Observation/note
Dive Station	Lat	Long	Depth	ROV IN	CTD ON	ROV ON BOTTOM	Lasers on	Video Recording	CTD change	Lander deployed	Water sample	Coral sample	Push core	Video changed	Video stopped	ROV OFF BOTTOM	ROV on deck		
3	17 52'00.23218	14 59.45945	0	14:30															ROV in water
3	18 52'00.24595	14 59.51886	43		14:40														Dive 3 CTD downcast on
3	18 52'00.23306	14 59.48812	664.2			15:09													ROV on bottom
3	19 52'00.23307	14 59.48813	664.2						15:10										CTD during started
3	20 52'00.24520	14 59.38863	697.4						17:21										CTD during 2 started
3	21 52'00.25005	14 59.37910	697.4							17:30									Lander 3 deployed
3	21 52'00.26260	14 60.40553	697.4													17:47			ROV off bottom
3	22 52'00.25883	14 59.40459	540						17:50										CTD Dive 3 upcast started
3	23 52'00.23587	14 59.37455	0						18:22										18:22 ROV at surface
3	23 52'00.23736	14 59.37410	0														18:29		ROV on deck
4	24 51'58.9745	14 59.9139	0	19:35															ROV in water
4	25 51'58.9746	14 59.9140	0		19:43														CTD on
4	26 51'58.0001	14 59.9337	650			20:07			20:07										ROV on bottom, CTD-during
4	26 51'58.0002	14 59.9338	650						20:10										HD camera on
4	27 51'58.9911	14 59.9425	645							21:27									Lander 4 Site deployed
4	28 51'58.9911	14 59.9425	646										21:34						Push core taken at Lander Site 4
4	29 51'58.9903	14 59.9344	645						21:41										CTD up
4	29 51'58.9904	14 59.9345	645											21:43					HD off
4	30 51'59.0150	14 59.9610	0						22:08										CTD off
4	30 51'58.9759	14 59.9135	0														22:29	Yes Luke, HD and CTD	ROV on deck
5	31 51'59.0033	15 01.1286	0	0:18															ROV in water
5	32 51'59.0033	15 01.1286	0		00:18														CTD on
5	32 51'59.0232	15 01.1670	719			00:51			00:51										ROV Bottom, CTD During, HD CAM on
5	33 51'59.0240	15 01.1558	719.5							00:58									Lander Site 5 chosen
5	34 51'59.0249	15 01.1559	719.5										01:27						Push Core @lander site5
5	35 51'59.0298	15 01.1591	718.1						01:47						01:47				ROV off Bottom, CTD up, HD CAM off
5	36 51'59.0347	15 01.1588	0		02:12														CTD OFF
5	36 51'59.0130	15 01.1209	0														02:26	Yes Luke, HD and CTD	

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

ROV Video log																				
Dive Station	Lat	Long	Depth	ROV IN	# + time	ROV ON BOTTOM	Lasers on	Video Recording	CTD change	Lander deployed	Water sample	Coral sample	Push core	Video changed	Video stopped	ROV OFF BOTTOM	ROV on deck	Data backed up?	Observation/note	
8	46 51° 52.21650	15° 01.9794	0	20:45																CTD started. Missed first 10 meters
8	47 51° 52.21651	15° 01.9795	0		20:53															
8	48 51° 52.25106	15° 01.9678	604			21:23			21:23											CTD during.
8	48 51° 52.23657	15° 01.9745	604				22:20	21:33												
8																				22:02: INS GPS back in action. From hereon Lat and Longs taken from ROV screen
8	48 51° 52.22817	01.96155	593											23:25				Yes, Luke, HD	Video change and reset	
8	48 51° 52.2288	15° 01.9530	594											01:21				HD	HD recording restarted	
8	49 51° 52.2274	15° 01.9576	594					01:24												Changed from circling to north-south trending survey
8	49 51° 52.2274	15° 01.9576	594					02:18												03:07 - positioning of ROV
8	49 51° 52.2274	15° 01.9576	594																	INS faulty again
8	49 51° 52.2274	15° 01.9576	594																	03:24 - INS back in action
8	50 51° 52.2274	15° 01.9576	594						05:01											03:40 - Positioning INS down
8	50 51° 52.2094	15° 02.0079	605												05:02					CTD Upcast start / HD video stopped
8																		Yes Luke, HD and CTD		
8	50 51° 52.1978	15° 01.9710	0														05:37			
8	50 51° 52.1940	15° 01.9710	0														05:39			ROV on deck

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

ROV Video log					time	# + time	time	y/n	# + time	# + time	# + time	# + time	# + time	# + time	# + time	time	time	time	Data backed up?	Observation/note
Dive	Station	Lat	Long	Depth	ROV IN	CTD ON	ROV ON BOTTOM	Lasers on	Video Recording	CTD change	Lander deployed	Water sample	Coral sample	Push core	Video changed	Video stopped	ROV OFF BOTTOM	ROV on deck		
9	51	51° 52.19429	15° 1.97297	0	08:11															ROV in
9	52	51° 52.22461	15° 1.96919	12.6		08:21														CTD on; dive 9 downcast
9	52	51° 52.23739	15° 1.94209	600.3			08:41													ROV on bottom/ CTD downcast stopped
9	53	51° 52.24493	15° 1.93623	604.8						08:43										CTD during started
9	53	51° 52.21018	15° 1.99705	611.1			09:11													ROV on bottom at pre-chosen site
9	53	51° 52.20904	15° 1.99923	612.2						09:16										HD Video on/ New Cartridge
9	54	51° 52.20357	15° 1.99797	611							09:38									Lander Deployed
9	55	51° 52.21026	15° 2.00247	611.2						09:39										CTD during 2 started
9	55	51° 52.21948	15° 1.99617	612.3																Lander fell at 09:46/ Part of Metal frame has snapped
9	55	51° 52.20848	15° 2.0076	608.1																10:18 Lander collected for redeployment
9	56	51° 52.20183	15° 1.99504	607.3							10:28									Lander Redeployed: Review Lander to be recovered as wrong lander had been deployed, new lat and longs required on next dive
9	56	51° 52.20272	15° 1.99590	606.9				10:33												Lasers turned on
9	56	51° 52.20265	15° 1.99725	608.1																10:36 White Balance done
9	57	51° 52.20211	15° 1.99701	607.6							10:39									Niskin bottle fired
9	57	N/A	N/A	N/A												11:10				HD video stopped
9	57	51° 52.20371	15° 1.99190	607										11:33						Framework 1 in box F
9	57	51° 52.20408	15° 1.98899	605.4					11:40											HD video started
9	57	51° 52.20539	15° 1.99059	608.8										11:46						Framework 2 in box G
9	58	51° 52.20542	15° 1.90950	608.4						11:50										CTD during 2 ended/ CTD during 3 started
9	59	51° 52.19907	15° 1.99554	609.3						11:58										CTD during 3 ended/ CTD during 4 started
9	59	51° 52.19943	15° 1.99608	609.6										12:03						Framework 3 in box A
9	60	51° 52.19059	15° 2.01176	606.6						12:14										CTD restarted for during 5
9	60	51° 52.19730	15° 2.00989	607.4										12:25						Framework 4 in box B
9	61	51° 52.19736	15° 2.00801	606.5										12:34						Push core 3 taken
9	61	51° 52.19736	15° 2.00801	606.5					12:34											Video Restarted
9	62	51° 52.20436	15° 1.99650	607.1						13:17										CTD restarted for during 6
9	62	51° 52.20601	15° 1.99750	608.1																13:54 Lander Recovered
9	63	51° 52.21995	15° 2.00923	607						13:57										CTD Upcast
9	63	51° 52.21995	15° 2.00923	607													13:57			ROV off Bottom
9	63	51° 52.21995	15° 2.00923	607												13:57				Video Stopped
9	64	51° 52.20796	15° 2.01336	57						14:31										CTD restarted for upcast 2
9	64	51° 52.20446	15° 2.01927	13.6																CTD Upcast stopped
9	64	51° 52.20490	15° 2.01735	0																14:36: ROV at surface
9	64	51° 52.20080	15° 202890	0															14:50	ROV on deck

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

ROV Video log				time	# + time	time	Y/n	# + time	# + time	# + time	# + time	# + time	# + time	time	time	time	Data backed up?	Observation/note		
Dive Station	Lat	Long	Depth	ROV IN	CTD ON	ROV ON BOTTOM	Lasers on	Video Recording	CTD change	Lander deployed	Water sample	Coral sample	Push core	Video changed	Video stopped	ROV OFF BOTTOM	ROV on deck			
10	65 51°52.17157	15°20.2461		0	16:30															ROV in water
10	66 51°52.17175	15°20.2500			16:42															CTD downcast
10	67 51°52.20259	15°2.03844	615.9						17:13											CTD During
10	67 51°52.20259	15°2.03844	615.9			17:13														Started
10	67 51°52.20387	15°2.00568	606.8			17:22														ROV on bottom
10	68 51°52.20353	15°02.01332	605.9							19:53										Lost two bottles (305, missing 22&24)
10	69 51°52.20624	15°02.01476	605.9							20:02										Lander 7 deployed
10	69 51°52.20624	15°02.01476	605.9																	HD Recording
10	69 51°52.20624	15°02.01476	605.9					20:02												Third bottle lost
10	69 -	-																		~19:30
10	70 51°52.20292	15°02.00540	602.6						20:15											CTD Up Start, HD
10	71 51°52.21545	15°02.02581	0						20:46						20:15	20:15				Stop, off bottom
10	71 51°52.17111	15°02.02634	0														20:55			CTD Off
11	72 51°58.37741	15°02.51312	0	00:00																ROV on Deck
11	73 51°58.37646	15°02.51563	0		00:04															ROV in water
11	73 51°58.39494	15°02.49531	698.4			00:32														CTD downcast
11	74 51°58.39494	15°02.49531	698.4																	ROV on bottom
11	74 51°58.39151	15°02.52585	697.4					00:43												CTD During
11	75 51°58.40933	15°02.49959	685.1							01:30										HD video on
11	76 51°58.40934	15°02.49960	681.8								01:50									Lander 6 deployed
11	77 51°58.40935	15°02.49961	681.8																	Niskin bottle fired
11	78 51°58.40936	15°02.49962	682.8																	Push core 4 taken
11	78 51°58.40372	15°02.51392																		CTD upcast
11	78 51°58.40373	15°02.51393																		ROV off bottom/
																				HD stopped
																				Yes, Luke, HD and CTD
																				ROV on deck
12	79 51°05.22931	15°01.19303																		Hydraulic valve went in ROV during downcast. Dead-sub recovery.
12	79 51°05.22932	15°01.19304																		ROV on deck. Issues all recovery with strong tides pulling ROV

