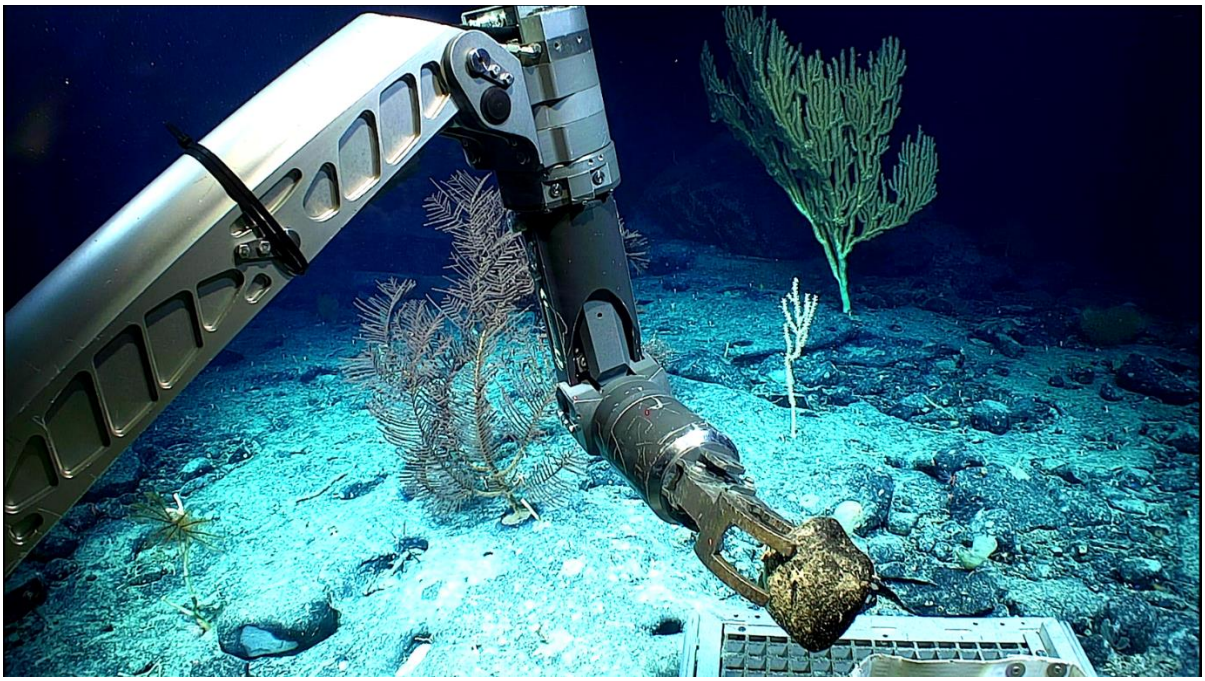
CE25008 – Volcanoes of Middle Earth and their Vulnerable Marine Ecosystems (VMEx2)



RV Celtic Explorer & Holland 1 ROV

Survey Number CE25008

Galway - Rockall Bank – Eriador Ridge – Edoras Bank – Owlsgard Bank - Rockall Bank - Galway

26th May – 16th June 2025

Andrew J. Wheeler[1]*, Felix Butschek[1], Manfredo Capriolo[2], Aaron Grey[1], Jessica Harty[3], Hazel Knight[2], Alexa Parimbelli[4], ROV Technical Team[5], Officers & Crew of the RV Celtic Explorer[5]

[1]School of Biological, Earth & Environmental Science, University College Cork, Ireland
[2] School of Geography, Earth & Environmental Sciences, University of Birmingham, UK
[3]Freelance
[4] Dept of Zoology, School of Natural Sciences, University of Galway, Ireland
[5]P&O Maritime and Marine Institute, Galway, Ireland

Corresponding author*: a.wheeler@ucc.ie

Table of Contents

Executive Summary

The "Volcanoes of Middle Earth and their Vulnerable Marine Ecosystems" survey (CE25008) set out to explore submarine seamounts and volcanic edifices (previously named after J.R. Tolkien's fantasy world) on the far western limit of the Irish continental margin. These presumed volcanic features covering 10,000s km^2 have not been sampled or directly observed before. Rock samples will enable us to assess their lithotype with petrographic and geochemical studies providing key insights on their emplacement history and relationships with other geological structures and processes. Dating of these rock samples will enable us to link eruption events to the timing of the North Atlantic Igneous Province (NAIP) and related past global climate warming events (namely the Paleocene-Eocene Thermal Maximum). Lastly, detailed mapping and sampling will also allow us to confirm that Eriador Ridge is a remnant of the Mid-Atlantic Ridge, unravelling further details on the opening of North Atlantic Ocean.

Biologically, little is known about the sessile megafauna in this region, although the presence of cold-water coral and sponge-dominated ecosystems has been modelled, fisheries by-catch noted and an EU fisheries closure enacted. Benthic video imaging of the VMEs (Vulnerable Marine Ecosystems) and their characterisation based on coral and sponge identification, verified by sampling for genetics, will greatly aid our understanding, thus supporting responsible management.

During this survey, Eriador Ridge was 90% mapped with 2,350 km^2 of hull-mounted multibeam echosounder for the first time, revealing a ridge composed of two sub-circular misaligned edifices. The top of each flank reveals a row of small cone-shaped rock outcrops, whereas the central area is flat and filled by sediments. An ROV dive near the crest of its western ridged flank (2360 m water depth) revealed a basalt-dominated terrain with the presence of megafauna including holothurians, sea lilies, antipatharians and bamboo corals. The basaltic rocks show features of typical middle-ocean ridge environments, with pillow- and rope-like geometries and lobe-rich flows. Overall, 19 rock (mostly basalt) samples have been collected from Eriador Ridge.

Edoras Bank is a series of aligned large circular plateaus. ROV video observations confirmed that the lower flanks (ca. 2500 m water depth) of two (western and middle) edifices exhibited steep slopes and cliffs made of basaltic rocks with pillow lavas supporting corals and sponges. The summit of the largest, easternly bank (ca. 1200 m water depth) had scarce bedrock exposures, but still supporting corals and sponges on dropstones. Mineralogical and geochemical analysis will help to verify this uncertainty. In total, 2122 km^2 of seabed was mapped, also covering a gap in the National Seabed Survey (Infomar) dataset, thus revealing craggy margins with many volcanic cones occurring also across the tops of the bank, some flat-topped. Overall, 45 rock samples (plus 12 pebbles from two dredges) have been collected from Edoras Bank. Among these, 31 rock (mostly basalt) samples are from Edoras Bank West and Middle, whereas 14 rock (mostly sandstone) samples are from Edoras Bank East.

Sandstones from Edoras Bank East suggest a more complex geological history or, potentially, that ice-rafted debris was sampled due to the lack of bedrock exposure. This difference in the predominant lithotype between the western (magmatic/oceanic) and eastern (sedimentary/continental) sectors of Edoras Bank supports the preliminary interpretations from geophysical data, which indicate the occurrence of continental crust slivers exclusively in the eastern portion of Edoras Bank.

The objective to deploy twin Little MonSta monitoring stations on and off a cold-water mound to assess the positive feedback of topography on internal wave dynamics influencing coral mound habitats was not possible due to the weather. However, one Little MonSta was deployed for 13 days (from which 3 days of data was valid) and 13 CTD cases with a downward-looking ADCP were taken every hour over the site with bottles fired to quantify the particulate organic carbon (POC) content in the water at depths. In addition, two long duration CTD with L-ADCP deployments (downward-looking ADCP; respectively, 8 and 9 hour duration) were carried out at basal water mass boundaries (485 mwd over a mound and 708 mwd off a mound). These data will help to assess internal waves, food supply to corals and its influence of coral habitat benthic environments.

Vulnerable Marine Ecosystem (VME) habitats were video surveyed on the Eriador Bank (2 dives), Edoras Bank (3 dives) and the Logachev Mounds (Rockall Bank, 3 dives) with key VME species noted. (1) *Solenosmilia variabilis* (Hexacorallia: Scleractinia) was observed forming aggregations on Edoras Bank and Eriador Seamount; (2) Reefs of *Madrepora oculata* and *Desmophyllum pertusum* were present on the top of all the mounds explored in the Logachev Mound province, were signs of historical trawling were recorded (fishing nets). The reefs on the Logachev mounds co-occurred with black and octocoral gardens dominated by *Leiopathes* sp. (orange and white morphotypes), *Paramuricea* sp., and *Acanthogorgia* sp.. Black and octocoral gardens, mainly dominated by *Bathypathes* sp., *Telopathes* sp. and *Keratoisididae* sp. (node-less branching, and whip-like), and hexactinellid sponge aggregations were also observed on Eriador. VME data collected on the dives will be annotated and used to inform predictive mapping in the north-east Atlantic. The reefs observed on the Logachev mounds were particularly abundant in species diversity, with numerous fish (conger eels, north Atlantic codlings, scorpion fish, and monk fish), chimaeriforms, crabs (including several *Paromola cuvieri*), and one skate observed.

In total, 58 biological samples were taken. Most of them were collected by snapping coral branches with coral cutters mounted on the ROV arm. Corals collected included dead and alive scleractinians (*Caryophyllia* sp., *Madrepora oculata*, *Desmophyllum pertusum*) antipatharians (*Antipathes* sp., *Bathypathes* sp., *Chrysopathes* sp., *Leiopathes* sp., *Parantipathes* sp., *Phanopathes* sp., *Sibopathes* sp., *Stauropathes* sp., *Telopathes*) , bamboo corals (*Keratoisididae*), and other octocorals (*Paramuricea* sp., *Acanthogorgia* sp.). Other samples consisted of associated organisms (i.e., animals attached to the coral colonies at the moment of collection) such as crinoids, brittle stars, and polychaetes. Zoanthids were collected during dredging. The samples collected will be identified using traditional and

molecular taxonomy to inform on which species are forming VMEs in the explored sites, and will in future ecological studies of habitat connectivity and characterization.

The survey was badly hampered by adverse weather with tight ROV diving weather windows and significant downtime due to ROV-related technical issues. As a result, no data was collected from Gondor Seamount, Fangorn or Lorien Banks, although Fangorn was rock sampled in last year PORO-CLIM Phase 2 survey on the RV Celtic Explorer and biologically surveyed previously.

Background

North Atlantic Igneous Province

Large Igneous Provinces (LIPs) are the result of exceptional magmatic activity, involving 10^6 km^3 of mainly basaltic magmas emplaced over a few million years (Myr) (Ernst 2014). Their peak activity, spanning less than 1 Myr, usually coincided in time with climatic and environmental changes, eventually leading to biotic turnovers throughout Earth's past (Clapham & Renne, 2019). The synchrony between the emplacement of LIPs and the occurrence of climatic and environmental perturbations hinges on the volcanic and thermogenic greenhouse gas emissions, whose gas remnants are preserved as melt and fluid inclusions in rock-forming minerals from LIPs (Capriolo et al. 2020; 2021). One of the most recent and most extensively studied events is the Paleocene-Eocene Thermal Maximum (PETM) climate change, triggered by the emplacement of the North Atlantic Igneous Province (NAIP; Saunders et al. 2013; Jones et al. 2019).

Among the most voluminous LIPs, the NAIP extends from Greenland to the Scandinavian Peninsula, the Faeroes and the British Isles, and involves both intrusive and extrusive igneous rocks, mainly mafic lavas with a significant number of ultramafic and silicic components (Storey et al., 2007). Its peak activity, about 60 million years ago (Ma), is correlated with the ascent of abnormally hot proto-Icelandic plume and strictly associated with the continental break-up and with the subsequent opening of North Atlantic Ocean.

The Irish offshore sub-province of the NAIP is especially understudied. INFOMAR multibeam echosounder data visualises complex igneous geomorphological structures such as Eriador Ridge, Gondor Seamount, Edoras, Fangorn and Lorien Banks, but these remain poorly understood due to the lack of ground-truthing and subsurface information.

The Edoras Bank is a major elongate igneous structure composed of quasi-circular, gently steeping domes - five smaller domes (~20 km diameter) to the West, almost merging, and five bigger domes (the largest being ~70 km in diameter) to the East, that form a linear, slightly arcuate trend from WSW to ENE, extending to the Owlsgard, Sandarro, Lyonesse and Mammal complexes. These complexes are associated with a large, positive, near-circular gravity 'high' anomaly which is probably caused by a dense gabbroic pluton beneath the former volcano (Hitchen, 2004). To the South, the Rohan and Fangorn Seamounts show a similar trend evoking tectonic magma emplacement controls. MBES data reveal several small secondary cones and plateaux, and probable guyots on Edoras and Fangorn.

Several questions on their geological significance, petrology, age, emplacement environment (subaerial or submarine) and relationship to the broader context of the NAIP exist. For example, seismic reflection profiles suggest that these centres erupted after the continental breakup, but the trigger and absolute timing of this postulated eruption in the absence of

rock samples remain unclear. However, one such mechanism which may be responsible could be the passage of a pulse of hot asthenosphere along the margin (Elliot & Parsons, 2008) as part of the NAIP activity.

NAIP magmatism is thought to have occurred in two principal periods, (I) 62–58 Ma and (II) 56–52 Ma (Wilkinson et al., 2016). The latter period was characterised by higher eruption rates and greater magmatic volumes, accompanied by rapid thinning and rupture of the continental lithosphere (Hitchen, 2004). This author supports the idea that the age of most of the Irish and British lavas is assumed to be adjacent to the Paleocene–Eocene boundary (at about 55.9 Ma). However, this is based on best estimate from a few dates obtained from the Rockall Bank and its granite (Ritchie & Hitchen, 1996).

Deep-water Vulnerable Marine Ecosystems, species description and delimitation

Away from human disturbance, the contemporary seabed on Fangorn Seamounts supports rich biodiversity of corals and sponges (Allcock et al., 2021), but little is known about the Edoras, Lorien and Edoras Banks (Morrisey et al., 2023). However, Ross et al. (2013) modelled a high probable of listed habitats. Such data, for example identifying the extent of VMEs, are critical for OSPAR deep-sea habitat assessments and supporting MPA designations.

The Irish deep-sea continental margin is noted for its bioabundant and biodiverse deep-sea habitats dominated by suspension- and filter-feeding megabenthic species (Morrissey et al., 2023). Due to their characteristic, many of these are classified as Vulnerable Marine Ecosystems (VME) identified under the United Nations General Assembly Resolutions 61/25 and 61/105 as sensitive communities vulnerable to identified impacts. To qualify as a VME, ecosystems must be unique and rare, have functional significance, be fragile with life-history traits of component species which make them slow to recover from fishing pressure, and possess structural complexity. Cold-water coral (Scleractinia, Antipatharia, Octocorallia) and deep-sea sponge dominated habitats often meet these criteria (Morrissey et al., 2023).

Very little information is available about the deep-sea communities on the seamounts SW of the Rockall Trough as these are mostly unexplored. Nevertheless, predictive modelling suggests the presence of VME forming species in the area (Yesson et al., 2012; Yesson et al., 2017; Ross et al., 2015; Howell et al., 2022; Rizzi et al, 2023, Parimbelli et al., in review).

Since the introduction of molecular studies of species delimitation, the accepted taxonomy of cold-water corals has been subjected to major taxonomical revisions, as the use of traditional taxonomic characters is not sufficient to correctly discriminate between cryptic species (e.g., Addamo et al., 2016; Watling et al., 2021; McFadden et al., 2022; Watling et al., 2022). As a result, many taxa have been revised or synonymised like in the case of *Lophelia pertusa*, now accepted as *Desmophyllum pertusum* (Addamo et al., 2016), and new species have been described (e.g., Morrissey et al., 2024). Species delimitation studies aim to understand the relationships between individuals belonging to same genera, therefore identifying the presence of cryptic species. help further unravel the complexity of cold-water

taxonomy and genetic affinities between taxa, more genetic sequencing of cold-water coral is required.

Cold-water coral habitats and internal waves

We know cold-water coral reefs benefit from particular organic carbon resuspension and concentration (Appah et al., 2020), which are invigorated by internal wave hydrodynamics in the Rockall Trough (Wang et al., 2019) and globally (van der Kaaden et al., 2024), yet the specific relationship between mounds and internal waves at the local reef scale is poorly understood. These relationships have been explored on the Porcupine Bank (Butschek et al., 2024) but high-resolution studies are need to specifically look at effect of reef topography on internal wave hydrodyamics at a local scale and potential positive feedback impacts.

