

# **CE21011 – Benthic Lander Recovery and Redeployment**



## **RV Celtic Explorer and Holland 1 ROV - Cruise Number CE21011**

### **Galway - Porcupine Seabight – Cork**

**14<sup>th</sup> August 2021 to 19<sup>th</sup> August 2021**

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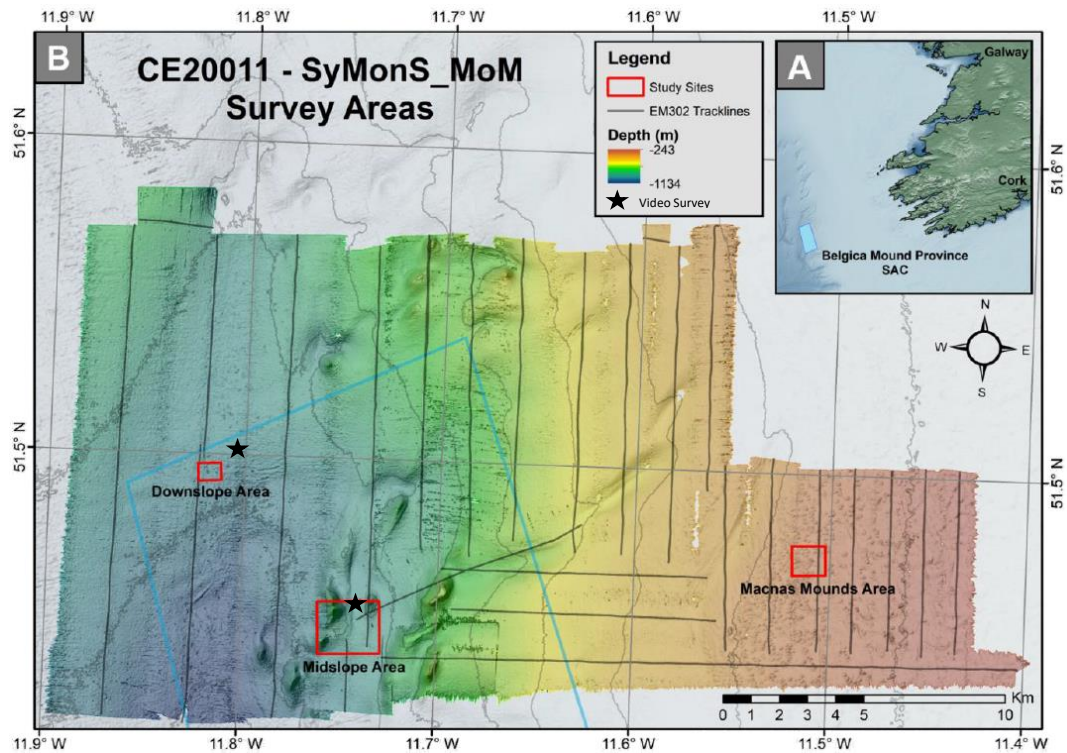
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## **Executive summary**

The Belgica Mound Province (BMP) in the NE Atlantic is home to diverse benthic megafauna, most notably cold water corals reefs. The reefs form mounds, which range in size from 3 to 12 m in height and occur in water depths of down to 1100m. In 2020, 7 benthic lander systems were deployed during the CE20011 cruise, to access the environmental controls on their growth and distribution patterns in the area. Each lander measured current speed and direction, temperature, biofouling and trapped current suspended particles for a period of 319 days. Cruise CE21011 sought out to recover, refit and redeploy these landers. Utilizing the *RV Celtic Explorer* and *Holland 1 ROV*, 6 of 7 landers were successfully recovered. 5 of the 6 landers had fallen over during their deployment cycle. Recovered ADCP data from these landers fell show that 1 fell over before starting to record (02/10/2020), 3 fell over after 3.5 weeks and 1 fell over after 22 weeks. 1 of the 7 landers deployed last year in the Macnas Mounds region was not recovered and was missing from the site. Sediment trap data shows little deposition across the sites, despite a prolonged capture window (15 days). ADCP data from each of the sites show periodic fluxes across temperature and current speeds. Biofouling was present on each lander. Coral dominated sediment waves from the midslope region discovered last year were imaged using the downward-facing 1080i HD video camera. 2 landers were redeployed in the downslope area, after a site suitability evaluation. These landers will extend the current assessment of the reefs to a two-year record. This data will be used in a number of projects including: the H2020 project “Integrated Assessment of Atlantic Marine Ecosystems in Space & Time” (*iATLANTIC*), 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, the Marine Protected Areas Monitoring and Management project funded through the INTERREG Va Regional Development Fund via SEUPG and the Marine Institute Post-doctoral Fellowship project, ‘Mop\_Up’ ([www.marinegeology.ucc.ie](http://www.marinegeology.ucc.ie)).

## **Background**

The Belgica Mound Province (BMP) is home to large cold water coral (CWC) mounds, which have accumulated through geological time. The corals which reside there are considered ecosystem engineers that form the base for biodiversity hotspots [1]. As such, the BMP been designated as a Special Area of Conservation. A recent study from the area shows a decline in coral cover across a 4 year span [2]. Investigations of temperature, current speeds and direction and supply of suspended particulate matter can provide crucial insights of why these organisms may be in a state of change. Data collected from this survey will grant further insights into these environmental proxies.



Survey areas from cruise CE20011. This years cruise (CE21016) returns to these sites to collect lander. Note inclusion of video survey carried out north east of downslope area.

## Survey Objectives

There are 4 key objectives on this cruise.

1. ROV Lander Retrieval

*Recover 7 landers deployed during last year's CE20011 cruise*

2. Explorative ROV Footage

*Acquire film for filmmaker Ken O'Sullivan*

3. ROV Lander Reconfiguration and Deployment

*Redeploy landers to extend environmental assessment of the BMP*

4. ROV Photogrammetry

*Acquire ROV footage of a coral mound using a 4m gridded survey design further adding to the interpretation of water column data collected during the QUERCI 1 research cruise [3]*

## **Equipment**

### *Research Vessel Celtic Explorer*

The *RV Celtic Explorer* is multipurpose research vessel measuring 65 metres in length and has a maximum endurance of 35 days. The aft deck of the vessel has a 25-tonne “A-frame” with 4 metres outward and inward reach, as well as a 3 metre, 10-tonne starboard “T-frame”. It has wet, dry and chemical laboratories equipped with standard scientific facilities. The ship contains three cranes located at the midship, forward and aft cranes, along with a 6 tonne CTD winch. The vessel is equipped with dynamic positioning (DP) and two Trimble 300-D GPS’. It has a personnel capacity of 20-22 berths for scientists/observers along with 13-15 berths for crew members who are highly skilled for the handling and deployment of scientific and engineering equipment.



*Drone image of the RV Celtic Explorer - by RCAirTech.uk*

### *Holland 1 ROV*

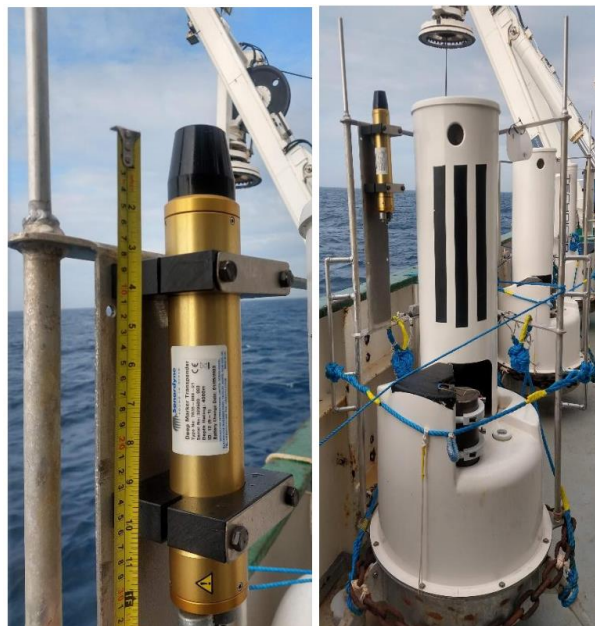
The *Holland 1* is a Remotely Operated Vehicle designed to perform a series of underwater operations including remotely-sensed data and sample collection. Its maximum depth can reach 3000 m at a maximum speed of 3 knots with 100 hp. The Holland 1 supports eleven camera systems which include a HDTV camera (HD Insite mini-Zeus with HD SDI fibre output), two deep-sea power lasers spaced 10 cm, a pan-tilt colour zoom camera (Kongsberg OE 14-366), a digital stills camera (Kongsberg OE 14-208), two HD high inspection cameras (Kongsberg OE 14-502), a Pegasus colour camera, two aurora colour cameras (for night vision), one mini tooling camera with an integrated ring light and two navigation-specific low-resolution cameras (Near SIT and B/W). Positioning data were recorded with a Sonardyne Ranger 2 ultra-short baseline (USBL) beacon and Kongsberg inertial navigation system (INS). The ROV It is also fitted with 2 robotic arms for sampling (1X7F and 1X5F) and an aspirator.