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

ROV/Video log				time	# + time	time	Y/N	# + time	# + time	# + time	# + time	# + time	# + time	# + time	time	time	time	Data backed up?	Observation/note
Dive Station	Lat	Long	Depth	ROV IN	CTD ON	ROV ON BOTTOM	Lasers on	Video Recording	CTD changes	Lander deployed	Water sample	Coral sample	Push core	Video changed	Video stopped	ROV OFF BOTTOM	ROV on deck		
13	80 52'01.22933	15°05.27689	0	00:17	00:20														ROV in water
13	81 52'01.22933	15°05.27689	0																CTD 'downcast' on
13	81 52'01.22102	15°05.30148	2124		01:46			01:46											CTD 'downcast' stopped. CTD 'during' started
13	82 52'01.22102	15°05.30148							01:46										Lander at deployment station
13	82 52'01.20977	15°05.27334	2125							03:03									Final lander position
13	83 52'01.20953	15°05.27092	2125																Lasers on. Commencing channel
13	83 52'01.20953	15°05.27092	2125				03:27												transsect video line (N-S trending)
13	83 52'01.08918	15°05.26782	2103																Decrease in depth along transect
13	84 52'01.08919	15°05.26783	2102																Failed push core attempt
13	84 52'01.08919	15°05.26783	2102																HD video stopped
13	84 52'01.08919	15°05.26783	2102							03:57									ROV off bottom
13	85 52'01.08919	15°05.26783	2102																ROV off bottom
13	86 52'01.12297	15°05.14738	0.8						04:00										CTD upcast started
13	86 52'01.09130	15°05.12541	0						05:20										CTD 'upcast' stopped
13	86 52'01.08977	15°05.12632	0																ROV off water
																			ROV on deck
																			ROV on deck
14	87 51° 58.93304	14°59.93607	0	15:45															ROV in water (unsure-Nav could be wrong)
14	88 51° 59.00257	14°59.97950	34		15:54				16:02										CTD start-Dive 14 Downcast
14	89 51° 58.99975	14°59.94719	197																CTD stop. Downcast 2 started
																			ROV on bottom (Co-ordinates not taken due to artistic recording on the ROV shack)
14	89		662.9			16:22													CTD during started (Co-ordinates not taken due to artistic recording on the ROV shack)
14	89		662.7																CTD during 2 started
14	90 51° 58.99104	14°59.96011	662.7						16:18										CTD during 2 started
14	91 51° 58.99100	14°59.96009	663.1																White balance
14	91 51° 58.99132	14°59.96048	662.6																HD video started
14	92 51° 59.97956	14°59.98886	658.3						16:55										CTD during 3 started
14	92 51° 59.97956	14°59.98886	658.3																CTD during 3 started
14	93 51° 59.04098	14°59.96941	712.5						17:15										CTD during 4 started
14	93 51° 58.99111	14°59.9425																	Video recording around the lander, downwards on reef side to side. Co-ordinates: 51° 58.9911/14° 59.9425
14	93 51° 58.97488	14°59.9449	647																17:48: Lander 5 spotted
14	93 51° 58.96834	14°59.93467	647.5					18:01											Video recording
14	93 51° 58.97276	14°59.94678	648				18:03												Lasers on
14	94 51° 58.97320	14°59.95518	649.9						18:22										CTD coms to magnetic switch time out, restarted to create during 5
14	95 51° 58.90653	14°59.93320	657.2						18:35										CTD restarted to during 6
14	95 51° 58.97124	14°59.94300	648.7																Video recording stopped
14	96 51° 58.98634	14°59.96408	651.2							19:08									CTD 'Upcast' started
14	96 51° 58.98776	15° 0.01850	650																ROV off the bottom
14	97 51° 58.98551	14° 59.2772	0						19:50										CTD 'Upcast' stopped
14	97 51° 58.98700	14° 59.92975	0																ROV on deck

Histology log sheet and stations

Histology samples				
Sample ID	Davidson's		70% ethanol	
	Fixed on	Fixed at	Replaced on	Replaced at
Ind_site_Cor. framewk #	Tuesday	12:30pm	Thurs	12:30pm
xx_yy_zz#				
01_CH_FW1	Wednesday	13:50	Friday	13:30
02_CH_FW1	Wednesday	13:50	Friday	13:30
06_CH_FW2	Wednesday	13:50	Friday	13:30
07_CH_FW2	Wednesday	13:50	Friday	13:30
11_CH_FW3	Wednesday	13:50	Friday	13:30
12_CH_FW3	Wednesday	13:50	Friday	13:30
16_CH_FW4	Wednesday	13:50	Friday	13:30
17_CH_FW4	Wednesday	13:50	Friday	13:30
21_CH_FW5	Wednesday	13:50	Friday	13:30
22_CH_FW5	Wednesday	13:50	Friday	13:30
01_CH_FW1	Thursday	13:03	Saturday	13:30
02_CH_FW1	Thursday	13:03	Saturday	13:30
06_CH_FW2	Thursday	13:03	Saturday	13:30
07_CH_FW2	Thursday	13:03	Saturday	13:30
11_CH_FW3	Thursday	13:03	Saturday	13:30
12_CH_FW3	Thursday	13:03	Saturday	13:30
16_CH_FW4	Thursday	13:03	Saturday	13:30
17_CH_FW4	Thursday	13:03	Saturday	13:30
21_CH_FW5	Thursday	13:03	Saturday	13:30
22_CH_FW5	Thursday	13:03	Saturday	13:30
01_CH_FW1	Friday	16:08	Sunday	13:30
02_CH_FW1	Friday	16:08	Sunday	13:30
06_CH_FW2	Friday	16:08	Sunday	13:30
07_CH_FW2	Friday	16:08	Sunday	13:30
11_CH_FW3	Friday	16:08	Sunday	13:30
12_CH_FW3	Friday	16:08	Sunday	13:30
16_CH_FW4	Friday	16:08	Sunday	13:30
17_CH_FW4	Friday	16:08	Sunday	13:30
21_CH_FW5	Friday	16:08	Sunday	13:30
22_CH_FW5	Friday	16:08	Sunday	13:30

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Coral framework sample log sheet and stations

Sample type	Site	Dive#	Latitude	Longitude	Depth (m)	Temperature	Salinity	Date	type	Time
coral framework-1	CH	2	52°13.62980	14°55.53560	721	10	3.5	15/05/2019	Biobox	10:23
coral framework-2	CH	2	52°13.63695	14°55.53769	719	9.6	3.56	15/05/2019	Biobox	10:28
coral framework-3	CH	2	52°13.62826	14°55.53961	719			15/05/2019	Biobox	10:36
coral framework-4	CH	2	52°13.62895	14°55.54572	718			15/05/2019	Biobox	10:47
coral framework-5	CH	2	52°13.62616	14°55.54294	719			15/05/2019	Biobox	11:07
coral framework-1	CF	6	51°58.3972	15°2.5176	693	9.4	3.4	16/05/2019	Biobox	07:28
coral framework-2	CF	6	51°58.3934	15°2.5287	690	9.4	3.5	16/05/2019	Biobox	07:37
coral framework-3	CF	6	51°58.3974	15°2.5297	691	9.4	3.6	16/05/2019	Biobox	07:47
coral framework-4	CF	6	51°58.39262	15°2.52768	694	9.4	3.6	16/05/2019	Biobox	07:55
coral framework-5	CF	6	51°58.58400	15°2.5207	688	9.4	3.6	16/05/2019	Biobox	08:02
coral framework-1	SB	9	51°52.2037	15°1.99106	607	9.3	3.7	17/05/2019	Biobox	10:33
coral framework-2	SB	9	51°52.205	15°1.98934	608.1	8.7	3.7	17/05/2019	Biobox	10:50
coral framework-3	SB	9	51°52.2199	15°1.99608	609.6	8.8	3.8	17/05/2019	Biobox	12:06
coral framework-4	SB	9	51°52.19837	15°2.000	607	8.8	3.8	17/05/2019	Biobox	12:25
coral framework-5	SB	9	51°52.1974	15°2.007	607	8.7	3.8	17/05/2019	Biobox	

Sediment and seawater samples around lander sites

Sample type	Site	Dive#	Latitude	Longitude	Depth	Temperature	Salinity	Date	type	Time
sediment	CH	2	52°13.6266	14°55.5427	718	9.8	3.6	15/05/2019	Push core	11:13
seawater	CH	2	52°13.62923	14°55.53959	718	10	3.5	15/05/2019	ROV_Niskin	10:11
sediment	CF	6	51°58.4026	15°2.52119	691	9.8	3.5	16/05/2019	Push core	08:39
seawater	CF	6	51°58.4016	15°2.51025	698	9.8	3.5	16/05/2019	ROV_Niskin	07:15
sediment	SB	9	51°52.19736	15°2.0089	607	8.7	3.8	17/05/2019	Push core	10:39
seawater	SB	9	51°52.1973	15°1.9954	607	8.7	3.8	17/05/2019	ROV_Niskin	12:34