Framework building cold-water corals give rise to diverse seabed morphologies and host exceptional levels of biodiversity in deep waters across the North-Atlantic Ocean (Morrissey et al., 2023). Their prevalence along the continental shelf edge has been linked to internal waves, a fundamental process to diapycnal mixing in the open ocean. Internal waves propagate into the deep ocean carrying energy from the mixed layer to the seabed. There, in deep waters across the Atlantic Ocean, azooxanthellate cold-water coral (CWC) ecosystems thrive below the photic zone feeding mainly on particulate organic carbon transfer from productive surface waters to the deep (Roberts et al., 2009). As suspension feeders, these cold-water corals benefit from strong currents, enhanced by internal waves, resuspending and delivering food. Recent studies measuring localized current speeds of up to 1.14 ms^{-1} (Lim et al., 2020) provide evidence that these systems are far from tranquil (e.g., Dorschel et al., 2007; Guihen et al., 2013). Calcareous framework-building cold-water corals (e.g *Lophelia pertusa* [aka De*smophelia* pertussum (Addamo et al., 2016)] and *Madrepora oculata*) can form biogenic reefs whose biodiversity and bioabundance exceed surrounding seabed areas (Henry and Roberts, 2007). The intermittent establishment of cold-water coral reefs may develop large carbonate mounds over geological time scales (Thierens et al., 2010).

A relationship between internal waves and cold-water corals has been observed as early as in the 1990s: while the distribution of CWCs around the Faroe Islands could not be fully attributed to internal waves, although a correlation between *Lophelia* abundance with slopes at which internal waves break was observed (Frederiksen et al., 1992). White (2007, 2003), White et al. (2007), White & Dorschel (2010) and Mohn et al. (2014) discussed the importance of internal waves to locally amplified bottom current conditions in CWC habitats of the Irish margin. These studies highlighted the important role of trapped as well as freely propagating internal waves, which are closely related in their dependence on topographic slope and background stratification (Huthnance, 1981), and may lead to local CWC hotspots (Mohn et al. 2014). Including such factors in species distribution models has thus been successfully implemented by Pearman et al (2020). Dorschel et al. (2005) and Mienis et al. (2007) also emphasised the importance of a locally amplified hydrodynamic regime to the balance between sedimentation and mound aggradation, underlining the importance of internal wave associated processes to CWCs at geological timescales.

Drawing on theoretical advances in internal wave theory since the mid-20th century, substantial progress on our understanding of internal wave – CWC interaction has been based on the coral-rich Irish margin. Van der Kaaden et al. (2021) postulated about the likely importance of internal waves to CWCs of the Logachev mounds through sediment resuspension, providing food supply in winter months with reduced availability of surface derived carbon. The combined lander deployment and oceanographic work during the VMEx2 survey tests this hypothesis using observational ADCP and CTD data as well as geochemical analyses.

References

Allcock, A.L & scientific party (2021). "Resources of Rockall" Cruise Report. RV Celtic Explorer and Holland 1 ROV. 21.07.2021 – 13.08.2021

Butschek, F., Lim., A., Arosio, R. & Wheeler, A.J. (2024). Could Cold-Water Coral Mounds Act as Natural Breakwaters for Internal Waves in Submarine Canyons?: a combined morphological – oceanographic investigation of baroclinic tides interacting with the seabed in a submarine canyon *INCISE*. *NIWA, Wellington, 2024.* Oral presentation

Capriolo, M., Marzoli, A., Aradi, L. E., Callegaro, S., Dal Corso, J., Newton, R. J., Mills, B. J. W., Wignall, P. B., Bartoli, O., Baker, D. R., Youbi, N., Remusat, L., Spiess, R. & Szabó, C. (2020). Deep CO_2 in the end-Triassic Central Atlantic Magmatic Province. Nature Communications 11, 1670. https://doi.org/10.1038/s41467-020-15325-6

Capriolo, M., Marzoli, A., Aradi, L. E., Ackerson, M. R., Bartoli, O., Callegaro, S., Dal Corso, J., Ernesto, M., Gouvêa Vasconcellos, E. M., De Min, A., Newton, R. J. & Szabó, C. (2021). Massive methane fluxing from magma–sediment interaction in the end-Triassic Central Atlantic Magmatic Province. Nature Communications 12, 5534. https://doi.org/10.1038/s41467-021-25510-w

Clapham, M. E. & Renne, P. R. (2019). Flood basalts and mass extinctions. Annual Review of Earth and Planetary Sciences 47(1), 275–303. https://doi.org/10.1146/annurev-earth-053018-060136

Dorschel, B., Hebbeln, D., Rüggeberg, A., Dullo, W.-C. & Freiwald, A. (2005). Growth and erosion of a cold-water coral covered carbonate mound in the Northeast Atlantic during the Late Pleistocene and Holocene. Earth and Planetary Science Letters 233, 33–44. https://doi.org/10.1016/j.epsl.2005.01.035

Elliot, G. M., Parsons, L., M. (2008). Influence of margin segmentation upon the break-up of the Hatton Bank rifted margin, NE Atlantic. Tectonophysics 457, 161–176

Ernst, R. E. (2014). Large Igneous Provinces. Cambridge University Press (United Kingdom).

Frederiksen, R., Jensen, A. & Westerberg, H. (1992). The distribution of the scleractinian coral Lophelia pertusa around the Faroe islands and the relation to internal tidal mixing. Sarsia 77, 157–171. https://doi.org/10.1080/00364827.1992.10413502

Guihen, D., White, M. & Lundälv, T. (2013). Boundary layer flow dynamics at a cold-water coral reef. Journal of Sea Research 78, 36-44. https://doi.org/10.1016/j.seares.2012.12.007

Henry, L.-A. & Roberts, J.M. (2007). Biodiversity and ecological composition of macrobenthos on cold-water coral mounds and adjacent off-mound habitat in the bathyal Porcupine Seabight, NE Atlantic. Deep Sea Research Part I: Oceanographic Research Papers 54, 654–672. https://doi.org/10.1016/j.dsr.2007.01.005

Hitchen, K. (2004). The geology of the UK Hatton-Rockall margin. Marine and Petroleum Geology 21, 993–1012. https://doi.org/10.1016/j.marpetgeo.2004.05.004

Hogan, R.I., Hopkins, K., Wheeler, A.J., Allcock, A.L. & Yesson, C. (2019). Novel diversity in mitochondrial genomes of deep-sea Pennatulacea (Cnidaria: Anthozoa: Octocorallia). *Mitochondrial DNA Part A.* 30, 764-777. doi 10.1080/24701394.2019.1634699.

Howell, K.L., Bridges, A.E., Graves, K.P., Allcock, L., la Bianca, GH., Ventura-Costa, C., Donaldson, S., Downie, A.-L., Furey, T., McGrath, F. & Ross, R. (2022). Performance of deep-sea habitat suitability models assessed using independent data, and implications for use in area-based management, Marine Ecology Progress Series 695, 33-51. doi: 10.3354/meps14098

Jones, S. M., Hoggett, M., Greene, S. E. & Dunkley Jones, T. (2019). Large Igneous Province thermogenic greenhouse gas flux could have initiated Paleocene-Eocene Thermal Maximum climate change. Nature Communications 10, 5547. https://doi.org/10.1038/s41467-019-12957-1

Lim, A., Wheeler, A.J., Price, D., O'Reilly, L., Harris, K. & Conti, C. (2020). Influence of benthic currents on cold-water coral habitats in the upper Porcupine Bank Canyon, NE Atlantic: a combined benthic monitoring and 3D photogrammetric investigation. Nature Science Reports 10, 19433. https://doi.org/10.1038/s41598-020-76446-y

Mienis, F., de Stigter, H.C., White, M., Duineveld, G., de Haas, H. & van Weering, T.C.E. (2007). Hydrodynamic controls on cold-water coral growth and carbonate-mound development at the SW and SE Rockall Trough Margin, NE Atlantic Ocean. Deep-Sea Research Part I: Oceanographic Research Papers 54, 1655–1674. https://doi.org/10.1016/j.dsr.2007.05.013

Mohn, C., Rengstorf, A., White, M., Duineveld, G., Mienis, F., Soetaert, K. & Grehan, A. (2014). Linking benthic hydrodynamics and cold-water coral occurrences: A high-resolution model study at three cold-water coral provinces in the NE Atlantic. Progress in Oceanography 122, 92–104. https://doi.org/10.1016/j.pocean.2013.12.003

Morrissey, D., Lim, A., Howell, K., White, M., Wheeler. A.J. & Allcock, L. (2023). The North-East Atlantic Margin: a review of geology, geography, oceanography, and vulnerable megabenthic ecosystems of Ireland and the United Kingdom's continental slope. Oceanography and Marine Biology: An Annual Review 61, 219–292. https://doi.org/10.1201/9781003363873

Morrissey, D., Allcock, A. L., & Quattrini, A. M. (2024). A new genus of bamboo coral (Octocorallia: Scleralcyonacea: Keratoisididae) from the Whittard Canyon, Ireland, Northeast Atlantic. Invertebrate Systematics, 38(9). Parimbelli, A., Johnson, M. P., Howell, K. L., Laguionie-Marchais, C. & Allcock, L. A. (2025). Licence to predict – Investigating approaches for modelling loe-occurrence deep-sea Irish Antipatharia with a new evaluation metric. [Manuscript submitted for publication]

Pearman, T., Robert, K., Callaway, A., Hall, R., Lo Iacono, C. & Huvenne, V. (2020). Improving the predictive capability of benthic species distribution models by incorporating oceanographic data - Towards holistic ecological modelling of a submarine canyon. PROGRESS IN OCEANOGRAPHY 184. https://doi.org/10.1016/j.pocean.2020.102338

Ritchie, J. D. & Hitchen, K. (1996). Early Paleogene offshore igneous activity to the northwest of the UK and its relationship to the North Atlantic Igneous province. In R. W. O'B. Knox, R. E. Corfield, & R. E. Dunay (Eds.), Correlation of the Early Paleogene in Northwest Europe. Geological Society, London, Special Publications 101, 63–78. https://doi.org/10.1144/GSL.SP.1996.101.01.04

Rizzi, A. (2023) The influence of morphology on deep-sea coral distribution: habitat suitability modelling of bamboo corals (Octocorallia: Scleralcyonacea: Keratoisididae) in the NE Atlantic (M. Sc.), University of Padua. ttps://thesis.unipd.it/retrieve/1487986f-184d-4520-8e98-8396752f8dd7/Rizzi_Alessia.pdf

Ross, R.E., Wort, E.J. & Howell, K.L. (2019) Combining distribution and dispersal models to identify a particularly vulnerable marine ecosystem. Frontiers in Marine Science, 6,574

Roberts, J.M., Wheeler, A.J., Freiwald, A. & Cairns, S.D. (2009). Cold-water corals: The biology and geology of deep-sea coral habitats, Cold-Water Corals: The Biology and Geology of Deep-Sea Coral Habitats. https://doi.org/10.1017/CBO9780511581588

Saunders, A. D., Fitton, J. G., Kerr, A. C., Norry, M. J. & Kent, R. W. (2013). The North Atlantic Igneous Province. Geophysical Monograph Series, 45–93. https://doi.org/10.1029/gm100p0045

Storey, M., Duncan, R. A. & Tegner, C. (2007). Timing and duration of volcanism in the North Atlantic Igneous Province: Implications for geodynamics and mantle plume activity. Chemical Geology 241, 264–281. https://doi.org/10.1016/j.chemgeo.2007.01.016

Thierens, M., Titschack, J., Dorschel, B., Huvenne, V.A.I., Wheeler, A.J., Stuut, J.-B. & O'Donnell, R. (2010). The 2.6 Ma depositional sequence from the Challenger cold-water coral carbonate mound (IODP Exp. 307): Sediment contributors and hydrodynamic palaeo-environments. Marine Geology 271, 260–277. https://doi.org/10.1016/j.margeo.2010.02.021

Van der Kaaden, A. S., Mohn, C., Gerkema, T., Maier, S. R., de Froe, E., van de Koppel, J., ... & van Oevelen, D. (2021). Feedbacks between hydrodynamics and cold-water coral mound development. Deep Sea Research Part I: Oceanographic Research Papers, 178, 103641.

van der Kaaden, A. S., Van Oevelen, D., Mohn, C., Soetaert, K., Rietkerk, M., Van De Koppel, J., & Gerkema, T. (2024). Resemblance of the global depth distribution of internal-tide generation and cold-water coral occurrences. Ocean Science, 20(2), 569-587.

Wang, H., Iacono, C.L., Wienberg, C., Titschack, J. & Hebbeln, D. (2019). Cold-water coral mounds in the southern Alboran Sea (western Mediterranean Sea): Internal waves as an important driver for mound formation since the last deglaciation. Marine Geology 412, 1–18.

Watling L, France SC (2021) Toward a revision of the bamboo corals: part 2, untangling the genus Lepidisis (Octocorallia: Isididae). Bulletin of the Peabody Museum of Natural History 62, 97–110. doi:10.3374/014.062.0202

Watling L, Saucier EH, France SC (2022) Towards a revision of the bamboo corals (Octocorallia): part 4, delineating the family Keratoisididae. Zootaxa 5093, 337–375. doi:10.11646/zootaxa. 5093.3.4White, M. (2003). Comparison of near seabed currents at two locations in the Porcupine Sea Bight—implications for benthic fauna. Journal of the Marine Biological Association of the United Kingdom 83, 683–686. https://doi.org/10.1017/S0025315403007641h

White, M. (2007). Benthic dynamics at the carbonate mound regions of the Porcupine Sea Bight continental margin. International Journal of Earth Sciences 96, 1–9. https://doi.org/10.1007/S00531-006-0099-1/FIGURES/6

White, M. & Dorschel, B. (2010). The importance of the permanent thermocline to the cold water coral carbonate mound distribution in the NE Atlantic. Earth and Planetary Science Letters 296, 395–402. https://doi.org/10.1016/J.EPSL.2010.05.025

White, M., Roberts, J.M. & van Weering, T. (2007). Do bottom-intensified diurnal tidal currents shape the alignment of carbonate mounds in the NE Atlantic? Geo-Marine Letters 27, 391–397. https://doi.org/10.1007/s00367-007-0060-8

Wilkinson, C., Ganerød, M., Hendriks B. W. H. & Eide, E. A. (2016). Compilation and appraisal of geochronological data from the North Atlantic Igneous Province (NAIP). Geological Society, London, Special Publications 447, 69–103. https://doi.org/10.1144/SP447.10

Yesson, C., Taylor, M. L., Tittensor, D. P., Davies, A. J., Guinotte, J., Baco, A., ... & Rogers, A. D. (2012). Global habitat suitability of cold-water octocorals. Journal of Biogeography, 39(7), 1278-1292.

Yesson, C., Bedford, F., Rogers, A. D., & Taylor, M. L. (2017). The global distribution of deep-water Antipatharia habitat. Deep Sea Research Part II: Topical Studies in Oceanography, 145, 79-86.

Survey Objectives (and cruise track)

Several objectives were planned for this survey and are listed below in the order they were planned to be addressed. Tasks to fulfil the objectives are also listed:

Objective 1: Study the relationships between seafloor geomorphology, structural trends, and volcanology of igneous intrusions in the continental and oceanic crusts linked to crustal thinning and opening of the North Atlantic Ocean as a consequence of the North Atlantic Igneous Province.

> *Task 1*: Map the seafloor topography in high resolution of the Eriador Ridge, Gondor Seamount, Edoras, Owlsgard and Lorien Banks to identify areas of volcanogenic rock outcrop that can be sampled. The high resolution MBES DTMs will be assessed to determine bedrock rubble outcrop. Analysis of the MBES data using the COMMA GIS toolbox will enable us to identify seabed geomorphological features and distinguish seabed facies types. Using learning from the previous ROV video off the Fangorn Bank, bedrock outcrop rubble fields will de identified and distinguished from hemipelagic sediment or cold-water coral reef cover. Note, the Fangorn Bank showed (from CE210101: an earlier biological ROV survey) that igneous rock outcrops weathered at the seabed breaking down into dense fields of ROV-collectable rock samples with occasional more massive rock outcrops.
>
> *Task 2*: Collect rock samples to assess the lithology, petrology and geochemistry of the Eriador Ridge, Gondor Seamount, Edoras, Owlsgard and Lorien Banks

Objective 2: Determine the timing between North Atlantic Igneous Province magma emplacement events West of Rockall Bank and their relationship to the Paleocene-Eocene Thermal Maximum

> *Task 3*: Collect volcanic rock samples for dating from the Eriador Ridge, Gondor Seamount, Edoras, Owlsgard and Lorien Banks. Task 2 will pin-point rock outcrop locations allowing for targeted sampling dives. Based on Fangorn Bank, we estimate that 50% of the MBES coverages will reveal outcrop with the remaining 50% will probably be covered by sediment or coral. We can therefore plan to increase efficiency in sample collection.