*Holland 1 ROV retrieving one of the lander systems*

### *Deep Water Lander Systems*

Eight deep-water lander systems have been designed especially for the UCC Marine Geosciences Research Group in partnership with the Marine Institute, Technicap and PO Maritime. Each lander is equipped with an Acoustic Doppler Current Profiler (ADCP) and sediment trap system. ADCP's are 1Hz Nortek Aquadopp, with maximum depth at 3000m, battery powered with autonomy of up to 12 months. All ADCPS were mounted vertically with sensors pointed upwards. The data measurement is performed 0-25 m from the transducer. The ADCPs were programmed to start data collection at 19/08/2021 and finish at 19/08/2022 with current speeds measuring for 2 minutes every 1 hour. Two landers were equipped with a Sonardyne transponder beacons for accurate positioning.



*Left: Sonardyne transponder beacon. Right: Lander system prior to deployment.*

The sediment trap systems are composed of streamlined carbon fibre housing with a funnel which allows particles to settle into bottles fixed in a battery powered rotating rosette. The rosette can support up to 24 plastic bottles of 500 ml which is connected to a titanium motor powered by a 12v AA alkaline battery pack. The rosette is programmed to rotate for each bottle to open for a period of 15 days. The bottles are set to collect particles (e.g. sediment, POM, microplastics) that settle into the funnel. For this survey, two of the landers were deployed with a sediment trap of 24 bottles programmed to rotate from the 19/08/2021 to the 19/08/2022 (1 year), where which bottle will stay open for 15 days. To prevent the decay of the organic matter in the samples for the 12 months, each of the 24 bottles were spiked with  $\text{HgCl}_2$ .

### Nylon strips

25 x 6 cm nylons strips were mounted to the lander frame for biofouling monitoring purposes. These are expected to serve as a harbour for biofouling material growth while the landers are underwater.



*Nylon strips (measuring tape as scale - right). Nylon strip mounted on lander frame (left)*

### Survey Log

Time (UTC +1)

#### 14.08.2021

14:00 Arrive at Galway Docks, temperature check and unpack rental vehicles.

15:00 Safety tour with Paddy. Ran through COVID protocols.

15:30 Organized wet lab and printed off safety data sheets for Mercury Chloride to hang around storage container.

19:00 Bridge talk with Dennis. Sailing at 20:00 hours for first site at Loop head. Loaded up the proposed sites into the SPS. We should arrive at Loop head for 0300 hours. Weather looking good from tomorrow night onwards

20:15 Left Galway dock for transit to Loop Head

**15.08.2021**

03:00 Arrived at Loop Head for first dive for Ken O'Sullivan

06:50 Finished dive

08:00 Transit to Shark Nursery

19:00 ADCP and Sediment trap demonstration in wet lab (retrieval and deployment)

20:00 Arrive on Shark Nursery site

**16.08.2021**

01:00 Surveying in Shark Nursery site complete. Transit to Macnas Mounds.

07:35 Arrived on site of Macnas Mounds area

08:40 ROV on bottom. HD video on.

09:00 Went to lander site Cyclops. Lander was not present on seabed. Exhaustive and systematic box search was done in the vicinity out to 150 to 200m from the deployment location. The ROV sonar (range – 50 m) was used to further scan the surrounding perimeter of the box. Moreover, no reliable signal was received the homing beacon attached to the lander. After 6 hours 41 minutes on the bottom the search was abandoned, and the lander is assumed lost.

14:25 Decision to recover ROV to deck and continue with survey.

14:55 Transit to lander site 2. MBES line ran over site in attempt to locate missing Lander. Unsuccessful.

16:10 Arrived in midslope region. Plan deviated to bring lander on downcast due to lack of recovery on last dive.

16:11 Deployment postponed for 30 minutes for maintenance issue with ROV.

17:49 Arrived in midslope region. Upon discovery of Lander Beyonce, it was on its side. Prior to retrieval, a video line was run with heading approximately north for 15 minutes, followed by a 15-minute return line to Lander site. Coral reefs are seen to occupy large sediment waves in the area. Lander Beyonce was then retrieved from its side. Lander on deck for immediate recalibration for upcoming deployment site. Removed beacon number 12 from Lander Beyonce. Attached Lander Higgins with beacon number 12 and fitted new batteries.

21:05 Arrived at downslope area. Deployment was postponed to leave ROV hydraulics cool down. Lander Beyonce was fitted with new lander bottles and ADCP and sediment trap batteries.

22:30 Began descent of ROV with Lander Higgins to downslope area. Target deployment adjacent to Lander Apollo. Lander Higgins deployed 25 m SW of Lander Apollo. Investigated other landers in the area, 4 had fallen over (Apollo, Dory, Elvis and Finbarr). Lander Gaia remained standing during the full duration of the deployment.

**17.08.2021**

01:40 *Lander recovery.* Recovered Lander Dory at 01:40. Recovered lander Elvis at 05:27. Recovered lander Finbarr at 07:37. Recovered Lander Apollo (includes beacon number 13) at 10:56. Attached beacon 13 to Lander Beyonce and deployed it in the study area at 14:04. Fired Nisken bottle above

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Lander Higgins for ADCP calibration. Nisken was orientated into the current to avoid capturing particles stirred by ROV thrusters. Lander Gaia recovered at 14:15.

15:50 Commenced transit to CWC video site. Arrived at 16:14. Commenced survey at 16:36, utilizing a 12 x 70 m grid lines with a 4 m spacing. ROV lasers were turned on for scale and videoing was carried out at 1.5 altitude. Surveying lasted 2 hours and 10 minutes. ROV recovered to deck at 20:00.

20:10 Transit to Midslope region to carry out further ROV exploration in area after areas of interest were identified previously in survey. ROV in water at 20:55 but retrieved at 21:04 due to technical fault with camera tilt. Issue resolved by 21:46. ROV redeployed by 22:06. Video survey began at 22:25, surveying with a heading of 020 from the Lander Beyonce recovery site following interesting coral distributions identified in dive 4.

### **18.08.2021**

02:52 ROV video survey finished. ROV on deck at 03:33. Begin transit to RMS Lusitania.

16:10 ROV deployed for surveying of RMS Lusitania for Ken O’Sullivan.

20:06 ROV on deck.

### **19.08.2021**

09:00 Arrived in Cobh.

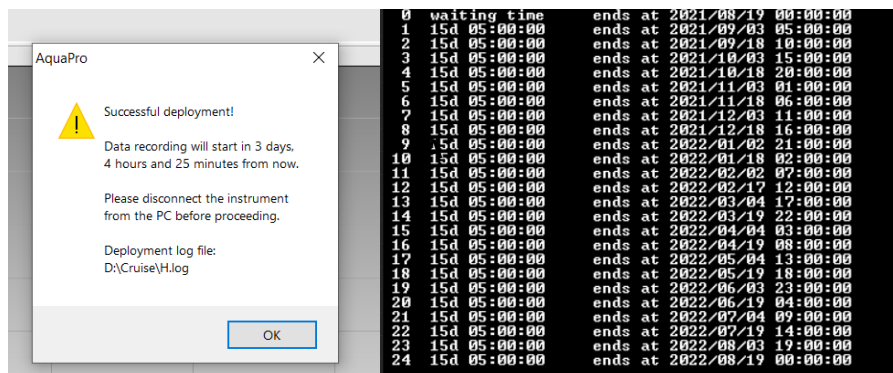
*End of Survey*

## Key Results Summary – Lander by Lander

### Lander Higgins

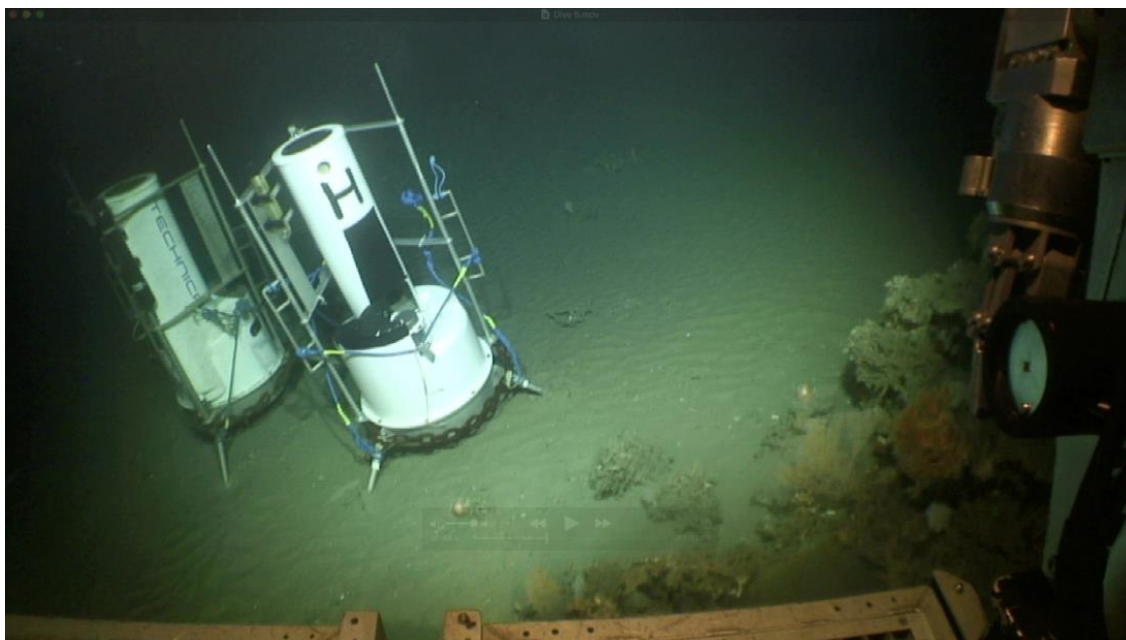
Lander Higgins had been stored with the Marine Institute and used as a ‘floater’, being prepared on transit to the first site.