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Water filter samples

Filter number	Initial ashed weight(g)	Processed dry weight(g)	TPM (g)	Processed ashed weght (g)	PIM(g)	POM(g)	Station number	Sample depth (m)	Volume filtered (L)	Lat	Long	Day	Time
CE19008-030	0.12772												
CE19008-031	0.12810						39	577	3	51°52.32	15°02.03	17/05/2019	19:09
CE19008-032	0.12639						39	594	3	51°52.32	15°02.03	17/05/2019	19:09
CE19008-033	0.12435						39	520	3	51°52.32	15°02.03	17/05/2019	19:09
CE19008-034	0.12642						42	1242	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-035	0.12602						42	1093.2	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-036	0.12401						42	993.5	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-037	0.12590						42	843.3	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-038	0.12449						42	747.7	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-039	0.12651						42	599.2	3	51°49.66	15°01.13	18/05/2018	21:36
CE19008-040	0.12474						43	1044	3.5	52°03.88	15°00.77	18/05/2018	07:58
CE19008-041	0.12717						43	976	3.5	52°03.88	15°00.77	18/05/2018	07:58
CE19008-042	0.12594						43	849	2.5	52°03.88	15°00.77	18/05/2018	07:58
CE19008-043	0.12488						43	750	2.5	52°03.88	15°00.78	18/05/2018	08:05
CE19008-044	0.12664						43	620	2	52°03.88	15°00.77	18/05/2018	08:08
CE19008-045	0.12760						43	560	2	52°03.88	15°00.77	18/05/2018	08:10
CE19008-046	0.12477						44	892	2.5	52°13.23	14°52.52	18/05/2018	10:04
CE19008-047	0.12642						44	850	2	52°13.23	14°52.52	18/05/2018	10:06
CE19008-048	0.12483						44	750	2	52°13.23	14°52.52	18/05/2018	10:08
CE19008-049	0.12519						44	630	2	52°13.23	14°52.52	18/05/2018	10:09
CE19008-050	0.12722						44	580	2	52°13.23	14°52.52	18/05/2018	10:12
CE19008-051	0.12737						44	490	2	52°13.23	14°52.52	18/05/2018	16:03

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Multibeam Log (EM302 and EM1002)

Station Log: Multibeam									
station #	start line #	Time (UTC)	Date	Lat SOL	Long SOL	WCD? Y/N	note		
44	0000	15:34	16/05/2019	51° 58.39	15°02.46	Y	Multibeam started		
44	0000	15:43	16/05/2019	51°58.15	15°02.58	Fault	Stopped logging		
44	0001	16:05	16/05/2019	51°58.33	15°07.55	Y	EM2040 start		
44	0611	16:05	16/05/2019	51°58.33	15°07.55	N	EM1002 start		
44	002	16:13	16/05/2019	51°57.85	15°02.81	Y	EM2040 stopped		
44	007	18:10	16/05/2019	51°58.24	15°02.69	Y	EM302 started		
44	007	18:49	16/05/2019	51°58.28	15°02.08	Y	EM302 and EM1002 stopped		
82	008	09:04	18/05/2019	52°09.35	14°55.11	Y	EM302 and EM1002 started		
82	009	09:37	18/05/2019	52°13.22	14°52.52	Y	EM302 and EM1002 stopped		
82	0010/0614	10:51	18/05/2019	52°12.37	14°51.61	Y	EM302 and EM1002 started		
84	0010/0614	11:01	18/05/2019	51°11.40	14°52.41	Y	EM302 and EM1002 stopped		
84	0011/0615	11:18	18/05/2019	52°12.05	14°52.02	Y	MBES started. Lines 0011/0615. No information on which multibeam was started.		
84	0011/0615	11:20	18/05/2019	52°11.78	14°52.30	Y	MBES stopped		
84	0012/0616	11:22	18/05/2019	52°11.60	14°52.46	Y	MBES started 0012		
84	0015	12:51	18/05/2019	52°01.35	15°01.52	Y	EM302 and EM1002 stopped		
84	0015/0616	13:34	18/05/2019	52°58.10	15°01.77	Y	EM302 and EM1002 started		
84	0016	15:31	18/05/2019	52°11.63	14°49.73	Y	EM302 and EM1002 stopped		
84	0017	15:46	18/05/2019	52°11.24	14°48.37	Y	EM302 and EM1002 started		
84	0019	17:50	18/05/2019	52°57.25	15°00.87	Y	EM302 and EM1002 stopped		
84	0020	17:52	18/05/2019	51°57.22	15°01.16	Y	MBES started.		
84	0020	18:24	18/05/2019	51°58.46	15°07.42	Y	MBES stopped		
84	0021	18:56	18/05/2019	51°57.88	15°08.09	Y	MBES started		
84	0021	19:20	18/05/2019	51°56.88	15°03.02	Y	MBES stopped		
84	0022	19:39	18/05/2019	51°57.36	15°03.90	Y	EM302 and EM1002 started		
84	0022	20:18	18/05/2019	51°52.37	15°52.36	Y	EM302 and EM1002 stopped		
84	0023	20:35	18/05/2019	51°52.69	15°02.99	Y	EM302 and EM1002 started		
84	0023	21:18	18/05/2019	51°55.39	15°11.49	Y	EM302 and EM1002 stopped		
84	0024	21:30	18/05/2019	51°57.00	15°09.94	Y	EM302 and EM1002 started. Transit to lander 8 location		
84	0024	21:57	18/05/2019	52°00.80	15°05.81	Y	EM302 and EM1002 stopped. End of transit to lander 8 location		
84	0026	22:14	18/05/2019	52°00.75	15°06.04	Y	EM302 and EM1002 started		
84	0026	22:55	18/05/2019	52°00.21	15°14.42	Y	EM302 and EM1002 stopped		
84	0027	23:12	18/05/2019	52°01.09	15°12.77	Y	EM302 and EM1002 started		
84	0027	23:17	18/05/2019	51°00.57	15°13.00	Y	EM302 and EM1002 started. Line 0027 aborted. Lander ready to be deployed.		
92	0028	06:35	19/05/2019	51°59.55	15°14.04	Y	EM 302 and EM 1002 started		
92	0028/0625	07:07	19/05/2019	51°57.94	15°15.81	Y	EM302 and EM 1002 stopped		
92	0029	07:27	19/05/2019	51°58.92	15°14.39	Y	EM302 started		
92	0031	09:43	19/05/2019	51°42.55	15°27.50	Y	EM302 stopped		
92	0032	09:58	19/05/2019	51°42.32	15°25.47	Y	EM302 started		
92	0032	10:51	19/05/2019	51°48.77	15°20.45	Y	EM302 stopped		
92	0033	11:52	19/05/2019	51°48.09	15°18.52	Y	EM302 started		
92	0033	12:07	19/05/2019	51°41.55	15°23.66	Y	EM302 stopped		
92	0034	12:35	19/05/2019	51°40.02	15°19.54	Y	EM302 started		
92	0035	14:24	19/05/2019	51°53.24	15°09.01	Y	EM302 stopped		
104	0036	20:44	19/05/2019	51°59.76	14°56.12	Y	EM302 started		
104	0048	07:27	20/05/2019	51°49.59	14°54.63	Y	Stopped EM302 and 1002 - to avoid loss of overlap		
104	0049	07:29	20/05/2019	51°49.53	14°54.74	Y	EM302 and 1002 started		
104	0049	07:42	20/05/2019	51°47.51	14°56.34	Y	EM302 and 1002 stopped		
104	0050/630	07:49	20/05/2019	51°47.74	14°56.87	Y	EM302 and 1002 started		
104	0050	08:24	20/05/2019	51°52.07	14°53.90	Y	EM302 and 1002 stopped		
104	0051/632	08:34	20/05/2019	51°51.73	14°52.73	Y	EM302 and 1002 started		
104		09:49	20/05/2019	51°42.72	14°57.81	Y	EM302 and 1002 stopped		
104		11:10	20/05/2019	51°38.45	15°13.46	Y	EM302 started		
104	0055	12:43	20/05/2019	51°44.40	15°30.56		Line cnt. Vessel turning		
104	0056	12:51	20/05/2019	51°44.93	15°30.14		Start of line, vessel turnover		
104	0058	13:58	20/05/2019	52°27.94	15°39.94	Y	WCD off and stopped logging		
104	0060	14:10	20/05/2019	51°38.03	15°42.55	N	Started logging		
104	0062	15:18	20/05/2019	51°41.08	15°59.66	N	Started logging, vessel turning		
104	0063	15:28	20/05/2019	51°40.48	16°01.60	N	Start of line, on line now		
104	0063	19:18	20/05/2019	51°22.55	16°42.21	N	Stopped logging EM302		
104	0067	22:32	20/05/2019	51°22.58	16°42.21	N	Started logging EM302		
104	0071	03:10	21/05/2019	51°01.53	16°28.54	N	Stopped logging EM302		
104	0072	03:00	21/05/2019	50°59.90	17°27.21	N	Started EM302		
104	0079	08:37	21/05/2019	51°23.64	16°34.57	N	End of Line 78, SOL 80, vessel turning		
104	0080	08:57	21/05/2019	51°22.32	16°32.83	N	Started logging		
104	0080	14:14	21/05/2019	51°58.11	17°25.35	N	Stopped logging line 85		
104		19:37	21/05/2019	51°17.91	16°10.14	N	Stopped logging (transit)		