Objective 3: Explore the seabed environments of the Eriador Ridge, Gondor Seamount, Edoras, Owlsgard and Lorien Banks to determine VME status, megafauna and habitat.

> *Task 4:* Biological sampling and visualisation of key taxonomically difficult megafaunal taxa with an emphasis on cold-water corals. Documentation of megafaunal presence and abundance from ROV video on the Eriador Ridge, Gondor Seamount, Edoras, Owlsgard and Lorien Banks to assess VME status and identify VME indicators. As rock outcrops are suitable substrate for coral and sponge colonisation, we will be able to assess megafaunal presence and sample megafaunal VME indicators whilst in video

mode for rock sampling, making efficient use of the ROV time. This will allow for taxonomical (molecular and traditional) identification of VME-forming species dominating this environment, with a particular focus on rare deep-adapted taxa. This data will feed in ongoing and future projects on delimitation and description of Northeast Atlantic anthozoans and their symbionts.

Objective 4: Hydrodynamics analysis to determine the influence of cold-water coral mounds on internal wave influenced hydrodynamics.

Task 5: Little MonSta monitoring station deployments to be undertaken on and off a cold-water coral mound measuring current dynamics (up to 20m from the seabed) and organic flux over part of the tidal cycle (14 days). In addition, a lower frequency ADCP will be deployed to monitor water mass properties up to 140m above the seabed as well as whole column water mass properties from a CTD deployment. This experiment will enable a study of mound/internal wave interactions and to assess the topographic feedback of the mounds on internal tides and its influence on food flux to the mound. Previous lander deployments in on the Western Irish margin have revealed this relationship over 3-9 month monitoring exercises. The shorter duration deployments will significantly increase the resolution of ADCP sampling rates revealing this process at a finer scale and providing valuable geochemical data over a neap-spring cycle. Little MonStas are equipped with an ADCP, a sediment trap, a CTD (temperature, salinity, dissolved oxygen, and turbidity).

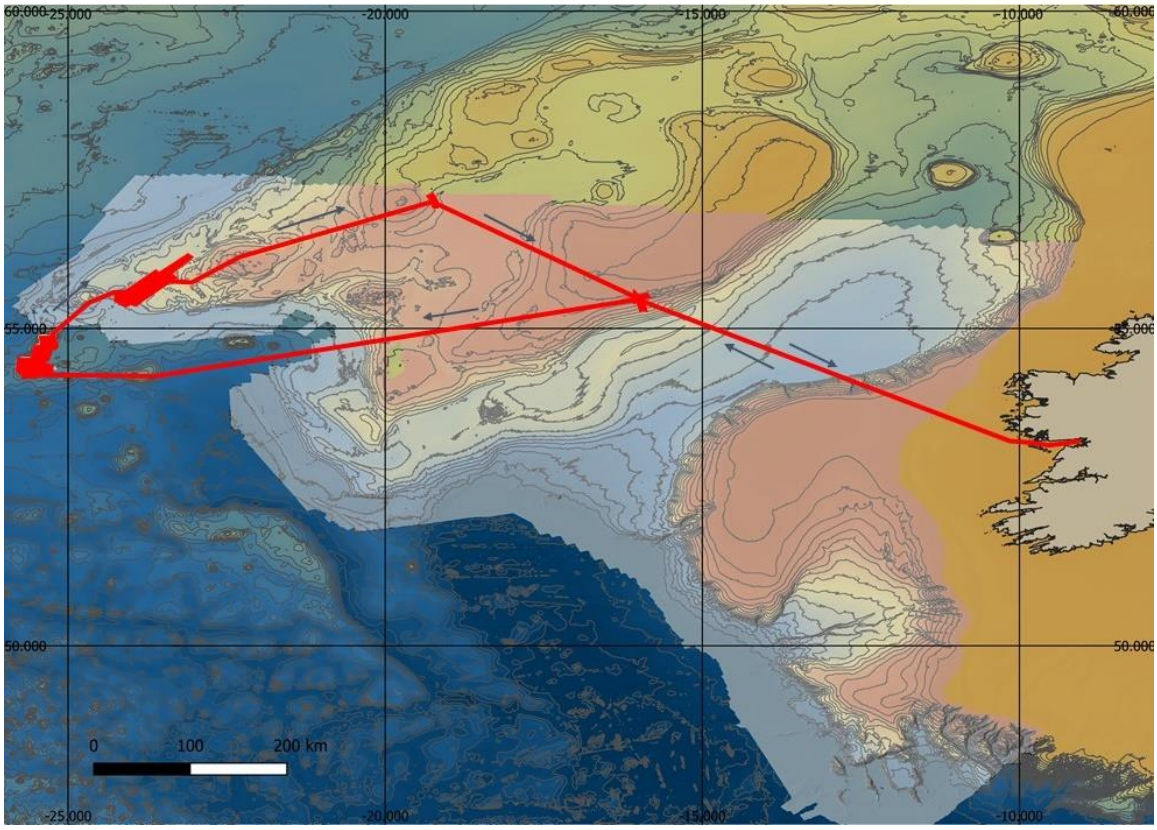


Figure 1. CE25008 VMEx2 survey shiptrack: Galway to Eriador to Edoras Bank to Owlsgard to Logachev Mounds (Rockall Bank) to Galway. Bathymetry courtesy of Infomar and GEBCO.

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, a fume hood 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 RV 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. The CTD forms part of the vessel's equipment pool.

Figure 2. RV Celtic Explorer (courtesy of Hugo Ferreira)

Holland 1 ROV

The Holland 1 3000m depth ROV (remote operated vehicle) is a platform for capturing real-time underwater video footage, data and user-controlled samples. It has 100 hp engine with a maximum speed of 3 knots. The Holland 1 has a HDTV camera, low resolution cameras and a HD digital stills with laser rangers which are well illuminated providing pan-and-tilt forward views, below and aft. It is also fitted with a CTD and 2 robotic arms for sampling (aT4 7-function arm and an Orion 5-function arm). Collected samples are stored in bio-boxes (divided into 8 compartments). An EM2040 multi-beam echo sounder was 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 6000m. Underwater navigation is done via USBL position smoothed by an integrated inertial navigation and Doppler system.

Figure 3. Holland 1 Remotely Operated Vehicle

An SIMRAD EM2040 multi-beam echo sounder was mounted on the Holland 1 ROV for high resolution bathymetry mapping of the seabed. The EM2040 operates at 200 - 400 kHz and is effective to 6000m. Underwater navigation is done via USBL position with an integrated inertial navigation and Doppler system. SIS was used as a top-end acquisition software.

Figure 4. Holland 1 Remotely Operated Vehicle with the EM2020 multibeam echosounder head install on the front

Little MonSta benthic monitoring platforms

Two "Little MonSta" benthic lander monitoring platforms, referred to as landers, were recovered from a 1 year deployment on the seabed during this survey. Each Little MonSta is equipped with an Acoustic Doppler Current Profiler (ADCP), Sediment Trap and Multi-sensor CTD package.

- The **ADCP** is a 1 MHz ***Nortek Aquadopp***, depth-rated to 3000 m water depth and powered by a battery pack that can continually measure data from 0-25 m from the

transducer for up to six months. The ADCP is mounted vertically, pointed upwards, near the top of the Little MonSta.

- The sediment trap is a ***Technicap PPS4/3 – 24S*** **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, and 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.
- The **IDRONAUT** ***CTD multi-sensor*** consists of conductivity, temperature, pressure, pH, dissolved oxygen, turbidity and reference sensors, depth rated to 7000 m
  - The ***pressure sensor*** is an annually calibrated strain gauge with an accuracy of 0.05% FS and response time of 50 ms.
  - The ***temperature sensor*** has a platinum resistance thermometer fitted to a stainless steel/titanium housing. This sensor can withstand 700 bar and has a response time of 50 ms.
  - A thermic insulated cylindrical plastic body houses the ***conductivity sensor cell*** used as a proxy for salinity. The sensor is a flow-through self-flushed cell consisting of seven platinum ring electrodes. Two adjacent pairs of rings sense the relative drop in voltage due to electrical conductivity of the measured water. Electrical interference from outside the measuring cell is shielded from the outermost pair of rings. Response time is 50ms per 1m/s waterflow.
  - The ***dissolved oxygen sensor*** contains a fluorescent dye that is excited by a certain wavelength. Luminescence response depends on amount of oxygen molecules present. This excitation of light is transmitted by a polymer fibre, simultaneously transmitting the fluorescence response of the sensor to the measurement device. The oxygen sensitive dye is immobilized in a polymer matrix. The sensor if stable over long deployment period. REDFLASH technology is excitable by red light and show oxygen-dependent luminescence in the NIR. Luminescence decreases with increasing of oxygen in the NIR. Excellent luminescence brightness of REFLASH indicator allows sensor matrix to be thin, leading to fast response times for oxygen sensors. A blue measuring membrane cap is fitted inside the titanium support to prevent unwanted removal or accidental loss. It is made of blue plastic to shield external light. A black sensor spot on the bottom of the cap allows for oxygen measurement.
  - The ***IDRONAUT reference sensor*** is in contact with the unknown sample by means of a small hole in the glass tip. The reference sensor is a silver/silver chloride cell in a saturated potassium chloride solid gel and the sensor head is made of titanium. It is developed for long-term monitoring where the internal cell is 0.7 mol NaCl. The glass body of the sensor is fitted with a plastic hydrating

cap filled with the IDRONAUT reference sensor storage solution based on 3-mol KCl (or NaCl). This cap is to be removed before measurements.

- A **turbidity meter** is fitted externally for the main IDRONAUT pressure vessel and is place at the top of the Little MonSta next to the opening of the sediment trap. It measures water turbidity with a range of 15 cm from the sensor head.

Figure 5. Little MonSta lander "Adele" ready for deployment on the front of the Holland 1 ROV

CTD with water bottle rosette

A Sea Bird Electronics SBE 911 plus CTD was used to measure the internal wave field above the Little MonSta landers by repeated (Yo-Yo) casts and to calculate sound velocity profiles (SVPs) to help navigate the multibeam echosounder ray paths and USBL beacons. The CTD was equipped with the following: 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 series of 24 water bottles is attached to a rosette and can be fired by live feed in real-time from the deck unit.

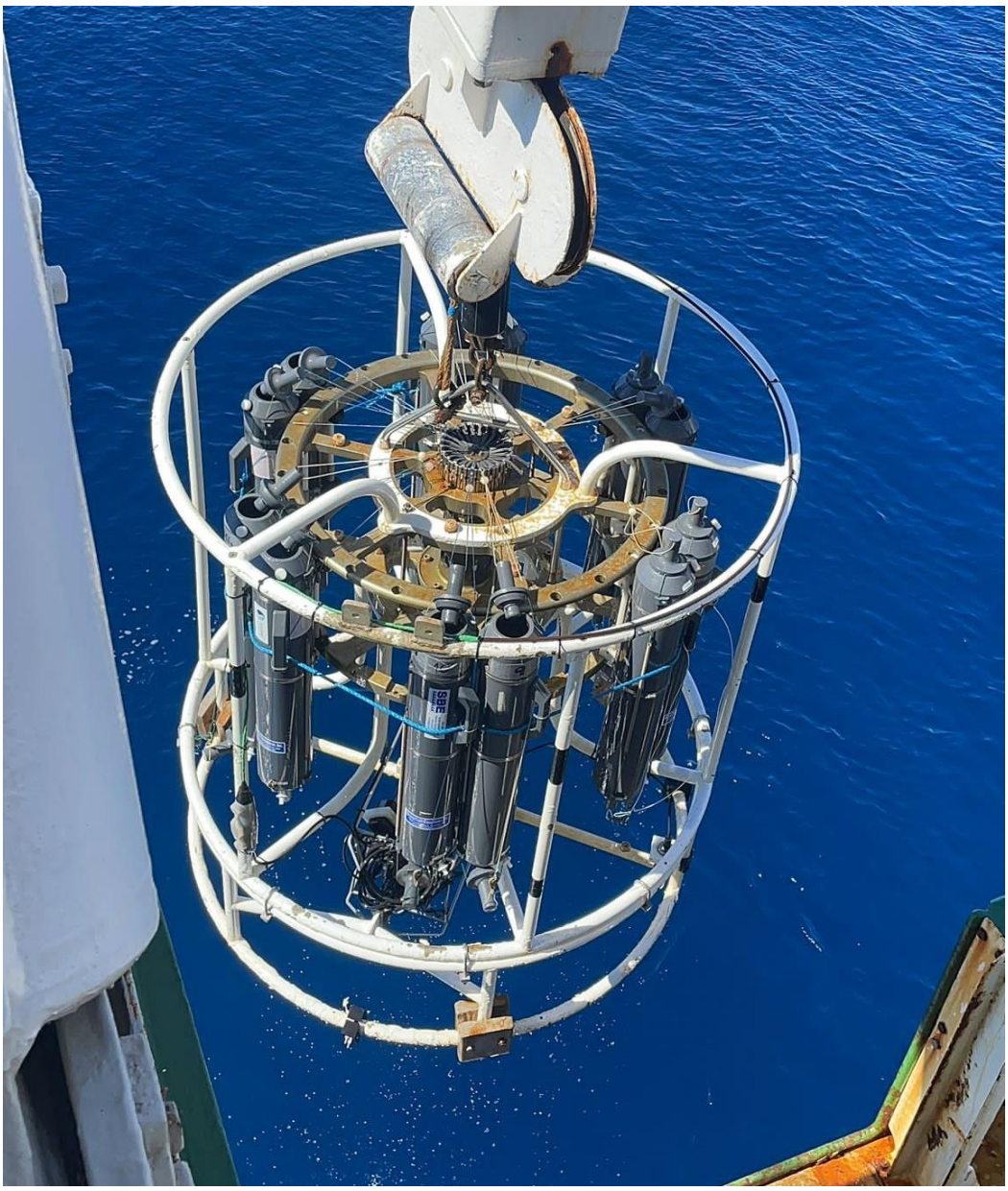


Figure 6. Sea Bird Electronics SBE 911 plus CTD

For the deployments of the CTD at the end of the survey, the CTD was fitted with a downward-facing Teledyne / RDI Workhorse 1 Sentinal 300 kHz ADCP. The ACDP was deployed in L-ADCP mode with a range of c.100 m and cell size of 4 m.

Figure 7. A Teledyne / RDI Workhorse 1 Sentinal 300 kHz ADCP bracketed to the CTD in a downward-facing L-APCD mode.

Rock dredge

The rock dredge consists of a robust rectangular iron opening bevelled to cut into the sediment with a heavy-duty nylon net inside. When towed on the seabed, additionally weighed down by a heavy tow chain, the dredge cuts into the seabed and cobbles and rocks are retained in the net with finer gravels, sand and muds passing through. The dredge has a weak-link shackle at the tow end which fails, reverts

in the orientation of the dredge into a passive mode, if obstacles hit are too resistant. The tow chain is connected to a 20 tonne Dynex cable and is towed through the A-frame.

To dredge, the ship is moved forward at 0.5 knot and the dredge lowered to the seabed and dragged for 100 m along the seabed before recovery. Contact with the seabed is estimated based on wire out and tension in the cable. Dredge is along the slope parallel to contours at the base of steep slopes on which bedrock is likely to be exposed and cobbles may have fallen down.

Figure 8. Rock dredge

Day Grab

A Day Grab was deployed to take bulk sediment samples from the starboard deck midship. The Day Grab is housed within a frame supporting 150kg of weights with a holder for a USBL beacon (not used). The jaws of the grab are 33 cm across enabling to take a maximum "grab" of 10,000 cm^3 of sediment (equivalent to 0.01 m^3).