#### *Deployment Preparation*



*Left: Lander Higgins Deployment Configuration Screenshot. Right: sediment trap configuration screenshot*

Lander Higgins was redeployed where Lander Gaia had been positioned in the downslope area during the CE20011 cruise, as Lander Gaia was the only one not to fall over.



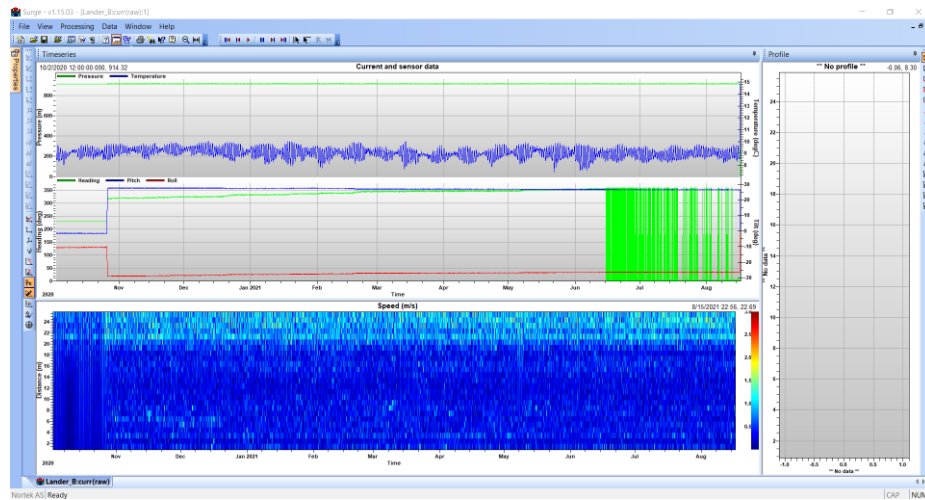
*Lander Higgins redeployed next to Lander Gaia*

## Lander Beyonce

Lander Beyonce was recovered on 16.08.2021 at 18.16 from the midslope area. It had fallen after about 3.5 weeks on the seabed.



*Lander Beyonce prior to recovery from seabed*

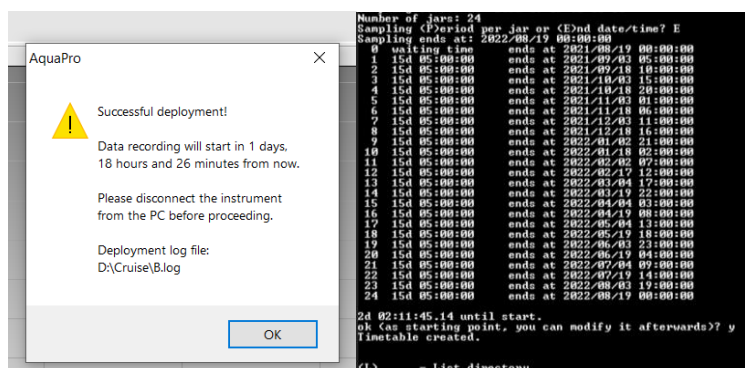


*Lander Beyonce ADCP data retrieved*



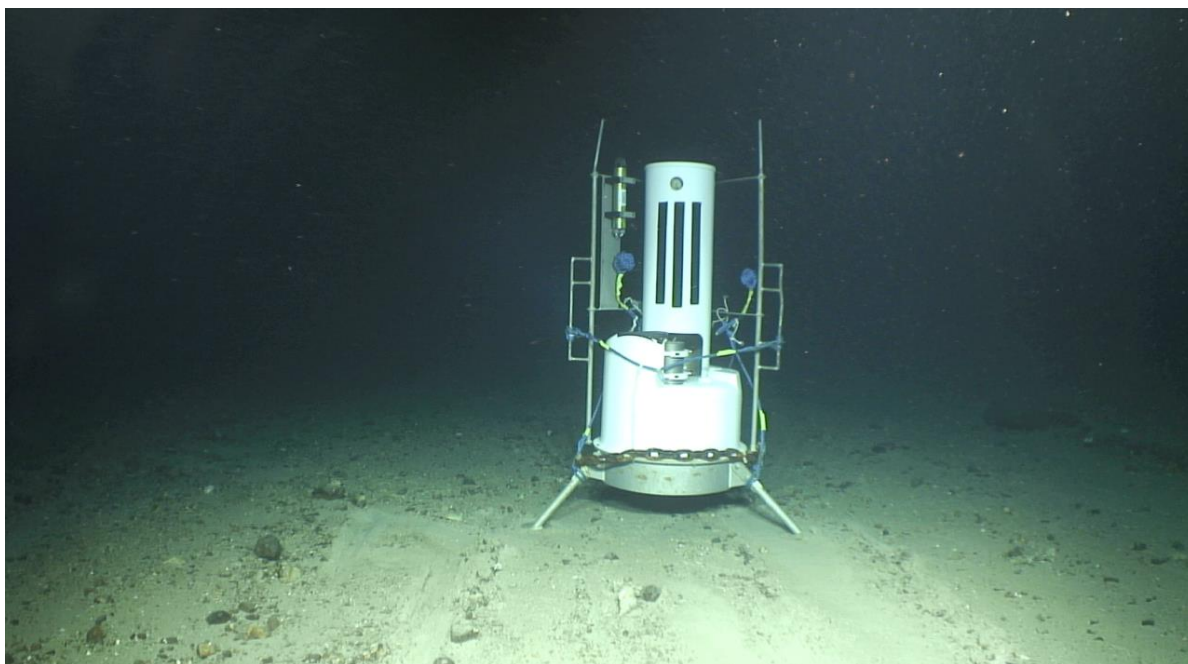
*Lander Beyonce nylon strip*

## Lander Beyonce reconfiguration



Left: Lander Beyonce ADCP reconfiguration screenshot Right: Reconfigured timetable for Sediment trap of lander B

Lander Beyonce was redeployed on 17.08.2021 at 13:04 in the same location where Lander Finbarr had been retrieved from (51.49699° N, -11.8181° E).



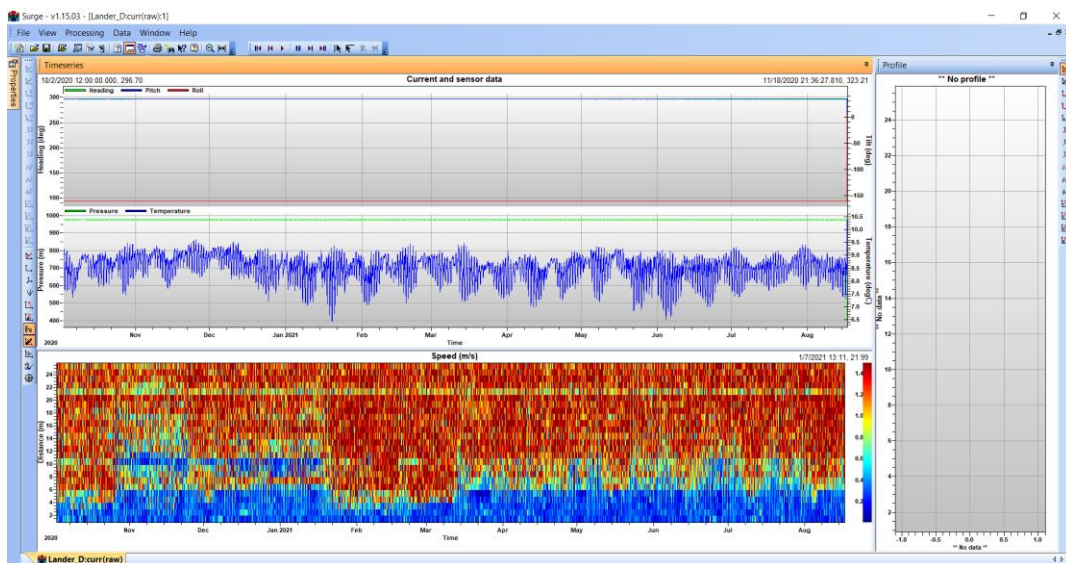
Lander Beyonce after redeployment

### Lander Dory

Lander Dory was found fallen over and recovered from the seabed on 17.08.2021 at 00:40. The ADCP data indicates that it fell between deployment and the programmed start of data recording, i.e. before 03.10.2020. The recorded temperature time series is still viable