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Master Log Sheet

Master Log sheet			Tick appropriate													Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Push Core	Water bottle	Hull MBES	
1	1	15/05/2019	04:02	52°14.6317	14°52.7400											ROV in water
1	1	15/05/2019	04:11													Issue with cable. Kink.
1	1	15/05/2019	04:13	52°14.6172	14°52.7453						X					Kink cleared in cable
2	1	15/05/2019	04:46	52°14.6233	14°52.7428	834					X					ROV on bottom. New CTD file
2	1	15/05/2019	04:47	52°14.6174	14°52.7455	834			X							HD camera on. REVIEW: camera was never turned on
2	1	15/05/2019	04:48	52°14.62	14°52.73	836		X								Hull ADCP Start
2	1	15/05/2019	04:55													INS GPS misplaced ROV roughly 20m to west. ROV pilots rebooting system
3	1	15/05/2019	05:11	52°14.6191	14°52.7467	839				X						Commencing deployment of Lander 1. GPS taken from INS screen
3	1	15/05/2019	05:12	52°14.6191	14°52.7467	839			X							HD camera on
3	1	15/05/2019	05:27	52°14.6191	14°52.7467	839				X						Lander 1 deployed
3	1	15/05/2019	05:32													White balance
3	1	15/05/2019	05:39													Attempted to fire Niskin bottle on ROV, but failed - issue with mechanism
3	1	15/05/2019	05:42	52°14.6361	14°52.7782	839										Commencing footage of area surrounding ROV
3	1	15/05/2019	05:47	52°14.6308	14°52.7682	839										CTD crashed. Reset as "during2"
3	1	15/05/2019	06:05	52°14.6308	14°52.7682	839			X		X					End of seafloor acquisition. HD camera off.
3	1	15/05/2019	06:07	52°14.62	14°52.72	836		X								Hull ADCP Stop
4	1	15/05/2019	06:07	52°14.6309	14°52.7683	830										CTD 'during 2' stopped. CTD upcast started
4	1	15/05/2019	06:38	52°14.6279	14°52.7683	0										06:38: CTD off. ROV at surface.
5	2	15/05/2019	08:20	52°13.6325	14°55.5175	0										ROV in water
6	2	15/05/2019	08:29	52°13.6364	14°55.5521	19.6					X					CTD 'downcast' turned on at 19.6 m water depth
6	2	15/05/2019	09:11	52°13.6321	14°55.5174	729.3										ROV on bottom (41 mins)
6	2	15/05/2019	09:12	52°13.63	14°55.53	717		X								Hull ADCP start
6	2	15/05/2019	n/a	52°13.6329	14°55.5365	717.6										Original site, was relocated
6	2	15/05/2019	09:17	52°13.6337	14°55.5164	730.1			X							Video recording
7	2	15/05/2019	09:17	52°13.6329	14°55.5164	730.6					X					CTD 'downcast' stopped. CTD 'during' started
8	2	15/05/2019	09:51	52°13.6371	14°55.5389	719.4				X						Lander 2 deployed at 9:51 (UTC), slightly different from original coordinates as it was on a slope
8	2	15/05/2019	09:52	52°13.63291	14°55.53657	717.6										Lasers on
9	2	15/05/2019	10:11	52°13.62923	14°55.53959	717.9								X		Bottle fired at 717.9m water depth
10	2	15/05/2019	10:23	52°13.62980	14°55.53560	720.4						X				Framework 1
11	2	15/05/2019	10:28	52°13.63695	14°55.53769	716.6						X				Framework 2
11	2	15/05/2019	10:36	52°13.62826	14°55.53961	718.6						X				Framework 3
11	2	15/05/2019	10:47	52°13.62895	14°55.54572	715.8						X				Framework 4
11	2	15/05/2019	10:53	52°13.62891	14°55.54183	716.9			X							HD video stopped
11	2	15/05/2019	10:55	52°13.62719	14°55.54221	717.8			X							Video hard drive changed
11	2	15/05/2019	11:07	52°13.62616	14°55.54259	721.3						X				Framework 5
12	2	15/05/2019	11:13	52°13.62666	14°55.54271	726.7							X			Push core at lander site 2
12	2	15/05/2019	11:14	52°13.63	14°55.49	667			X							HD video stopped
13	2	15/05/2019	11:14	52°13.63	14°55.49	667					X					CTD 'downcast' stopped. CTD 'Upcast' started
13	2	15/05/2019	11:25	52°21.36	14°55.50	714		X								Hull ADCP stop
14	2	15/05/2019	11:34	53°13.6329	14°55.5362	668					X					CTD Upcast Crash changed to "upcast 2"
15	2	15/05/2019	11:45	53°13.6230	14°55.5363	139.7					X					CTD Upcast Crash changed to "upcast 3"
15	2	15/05/2019	11:53	N/A	N/A	125										Sea save crashed; wont let us start/stop data collection or exit the programme
15	2	15/05/2019	12:14	52° 13.6325	14° 55.4365	0										ROV back on deck
16	3	15/05/2019	14:30	52° 00.23218	14° 59.45945	0					X					ROV in water
17	3	15/05/2019	14:40	52° 00.24595	14° 59.51886	43										Dive 3 CTD 'downcast' started
17	3	15/05/2019	15:07	52°00.22	14°59.46	660		X								Hull ADCP on

CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

Master Log sheet			Tick appropriate													Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Push Core	Water bottle	Hull MBES	
17	3	15/05/2019	15:09	52° 00.23306	14° 59.48812	664.2		X			X					ROV on bottom
18	3	15/05/2019	15:10	52° 00.23307	14° 59.48813	664.2					X					CTD 'during' started
19	3	15/05/2019	17:21	52° 00.24520	14° 59.38863	697.4	X									CTD 'during 2' started
20	3	15/05/2019	17:30	52° 00.25005	14° 59.37910	697.4				X						Lander3 deployed
20	3	15/05/2019	17:47	52° 00.26260	14° 60.40553	697.4					X					ROV off bottom
20	3	15/05/2019	17:49	52°00.23	14°59.38	659		X								Hull ADCP off
21	3	15/05/2019	17:50	52°00.25883	14°59.40459	540				X						CTD Dive 3 'upcast' started
21	3	15/05/2019	n/a	n/a	n/a											Co-ordinates not taken down for the end of the video
21	3	15/05/2019	18:22	52°00.23587	14°59.37455	0										18:22 ROV at surface
21	3	15/05/2019	18:29	52°00.23587	14°59.37455	0										ROV on deck
22	4	15/05/2019	19:35	51°58.9745	14°59.9139	0										ROV in water
23	4	15/05/2019	19:43	51°58.9746	14°59.9140	0					X					CTD 'upcast' started
24	4	15/05/2019	20:07	51°58.0001	14°59.9337	650										ROV on bottom. CTD 'upcast' ended. CTD 'during' started
24	4	15/05/2019	20:09	51°58.97	14°59.42	641		X								Hull ADCP start
24	4	15/05/2019	20:10	51°58.0002	14°59.9338	650			X							HD camera on
25	4	15/05/2019	21:27	51°58.9911	14°59.425	645				X						Lander site 4 deployed
26	4	15/05/2019	21:34	51°58.9911	14°59.425	646							X			Push core on site 4
27	4	15/05/2019	21:41	51°58.9903	14°59.9344	645					X					CTD upcast started
27	4	15/05/2019	21:42	51°58.97	14°59.92	646		X								Hull ADCP off
27	4	15/05/2019	21:43	51°58.9904	14°59.9345	645			X							HD video off
27	4	15/05/2019	22:08	51°59.0150	14°59.9610	0					X					CTD off
27	4	15/05/2019	22:29	51°58.9759	14°59.9135	0										ROV on deck
28	5	16/05/2019	00:00	51°59.0033	15°01.1286	0										ROV in water
29	5	16/05/2019	00:18	51°59.0033	15°01.1286	0					X					CTD 'downcast' started
29	5	16/05/2019	00:50	51°59.00	15°01.14	718		X								Hull ADCP start
30	5	16/05/2019	00:51	51°59.0232	15°01.1670	719										ROV bottom, CTD 'during' started
30	5	16/05/2019	00:51	51°59.0232	15°01.1670	719			X							HD video ON
31	5	16/05/2019	00:58	51°59.0240	15°01.1558	719.5				X						Lander site 5 deployed
32	5	16/05/2019	01:27	51°59.0249	15°01.1559	719.5							X			Push core on site 5
32	5	16/05/2019	01:47	51°59.0298	15°01.1591	718.1										ROV off bottom
33	5	16/05/2019	01:47	51°59.0298	15°01.1591	718.1										CTD 'upcast' started
33	5	16/05/2019	01:47	51°59.0298	15°01.1591	718.1										HD cam off
33	5	16/05/2019	01:47	51°59.00	15°01.14	718										Hull ADCP off
33	5	16/05/2019	02:12	51°59.0347	15°01.1588	0										CTD off
33	5	16/05/2019	02:26	51°59.0130	15°01.1209	0										ROV on deck
34	6	16/05/2019	04:05	51°58.38654	15°02.50730	0										ROV in water
35	6	16/05/2019	04:10	51°58.38655	15°02.50731	0					X					CTD 'downcast' started
35	6	16/05/2019	04:46	51°58.39118	15°02.51616	683										ROV on bottom
35	6	16/05/2019	04:41	51°58.37	15°02.49	687		X								Hull ADCP start
36	6	16/05/2019	04:47	51°58.39119	15°02.51517	683					X					CTD 'during' started
37	6	16/05/2019	05:44	51°58.39137	15°02.52381	690				X						Lander site 6 deployment attempt. Lander fell over at 05:44. Repaired. Fell over again at 08:06 and again at 08:43
37	6	16/05/2019	05:56	51°58.39138	15°02.52382	690			X							Video recording started
38	6	16/05/2019	06:25	51°58.39893	15°02.52310	690										Lander repaired on site. Placed in new position. Vide co-ordinates
39	6	16/05/2019	06:25	51°58.40169	15°02.51094	691.6							X			Niskin bottle fired
40	6	16/05/2019	07:28	51°58.39740	15°02.51698	693.5						X				Framework 1 in Drawer D