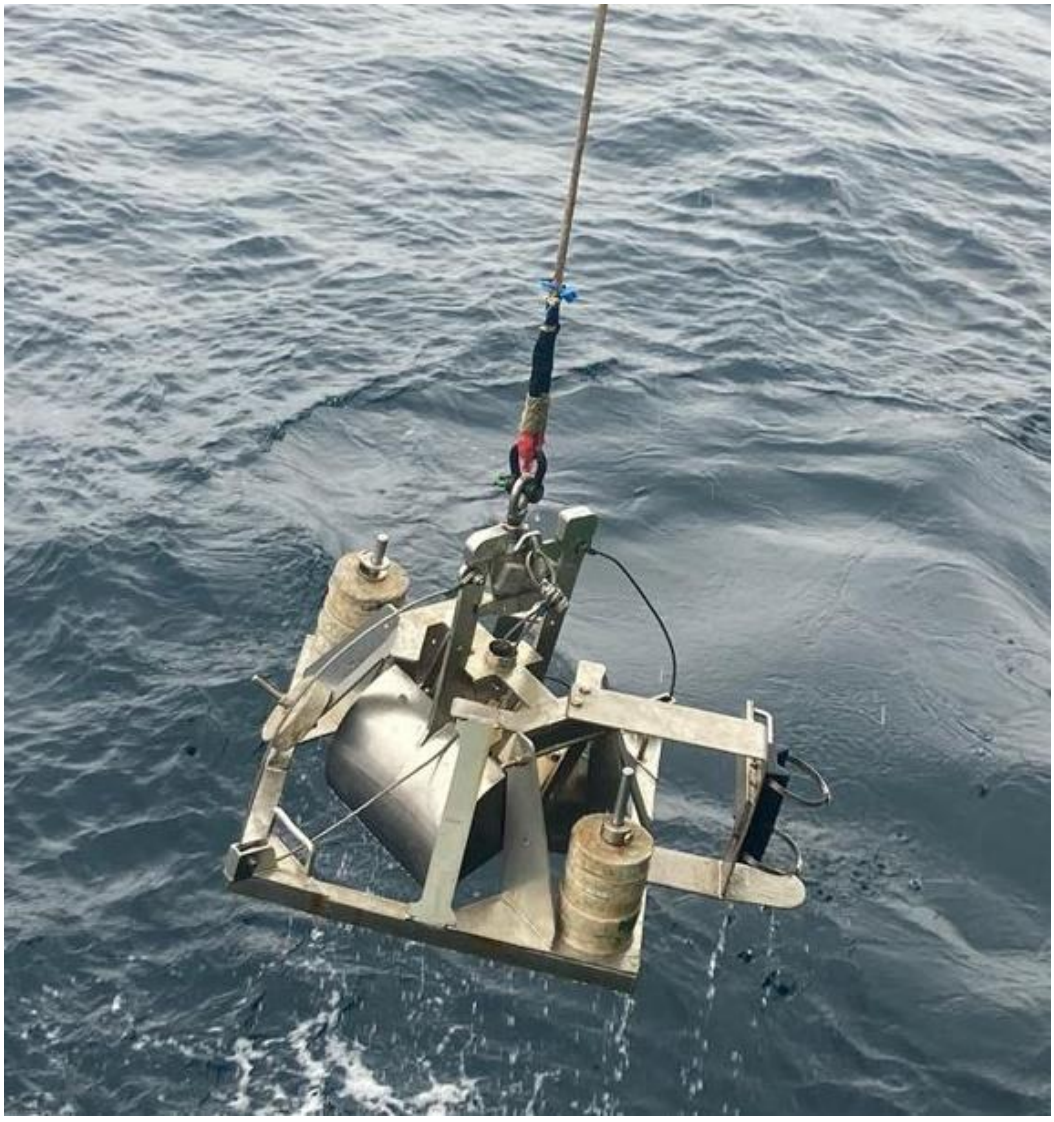


Figure 9. Deployment of the RV Celtic Explorer Day Grab. The jaws of the curved body of the grab are open within a frame carry 150 kg of weight. Beacon not fitted.

Survey Log

Note: all times are in UTC (-1hr Shiptime)

26th May 2025: Galway Harbour

Vessel mobilisation starts at **07.00 UTC**. ROV lifted on deck at **09.00**. Weather is heavy rain impeding mobilisation. Science party all on-board at **13.00**.

27th May 2025: Galway Harbour

ROV mobilisation continues and science preparations. Little MonStas on deck by **11.00**.

28th May 2025: Galway Harbour to Galway Bay - Wind SW Force 5

ROV mobilisation continues and science preparations. At **16.31** RV Celtic Explorer leaves Galway Dock and transit to offshore where a wet test of the ROV. *16.20 Wind SW Force 5. 17.00 Moderate sea with low swell.* Drop keel lowered at **19.35** and at **19.47** ROV wet test commences in 53m of water. ROV is all good but USBL positioning has some issues that are being fixed. **23.58** start to recover ROV.

29th May 2025: Galway Bay (Wind SW Force 6-7)

00.06 ROV on surface. *Wind SW Force 6, low swell.* ROV recovered to deck at **00:16** with the ship's crane. Replacement USBL beacon fitted. **01.30** CTD started (**CE25008_CDT_1**) and **01.38** CTD on deck. *02.00 Wind SW Force 6, low swell, visibility good. 03.00 Wind SW Force 6, low swell, visibility good. 08.00 Wind SW Force 7, moderate swell, rough sea with low swell, clear.* ROV cable re-termination started at **08.00**. *09.43 Wind SW, Force 7. 11.55 Wind SW, Force 6. 13.00 Wind SW, Force 6, low swell, visibility good. 16.00 Wind SW, Force 6, low swell, visibility good. 20.00 Wind SW, Force 5, moderate seas and low swell, clear.* Re-termination of ROV umbilical completed and tension tested by **20.00**. *21.54 Wind SW, Force 5. 23.55 Wind SW, Force 5.*

30th May 2025: Galway Bay – Rockall Trough (Wind SW Force 4- 8)

00.52 Wind SW 22 kts, low swell. ROV launched at **01.09** for wet test and recovered to deck by **01.43.** Wet test complete but ongoing issues with USBL and ROV navigation. *02.00 Wind WSW Force 5, low swell, visibility good*. By **03.10**, vessel underway for the first lander deployment site on Rockall Bank. *04.00 Wind SW Force 5, low swell, visibility good*. *10.58 Wind SW Force 4*. *17.00 Wind S Force 4*. *22.27 Wind S Force 7*. *23.53 Wind S Force 8*.

31st May 2025: Rockall Trough – Rockall Bank (Wind SW-WNW Force 3- 7)

Arrive on station at **06.30**. CTD started (**CE25008_CTD_2**) at **07.05** with USBL beacon on the CTD to see if it is behaving properly and can now integrate with ROV's INS positioning. It does! CTD back on deck at **07.36**. ROV being prepped for Little MonSta Adele to go on to the top of a small 100m tall cold-water coral Logachev Mound. *08.00 Wind SSW Force 3, slight sea and low swell.* ROV off the deck at **08.27** but there was an issue with the ROV and it was back on deck at **08.36**. ROV off deck for a second attempt at **08.38** and in the water at **08.32** but there

is still a problem with the USBL positioning so ROV recovered to the surface at **08.52**. USBL beacons placed in a higher position on the ROV and the ROV was off deck at **10.20** (**CE25008_ROV_3:** Dive 1). *10.55 Wind SW Force 5*. *23.53 Wind S Force 8*. **Little MonSta Adele** was placed near the summit of a Logachev Mound. It initially toppled but was then repositioned and was close to upright (Fig. 1). *12.00 Wind W Force 5, low swell*. **ROV** was recovered to deck at **12.39**. Gale winds cause us to pause the next ROV dive. *15.00 Wind SW Force 5, Moderate swell, good visibility.* CTD deployed (**CE25008_CTD_4**) at **15.12** as part of a series of one hourly CTD cases for 13 hrs (hopefully, if the weather allows) to look at how water column in stabilities caused by internal tides change at the site near where the Little MonSta Adele is deployed. Further CTDs were deployed at 1 hr intervals in the same spot from **16.14** to **19.09** (**CE25008_CTD_5, CE25008_CTD_6, CE25008_CTD_7 & CE25008_CTD_8**). Due to unfavourable weather forecasts it was reluctantly decided to abandon the second Little MonSta deployment and transit to Eriador for the next part of the survey commencing at **21.50**. *21.17 Wind WNW Force 3.*This means that this objective was no completed despite our efforts due to unfavourable weather and significant delays due to technical issues with the USBL and consequently ROV.

Figure 10. Little MonSta Adele placed near the summit of a Logachev Mound.

1st June 2025: Rockall Bank – Rohan Seamount (Wind SW-NW Force 4- 7)
Continued transit to Eriador avoiding the worst of the weather. 00.00 Wind NW Force 4. Continue transit. 06.00 NW Force 5. Continue transit. 10.00 NW Force 5. Continue transit.17.00 Wind SW Force 4. Continue transit. 23.50 Wind SSW Force 7. Continue transit.

2nd June 2025: Rohan Seamount to Eriador Ridge (Wind NW-WNW Force 6-7)
Continue transit. *06.00 Wind W Force 6*. Continue transit. *11.56 Wind NW, Force 7.* Vessel dropped to 4 kts due to a strong head winds and short period 3m swell on the nose. *16.00 Wind WNW, Force 7, rough, visibility good. 21.52 Wind WNW, Force 6.*

3rd June 2025: Eriador Ridge (Wind WNW-W Force 3-6)

With the weather easing, commenced a west to east ship multibeam echosounder line (**CE25008_MB_10)** with a following sea at **00.12** finishing at **01.41**. *01.00 Wind W, Force 6, rough, good visibility.* The changed heading for the Eriador dive site and started a new ship's MBES line (**CE25008_MB_11**) at **02.22** finishing at **03.54**. This line was poorer quality. Arrived at the Eriador ROV dive station at **04.00**. *04.00 Wind WNW, Force 5, moderate swell, good visibility.* Sea looks promising and preparing to dive with the ROV in MBES mode. ROV in the water at **05.51** for an ROV MBES dive (**CE25008_RV_12**) on Eriador Ridge (fantastic). *06.00 Wind W, Force 3/4.* ROV descending at 20m per minute to 2470m (100m of the seabed). Lost USBL contact on the way down so INS has fallen out. Due to the failure of the INS it was not possible to do the ROV MBES mapping to find samples sites as planned. We therefore completed the transect in ROV video mode (without HD camera) and an inability to sample. Initially the seabed was muddy with dropstones but we there found three good exposures of bedrock with smaller boulders that could be sampled on a later dive. Several holothurians were observed on mud at the start of the dive, while sea lilies (SM383 *Anachalypsicrinus nefertiti*) were present on dropstones. The bedrock was covered in black manganese oxides but a steep cliff with pillow lavas was clearly visible on large vertical cliffs ascending to ridge lines. Sea lilies and frequently occurring antipatharians (*Bathypathes sp.,* morphology fitting SM158 *Bathypathes patula*) were observed on the bedrock, along with one single bamboo coral (morphology fitting Keratoisididae Clade D1, H1.2 and H2; Morrissey et al., 2021). Very impressive. *07.00 Wind W, Force 3, slight sea and moderate swell. 12.00 Wind W, Force 4, low swell, good visibility.* At the end of the dive the ROV was recovered to deck at **13.03** after 20 minutes trouble shooting the USBL beacons. *13.04 Wind W, Force 5, moderate swell, good visibility.* We then started a ships' MBES line (**CE25008_MB_13**) at **13.41** going back over the last line CE25008_MB_11 which was of poor quality to increase the sounding density. At the end of the line (**14.38**), we took a CTD (**CE25008_CTD_14**) to get a sound velocity profile at **14.51** which was input into the MBES. *14.45 Wind W, Force 6, moderate swell, good visibility.* A new line was then commenced at **16.07** (**CE25008_MB_15**) to the east which was a continuation of CE25008_MB_10. However, after some minutes the MBES collapsed at **16.50** making a premature EOL. We then took the vessel back to the start of CE25008_MB_15 to restart the line but the MBES did not come back despite reboots and complete power cycles. *19.00 Wind W, Force 5, moderate swell, good visibility.* At **21.02**, the multibeam system successfully rebooted and remained stable and a series of east-west hull-mounted multibeam echosounder lines were undertaken (**CE25008_MB_16**) followed by a west-east line (**CE25008_MB_17**) to the north at **22.33** finishing at **23.51**. *22.50 Wind WNW, Force 6.*

4th June 2025: Eriador Ridge (Wind W-NW Force 3-5)

00.00 Wind WNW, Force 6, moderate swell, good visibility. Multibeaming Eriador Ridge with a series east-west lines (**CE25008_MB_18 - xx**) starting at **00.28** filling in the gap between existing multibeam lines continued for the rest of day. *03.00 Wind WNW, Force 6, moderate swell.* Line **CE25008_MB_19** commenced at **03.54** and is a east to west line of poor quality. Line **CE25008_MB_20** commenced at **05.25** and is a west-east line. Line **CE25008_MB_21** commenced at **08.30** and is a short east-west line infilling gaps between lines

CE25008_MB_19 and 20. *09.30 Wind W, Force 5.* Line **CE25008_MB_22** (SOL **11.15**) to **CE25008_MB_27** (EOL **23.46**) continued to build the mosaic across the middle part of Eriador east-west northerly**.** *14.03 Wind W, Force 4, moderate swell, visibility good. 19.00 Wind NW, Force 4, moderate swell. 22.51 Wind NW, Force 3, moderate swell.* Line **CE25008_MB_28** saw a change in the survey and ran northerly slowing cutting across Eriador from west to east down to the abyssal plain.

5th June 2025: Eriador Ridge (Wind N-WSW Force 3)

Line **CE25008_MB_29** finished at **00.27** and was followed by a parallel adjacent line to the west heading south back to the main mosaic ending at (**03.19**). *01.00 Wind NW, Force 3, low swell, visibility good.* A north-south cross line was then run through the mosaic (**CE25008_MB_30: 03.24**) to tie them all together. At **05.00** we returned to dive site 2 (CE25008_RV_12) to assess the weather and the decision was made to dive to in video and sampling mode on the three bedrock locations identified on CE25008_RMB_12. ROV off deck at **05.48**. ROV on the bottom at **09.40** (**CE25008_RV_31**) on middy seabed with comet marks and proceeded upslope. *07.00 Wind N, Force 3, slight sea and low swell, cloudy with visibility good.* Some areas of eroded hardgrounds were encountered before the base of a step slope with exposed bedrock where rock and coral sampling was undertaken. Proceeding up the slope more rock and coral samples were taken. At the top of the slope was a narrow ridge, again more rock samples although megafauna were scarce. The ridge was transversed to the shallow slopes of a plateau edge where the final sampling was undertaken. In total, 19 rock samples were collected from 4 locations along the dive. Several antipatharians were observed during the dive, along with hexactinellids and demosponges, and a sea-pen (likely *Halipteris* sp.). Samples of *Bathypathes* sp., *Telopathes* sp. (Fig. 2), and *Stauropathes* sp. were collected from the site. *13.00 Wind WNW, Force 3, low swell, visibility good.* ROV on deck at **13.48**. Following the dive, we transited north and filled in a gap with a short west-east multibeam echosounder line (**CE25008_MB_32**) at **16.27**. This was followed at **17.48** by an extension to the northern most mosaic with a south to north line (**CE25008_MB_33**) on the western side of the northern extension to the mosaic to half way up. *19.00 Wind N, Force 3, slight sea and moderate swell.* Followed at **19.33** by a west to east cross line (**CE25008_MB_34**) and then a south to north line (**CE25008_MB_35**) on the eastern side of the northern extension to the mosaic at **20.34**. These were done at 8 kts but the data seemed good. At the top of the mosaic, a final multibeam echosounder line (**CE25008_MB_36**) was logged NE at to the **22.04** dive site joining the mosaic to the westernmost of the Infomar coverage. *22.04 Wind WSW, Force 3.*

Figure 11. Telopathes *sp. found on Eriador Seamount on exposed bedrock. hosting brittle stars.*

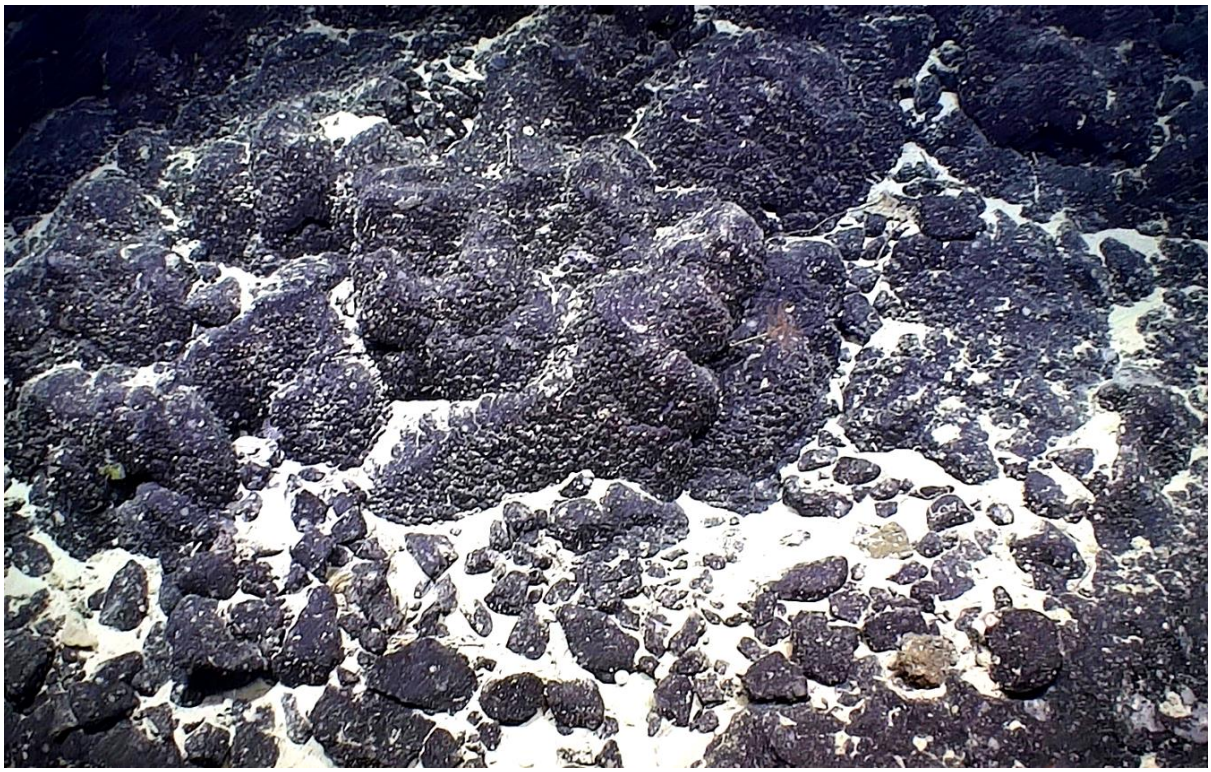


Figure 12. Exposed pillow-lavas.