*Lander Dory on seabed prior to recovery*



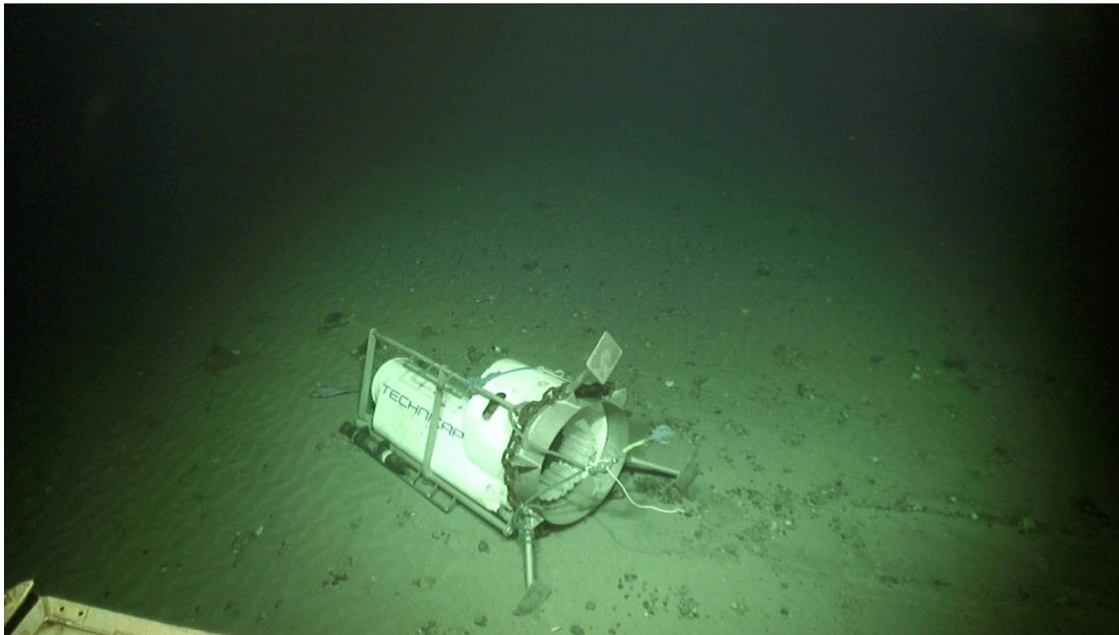
*Lander Dory ADCP data retrieved*



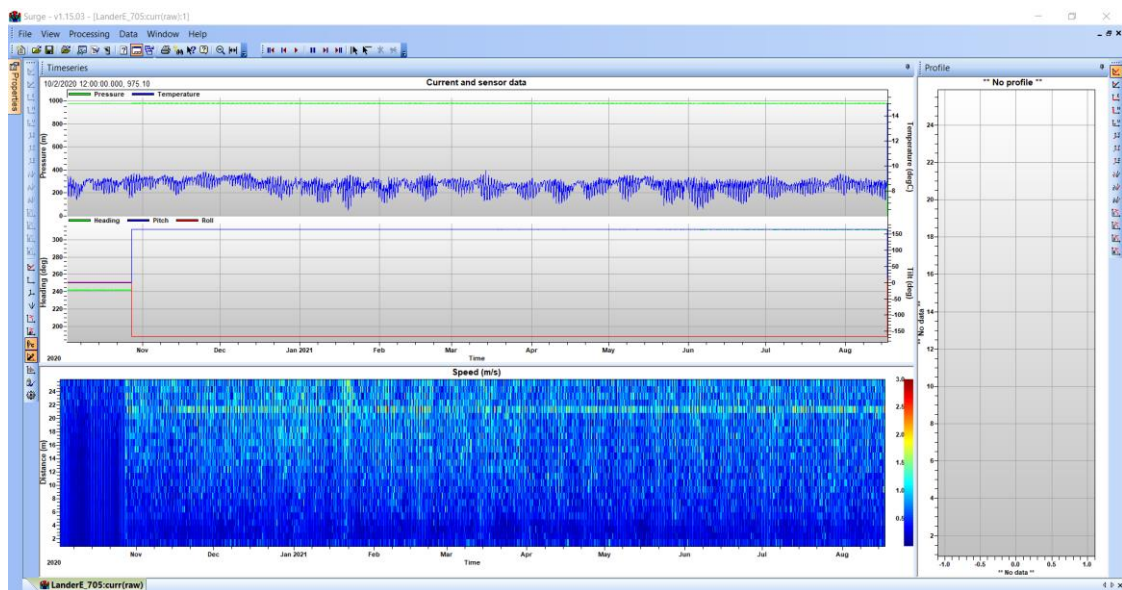
*Lander Dory nylon strip*

## Lander Elvis

Lander Elvis was recovered on 17.08.2021 at 04:27. It fell over after approximately 3.5 weeks at a similar time as Lander Beyonce.



*Lander Elvis prior to recovery*



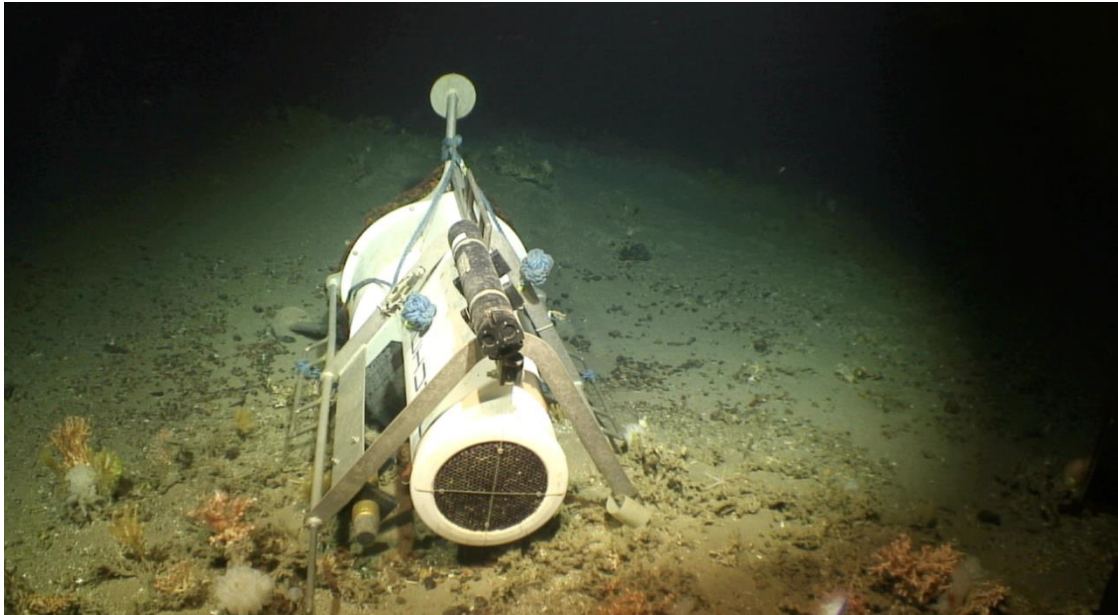
*Lander Elvis ADCP after retrieval*



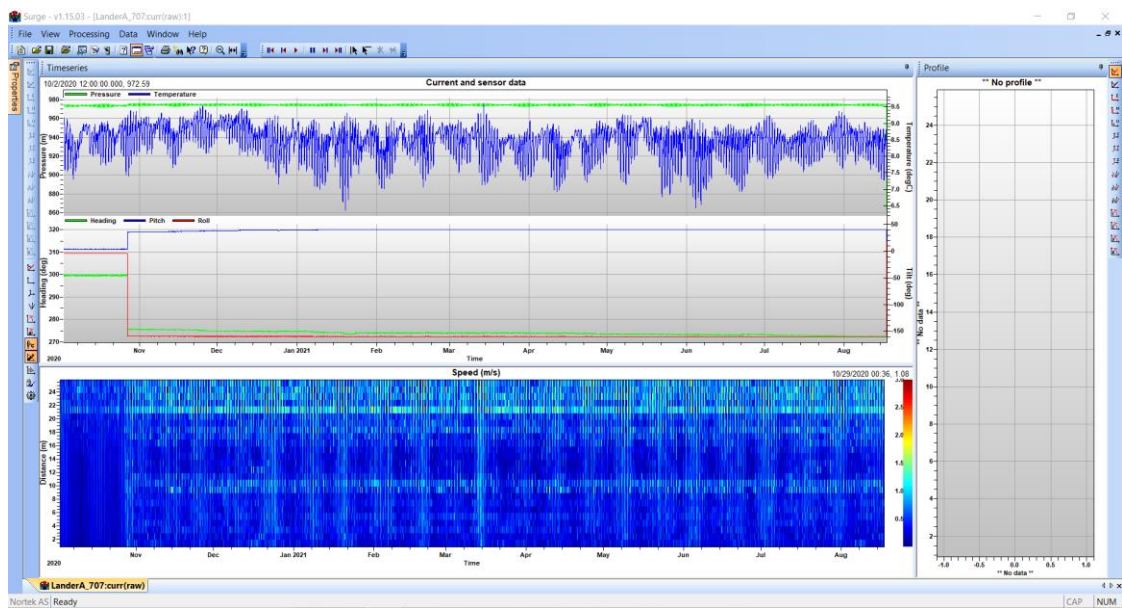
*Recovered nylon strip from Lander Elvis*

## Lander Apollo

Lander Apollo was recovered on 17.08.2021 at 09:55, having recorded for about 3.5 weeks.