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Master Log sheet			Tick appropriate													Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Push Core	Water bottle	Hull MBES	
40	6	16/05/2019	07:37	51°58.38292	15°02.53067	690.3						X				Framework 2 in Drawer B
40	6	16/05/2019	07:41	51°58.39232	15°02.63067	690.3										Lasers on
40	6	16/05/2019	07:47	51°58.39368	15°02.60430	689.5						X				Framework 3 in Drawer A
40	6	16/05/2019	07:55	51°58.39262	15°02.52768	694.5						X				Framework 4 in Drawer C
40	6	16/05/2019	08:02	51°58.39921	15°02.52953	689.2						X				Framework5 in Drawer G
40	6	16/05/2019	08:06	51°58.40408	15°02.52189	688.7										Lander has fallen over
41	6	16/05/2019	08:39	51°58.40075	15°02.51962	692.4							X			Push core on site 6
41	6	16/05/2019	08:43	51°58.40138	15°02.52144	690.3										Lander has fallen again
41	6	16/05/2019	09:30	51°58.40178	15°02.1990	691.4										Video cartridge stopped 2 hours late
41	6	16/05/2019	09:31	51°58.40178	15°02.1990	691.4										Video cartridge changed out late
42	6	16/05/2019	10:39	51°58.40176	15°02.52266	694										CTD upcast started
42	6	16/05/2019	10:39	51°58.40176	15°02.52266	694										ROV off bottom
42	6	16/05/2019	10:39	51°58.37	15°02.47	691										Hull ADCP off
42	6	16/05/2019	11:03	51°58.40676	15°02.49568	122.9										HD video off
42	6	16/05/2019	11:10	51°58.38139	15°02.49790	21.8										CTD upcast off
42	6	16/05/2019	11:19	51°58.37293	15°02.46363	0										ROV on deck
43	7	16/05/2019	13:47	51°56.39840	15°02.45682	0										ROV in water
43	7	16/05/2019	13:51	51°58.39818	15°02.45679	0										ROV taken back on deck, issue with hydraulic pressure
44	MB	16/05/2019	15:34	51°58.39	15°02.46										X	Multibeam started
44	MB	16/05/2019	15:43	51°58.15	15°02.58										X	Stopped logging
44	MB	16/05/2019	16:05	51°58.33	15°07.55										X	EM 2040 start
44	MB	16/05/2019	16:05	51°58.33	15°07.55										X	EM 1002 start
44	MB	16/05/2019	16:13	51°57.85	15°02.81										X	EM2040 stopped
44	MB	16/05/2019	18:10	51°58.24	15°02.69										X	EM302 started
44	MB	16/05/2019	18:49	51°58.28	15°02.08										X	EM302 and EM1002 stopped
45	CTD	16/05/2019	19:09	51°52.32	15°02.03	594	X							X		CTD Water samples - 3 bottles - 1°: 594m, 2°: 577m, 3°: 520m
46	8	16/05/2019	20:45	51°52.21650	15°01.9794	0										ROV in water
47	8	16/05/2019	20:53	51°52.21651	15°01.9795	0					X					CTD started downcast. Missed the first 10 meters
47	8	16/05/2019	21:23	51°52.25106	15°01.9678	604										ROV in bottom
48	8	16/05/2019	21:23	51°52.25106	15°01.9678	604										CTD change 'during'
48	8	16/05/2019	21:24	51°52.21	15°01.99	599		X								Hull ADCP start
48	8	16/05/2019	21:33	51°52.23657	15°01.97454	604			X							HD video ON. Video stopped at 05:02 on 17/05/2019
48	8	16/05/2019	22:02	51°52.22817	15°01.96155	593										INS GPS showed faults. Back in action at 22:02. From hereon lats and longs taken from ROV screen
48	8	16/05/2019	22:20	51°52.23657	15°01.97454	604										Lasers on
48	8	17/05/2019	23:25	51°52.2287	15°01.96155	593			X							HD video cartridge changed
48	8	17/05/2019	01:21	51°52.2288	15°01.9530	594			X							HD video cartridge changed and reset
48	8	17/05/2019	01:24	51°52.2274	15°01.9576	594			X							HD video recording restarted
48	8	17/05/2019	02:18	51°52.2274	15°01.9576	594			X							HD video recording changed from circling to north-south trending lines
48	8	17/05/2019	02:59	51°52.20	15°01.96	596		X								Hull ADCP OFF and ON again
48	8	17/05/2019	03:07	51°52.2274	15°01.9576	594										INS GPS faulty again
48	8	17/05/2019	03:24	51°52.2274	15°01.9576	594										INS GPS back in action
48	8	17/05/2019	03:40	51°52.2274	15°01.9576	594										INS GPS down. Time INS GPS went back in action was not recorded
48	8	17/05/2019	05:02	51°52.2094	15°02.0079	605			X							HD video recording stopped
49	8	17/05/2019	05:02	51°52.2094	15°02.0079	605										CTD 'upcast' started

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Master Log sheet			Tick appropriate													Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Push Core	Water bottle	Hull MBES	
49	8	17/05/2019	05:02	51°52.19	15°01.98	600		X								Hull ADCP off
49	8	17/05/2019	05:39	51°52.1940	15°01.9710	0										ROV on deck
50	9	17/05/2019	08:11	51°52.19429	15°1.97297	0										ROV in water
51	9	17/05/2019	08:21	51°52.22461	15°1.96919	12.6					X					CTD 'downcast' started
51	9	17/05/2019	08:41	51°52.23739	15°1.94209	600.3										ROV on bottom. CTD 'downcast' stopped.
52	9	17/05/2019	08:43	51°52.24493	15°1.93623	604.8					X					CTD 'during' started
52	9	17/05/2019	09:11	51°52.21018	15°1.99705	611.1										ROV placed on pre-chosen site for lander deployment
52	9	17/05/2019	09:16	51°52.20904	15°1.99923	612.2			X							HD video recording started. New Cartridge
53	9	17/05/2019	09:38	51°52.20357	15°1.99797	611				X						Lander deployed. First attempt
54	9	17/05/2019	09:39	51°52.21026	15°2.00247	611.2					X					CTD 'during 2' started
54	9	17/05/2019	09:46	51°52.21948	15°1.999617	612.3				X						Lander fell due structural problems. Part of the metal frame has snapped
54	9	17/05/2019	10:18	51°52.20848	15°2.0076	601.1				X						Lander collected for redeployment
55	9	17/05/2019	10:28	51°52.20183	15°1.99504	607.3				X						Lander deployed. Second attempt. Wrong lander deployed. New co-ordinates required for next dive.
55	9	17/05/2019	10:33	51°52.20272	15°1.99590	606.9										Lasers turned on
55	9	17/05/2019	10:36	51°52.20265	15°1.99725	608.1			X							White balance for HD video done
56	9	17/05/2019	10:39	51°52.20211	15°1.99701	607.6							X			Niskin water bottle fired
56	9	17/05/2019	N/A	N/A	N/A	N/A										HD video stopped
57	9	17/05/2019	11:33	51°52.20371	15°1.99190	607					X					Coral framework 1 in box F
57	9	17/05/2019	11:40	51°52.20408	15°1.98899	605.4			X							HD video recording started.
57	9	17/05/2019	11:46	51°52.20539	15°1.99059	608.8					X					Coral framework 2 in box G
58	9	17/05/2019	11:50	51°52.20542	15°1.90950	608.4					X					CTD 'during 2' ended. CTD 'during 3' started
59	9	17/05/2019	11:58	51°52.19907	15°1.99554	609.3					X					CTD 'during 3' ended. CTD 'during 4' started
59	9	17/05/2019	12:03	51°52.19943	15°1.99608	609.6					X					Coral framework 3 in box A
60	9	17/05/2019	12:14	51°52.19059	15°2.01176	606.6					X					CTD 'during 4' ended. CTD 'during 5' started
61	9	17/05/2019	12:25	51°52.19730	15°2.00989	607.4					X					Coral framework 4 in box B
62	9	17/05/2019	12:34	51°52.19736	15°2.00801	606.5						X				Push core collected
62	9	17/05/2019	12:34	51°52.19736	15°2.00801	606.5			X							HD video recording restarted
63	9	17/05/2019	13:17	51°52.20436	15°1.99650	607.1					X					CTD 'during 5' ended. CTD 'during 6' started
64	9	17/05/2019	13:54	51°52.20601	15°1.99750	608.1				X						Lander recovered for on-deck maintenance
65	9	17/05/2019	13:57	51°52.21995	15°2.00923	607					X					CTD Upcast started
65	9	17/05/2019	13:57	51°52.21995	15°2.00923	607										ROV off bottom
65	9	17/05/2019	13:57	51°52.21995	15°2.00923	607			X							HD video recording stopped.
66	9	17/05/2019	14:31	51°52.20796	15°2.01336	57					X					CTD 'Upcast' ended. CTD 'upcast 2' started
66	9	17/05/2019	N/A	51°52.20446	15°2.01927	13.6					X					CTD 'upcast 2' stopped
66	9	17/05/2019	14:50	51°52.202890	15°202890	0										ROV on deck
																No ADCP information was found for dive 9
67	10	17/05/2019	16:30	51°52.17157	15°2.02461	0										ROV in water
68	10	17/05/2019	16:42	51°52.17175	15°2.02500	0					X					CTD 'downcast' started
68	10	17/05/2019	17:11	51°52.17	15°02.04	613		X								Hull ADCP started
69	10	17/05/2019	17:13	51°52.20259	15°2.03844	615.9					X					CTD 'during' started
69	10	17/05/2019	17:13	51°52.20259	15°2.03844	615.9										ROV on bottom
69	10	17/05/2019	17:22	51°52.20387	15°2.00568	606.8										ROV on bottom. Searching for new location for lander deployment
69	10	17/05/2019	19:53	51°52.20352	15°02.01332	605.9										Three bottles were lost from the lander (bottles 22 and 24. The other one was not identified) motor n° 305
70	10	17/05/2019	20:02	51°52.20624	15°02.01476	605.9				X						Lander 6 deployed
70	10	17/05/2019	20:02	51°52.20624	15°02.01476	605.9			X							HD video recording started
70	10	17/05/2019	20:16	51°52.17	15°02.03	609		X								Hull ADCP stopped