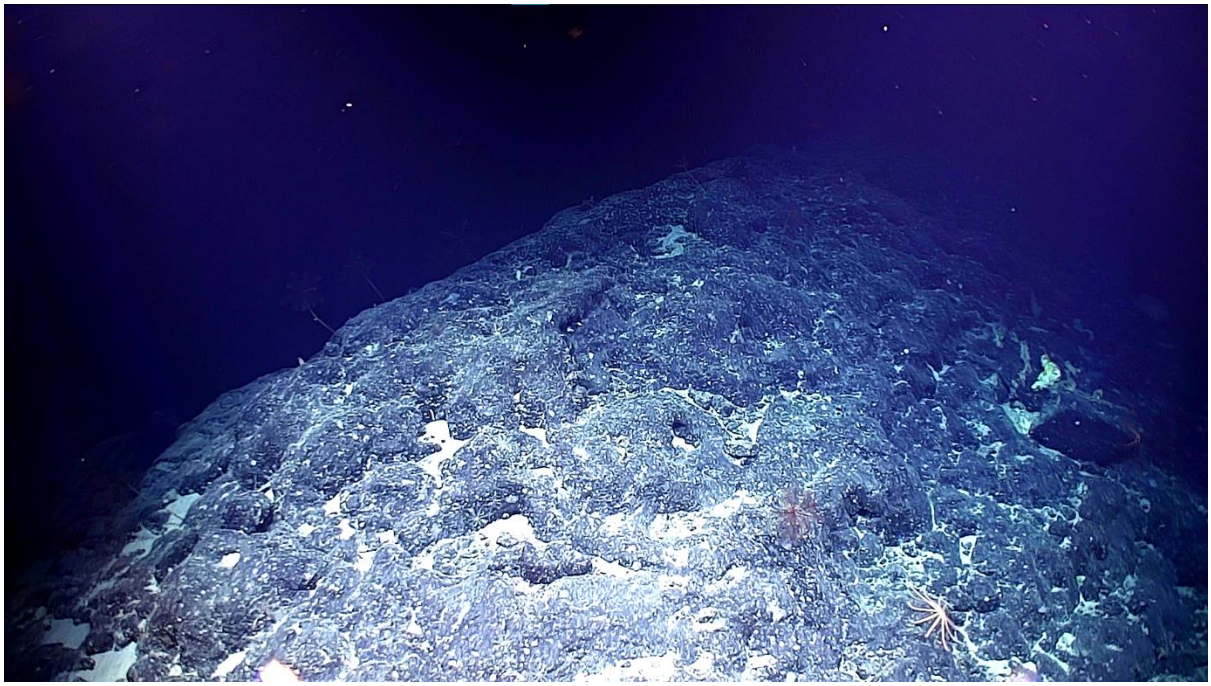


Figure 13. Small ridge on the upper western flank of Eriador Ridge

6th June 2025: Edoras Bank (Wind SE-WSW Force 1-4)

01.00 Wind WSW, Force 2, low swell, visibility good. Arrive at station at 02.24 ending multibeam line (CE25008_MB_36). ROV dive (**CE25008_RV_37**) off deck at **03.01** on the westernmost of the Edoras Bank volcanic edifices at 2600m. The ROV reached the seabed at **04.33** which was rippled sand and proceeded upslope where some boulders were encountered. The seabed continued to steepen until bedrock was exposed showing was appeared to be basalts with the typical rounded bedrock face morphology. We stopped at 4 locations to collect 16 bedrock samples proceeding to the top of the slope. The whole transect consisted of a bamboo coral (Keratoisididae) garden, although most of which dead, with numerous hexactinellids growing amongst them (Fig. 3). Interestingly, the bamboo corals observed in the dives presented no proteinaceous nodes, and samples were collected for further taxonomy and identification. Occasional antipatharians (*Stauropathes* sp., and *Bathypathes* sp.) were observed and collected for further study. We also noted some sub-fossil *Desmophyllum* sp. Which is curious at this water depth even though they probably fell down from higher up (Fig. 4). Following in this dive we ran a short shipbased MBES line across the ROV dive track (**CE25008_MB_38**) at **10.45**. *07.00 Wind SE, Force 3, slight sea and low swell.* Followed by a SW-NE shipbased multibeam echosounder transit line (**CE25008_MB_39**) at **10.56** to the next ROV dive site. *12.00 Wind SE, Force 1, low swell, visibility good.* We then ran a short shipbased multibeam echosounder line (**CE25008_MB_40 & 41**) at **12.28** over the new proposed ROV dive transect twice. The ROV was deployed at **13.22** for a new ROV sampling dive but had a communication failure with the hydraulic system at 500m (**14.31**) and was recovered to deck where we waited to see how significant the failure was. *15.00 Wind SSW, Force 2.* At **17.00** we realised it was a significant issue so we started a ship-based multibeam echosounder line from north to south at 17.45 (**CE25008_MB_42**) across Edoras Bank reaching the end of line at **18.31**. Turning to the NE we started a long (15 nm) multibeam

echosounder line (**CE25008_MB_43**) at **18.35** filling in a hole in the Infomar seabed mapping coverage for this area. *22.04 Wind WNW, Force 4.*

Figure 14. Remains of bamboo coral garden on rock outcrop.

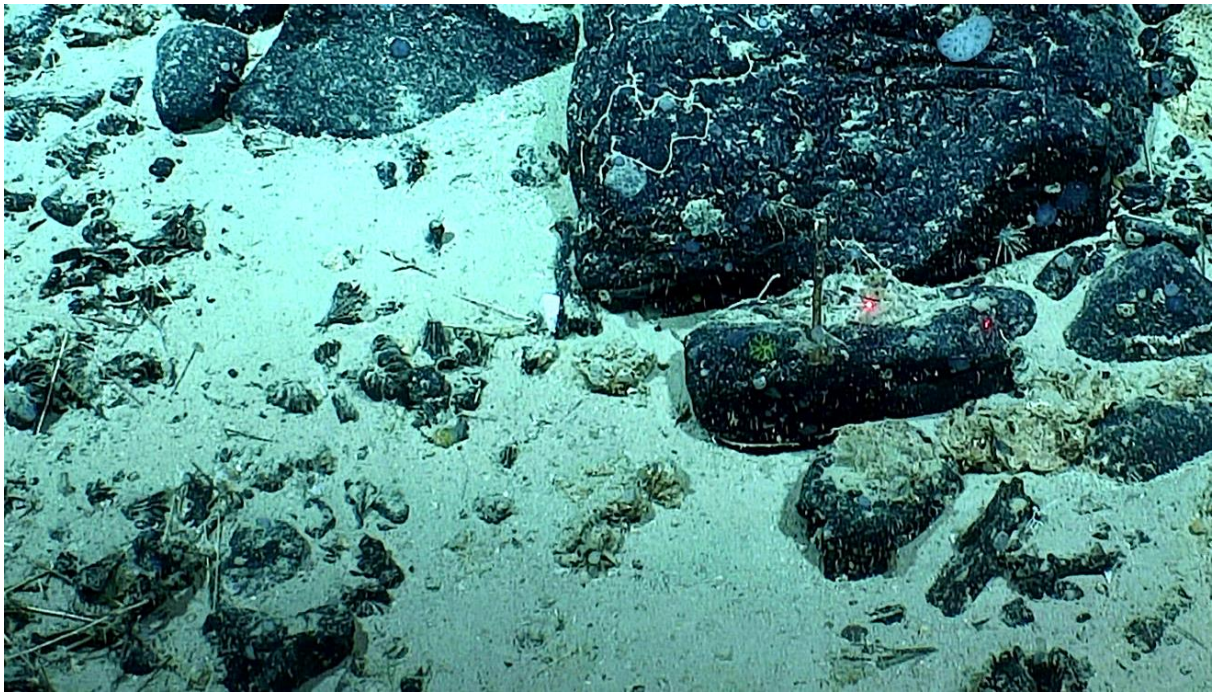


Figure 15. Fossil cup corals (likely Desmophyllum *sp.) on boulders of eroded bedrock.*

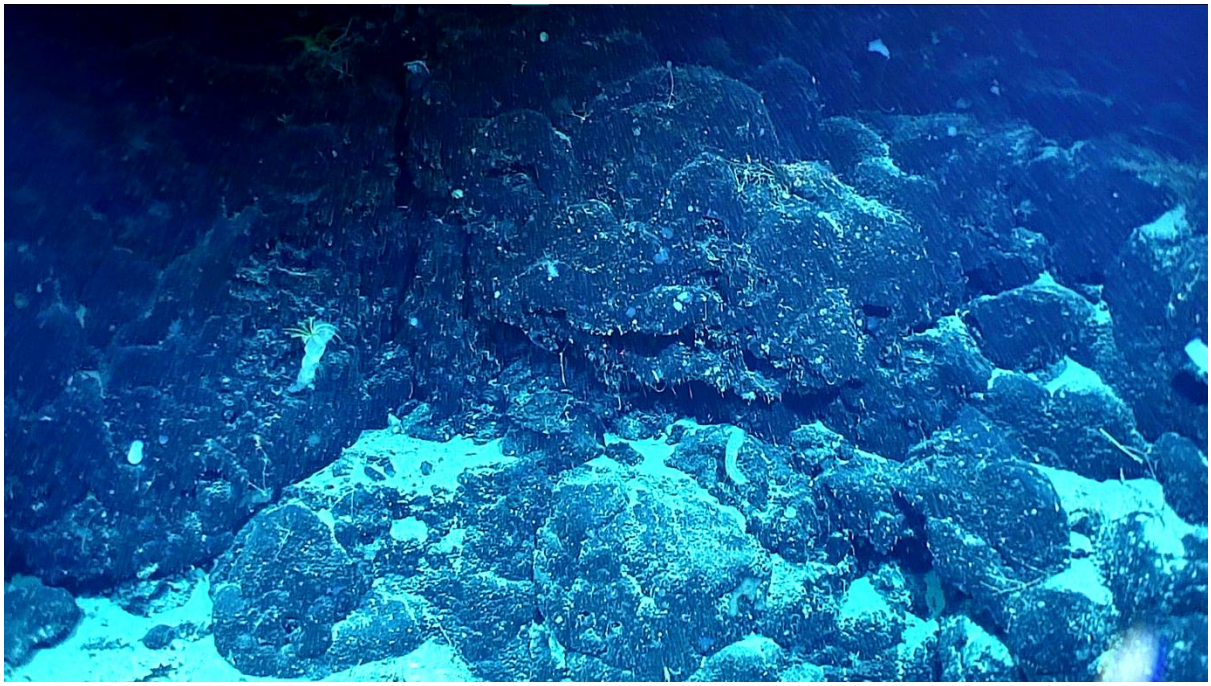


Figure 16. Bedrock exposures.

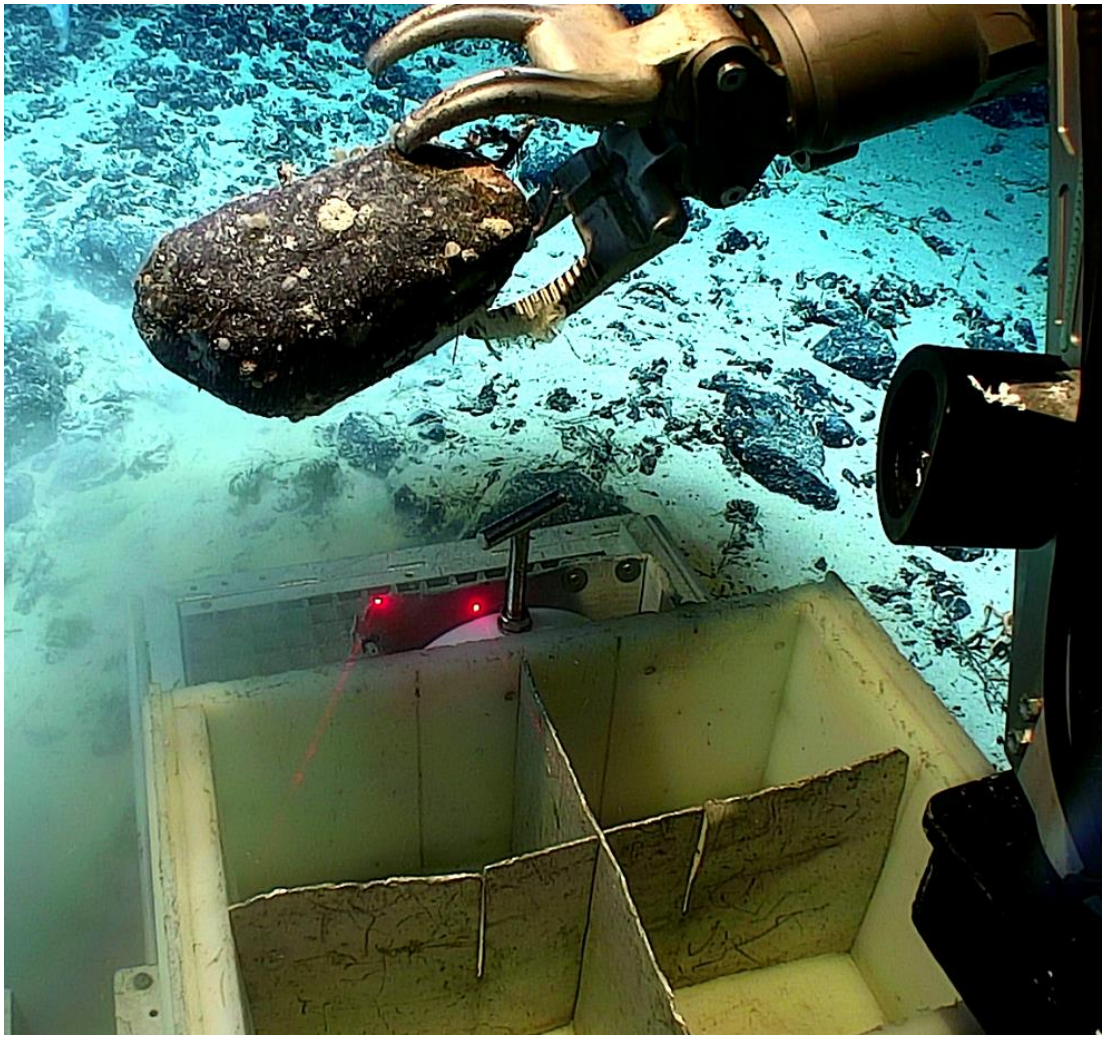


Figure 17. Rock sampling.