*Lander Apollo prior to retrieval*



*Lander Apollo ADCP data after retrieval*



*Recovered nylon strip from Lander Apollo*

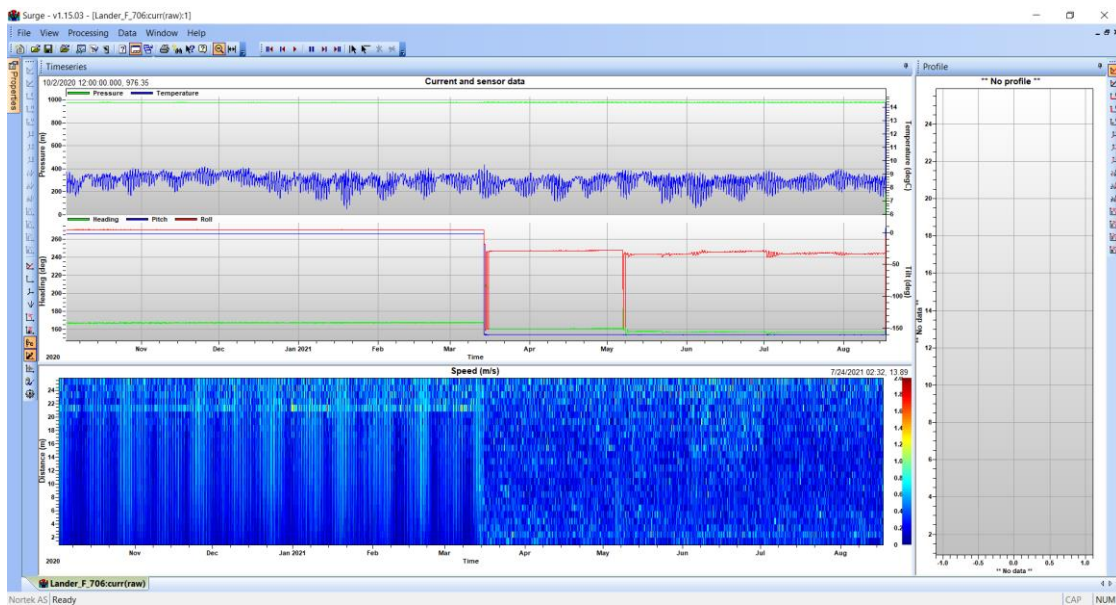
## CE21011 – Benthic Lander Recovery and Redeployment

### Lander Finbarr

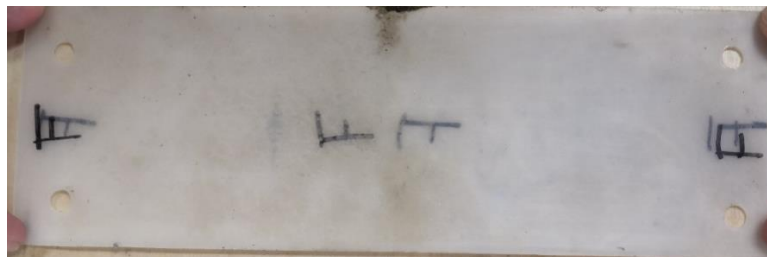
Lander Finbarr was retrieved at on 17.08.2021 at 07:56, having collected about 22 weeks of data before falling over around the spring equinox.



*Lander Finbarr on seabed prior to recovery*



*Lander Finbarr ADCP data after retrieval*



*Lander Finbarr recovered nylon strip*

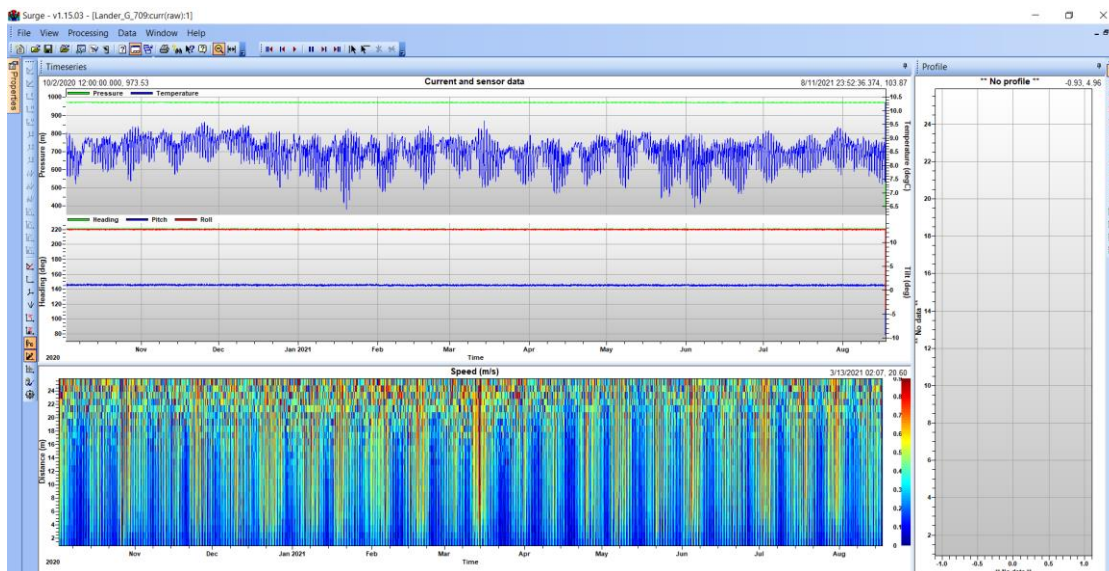
## CE21011 – Benthic Lander Recovery and Redeployment

### Lander Gaia

Lander Gaia was recovered on 17.08.2021 at 13.39. Prior to retrieving the lander, a Niskin bottle was fired 5m above the seabed at 13.19 to calibrate ADCP backscatter data. The lander was the only one to remain upright for the full deployment period and collected a full complement of ADCP data and 22 of the sediment trap sampling bottles closed prior to retrieval.



*Lander Gaia on seabed prior to recovery*



*Lander Gaia ADCP data after retrieval*



*Recovered nylon strip from Lander Gaia*

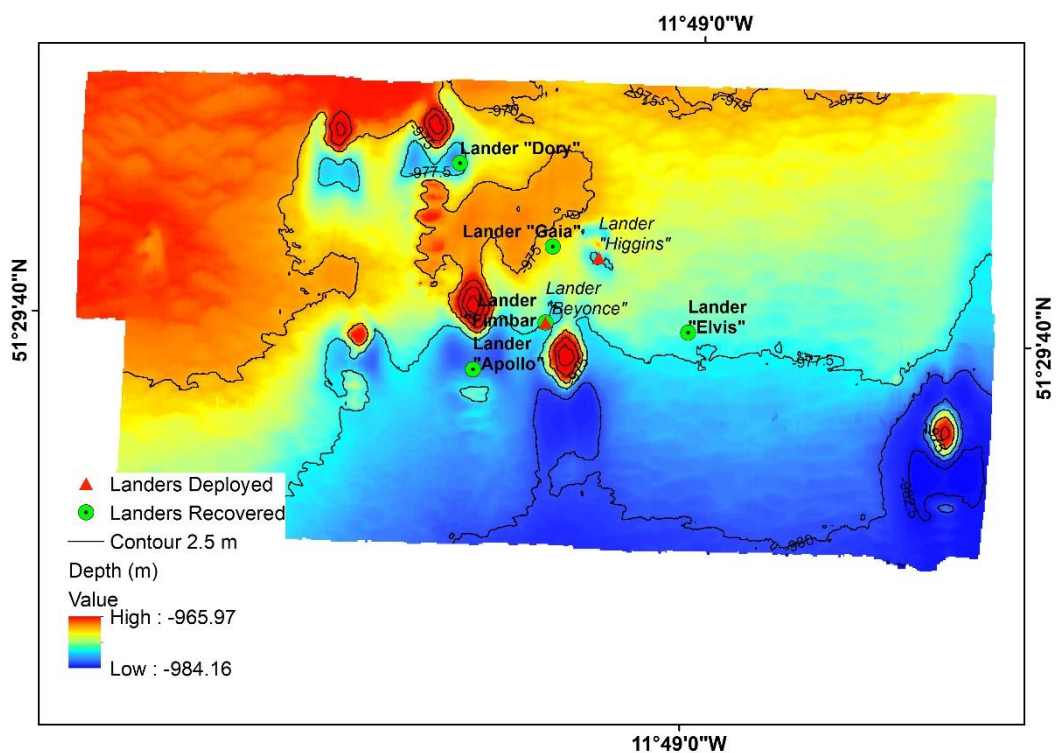
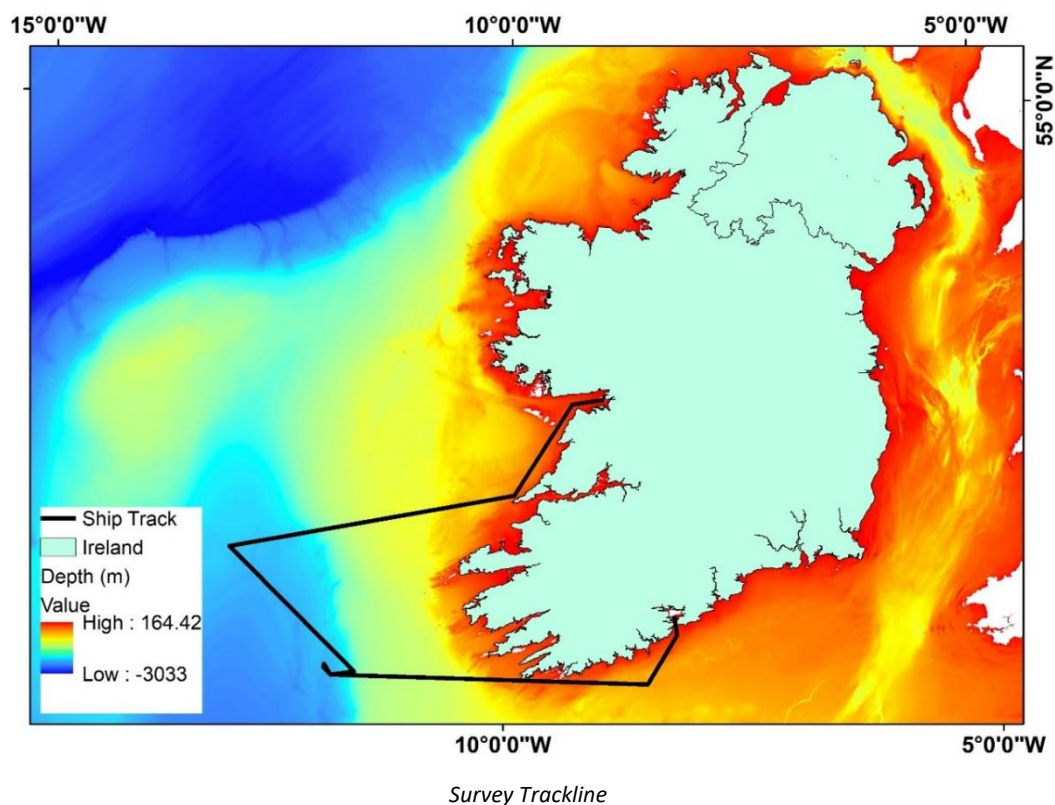
## Appendices