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Master Log sheet				Tick appropriate													Hull MBES	Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Core	Push	Water bottle			
71	10	17/05/2019	20:15	51°52.20292	15°02.00540	602.6					X						CTD 'during' ended. CTD 'upcast' started	
71	10	17/05/2019	20:15	51°52.20292	15°02.00540	602.6			X								HD video recording stopped.	
71	10	17/05/2019	20:15	51°52.20292	15°02.00540	602.6											ROV off bottom	
71	10	17/05/2019	20:46	51°52.21545	15°02.02581	0					X						CTD 'upcast' ended.	
71	10	17/05/2019	20:55	51°52.17111	15°02.02634	0											ROV on deck	
72	CTD	17/05/2019	21:36	51°49.66	15°02.15	1263	X										CTD in water. 6 water bottles fired. 1°: 1242m, 2°: 1093.2m, 3°: 993.5m, 4°:845.3m, 5°:747.7m, 6°: 599.2m	
73	11	18/05/2019	00:00	51°58.37741	15°02.51312	0											ROV in water	
74	11	18/05/2019	00:04	51°58.37646	15°02.51563	0					X						CTD 'downcast' started	
74	11	18/05/2019	00:32	51°58.39494	15°02.49531	698.4											ROV on bottom	
75	11	18/05/2019	00:33	51°58.39494	15°02.49531	698.4					X						CTD 'downcast' ended. CTD 'during' started	
75	11	18/05/2019	00:34	51°58.38	15°02.52	682		X									Hull ADCP started	
75	11	18/05/2019	00:43	51°58.39151	15°02.52585	697.4			X								HD video recording started	
76	11	18/05/2019	01:30	51°58.40933	15°02.49959	685.1				X							Lander 6 Deployed	
77	11	18/05/2019	01:50	51°58.40934	15°02.49960	681.8									X		Niskin bottle fired	
78	11	18/05/2019	01:58	51°58.40935	15°02.49961	681.8							X				Push core 4 taken	
79	11	18/05/2019	02:03	51°58.40936	15°02.49962	682.8					X						CTD 'during' ended. CTD 'upcast' started.	
79	11	18/05/2019	02:08	51°58.40372	15°02.51392	682.8											ROV off bottom	
79	11	18/05/2019	02:09	51°58.40372	15°02.51392	685			X								HD Video recording stopped	
79	11	18/05/2019	02:09	51°58.38	15°02.52	685		X									Hull ADCP stopped	
79	11	18/05/2019	02:38	51°58.40373	15°02.51393	0					X						CTD 'upcast' ended	
79	11	18/05/2019	02:50	51°58.40373	15°02.51393	0											ROV on deck	
80	12	18/05/2019	05:27	51°05.22931	15°01.19303												Dive aborted due to hydraulic issue with the ROV. ROV recovered to deck	
80	12	18/05/2019	06:25	51°05.22931	15°01.19303	0											ROV on deck	
81	CTD	18/05/2019	07:58	52°03.88	15°00.78	1683									X		CTD in water - 6 Water bottles fired. 1°: 1044m, 2°: 976m, 3°: 849m, 4°: 750m, 5°:620m, 6°:560m	
82	MB	18/05/2019	09:04	52°09.35	14°55.11	0											EM302 and EM1002 started. Start line 008	
82	MB	18/05/2019	09:37	52°13.22	14°52.52	0											EM302 and EM1002 stopped. Start line 009	
83	CTD	18/05/2019	10:03	52°13.23	14°52.52	900	x								X		CTD - 6 Water bottles fired. 1°: 892m, 2°: 850m, 3°:750m, 4°: 630m, 5°: 580m, 6°: 490m	
84	MB	18/05/2019	10:51	52°12.37	14°51.61	0											EM302 and EM1002 started. Start line 0010/0614 (double check coordinates with GER. Not readable on the log sheet)	
84	MB	18/05/2019	11:01	51°11.40	14°52.41	0											EM302 and EM1002 stopped	
84	MB	18/05/2019	11:08	52°12.05	14°52.02	0											MBES started. Lines 0011/0615. No information on which multibeam was started.	
84	MB	18/05/2019	11:20	52°11.78	14°52.30	0											X MBES stopped. Lines 0011/0615.	
84	MB	18/05/2019	11:22	52°11.60	14°52.46	0											X MBES started 0012	
84	MB	18/05/2019	12:51	52°01.35	15°01.51	0											X EM 302 and EM1002 stopped. Lines 0011/0615	
84	MB	18/05/2019	13:34	52°58.10	15°01.77	0											X EM302 and EM1002 started. Lines 0015/0616	
84	MB	18/05/2019	15:31	52°11.63	14°99.73	0											X EM 302 and EM1002 stopped. Lines 0015/0616	
84	MB	18/05/2019	15:46	52°11.24	14°48.37	0											X EM 302 and EM1002 started. Line 0017	
84	MB	18/05/2019	17:50	52°57.25	15°00.87	0											X EM 302 and EM 1002 started. Line 0019	
84	MB	18/05/2019	17:52	51°57.22	15°01.16	0											X MBES started. Line 0020. No information on which multibeam was on.	
84	MB	18/05/2019	18:24	51°58.46	15°07.42	0											X MBES stopped. Line 0020. No information on which multibeam was on.	
84	MB	18/05/2019	18:56	51°57.88	15°08.09	0											X MBES started. Line 0021. No information on which multibeam was on.	
84	MB	18/05/2019	19:20	51°57.88	15°03.02	0											X MBES stopped. Line 0021. No information on which multibeam was on.	

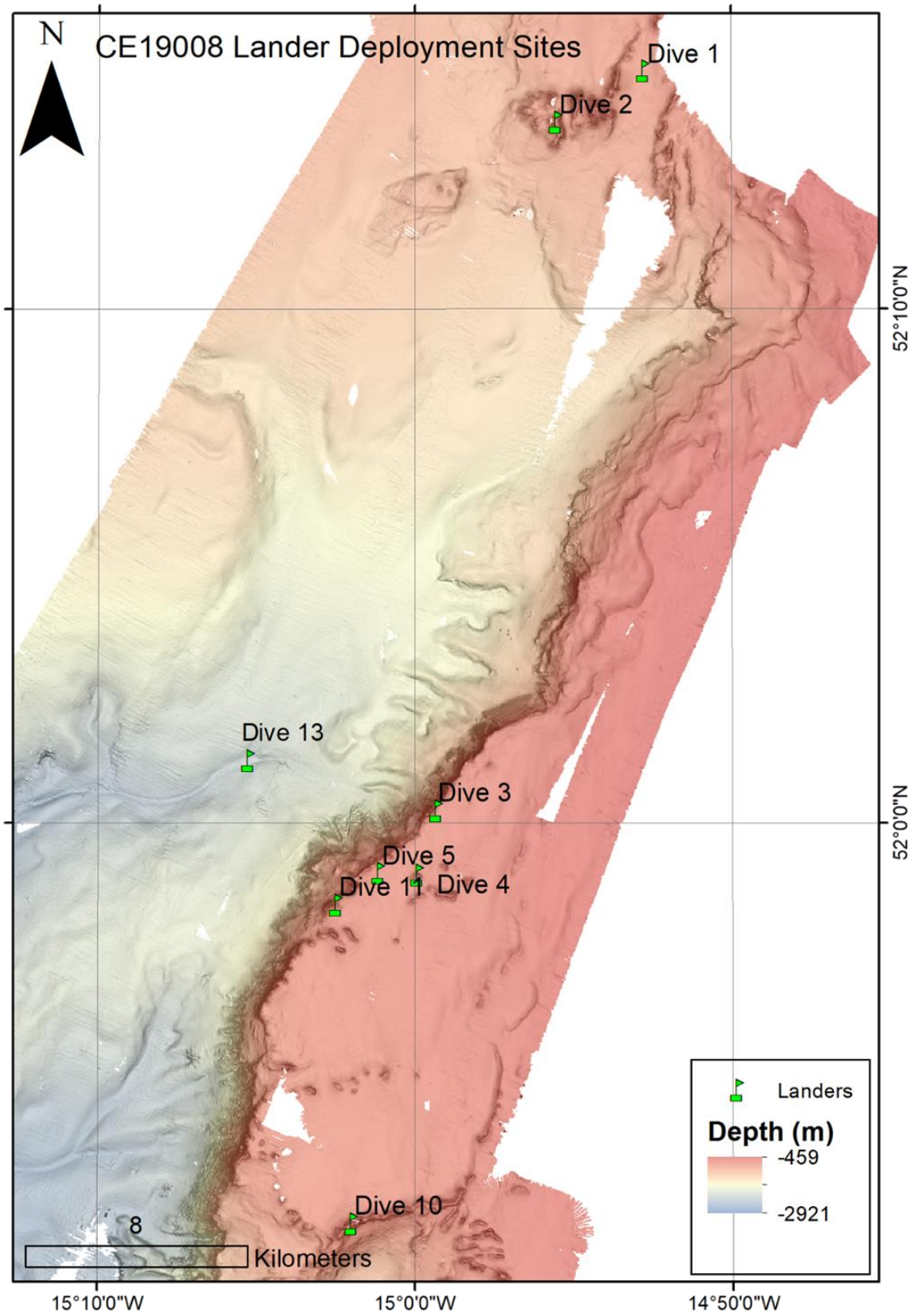
CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