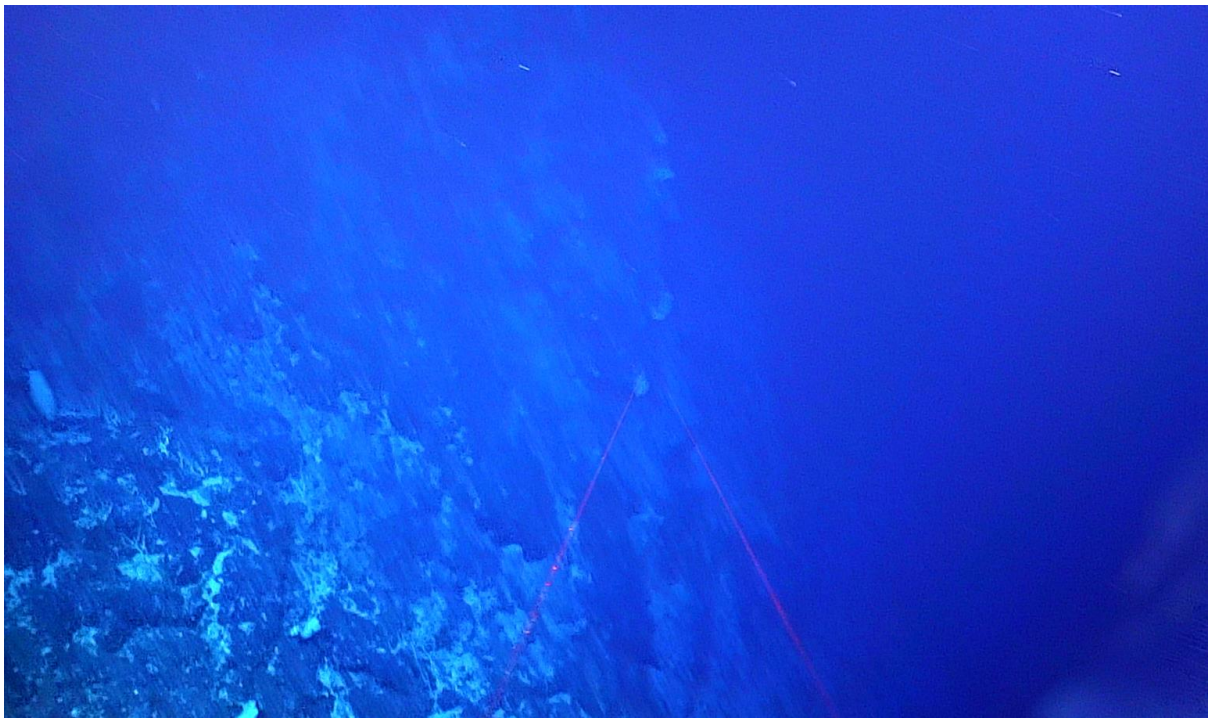


Figure 18. Cliffed terrain on the lower flank of Edoras Bank.

7th June 2025: Edoras Bank (Wind W Force 5-6)

00.00 Wind WNW, Force 5, low swell, visibility good. A parallel adjacent line running to the SW with 50% overlap (**CE25008_MB_44**) was started at **01.01**. *10.09 Wind WNW, Force 5.* Following this a series of lines were run to build the mosaic until **16.44** with **CE25008_MB_45** starting at **10.31**, **CE25008_MB_46** starting at **11.08** and **CE25008_MB_47** starting at **15.43**. *15.00 Wind W, Force 6, moderate swell, visibility good.* At **16.12**, as series of crosslines were done to also do a patch test in the middle and across the mosaic with **CE25008_MB_48** starting at **16.44**, **CE25008_MB_49** starting at **17.47, CE25008_MB_50** starting at **18.39**, **CE25008_MB_51** starting at **19.40**, and **CE25008_MB_52** starting at **20.35**. *19.00 Wind W, Force 5, moderate swell, clear.* Following the patch test, an NW-SW line was completed to add further to the mosaic starting at **22.00** (**CE25008_MB_53**). *22.49 Wind W, Force 5.*

8th June 2025: Edoras Bank (Wind WNW-SSE Force 3-5)

00.00 Wind WNW, Force 5, moderate swell, visibility good. Followed CE25008_MB_53, additional lines were taken further expanding the mosaic with **CE25008_MB_54** starting at **02.44** and **CE25008_MB_55** starting at 03.58 and ending at **08.32**. *04.00 Wind W, Force 5, moderate swell.* Following this, we transit south to start out first rock dredge (failure) which was off deck **10.55**. *11.05 Wind SW, Force 5.* The ship then moved forward 0.3 kt and the cable was lowered to 2600m. More cable was paid out and kicks in the wire indicated that the dredge was towing. Dredging on the seabed started at **11.39**. It was then dredged for approximately 15 mins at 0.3 kt (135m) and off the seabed at **11.59**. The dredge was on deck **12.31** and was empty. Mud on the chains and edge suggests that it was on the seabed but the front of the dredge was not polished (still rusty) suggesting that it didn't bite into the seabed.

We think that it didn't have enough cable out although there was already 2800m out on 2450m of water. A second attempt was tried but this time with 3500 m of cable to help with a lower towing angle (1:1.4). Dredge (**CE25008_RD_56**) in the water at **13.08** and 3500m of cable was paid out in 2415m of water. The dredge was towed at long the seabed at 0.3 kt for 15 minutes covering 135m of ground. On recovery at **16.00**, only a handful of small stones were recovered. We then moved to a different dredge site chosen on the multibeam data collected during this survey and processed overnight. This site was much closer to steep terrain so had a better chance of encountering boulders, we towed the dredge very close to probably rock. *17.05 Wind SW, Force 4.* The dredge was deployed at **18.22** (**CE25008_RD_57**), 3500m of cable was laid out in 2219m of water, it was towed at 0.3 kt for 15 minutes (135m). On recovery, only small stones were recovered again suggesting that it had dredged but either inadequately or theire were simply no large stones to dredge. Some zooanthids were collected with the stones. The option to dredge directly over rock was not possible so the dredging was abandoned. *21.05 Wind SW, Force 3.* At 22.13, at hull-mounted multibeam echosounder line was run (**CE25008_MB_58**) from the dredge site to the next ROV dive site northeasterly finishing at **23.34**. *22.52 Wind SSW, Force 3.*

9th June 2025: Edoras Bank (Wind N-SE Light airs to Force 4)

02.00 Wind NE, Force 2, low swell, good visibility. While waiting for the ROV to be ready, three short multibeam echosounder lines were run to box in the dive site. **CE25008_MB_59** commenced at **02.50**, **CE25008_MB_60** commenced at **03.24** and **CE25008_MB_61** commenced at **03.53** finishing at **04.09**. At 04.32 the ROV went into the water for Dive 5 (**CE25008_RV_62**) on the central Edoras Bank (EBC). The ROV was on the bottom at **05.50** at 2068m water depth. The seabed was relatively flat, sandy with some dropstones with comet marks. A seapen field (likely of *Anthopthilum* sp., Fig. 5) was observed short after the beginning of the dive, and continued until **06.06,** when the seabed became steeper as the ROV progressed northerly encountering bedrock at **06.15**. Bedrock sampling (x5) was done here on basalt pillow lavas at **06.20**. The seapen field resumed when we then continued upslope back onto sandy sediment with dropstones sampling a gorgonian in a dropstone at **07.03**. At **07.12** to **07.15**, OFOP crashed so we temporarily lost ROV navigation. By **07.15** we were back on bedrock that continued to the end of the dive. The terrain became very steep with spectacular exposures of pillow lavas. A specimen of *Paramuricea* sp. was observed and sampled at **07:42**. At **08:55** we reached a black and octocoral garden dominated by whip-like bamboo corals more than a meter tall (Fig. 6). *Bathypathes* sp., *Stauropathes* sp., *Telopathes* sp., *Anthomastus* sp., glass sponges and a very large *Leiopathes* sp., were also observed. Sampling was done half way up the slope on a small steep ledge and at the top of the cliff at **09.11** where corals and basalts we sampled. *09.34 Wind NNE, Force 4.* The dive ended at **09.32** with the ROV recovered to deck by **10.38**. At **11.12** we commenced a transit line to the next dive site in the middle the largest edifice of Edoras Bank collecting multibeam along the way (**CE25008_MB_63**) finishing at **14.47**. *12.00 Wind N, Force 3, low swell, visibility good.* At **15.17**, the ROV was off-deck to commence a shallower (1324 – 1227m water depth) dive on the top of the largest of the Edoras Banks to the east (**CE25008_RV_64**). *15.00 Wind N, Force 3, low swell.* The ROV was on the bottom at **16.36** after some struggles to get down due to

strong currents. The seabed was a muddy gravel with exposed dropstones and we continued up slope. Along the slope coral rubble indicated the presence of *Lophelia pertusa* (aka *Desmophyllum pertusum*) upslope and bedrock exposures were elusive. Live aggregations of *Lophelia* were observed later in the dive, and were associated with many black and octocorals: *Trachythela rudis*, mushroom corals (*Anthomastus* sp.), bubblegum corals (*Paragorgia* sp.), *Chrysogorgia* sp., *Stichopathes* sp., and bamboo corals. At **17.20** it was decided to collect exposed rocks (4 samples) although no bedrock was visible, these may have been dropstones but it was hoped a dominant local origin would be evident on analysis. Further upslope at **17.44**, a bedrock exposure was encountered and more rock samples were collected (6 samples). Dead and eroded *Lophelia* reef was apparent with accumulations around large dropstones. At the end of the dive at **18.48** a second exposure of bedrock was encountered and the final rocks were collected (3 samples). In addition, at the end of the dive, a *Dendrobathypathes* branch was sampled. The dive was finished due to concerns regarding the hydraulic pressure and the strong currents on recovery. *19.00 Wind light airs, low swell, calm seas.* At **20.07** a ship-based multibeam line (**CE25008_MB_65**). was run at 7.7kt from Edoras Bank to Owlsgard in northeasterly direction. *22.50 Wind SE, Force 4.*

Figure 19. Seapen field. A fly-trap anemone growing on a rock in the middle of the photo on a dropstone (IRD: ice rafted debris) with a down current comet mark of IRD.

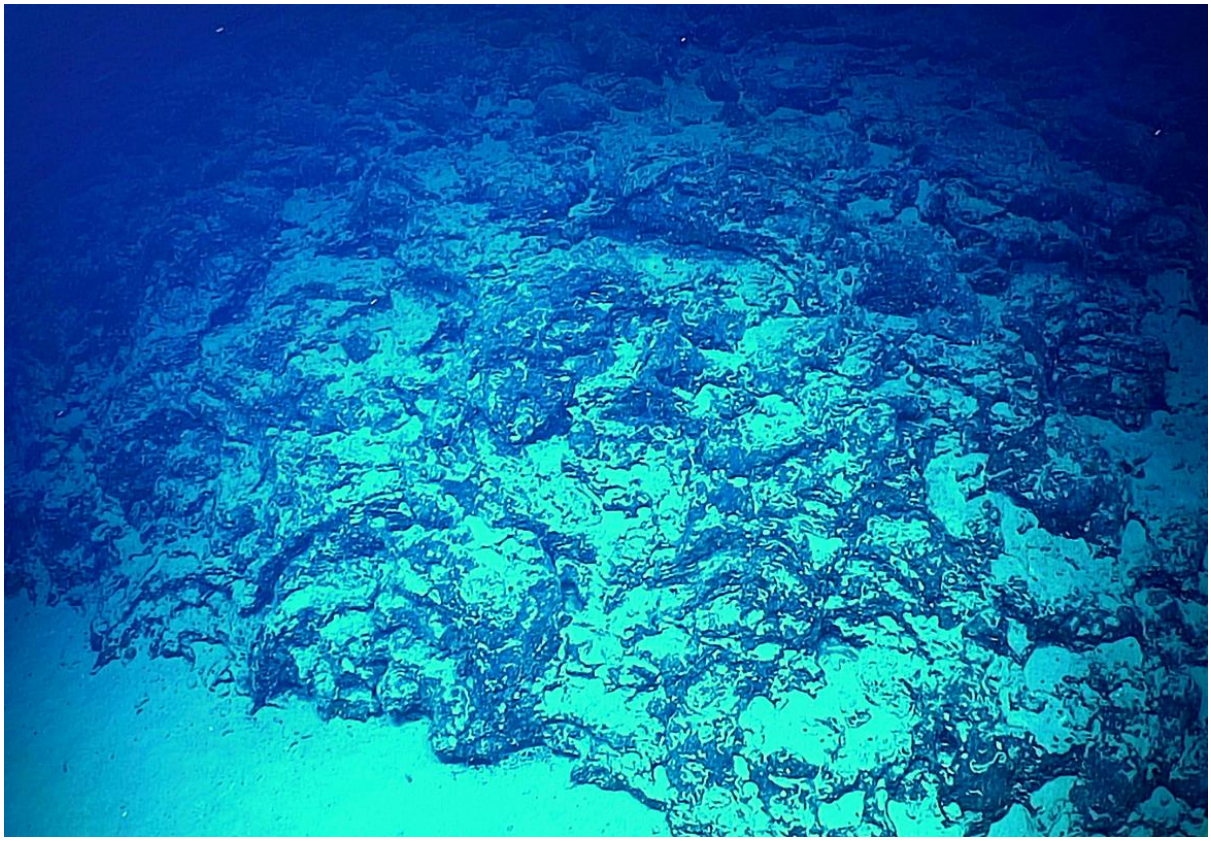


Figure 20. Eroded pillow lava bedrock exposures.

Figure 21. Edoras Bank Middle (Dive 62), angular basaltic blocks close to an outcrop of pillow-like lavas.

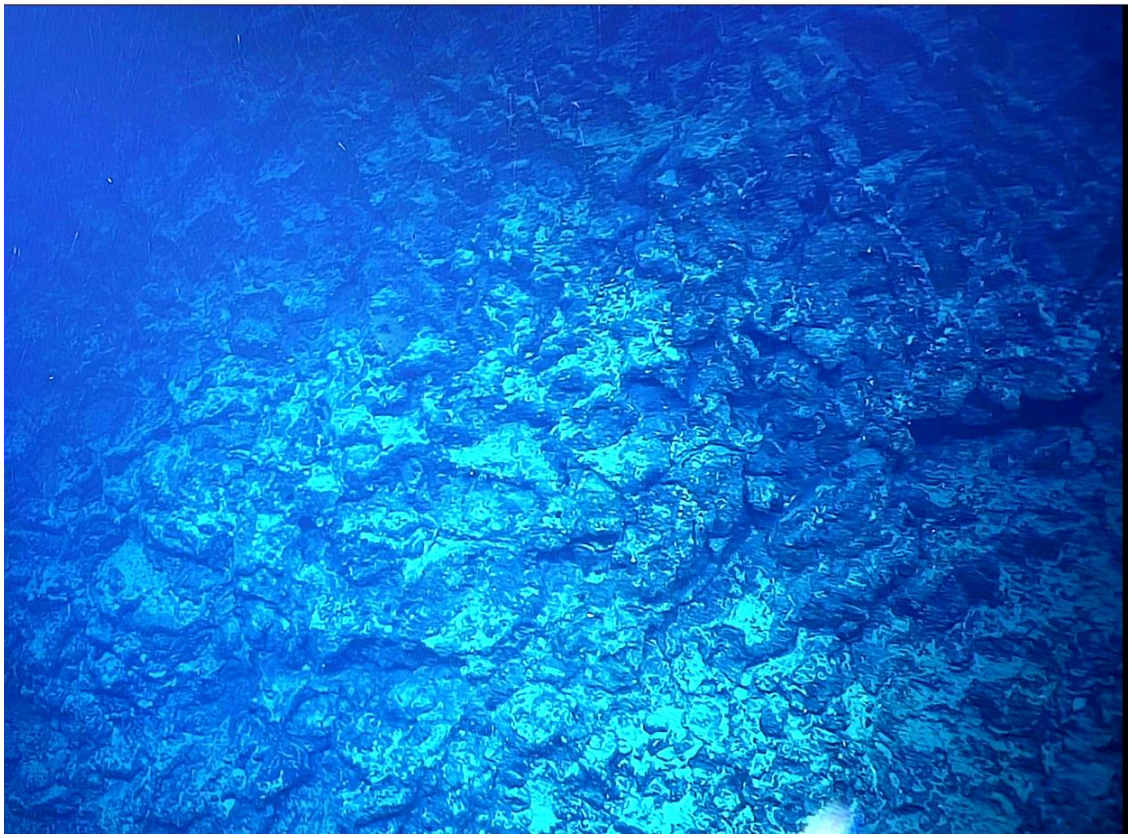


Figure 22. Cliff of exposed pillow lavas.