Ship's compliment		
Officers and crew	ROV Technical Team	Scientists
Captain Denis Rowan – Master	Paddy O'Driscoll – ROV Superintendent	Luke O'Reilly – Chief Scientist
Garvan Meehan – Chief Engineer	Karl Bredendieck - ROV Pilot	Gerard Summer – Day Watch Leader
Kenneth Downing – Chief Officer & Security Officer	Will Handley – ROV Pilot	Larissa Macedo de Oliveira – Night Watch Leader
Paddy Kenny – 2 <sup>nd</sup> Chief Officer & Safety Officer	Rob Carpenter – ROV Pilot	Prof. Andy Wheeler – Scientist
John Sammon – 2 <sup>nd</sup> Engineer	Richard Goligher – ROV Pilot	Felix Butschek – Scientist
Mike Slyne – Electro-Technical Officer	George “Dode” Findlay – ROV Pilot	Ken O'Sullivan - Film maker
Thomas Gilmartin - Bosun		
Noel O'Driscoll – Bosun's Mate		
Colm McGuinness – AB Deckhand		
Nigel Dowd – AB Deckhand		
Peter Joyce – AB Deckhand		
Tómas O'Gralaig – AB deckhand		
Jimmy Moran – Cook		
Maurice Murphy – Asst Cook		
Clynton Gregory – Technician		



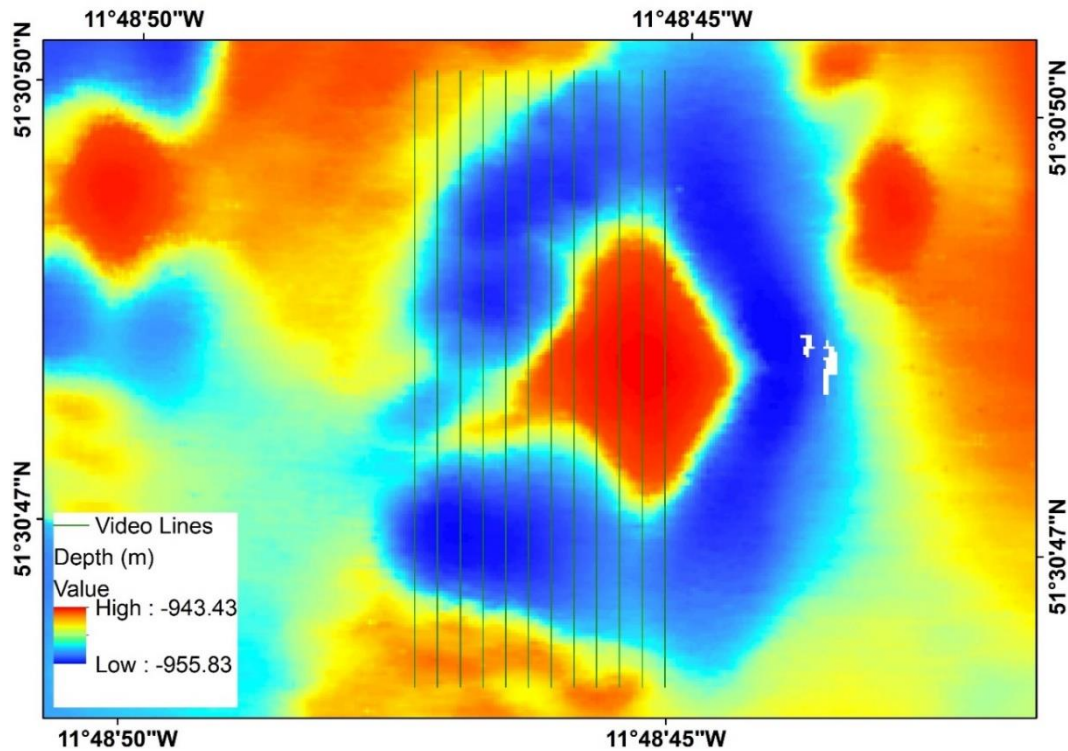
*L – R: Larissa Macedo, Ken O'Sullivan, Felix Butschek, Gerard Summers, Luke O'Reilly and Prof. Andy Wheeler*

### Stations (Logs and maps)



Lander recovery and redeployment in the Moira Mounds region

## CE21011 – Benthic Lander Recovery and Redeployment



Survey track line (Dive 11)

### Master Log

Station Number	Dive #	Date	Time (UTC)	DMS	DMS	Tick appropriate				Note
				Latitude	Longitude	Depth (m)	ROV Video	Lander	Hull MBES	
1	1	15.08.21								Arrived on site for Loop Head dive
1	1	15.08.21								ROV deployed
1	1	15.08.21								ROV recovered
2	2	15.08.21								Arrived on site for Shark Nursery Dive
2	2	15.08.21								ROV deployed
2	2	15.08.21								ROV recovered
3	3	16.08.21	06:35	51° 28' 22.267	11° 30' 33.926	343				Arrived on site for Macnas Mounds
3	3	16.08.21	07:18							ROV in water
3	3	16.08.21	07:40	51° 28' 23.4108	11° 30' 35.277	347				ROV on bottom - HD on *Ship cords - C Nav"
3	3	16.08.21	13:15	51 28 20.815	11 30 36.344	344			X	MBES SOL Sonardyne ship EM302
3	3	16.08.21	13:20	51 28 20 866	11 30 36.360	345			X	MBES EOL Sonardyne Ship 0046
3	3	16.08.21	13:25	51 28 20.5066	11 30 35.2972	346		x		ROV left bottom, lander C not recovered

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3	3	16.08.21	13:55						ROV recovered
		16.08.21	13:58						Transit to start of MBES line
4		16.08.21	14:00	51 28 25.174	11 30 27 665				Start of MBES
4		16.08.21		51 28 09.502	11 31 01.085				End of MBES
5	4	16.08.21	16:18	51 26 49.580	11 44 32.025	900			ROV in water
5	4	16.08.21	16:57	51 26 49.7941	11 44 32.1525	904		X	ROV on bottom
5	4	16.08.21	16:49	51 26 49.7432	11 44 32.1367	901		X	Lander "Beyonce" sighted. Commenced video line north of lander for potential further ROV video survey
5	4	16.08.21	18:16	51 26 50.2203	11 44 30.7222	903		X	Lander "Beyonce" recovered ROV off bottom.
5		16.08.21	18:55						ROV recovered
6		16.08.21	20:05						Arrive at Lander Site 3
6	5	16.08.21	21:28	51 29 38.282	11 49 11.949	965			ROV in water
6	5	16.08.21	21:36	51 29 38.386	11 49 12.033	965			ROV descending with Lander "Higgins" with beacon
6	5	16.08.21	22:15	51 29 38.7346	11 49 09.0544	970		X	ROV on bottom
6	5	16.08.21	22:29	51 29 38.7543	11 49 09.0523	970		X	Lander "Higgins" deployed
6	5	16.08.21	22:40	51 29 38.699	11 49 09.02	967		X	Lander "Apollo" spotted - Fallen on its side - with beacon
6	5	16.08.21	23:03	51 29 39.820	11 48 58.739	964		X	Lander "Elvis" spotted - Fallen on its side
6	5	16.08.21	23:23	51 29 39.909	11 49 03.200	967.2		X	Lander "Finbarr" spotted - Fallen on its side
6	5	16.08.21	23:34	51 29 40.152	11 49 94.05	962.3		X	Lander "Gaya" spotted - up right position
6	5	16.08.21	23:42	51 29 41.126	11 49 09.235	963.1		X	Lander "Dory" spotted - fallen on its side
6	5	17.08.21	00:40	51 29 43.442	11 49 07.146	928.3		X	Lander "Dory" secured by ROV - recovery to surface starts
6	5	17.08.21	01:21	51 29 43.330	11 49 7.565	17.4		X	ROV off water
6	5	17.08.21	01:25	51 29 43.330	11 49 7.569	0		X	ROV on deck
7	6	17.08.21	02:00:00	51 29 38.201	11 49 6.580	0		X	ROV off deck
7	6	17.08.21	02:45	51 29 38.609	11 49 6.602	966.1		X	ROV on bottom - start recovery of Lander "Higgins" for new deployment
7	6	17.08.21	02:57	51029 38.697	11 49 5.825	962.6		X	Lander Higgins secured - start transit to redeployment site