Master Log sheet			Time (UTC)	Lat	Long	Depth (m)	Tick appropriate						Push Core	Water bottle	Hull MBES	Note
Station	Dive #	Date					CTD	ADCP	ROV Video	Lander	ROV CTD	Coral				
84	MB	18/05/2019	19:39	51°57.36	15°03.90	0									X	EM 302 and EM 1002 started. Line 0022
84	MB	18/05/2019	20:18	51°52.37	15°52.36	0									X	EM 302 and EM 1002 stopped. Line 0022
84	MB	18/05/2019	20:35	51°52.69	15°02.99	0									X	EM 302 and EM 1002 started. Line 0023
84	MB	18/05/2019	21:18	51°55.39	15°11.49	0									X	EM 302 and EM 1002 stopped. Lines 0023
84	MB	18/05/2019	21:30	51°57.00	15°09.94	0									X	EM 302 and EM 1002 started. Line 0024. Transit to lander 8 location
84	MB	18/05/2019	21:57	52°00.80	15°05.81	0									X	EM 302 and EM 1002 stopped. Line 0024. End of transit to lander 8 location
84	MB	18/05/2019	22:14	52°00.75	15°06.04	0									X	EM 302 and EM 1002 started. Line 0626
84	MB	18/05/2019	22:54	52°00.21	15°14.42	0									X	EM 302 and EM 1002 stopped
84	MB	18/05/2019	23:12	52°01.09	15°12.77	0									X	EM 302 and EM 1002 started. Line 0027
84	MB	18/05/2019	23:17	51°00.57	15°13.00	0									X	EM 302 and EM 1002 started. Line 0027 aborted. Lander ready to be deployed
85	13	19/05/2019	00:14	52°01.22933	15°05.27689	0										ROV off deck
85	13	19/01/1900	00:17	52°01.22933	15°05.27689	0										ROV in water
86	13	19/05/2019	00:20	52°01.22933	15°05.27689	0					X					CTD 'downcast' started
86	13	19/05/2019	01:46	52°01.22102	15°05.30148	2124										ROV on bottom
86	13	19/05/2019	01:46	52°01.22102	15°05.30148	2124			X							HD video recording started
87	13	19/05/2019	01:46	52°01.22102	15°05.30148	2124					X					CTD 'downcast' stopped. CTD 'during' started
87	13	19/05/2019	02:17	52°01.18	15°02.26	2117		X								Hull ADCP on
89	13	19/05/2019	03:03	52°01.20953	15°05.27092	2125				X						Lander 8 deployed
89	13	19/05/2019	03:27	52°01.20953	15°05.27092	2125			X							Lasers on. Commencing channel transect video line (N-S trending)
90	13	19/05/2019	03:57	52°01.08919	15°05.26783	2102										Push core failed attempt. Issue with the core lid.
90	13	19/05/2019	04:00	52°01.08919	15°05.26783	2102										HD video recording stopped
90	13	19/05/2019	04:00	52°01.08919	15°05.26783	2102										ROV off bottom
91	13	19/05/2019	04:00	52°01.08919	15°05.26783	2102					X					CTD 'during' stopped. CTD 'upcast' started
91	13	19/05/2019	04:04	52°02.05	15°05.26	2091		X								Hull ADCP off
91	13	19/05/2019	05:20	52°01.12297	15°05.14738	0.8				X						CTD 'upcast' stopped
91	13	19/05/2019	05:35	52°01.09130	15°05.12541	0										ROV off water
91	13	19/05/2019	05:42	52°01.08977	15°05.12632	0										ROV on deck
92	MTB	19/05/2019	06:35	51°59.55	15°14.04										X	EM302+EM1002 started
92	MTB	19/05/2019	07:07	51°57.94	15°15.82										X	EM302+EM1002 stopped
92	MTB	19/05/2019	07:27	51°58.92	15°14.39										X	EM302 started
92	MTB	19/05/2019	09:43	51°42.55	15°27.50										X	EM302 stopped logging
92	MTB	19/05/2019	09:58	51°42.32	15°25.47										X	EM302 started logging
92	MTB	19/05/2019	10:51	51°48.77	15°20.45										X	EM302 stopped logging
92	MTB	19/05/2019	11:52	51°48.09	15°18.52										X	EM302 started logging
92	MTB	19/05/2019	12:07	51°41.55	15°23.66										X	line 0033 stopped
92	MTB	19/05/2019	12:35	51°40.02	15°19.54										X	start line 0034
92	MTB	19/05/2019	14:24	51°53.24	15°09.01										X	stop line EM302
93	14	19/05/2019	15:45	51°58.93304	14°59.93607	0										ROV in water
94	14	19/05/2019	15:54	51°59.00757	14°59.97950	34					X					CTD 'downcast' started
95	14	19/05/2019	16:02	51°58.99975	14°59.94719	197					X					CTD 'downcast' stopped. CTD 'downcast 2' started
96	14	19/05/2019				662.7					X					CTD 'during' started. (Co-ordinates not taken due to missed photo)
96	14	19/05/2019	16:18	51°58.99104	14°59.96011	662.7					X					CTD 'during2' started.
97	14	19/05/2019	16:22			662.9										ROV on bottom (Co-ordinates not taken due to missed photo)
98	14	19/05/2019		51°58.99100	14°59.96009	663.1										White balance taken
98	14	19/05/2019		51°58.99132	14°59.96048	662.6			X							HD video recording started

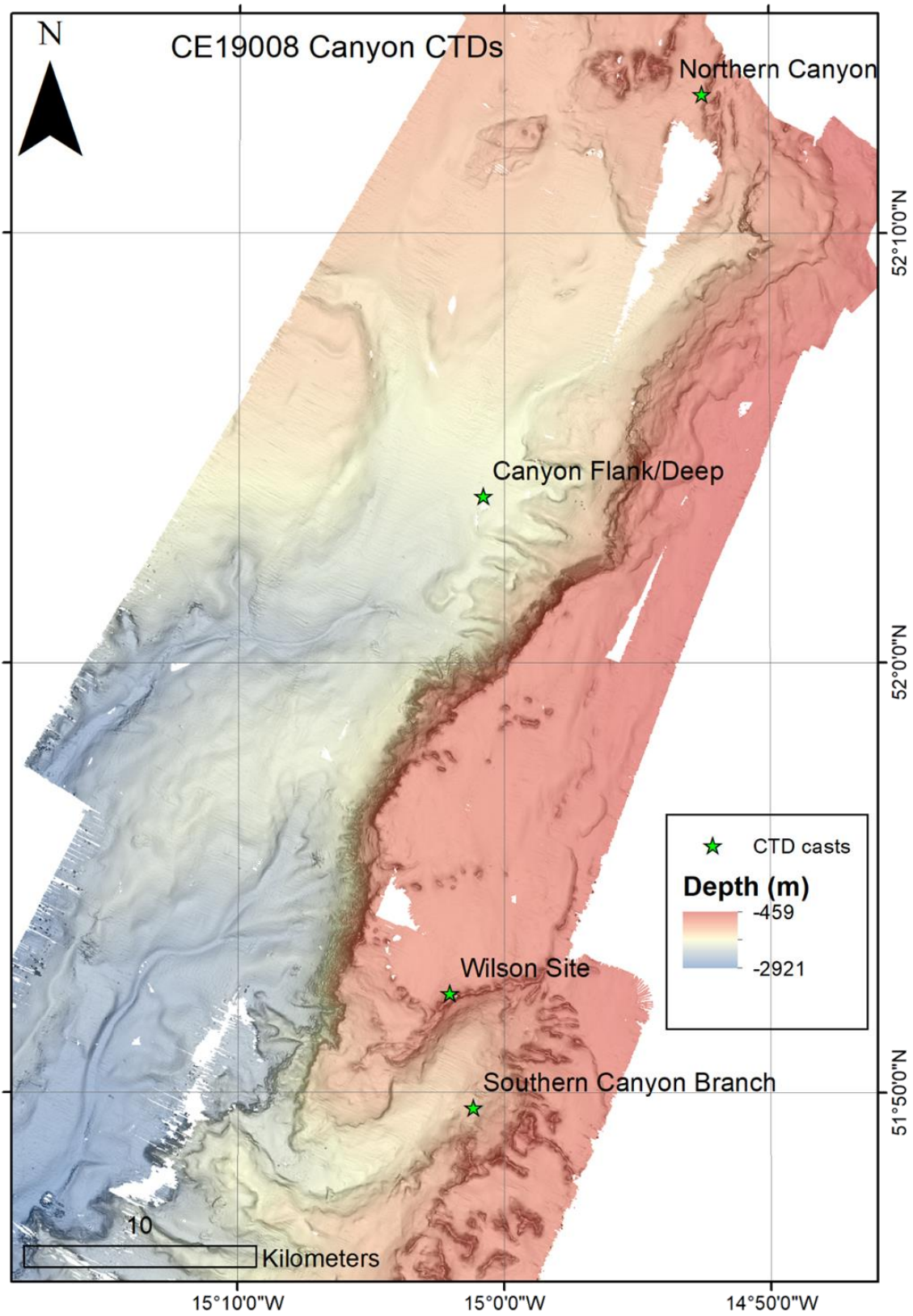
CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

Master Log sheet				Tick appropriate													Note
Station	Dive #	Date	Time (UTC)	Lat	Long	Depth (m)	CTD	ADCP	ROV Video	Lander	ROV CTD	Coral	Push Core	Water bottle	Hull MBES		
99	14	19/05/2019	16:55	51°59.97956	14°59.99886	658.3					X					CTD 'during 3' started	
100	14	19/05/2019	17:15	51°59.04098	14°59.96941	712.5					X					CTD 'during 4' started	
100	14	19/05/2019		51°58.9911	14°59.9425				X							HD video recording around the lander, downwards on reed side to side	
100	14	19/05/2019	17:48	51°58.97488	14°59.9449	647										Lander 5 spotted	
100	14	19/05/2019	18:01	51°58.96834	14°59.93467	647.5			X							HD video recording	
100	14	19/05/2019	18:03	51°58.97276	14°59.94678	648										Lasers on	
100	14	19/05/2019	18:22	51°58.97320	14°59.95518	649.9										CTD 'during 5' started. CTD coms to magnetic switch time out, restarted to during 5	
101	14	19/05/2019	18:35	51°58.90653	14°59.93320	657.2					X					CTD 'during 6' started	
101	14	19/05/2019	19:08	51°58.97120	14°59.94300	648.7			X							HD video recording stopped	
102	14	19/05/2019	19:13	51°58.98634	14°59.96408	651.2					X					CTD 'upcast' started	
102	14	19/05/2019	19:24	51°58.98776	15°0.01850	650										ROV off bottom	
103	14	19/05/2019	19:50	51°58.98551	14°59.2772	0					X					CTD 'upcast' stopped	
103	14	19/05/2019	20:08	51°58.987100	14°59.92975	0										ROV on deck	
104	MTB	19/05/2019	20:44	51°59.76	14°56.12										X	start line 0036 EM302, EM1002	
104	MTB	20/05/2019	07:27	51°49.59	14°54.63										X	stopped EM302+ 1002, to avoid loss of overlap	
104	MTB	20/05/2019	07:29	51°49.53	14°54.74										X	EM302+1002 logging	
104	MTB	20/05/2019	07:42	51°47.51	14°56.34										X	EM302+1002 stop logging	
104	MTB	20/05/2019	07:49	51°47.74	14°56.87										X	EM302+1002 logging	
104	MTB	20/05/2019/	08:24	51°52.07	14°53.90										X	EM302+1002 stop logging	
104	MTB	20/05/2019	08:34	51°51.73	14°52.93										X	EM302+1002 started	
104	MTB	20/05/2019	09:49	51°42.72	14°57.81										X	EM302+1002 stopped	
104	MTB	20/05/2019	11:10	51°38.45	14°13.46										X	EM302 started	
104	MTB	20/05/2019	12:43	51°44.40	15°30.56										X	line cut vessel turning	
104	MTB	20/05/2019	12:51	51°44.93	15°30.14										X	SOL 0056 vessel turnover	
104	MTB	20/05/2019	13:58	52°27.94	15°39.94										X	folders up 19 on hard drive-EM302, WCL off+ stopped logging	
104	MTB	20/05/2019	14:10	51°38.03	15°42.55										X	logging	
104	MTB	20/05/2019	15:18	51°41.08	15°59.66										X	SOL 0062 Vessel turning	
104	MTB	20/05/2019	15:28	51°40.48	16°01.60										X	SOL 0063 On EEZ line now	
104	MTB	20/05/2019	19:18	51°22.55	16°42.21										X	Stopped logging EM302	
104	MTB	20/05/2019	22:32	51°22.58	16°42.21										X	EM302 logging	
104	MTB	21/05/2019	03:10	51°01.53	17°28.54										X	EM302 stopped logging	
104	MTB	21/05/2019	03:N/A	50°59.90	17°27.71										X	EM302 started	
104	MTB	21/05/2019	08:37	51°23.64	16°34.57										X	End of line 78, SOL 80, Vessel turning	
104	MTB	21/05/2019	08:57	51°22.32	16°32.83										X	Started logging	
104	MTB	21/05/2019	14:14	50°58.11	16°10.14										X	Stopped logging EM302	
105	CTD8	22/05/2019	09:11	52°07.42	12°59.34		X									3 bottles fired and named CTD transit 1	
106	CTD9	22/05/2019					X									3 bottles fired	