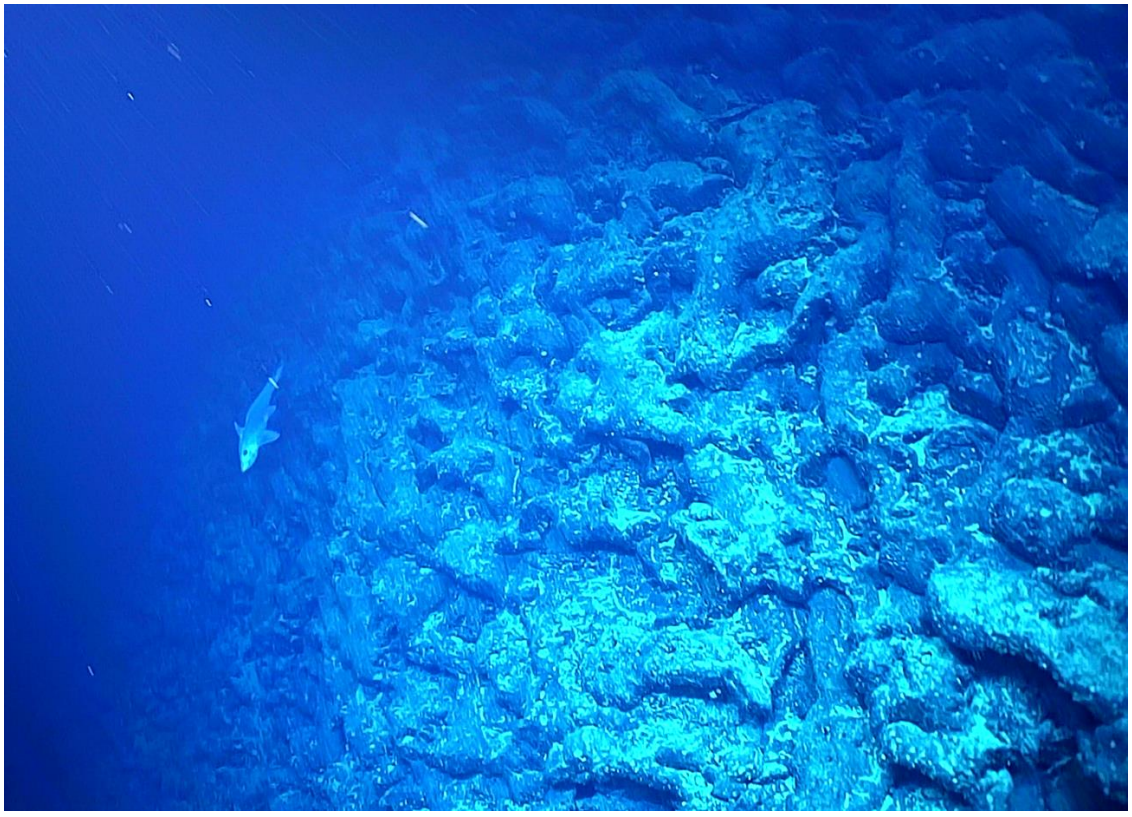


Figure 23. Cliff of exposed pillow lavas with Chimera monstrosa.

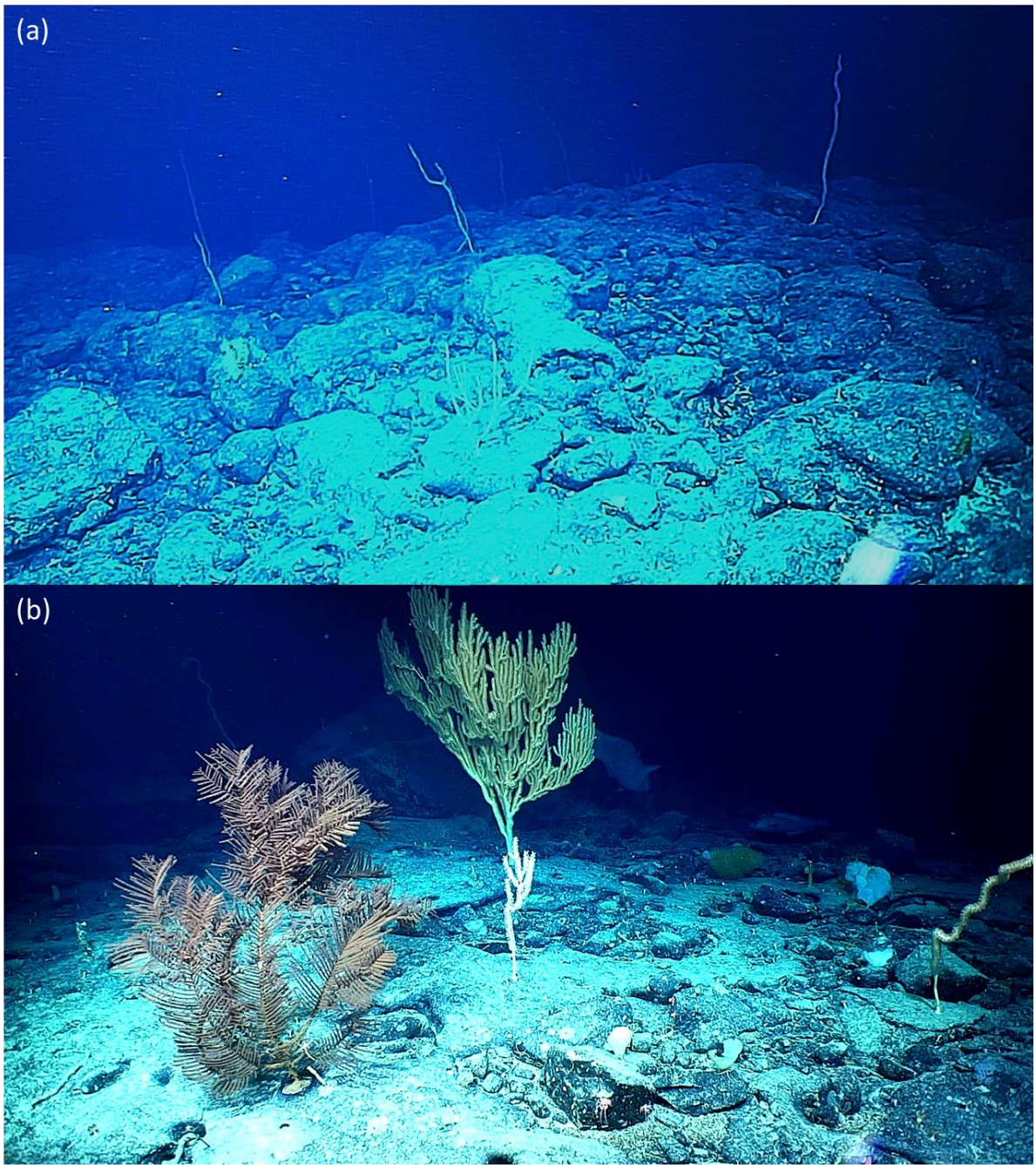


Figure 24. Black and octocoral garden. (a) Whip-like bamboo corals on exposed bedrock; (b) Telopathes *sp., and bamboo corals (keratoisidids) on exposed bedrock.*

10th June 2025: Owlsgard Bank (Wind SE-SW Force 5-7)

01.00 Wind SSE, Force 6, low swell, good visibility. 05.00 Wind SE, Force 7, moderate swell, rough seas. 09.55 Wind SSE, Force 6. Arrived at Owlgard at **11.54** finishing line CE25008_MB_65. Sea conditions were observed and it was decided that it was too rough to deploy the ROV. Multibeam echosounder lines where therefore run along the margin of Owlsgard to better contextualise the dive site (which in the end never happened). Multibeam echosounder line (**CE25008_MB_66**) was run at **12.19** south. The was a small data gap due to a system crash at **13.0**2. Multibeam echosounder line (**CE25008_MB_67**) was run at **13.33**

northwest parallel to CE25008_MB_65. *13.00 Wind S, Force 7.* At **14.21**, the line continued but we turned the heading more northerly to better follow the isobaths. At **15.12**, we started multibeam line **CE25008_MB_68** parallel to CE25008_MB_67 running south finishing at **16.29**. In the meantime, the sea-state was being checked for diving at **12.00**, **14.00** and **17.00** by which time it was decided that it was not calming down adequately before it was predicted to pick up again and that the dive should be abandoned. *17.00 Wind S, Force 5.* Commenced transit for Rockall Bank at **18.13**. *21.18 Wind SW, Force 5.*

11th June 2025: Rockall Bank (Wind SW-SE Force 1-4)

02.00 Wind SW, Force 4, low swell, good visibility. 07.00 Wind light airs, low swell. Arrive just north of the Adele Little MonSta deployment site (CE25008_RV_03) on the Rockall Bank at **07.58** and started southerly multibeam echosounder line (**CE25008_MB_69**) to build a small mosaic over the Little MonSta deployment site. *12.00 Wind variable, Force 1, low swell.* A series of mainly east-west multibeam echosounder lines (**CE25008_MB_70-73**) building a mosaic over the crossline covering the eastern Logachev Mounds and adjacent up and downslope areas was enacted until **13.16**. At **14.52**, a Day grab bulk sediment sample (**CE25008_DG_74**) was collected on the Logachev Mound hosting the Little MonSta Adele on the third attempt at **14.52**. *15.00 Wind SW, Force 2, long swell, good visibility.* While the waited for the weather to improve for diving, multibeam echosounder lines were continued building the mosaic from **15.21** (**CE25008_MB_75**) to **20.21** (**CE25008_DG_78**). At **21.04**, a series of CTD stations were deployed (**CE25008_CTD_77** to **91**) with the 300 kHz APCD. These were lowered at 1 hour intervals to depths ranging from 765 to 792 m water depth at the same location to monitor water column buoyance and an indication of internal wave propagation over the tidal cycle. *19.00 Wind SSE, Force 3, slight sea, moderate swell. 22.55 Wind SE, Force 3.*

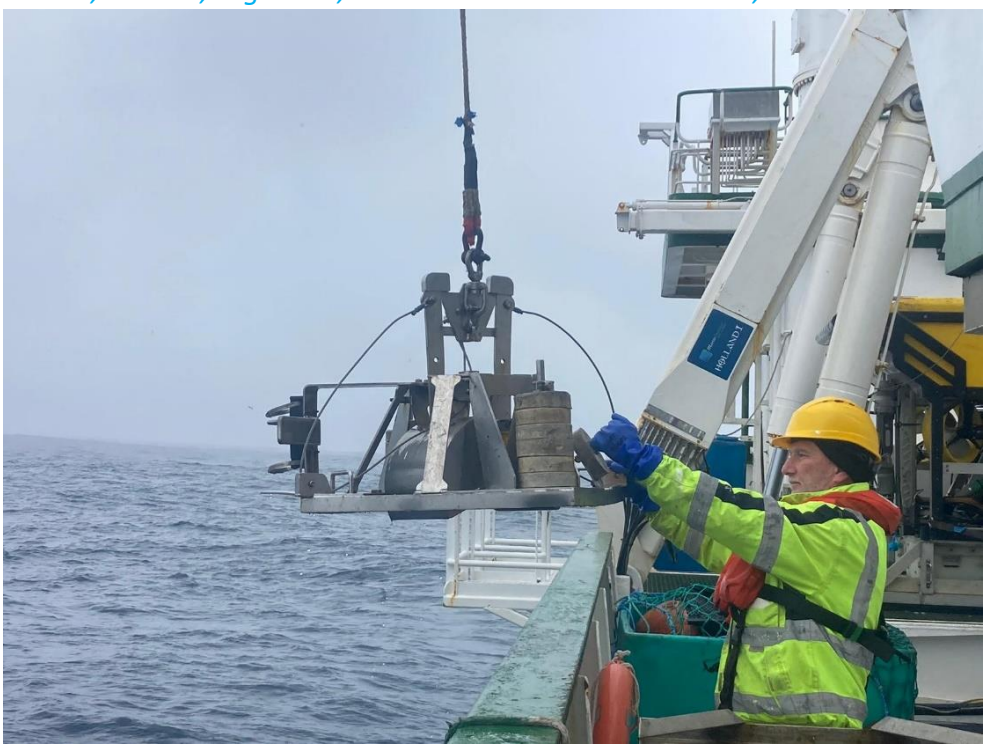


Figure 25. Day grab being deployed at Station 74.

12th June 2025: Rockall Bank (Wind all corners, Force 1-2)

00.00 Wind variable, Force 1, long swell. 04.45 Wind N, Force 2. 10.05 Wind SE, Force 2, fog. CTD cast **CE25008_CTD_91** was recovered to deck at **10.00**. On this CTD, all bottles were also fired at **09.34**. Following the CTD, with the seas constantly falling, multibeam seabed mapping was resumed to further build the mosaic with **CE25008_MB_92** was started at **10.10**. Multibeaming continued until 15.10 with lines **CE25008_MB_92** to **CE25008_MB_97** acquired. *15.00 Wind W, Force 2, long swell.* At **16.06** the ROV went into the water (**CE25008_RV_97**) to collect the Little MonSta Adele as the sea was now calm enough. The currents at the seabed were strong with the ROV locating Adele on the seabed by **16.44**, 2 minutes after reaching the bottom. Recovery of Adele with only one arm (unconventionally), on a steep slope and with strong currents was challenging and some damage was done to the lander frame. However, with perseverance, Adele was recovered to deck by **19.52**. The ROVs port jaws were now changed to the bio-snipper. *21.34 Wind NW, Force 2.* At **23.14**, the ROV was back off deck again **CE25008_RV_99** on a biological sampling dive. Strong currents were encountered on descent with the start of the dive off target, which was fine as this was a reconnaissance dive. A transect was ran, with strong currents at the start, along the foot a ridge of giant cold-water coral carbonate mounds and into a gully between mounds where the currents dropped. The ROV landed on an area of *Lophelia* and *Madrepora* rubble, which soon developed in aggregations parallel to margin of terraces. At the foot of the mounds at the start of the dive coral rubble and coral and sponge colonised dropstones were encountered as encountered with *Leiopathes* sp. and *Sibopathes* sp. sampled. Lophelia/Madrepora aggregations became more occurring in the gully, and many black corals, including frequent big colonies of *Leiopathes* sp., were observed. The dive continued upslope to the crest of the giant carbonate mound. Many urchins (*Cidaris cidaris*), fish and ghost sharks were encountered in this segment of the transect. Other coral observed were *Trissopathes sp., Parantipathes* sp.1 and sp.2, *Bathypathes*, and many malacalcyonaceans (likely Plexauridae and Paramuriceidae). More samples of *Sibopathes* and *Parantipathes* sp.2 were collected. *Trachytela rudis* and neon yellow demosponges were often observed growing among the rubble. At 03:01, an unidentified yellow antipatharian (*Phanopathes* sp.?) was sampled. At the same location, a big rock outcrop colonised by many anthozoans and hexactinellids was found with soft corals (Malacalcyonacea, *Duva* sp., or *Gersemia* sp.?) and a carnivorous sponge. On the mound top we reached a healthy *Lophelia*/*Madrepora* reef associated to a *Leiopathes* sp. garden, that extended north-west and south-east.