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7	6	17.08.21	03:15	51 29 41.773	11 49 3.301	962.9		X		ROV spotted Lander "Gaya" site - Started redeploy lander "Higgins" at the site
7	6	17.08.21	03:24	51 29 41.740	11 49 3.421	963.1		X		Lander "Higgins" deployed at new site
7	6	17.08.21	04:27	52 29 40.907	12 49 3.978	964		X		Lander "Elvis" recovered
7	6	17.08.21	04:54	51 29 42.086	11 49 09.67	0		X		ROV at surface
7	6	17.08.21	05:04	51 29 40.492	11 49 02.470	0		X		ROV on deck
8	7	17.08.21	05:49	51 29 40.457	11 49 02.527	0				ROV off deck
8	7	17.08.21	05:52	51 29 40.457	11 49 02.527	0				ROV in water
8	7	17.08.21	06:37	51 29 39.989	11 49 03 579	959		X		ROV on bottom for retrieval of lander "Finbarr"- spotted lander "F"
8	7	17.08.21	07:06	51 29 41.959	11 49 01.200	737		X		Lander "Finnbar" retrieved
8	7	17.08.21	07:41	51 29 38.107	11 49 04.597	0				ROV on deck
9	8	17.08.21	08:25	52 29 38.107	12 49 04.597	935				ROV in water
9	8	17.08.21	09:56	51 29 39.518	11 49 06.115					Lander "Apollo" recovered
			10:40	51 29 37.522	11 49 06.445					ROV on deck
10	9	17.08.21	12:12	51 29 37.564	11 49 06.530					ROV in water
10	9	17.08.21	13:04	51 29 49.176	11 49 05.095	966				Lander Beyonce depolyed with Beacon 13
10	9	17.08.21	13:15	51 29 42.056	11 49 03.739	965.4		X		Sighted "Gaia" and "Higgins"
10	9		13:19	51 29 42.056	11 49 03.739	960				Niskin bottle fired over lander H
11	10	17.08.21	13:39	51 29 41.809	11 49 03.246	965		X		Lander Recovered and ROV ascending.
			14:35							ROV on deck
	11	17.08.21	14:50							Transit to CWC video site
12	11	17.08.21	15:14	51 30 45.955	11 48 46.250					ROV deployed
12	11	17.08.21	15:36	51 30 08.860	11 48 76.59		X			ROV on bottom video survey commence
12	11	17.08.21	18:10							ROV video survey complete
12	11	17.08.21	19:00	51 30 40.851	11 48 56.166					ROV on deck
13	12	17.08.21	19:55	51 26 48.700	11 44 30.350		X			ROV off deck
13	12	17.08.21	20:04	51 26 50.184	11 44 30.720					ROV recovered due to technical issues with camera tilt
13	12	17.08.21	20:46	51 26 50.192	11 44 30.782		X			ROV off deck - Issue with camera tilt repaired
13	12	17.08.21	21:06	51 26 50.192	11 44 30.782		X			ROV in water

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13	12	17.08.21	21:25	51 26 52.256	11 44 26.261	900				ROV on bottom - Video survey commenced
13	12	18.08.21	01:52	51 28 16.498	11 43 36.819	882				Video survey finished
13	12	18.08.21	02:21	51 28 15.949	11 43 36.677	0				ROV at surface
13	12	18.08.21	02:33	51 28 39.939	11 43 39.681					ROV on deck
14	13	18.08.21	15:15	51 25 00.332	08 33 04.972	0				ROV in water
14	13	18.08.21	16:13	51 24 45.473	08 32 52.119	84				RMS Lusitania spotted
14	13	18.08.21	16:38	51 24 46.860	08 32 53.831	0				ROV on deck to load up chum bucket
14	13	18.08.21	17:10	51 24 46.860	08 32 53.831	0				ROV back in the water
14	13	18.08.21	20:40	51 24 46.821	8 32 53.854	0				ROV at surface
14	13	18.08.21	21:06	51 24 46.821	8 32 53.854	0				ROV on deck, vessel to remain in position on DP for ROV dismantling

### Sediment Trap Log

<i>Sediment Trap</i>	<i>Bottle Number</i>	<i>Sample Retrieved (Y/N)</i>	<i>How much approx?</i>	<i>Description</i>	<i>Notes</i>
A	1	Y	<1%	POM, sediment	Data recorded until end of October
A	2	Y	<1%	POM, sediment	Data recorded until end of October
A	3	Y	<1%	POM, sediment	Data recorded until end of October
A	4	N	N/a	N/a	Fell over
A	5	N	N/a	N/a	Fell over
A	6	N	N/a	N/a	Fell over
A	7	N	N/a	N/a	Fell over
A	8	N	N/a	N/a	Fell over
A	9	N	N/a	N/a	Fell over
A	10	N	N/a	N/a	Fell over
A	11	N	N/a	N/a	Fell over
A	12	N	N/a	N/a	Fell over
A	13	N	N/a	N/a	Fell over
A	14	N	N/a	N/a	Fell over
A	15	N	N/a	N/a	Fell over
A	16	N	N/a	N/a	Fell over
A	17	N	N/a	N/a	Fell over
A	18	N	N/a	N/a	Fell over
A	19	N	N/a	N/a	Fell over
A	20	N	N/a	N/a	Fell over
A	21	N	N/a	N/a	Fell over
A	22	N	N/a	N/a	Fell over
A	23	N	N/a	N/a	Fell over

**CE21011 – Benthic Lander Recovery and Redeployment**

A	24	N	N/a	N/a	Fell over
B	1	N	<2%	POM, sediment	Fell over
B	2	N	<1%	N/a	Fell over
B	3	N	<1%	N/a	Fell over
B	4	N	<1%	N/a	Fell over
B	5	N	<1%	N/a	Fell over
B	6	N	<1%	N/a	Fell over
B	7	N	<1%	N/a	Fell over
B	8	N	<1%	N/a	Fell over
B	9	N	<1%	N/a	Fell over
B	10	N	<1%	N/a	Fell over
B	11	N	<1%	N/a	Fell over
B	12	N	<1%	N/a	Fell over
B	13	N	<1%	N/a	Fell over
B	14	N	<1%	N/a	Fell over
B	15	N	<1%	N/a	Fell over
B	16	N	<1%	N/a	Fell over
B	17	N	<1%	N/a	Fell over
B	18	N	<1%	N/a	Fell over
B	19	N	<1%	N/a	Fell over
B	20	N	<1%	N/a	Fell over
B	21	N	<1%	N/a	Fell over
B	22	N	<1%	N/a	Fell over
B	23	N	N/a	N/a	In the process of deployment
B	24	N	N/a	N/a	Had not deployed yet
D	1	N	<1%	N/a	Fell over before started recording
D	2	N	<1%	N/a	Fell over before started recording
D	3	N	<1%	N/a	Fell over before started recording
D	4	N	<1%	N/a	Fell over before started recording
D	5	N	<1%	N/a	Fell over before started recording
D	6	N	<1%	N/a	Fell over before started recording
D	7	N	<1%	N/a	Fell over before started recording
D	8	N	<1%	N/a	Fell over before started recording
D	9	N	<1%	N/a	Fell over before started recording
D	10	N	<1%	N/a	Fell over before started recording
D	11	N	<1%	N/a	Fell over before started recording
D	12	N	<1%	N/a	Fell over before started recording
D	13	N	<1%	N/a	Fell over before started recording
D	14	N	<1%	N/a	Fell over before started recording
D	15	N	<1%	N/a	Fell over before started recording