Lander Deployment Sites



CTD Stations



CE19008 Cruise Report: Monitoring Changes in Submarine Canyon Coral Habitats - Leg 1 (MoCha_SCan)

CTD/SVP log		Bottle number (please write the deth at which bottle was fired below).											
Station #	CTD #	Lat	Long	Time	Depth	1	2	3	4	5	6	7	8
45	1	51°52.32	15°02.03	19:09	594	594	577	520					
72	2	51°49.66	15°01.13	21:36	1263	1242	1093	994	845	748	599		
81	3	52°03.88	15°00.77	07:58	1683	1044	976	849					
81	3	52°03.88	15°00.78	08:05	1764				750				
81	3	52°03.88	15°00.77	08:08	1765					620			
81	3	52°03.88	15°00.77	08:10	1766						560		
83	4	52°13.23	14°52.52	10:03	900	892							
83	4	52°13.23	14°52.52	10:04	930		850						
83	4	52°13.23	14°52.52	10:06	931			750					
83	4	52°13.23	14°52.52	10:08	931				630				
83	4	52°13.23	14°52.52	10:09	932					580			
83	4	52°13.23	14°52.52	10:12	931						490		
	EEZ CTD	51 27.27	16 47.00	20:52	4526	4526	4526	4526					
	CTD Transit 1	52 07.41	12 59.34	09:27	705	687	350	2.8					
	CTD Transit 2	52 40.87	10 45.75	18.2	122	110	62	2					

Weather Report

station	Long	Lat	time	At. Pressure	Wind Dir	Wind Speed	Wind Gust	Wave Height	Wave Period	Air Temp	DewPoint	Sea Temp	RelativeHumidity
			UTC	mb		kn	kn	m	s	degree_C	degree_C	degree_C	percent
M6	15°52.88	53°04.489	2019-05-13T00:00:00Z	1021.9	140	28	37	4.3	7	11	9.3	11	89
M6	15°52.88	53°04.489	2019-05-13T06:00:00Z	1023.5	NaN	NaN	NaN	4.3	7	11.8	10.2	10.9	90
M6	15°52.88	53°04.489	2019-05-13T12:00:00Z	1024.9	160	19	31	4.2	8	11.7	10.5	11.1	92
M6	15°52.88	53°04.489	2019-05-13T18:00:00Z	1024.9	150	19	25	3.5	8	11.8	10.6	10.9	92
M6	15°52.88	53°04.489	2019-05-14T00:00:00Z	1023.9	150	23	37	3.5	7	11.6	10	10.8	90
M6	15°52.88	53°04.489	2019-05-14T06:00:00Z	1020.9	140	25	37	3.6	7	11.5	9.3	10.7	86
M6	15°52.88	53°04.489	2019-05-14T12:00:00Z	1019.5	140	21	25	3.5	7	11.7	10	10.8	89
M6	15°52.88	53°04.489	2019-05-14T18:00:00Z	1017.9	150	15	23	4.3	8	11.7	10.3	10.8	91
M6	15°52.88	53°04.489	2019-05-15T00:00:00Z	1017.3	150	18	21	3.7	8	11.3	10.5	10.8	95
M6	15°52.88	53°04.489	2019-05-15T06:00:00Z	1016.1	NaN	NaN	NaN	3.6	8	11.1	10.5	10.8	96
M6	15°52.88	53°04.489	2019-05-15T12:00:00Z	1016.9	200	8	8	2.7	8	11.5	10.7	11.2	95
M6	15°52.88	53°04.489	2019-05-15T18:00:00Z	1017.1	190	7	8	2.9	8	11.8	10.5	12	92
M6	15°52.88	53°04.489	2019-05-16T00:00:00Z	1017.7	190	6	8	2.5	8	11.6	10.8	11.8	95
M6	15°52.88	53°04.489	2019-05-16T06:00:00Z	1017.3	210	3	6	2.2	8	11.1	10	11.4	93
M6	15°52.88	53°04.489	2019-05-16T12:00:00Z	1016.9	360	2	4	2.1	8	11.8	8.8	11.7	82
M6	15°52.88	53°04.489	2019-05-16T18:00:00Z	1015.7	300	11	16	1.7	7	11.3	8.3	12.3	82
M6	15°52.88	53°04.489	2019-05-17T00:00:00Z	1016.3	310	9	14	1.8	7	11.1	8.6	11.9	85
M6	15°52.88	53°04.489	2019-05-17T06:00:00Z	1016.3	300	16	20	2.3	8	10.2	8.9	11.7	92
M6	15°52.88	53°04.489	2019-05-17T12:00:00Z	1017.5	330	12	16	2.1	7	10.7	6.8	11.7	77
M6	15°52.88	53°04.489	2019-05-17T18:00:00Z	1017.3	310	8	8	2	8	10.8	5.7	11.9	71
M6	15°52.88	53°04.489	2019-05-18T00:00:00Z	1017.7	310	9	14	1.8	7	10.6	6.8	11.9	77
M6	15°52.88	53°04.489	2019-05-18T06:00:00Z	1016.7	330	11	16	1.4	7	10.2	5.8	12	74
M6	15°52.88	53°04.489	2019-05-18T12:00:00Z	1017.3	330	9	12	1.4	6	10.6	5.4	12	70
M6	15°52.88	53°04.489	2019-05-18T18:00:00Z	1017.1	320	10	14	1.1	6	10.8	5	12.3	67
M6	15°52.88	53°04.489	2019-05-19T00:00:00Z	1017.9	270	6	8	1.2	5	10.3	4.8	11.9	69
M6	15°52.88	53°04.489	2019-05-19T06:00:00Z	1016.9	310	11	14	1.2	6	10.8	5.2	12.1	68
M6	15°52.88	53°04.489	2019-05-19T12:00:00Z	1018.1	NaN	NaN	NaN	1.1	5	10.6	5.7	12.2	72
M6	15°52.88	53°04.489	2019-05-19T18:00:00Z	1017.3	300	2	4	1.1	6	11.6	4.6	13.1	62
M6	15°52.88	53°04.489	2019-05-20T00:00:00Z	1017.5	100	4	8	1.1	6	10.8	4.4	12.7	65
M6	15°52.88	53°04.489	2019-05-20T06:00:00Z	1016.5	110	7	8	0.9	6	11	5.8	12.5	70
M6	15°52.88	53°04.489	2019-05-20T12:00:00Z	1017.9	110	10	12	0.8	6	11.5	6.6	12.8	72
M6	15°52.88	53°04.489	2019-05-20T18:00:00Z	1017.9	100	10	14	1	5	11.8	6.7	12.9	71
M6	15°52.88	53°04.489	2019-05-21T00:00:00Z	1019.1	130	11	16	1.4	5	11.7	6.9	12.3	72
M6	15°52.88	53°04.489	2019-05-21T06:00:00Z	1017.9	130	14	18	1.4	5	11.5	7.2	12.3	75
M6	15°52.88	53°04.489	2019-05-21T12:00:00Z	1018.3	130	16	NaN	1.7	5	11.7	8.7	12.5	82
M6	15°52.88	53°04.489	2019-05-21T18:00:00Z	1016.5	110	17	21	1.8	5	11.9	11	12.3	94
M6	15°52.88	53°04.489	2019-05-22T00:00:00Z	1015.7	NaN	NaN	NaN	1.8	5	12.3	11.3	11.9	94
M6	15°52.88	53°04.489	2019-05-22T06:00:00Z	1013.5	130	17	21	1.7	5	12.6	12	12.1	96
M6	15°52.88	53°04.489	2019-05-22T10:00:00Z	1013.3	130	18	21	1.7	5	12.2	11.8	12.1	97



Acknowledgements

This research survey is carried out with the support of the Marine Institute, funded under the Marine Research Programme 2014-2020 by the Irish Government to support and promote the Atlantic Ocean Research Alliance (2018-2021). Aaron Lim, Luke O' Reilly, John Appah, Kim Harris and Larissa Macedo are funded by the Science Foundation of Ireland Investigator Program (co-funded by the Marine Insitutie and Geological Survey, Ireland). The authors would like to thank Fergus McAuliff (outreach and communications manager, Irish Centre for Research in Applied Geosciences) and Emer O' Boyle (Director of the UCD Artist in Residency Program) for creating a link between art and science on this survey. Aaron Lim would like to thank Paddy O' Driscoll for his support in the year leading up to the survey in designing and implementing the fabrication of the Holland 1 ROV-adapted landers. The authors would like to thank the crew, officers and technical staff of the Holland 1 ROV and RV Celtic Explorer.