**CE21011 – Benthic Lander Recovery and Redeployment**

D	16	N	<1%	N/a	Fell over before started recording
D	17	N	<1%	N/a	Fell over before started recording
D	18	N	<1%	N/a	Fell over before started recording
D	19	N	<1%	N/a	Fell over before started recording
D	20	N	<1%	N/a	Fell over before started recording
D	21	N	<1%	N/a	Fell over before started recording
D	22	N	<1%	N/a	Fell over before started recording
D	23	N	<1%	N/a	Fell over before started recording
D	24	N	<1%	N/a	Fell over before started recording
E	1	Y	<1%	POM, sediment	Data recorded until end of October
E	2	Y	<2%	POM, sediment	Data recorded until end of October
E	3	Y	<1%	N/a	Data recorded until end of October
E	4	N	<1%	N/a	Lander fell over
E	5	N	<1%	N/a	Lander fell over
E	6	N	<1%	N/a	Lander fell over
E	7	N	<1%	N/a	Lander fell over
E	8	N	<1%	N/a	Lander fell over
E	9	N	<1%	N/a	Lander fell over
E	10	N	<1%	N/a	Lander fell over
E	11	N	<1%	N/a	Lander fell over
E	12	N	<1%	N/a	Lander fell over
E	13	N	<1%	N/a	Lander fell over
E	14	N	<1%	N/a	Lander fell over
E	15	N	<1%	N/a	Lander fell over
E	16	N	<1%	N/a	Lander fell over
E	17	N	<1%	N/a	Lander fell over
E	18	N	<1%	N/a	Lander fell over
E	19	N	<1%	N/a	Lander fell over
E	20	N	<1%	N/a	Lander fell over
E	21	N	<1%	N/a	Lander fell over
E	22	N	<1%	N/a	Lander fell over
E	23	N	<1%	N/a	Lander fell over
E	24	N	<1%	N/a	Lander fell over
F	1	Y	<1%	POM, sediment	Data recorded until mid March
F	2	Y	<1%	POM, sediment	Data recorded until mid March
F	3	Y	<1%	POM, sediment	Data recorded until mid March
F	4	Y	<1%	POM, sediment	Data recorded until mid March
F	5	Y	<1%	POM, sediment	Data recorded until mid March

## CE21011 – Benthic Lander Recovery and Redeployment

F	6	Y	<1%	POM, sediment	Data recorded until mid March
F	7	Y	<1%	POM, sediment	Data recorded until mid March
F	8	Y	<1%	POM, sediment	Data recorded until mid March
F	9	Y	<1%	POM, sediment	Data recorded until mid March
F	10	Y	<1%	POM, sediment	Data recorded until mid March
F	11	Y	<1%	POM, sediment	Data recorded until mid March
F	12	N	<1%	N/a	Lander fell over
F	13	N	<1%	N/a	Lander fell over
F	14	N	<1%	N/a	Lander fell over
F	15	N	<1%	N/a	Lander fell over
F	16	N	<1%	N/a	Lander fell over
F	17	N	<1%	N/a	Lander fell over
F	18	N	<1%	N/a	Lander fell over
F	19	N	<1%	N/a	Lander fell over
F	20	N	<1%	N/a	Lander fell over
F	21	N	<1%	N/a	Lander fell over
F	22	N	<1%	N/a	Lander fell over
F	23	N	<1%	N/a	Lander fell over
F	24	N	<1%	N/a	Lander fell over
G	1	Y	<1%	POM, sediment	Full recovery
G	2	Y	<1%	POM, sediment	Full recovery
G	3	Y	<1%	POM, sediment	Full recovery
G	4	Y	<1%	POM, sediment	Full recovery
G	5	Y	<1%	POM, sediment	Full recovery
G	6	Y	<1%	POM, sediment	Full recovery
G	7	Y	<1%	POM, sediment	Full recovery
G	8	Y	<1%	POM, sediment	Full recovery
G	9	Y	<1%	POM, sediment	Full recovery
G	10	Y	<1%	POM, sediment	Full recovery
G	11	Y	<1%	POM, sediment	Full recovery
G	12	Y	<1%	POM, sediment	Full recovery
G	13	Y	<1%	POM, sediment	Full recovery
G	14	Y	<1%	POM, sediment	Full recovery
G	15	Y	<1%	POM, sediment	Full recovery
G	16	Y	<1%	POM, sediment	Full recovery
G	17	Y	<1%	POM, sediment	Full recovery
G	18	Y	<1%	POM, sediment	Full recovery
G	19	Y	<1%	POM, sediment	Full recovery
G	20	Y	<1%	POM, sediment	Full recovery
G	21	Y	<1%	POM, sediment	Full recovery
G	22	Y	<1%	POM, sediment	Full recovery
G	23	N	<1%	POM, sediment	Full recovery
G	24	N	<1%	POM, sediment	Full recovery

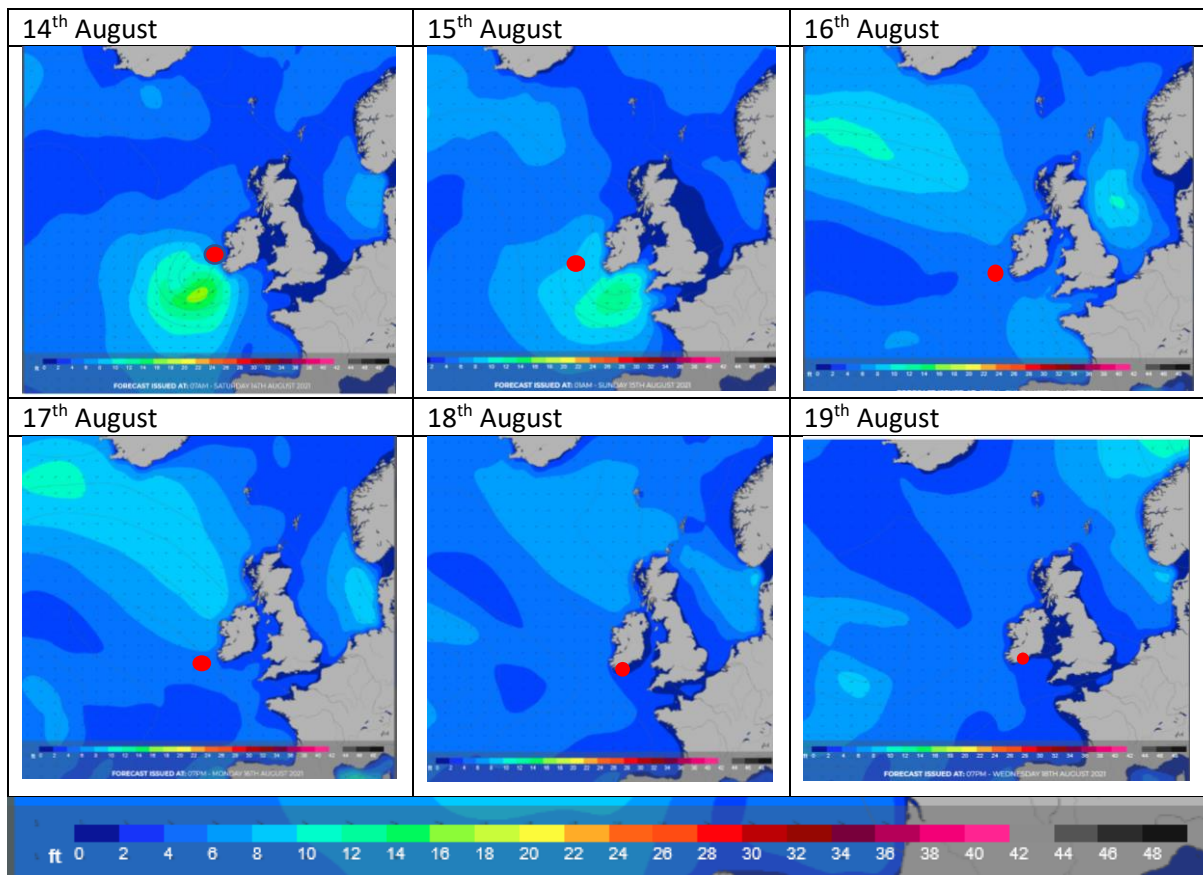
### Lander Nomenclature

Lander Code	Name	Definition
Lander A	Apollo	Greek God of Truth, our rocket to the deep
Lander B	Beyonce	A lander of destiny, doing her thing in the deep, an unstoppable force
Lander C	Cyclops	Mythological one-eyed monster, sadly the one that got away
Lander D	Dory	With a homing beacon, Dory will never get lost
Lander E	Elvis	The King, respect
Lander F	Finbarr	St. Finbarr, patron saint of Cork, from whom all knowledge flows
Lander G	Gaia	Mother Earth, our muse
Lander H	President Higgins	Presidential-class lander, a pint-sized colossus of our time

*Note: all Landers are Little MonStas [4]*

### Weather Report

#### Wave Height



14<sup>th</sup> August 2021

*Galway and transit to Loop Head*

21.28: Easterly Force 4

23.52: South East Force 4

15<sup>th</sup> August 2021

*Loop Head to northern Porcupine Seabight (Hovland Mounds) and transit to the NE Porcupine Seabight (Macnas Mounds)*

08:00 North Force 3, slight sea , visibility good

10:00 North Force 6

12.12: North Force 7

17.15: North West Force 5-6, moderate sea

20.03: North West Force 5, moderate sea

23.53: North West Force 4

16<sup>th</sup> August 2021

*NE Porcupine Seabight: Macnas Mounds to Moira Mounds*

08.00: North West Force 5, slight sea, visibility good

11.55: North West Force 5

20.00: West North West Force 4, slight sea, visibility good

23.54: North West Force 4

17<sup>th</sup> August 2021

*NE Porcupine Seabight: Moira Mounds to north east of Galway Mound*

06.05: West North West Force 4, slight sea

08.00: West North West Force 4, slight sea

11.52: North West Force 5

20.00: Westerly Force 4

23.54: North West Force 4

18<sup>th</sup> August 2021

*NE Porcupine Seabight to RMS Lusitania (off Kinsale Head)*

07.55: Westerly Force 3slight/calm sea, visibility good

20.00: North East Force 2, calm

23.55: South West Force 4

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*Iconic. Best served with a thin veneer of mustard*