13th June 2025 (Friday): Rockall Bank (Wind variable to WSW, Light airs to Force 4)

01.00 Wind variable, Force 1, calm. The ROV was recovered to deck at **04.07**, biological samples processed and ship transited back to the Little MonSta Adele recovery site arriving at **05.04**. *07.00 Wind light airs, calm.* Here a CTD with L-ADCP (**CE25008_CTD_100**) was lower to 20m of the seabed (560m) to detect the main water mass boundary and then brough up to the boundary at 485m. The CTD with the L-ADCP was then held at this depth for 8 hours being recovered at **12.32**. *13.00 Wind variable, light airs, calm.* A second coral bio-sampling dive was then undertaken (**CE25008_RV_101**) being in the water at **13.26**. The ROV was on the bottom by **14.04** and headed up a gully where the currents were not so strong this time. Uphill, the scleractinian aggregations

observed at the bottom of the gully developed in a proper reef framework, with *Madrepora oculata* and *Lophelia pertusa* as dominant species. Many black corals, mostly *Chrysopathes* sp. and *Sibopathes* sp., were observed occurring with scleractinian aggregations. On the reefs, colonies of *Leiopathes* were the most present. Specimens of white *Leiopathes glaberrima* were observed and sampled. At the head of the gully, the ROV climbed up the ridge and to the summit of a cold-water coral giant carbonate mound. There was evidence of lost fishing gear (ropes) and a lot of the summit appear appeared devoid of coral probably due to trawl damage. The ROV left the seabed at **17.48** and was recovered to deck by **18.31**. Following the ROV dive, the vessel moved back to the CTD yo-yo stations (CE25008_CTD_079-091) and the CTD was lowered with the downward looking ADCP to 708m (water mass boundary) following a full cast (**CE25008_CTD_102**) to 787m at **19.41**. The 9 hours deployment at 708m started at **20.01**. *21.05 Wind WSW, Force 4.*

14th June 2025: Rockall Bank to Rockall Trough (Wind WSW-NW Force 2-4)

01.00 Wind WSW, Force 4, low swell. The CTD was recovered 9 hour deployment finished at **06.00** and was on deck at **06.13**. *06.54 Wind NW, Force 2, slight sea, low swell.* A final ROV dive (**CE25008_RV_103**) was then undertaken getting into the water at **06.55**. This dive was again starting up a gully between to giant cold-water coral carbonate mounds and reached the seabed at **07.29**. The ROV proceed upslope and rose to a ridge with coral colonies become more common. Among the scleractinian aggregations and reefs, specimens of Cladopathidae (*Chrysopathes* sp., *Sibopathes* sp.) and many malacalcyonaceans (e.g. *Acanthogorgia* sp., *Paramuricea* sp.) were observed. Octocorals and scleractinians were sampled. A fishnet was observed, indicating signs of past trawling on this mound too. At the ridge, the ROV turned north up towards the summit area. Here, the slope was steep and dense coral colonisation dominated by *Madrepora* and subordinate *Lophelia*, with reoccurrent *Leiopathes* sp., *Paramuricea* sp., *Acanthogorgia* sp., plus other black corals. At the summit, corals reached a significant thickness. The summit area was explored and we headed north slightly downslope were coral become sparse then absent.Coral ridges started to appear as we approached the next coral mound, suggesting possible zonation of reefs on the mounds. The dive ended with a ridge of coral were we observed black sheets of organic materials, likely the fall of a brooding squid egg sack.. After sampling the ROV was recovered at **10.59**. The ROV was on deck at **11.24**. All was secured and we commenced transit for Galway from Logachev Mounds, Rockall Bank at **12.51**. *15.00 Wind NW, Force 4, low swell, good visibility.*

15th June 2025: Rockall Trough to Galway Bay (Wind W, Force 4)

Transit to Galway continued at over 10 knots with demobilisation and packing of equipment on route. *08.59 Wind W, Force 4.* We arrived outside Galway Dock at **xxx**.

16th June 2025: Galway Dock

Demobilisation and survey end. Scientific party departs

Downtime

Significant technical issues, both technical and weather associated occurred, which often conspired. As a results, survey objectives were not met fully and the number of proposed sites reduced. We did make it to our priority far western sites and managed to stay there for most of the survey, be it with diminished productivity. We were eventually hunted east by the weather and managed to salvage our oceanographic work on the Logachev Mounds, thwarted by weather and delays at the start, as well as complete more dives on the Logachev Mounds for VME studies.

Technical Issues

Mobilisation was slower than anticipated with heavy rain slowing wiring operations for the ROV which was also craned on late. As a result, we missed our 6am tide window with the dock gates but were fully mobilised to catch the next tide.
Downtime = 11 hrs 30 minutes

During the wet test that commenced at **28.05 19.47** in Galway Bay communication issues occurred with the USBL. The rear USBL was not communicating and the forward USBL was also giving unreliable readings. The fore USBL was fixed with new configuration settings. There was an apparent issue with the trigger signal getting from the dry lab to the ROV shack which was resolved; the trigger was working but the indicator LED was at fault. On recovery of the ROV (**28.05 23.58**), when the ROV lifted off the seabed it started to spin but the INS had failed and the screen in the ROV shack was frozen. As the sediment had picked up into the sea water it wasn't clear the ROV was spinning. As a result, major twists were made in the umbilical. The ROV was recovered to the surface (**29.05 00.06**) and the twists were unravelled as much as possible. ROV had to be recovered to deck (**29.05 00.16**) with the ship's crane. A replacement rear USBL beacon was fitted to the ROV and the cabled was re-terminated. ROV umbilical re-termination and tension-load testing was complete by **20.00**. Wet test commenced at **30.05 01.09.** Some USBL problems persist with the INS also not working at present so navigation is running off raw USBL positions with jumps. ROV finally recovered to deck ready to go at **01.43**. On **31.05 07.05**, the USBL beacon was tested on the CTD, it worked and it was received by the ROV's INS.
Downtime = 31 hrs 49 minutes

Continuing issues with USBL occurred on the first ROV dive (**CE25008_ROV_3:** Dive 1) after the transit from Galway Bay to Rockall Bank. The ROV has no USBL positioning at all. ROV off the deck at **08.27** but recovered to deck, then redeployed going to 300m but then recovered to the surface then back onto the deck at **09.13**. It was decided to put the beacons back on the CTD for easy testing. The USBL beacons work fine on the CTD so they were refitted to the ROV but in a more elevated position to see if the lander and ROV were blocking the signal.

One of the USBL beacons worked so the dive as taken. ROV went in at **10.20**. By 250m both USBL beacons were responding.

During ROV dive 2 (**CE25008_ROV_11:** Dive 2) on **03.06 05.51**, the rear USBL beacon dropped out at c.600m water depth and this caused the INS to crash. This is very dangerous for the ROV and it descended without navigation and risked having an "unrecognised" spin threatening the cable as occurred in the Galway Bay first wet test. On reaching the seabed, the INS system was completely rebooted but it would not accept the remaining USBL beacon and it was too deep (2500m) for the ship to communicate with the beacon and hence reconfigure it. As the ROV was equipped in ROV multibeam echosounder mode, the INS system was critical to the operation. Rather than waste the dive we went to the seafloor and did the 1km transect in video mode (composite video with no HD video). Fortunately, we found 3 bedrock exposure for future sampling along the transect so the dive was a salvageable success.

When we recovered the ROV to the surface (**CE25008_ROV_12:** Dive 2) at **10.39**, time was spent reconfiguring the USBL beacons to see if we could overcome the problem. It was decided to put the most reliable beacon on the front of the ROV where it will be most stable and not to put the other one on. Hopefully this will be the safest option. As well as not collecting valuable MBES data (although we did find sampling targets) we wasted time trouble shooting the USBLs again.
Downtime = 0 hrs 20 minutes

Ship's MBES line (**CE25008_MB_15**) lasted 43 minutes before MBES stopped pinging due to a supposed issue with the PU and 1PPS trigger. A reboot of the SIS software and a complete power cycle of MBES system failed to resolve the issue. The 1PPS signal was being sent to the PU which was receiving it so the error message appears to be a red herring. BIST test and other tests did not show any problems. At **19.22** the whole system was powered down again and allowed to cool off for 1 hour. The external trigger was disabled and all connection to the system were wiggled. On restarting the system booted up well and multibeaming recommenced at **21.02**. A second minor data crash occurred when an excessively large basemap was uploaded into the system but the reboot was successful. In addition, the system crashed later on that next day but rebooted OK.
Downtime = 1 hrs 40 minutes

Several times the SIS system hanging during the cruise and require a reboot causing minor gaps mosaics.

At **06.06 13.22** the ROV went into the water for a Dive on Edoras Bank A but developed a comms failure with the hydraulics system at **14.31** at 1500m water depth and the ROV was recovered to deck. The vessel waited in station until it was clear that this was a major downtime issue which was realised at **17.00**. To make best use of this downtime the vessel did some multibeam mapping filling in a hole in the Infomar dataset. During the night of **06.06**,

the electronic bottle in the ROV was opened and the problem was isolated to a burnt out multiplexor board. This was replaced and powered up. The communications worked again except to the lights. This suggested that the lights are damaging the new board. Different lights were then swapped in at **07.06 11.00** to try to find the cause of the issue that damaged the multiplexor board. The fault was found to be independent of the multiplexor and was isolated to the Lamp box. The lamps were working by **19.00** with some bypasses in the lamp box. The lighting is not ideal but functional although the video has a significant blue shift (as evident in the screen grabs in this report. At this stage it was then discovered that the starboard arm was not working so that was being looked at during the night of **07.06**. At **07.06 22.30** it was discovered that the circuit board for the starboard was fried and there is no replacement. The starboard arm is therefore non-functional which provide challenges in recovering the Little MonSta at the end of the survey. ROV personnel had to sleep as they had been working long hours to solve these issues. At **08.06 09.30**, all were up and discussion on how to continue occur. It was decided that it was feasible to recover the Lander with one arm. Repairs to the ROV for mobilisation continued during the day of **08.06** with the ROV ready for deployment at **09.32 04.32**.
Downtime = 2 day 15 hrs 10 minutes

Although operating with one arm prohibiting rock and effective biological sampling on the same dive, and with moderate lighting with a significant blue shift, ROV operations continued and the USBL inputs to the ROV and INS remained stable.

Total technical downtime = *4 days 11 hours 29 minutes = 20.3% of the survey*

The weather

There was good weather at the start of the survey but by the wet test it was up to gale force winds with 4.5m swell in the Rockall Trough. However, technical downtime with the ROV coincided with this although the long-range forecast had significantly deteriorated.

Unfortunately, on **31.05 21.00** the decision was made to abandon deploying the second Little MonSta as the swell had increased with the wind at **15.00.** The forecast for the following day, following a short sharp blow, was unlikely to give a significant window to deploy the next day. Initially we used the time to take repeat CTDs but with the unfavourable forecast for the next day probably precluding the deployment of the Little MonSta, and the significant risk that if we waited we would get caught and delayed by a large frontal system approaching, it was decided to "cut our losses" and head to Eriador at **21.50** therefore avoiding the worst of the bad weather but enabling us to get on with the rest of the survey. We anticipated that in the long run this would gain us survey time despite failing to complete Objective 4. Transit speed was significantly reduced to 4 knots when we tried to cross the storm. On arrival at Eriador Ridge, it was too rough to dive so we did seabed mapping with the ship's MBES instead (**CE25008_MB_10 & 11**) when the calmed. This was only possible with a following sea.
Downtime = 1 day

On **03.06 13.00** another weather system increased the swell height and wind speed beyond ROV deployment tolerances. This bad weather last 2 days during which we did seabed mapping of Eriador Ridge with the ship's MBES instead (**CE25008_MB_15**).
Downtime = 2 days

On **10.06**, poor weather was experienced across the whole study area and we were hunted east abandoning our priority targets early. Thus, we moved to Owlsgard arriving at **10.06 11.54** to find the best prospect of diving but conditions there did not improve sufficiently, no dive was possible but we did collect some multibeam rather than nothing. This was poor quality. We headed east again as swell height increased due to the next much larger approaching weather system. That weather system then changed course south making the Rockall Bank much calmer than was predicted on arrival at **11.06 07.58**. However, the swell came later rising to over 3.5 m during the day, with a long period and no wind. Conditions for ROV dives were similarly precluded and we proceeded to make use of the vessel with low priority multibeam echosounder data, a Day grab sample and 13 hours of CTDs every hour. It was not possible to resume diving until the swell had dropped on **12.06** at **15.10**. The swell had to significantly drop was the Little MonSta recovery had to be done with one arm which still proved difficult.
Downtime = 2 days 5 hours and 16 minutes

Total weather downtime = 5 days and 5 hours = 23% of the survey

Total downtime = 9 days 16.5 hours = 44% of the survey

Summary of Findings

Sampling bedrock from volcanic edifices

It was initially planned to use ROV multibeam echosounder mapping to produce high resolution map coverages (Objective 1: Task 1) from which to choose dive targets for sampling based of topography and rugosity. Unfortunately, due to time constraints imposed by the weather and technical issues as well as the lack of confidence in solving the USBL- INS compatibility issue, ROV multibeam was abandoned after one unsuccessful attempt on Eriador Ridge.

Nevertheless, ROV dives to collect rock samples (Objective 1: Task 2) were still performed with promising dive targets chosen based on Infomar ship-based lower resolution MBES data and the new MBES data collected during the survey. On dives, rock outcrops were then hunted with the ROV sonar. In total 76 rock samples were collected consisting of mainly basalts and sandstones, most likely being part of the country rock, and some ice-rafted debris of different lithotypes. Collected rock samples will then be used for petrography, geochemistry and dating to determine the timing and magmatic properties of volcanogenic features (Objective 2: Task 3).

Mapping Eriador Ridge, Edoras Bank, and Owlsgard Bank

An additional objective was achieved with the ship's MBES due to the constraints on dive windows with Eriador Ridge, parts of Edoras Bank, the Western lower flank of Owlsgard and the Western part of the Logachev Mounds mapped. A total of c.4500 km^2 of multibeam echosounder bathymetry was collected (but no higher resolution ROV-based multibeam echosounder data as planned). The enigmatic feature of Eriador Ridge does not appear to be a seamount, being ridge shaped, and it has been postulated that it is a remnant of mid-Atlantic Ridge.

Mapping of Eriador Ridge revealed an increased level of complexity in the morphology along strike compared to the currently available best bathymetric data (GEBCO global grid). Mapping shows two elongate sub-circular features forming the Ridge, that are slightly offset forming the northern and southern segments of the Ridge. The Ridge appears to contain two separate ridge-like structures, one along each margin of the Ridge which are marked by aligned irregular basement highs and steeper slope angle. These are separated by a broad flat region forming the central summit area of the Ridge, thought to be sediment filling between the two basement highs. ROV sampling on the western margin confirmed exposed bedrock on the ridge structures. The new mapping confirmed that these features look like a remnant part of the mid-Atlantic Ridge but a lack of high resolution mapping still this supposition speculative. The collected rock samples will assist in determining this theory.

Edoras Bank was mapped as part of the Irish National Seabed Survey (now Infomar) but the data was of low quality and there was a significant gap where survey data was rejected.

Downtime with the ROV enabled us to fill the hole in the National Seabed Survey and also collect repeat but high-quality data across and along the margins of the Edoras Bank. 2122 km^2 of seabed was mapped. This data revealed steep craggy sides to the bank and a flat top with outcrops of bedrock forming small hills distributed randomly over its surface. These hills have clear been eroded exposing bedrock.

Multibeam bathymetry from Owlsgard was poor quality due to bad weather taken when no other operations were possible. It revealed a margin that was heavily gullied.

VME biological sampling

Fulfilling Objective: Tasks 4 and 5, black and octocoral gardens were observed on Eriador Ridge and Edoras Bank, with biological samples were collected for morphological and molecular characterization. As the dives were carried out on bedrock outcrops and at great depths, it was possible to access samples that are commonly not found on more visited locations (such as *Telopathes* sp.). A sea-pen field was also observed on Edoras Bank; although no coral samples were collected, ROV video data can be used in combination with existing information to better describe the ecological niche occupied by this VME and inform conservation management. As many of the collected corals presented associates, the samples obtained in this survey can be used to inform future studies on the role that cold-water corals have in supporting deep-sea fauna in the context of VMEs.

ROV dives revealed abundance of *Lophelia* and *Madrepora* reefs on unexplored coral mounds of the Logachev province, although signs of historic fishing were observed. The reefs were very healthy and hosted an abundance of different taxa, including many species of fish, elasmobranchs, crustaceans and chimeras. Biological samples collected in this area will be used to inform on the species that sustain deep-sea VMEs, and video data will be used to validate models that predict the distribution of VMEs on carbonate mounds.

Rockall Bank internal waves and cold-water corals

Unfortunately, because of weather constraints, this objective (Objective 4: Task 5) was abandoned as defined. To look at the influence of cold-water coral mound topography on internal wave dynamics and food supply to corals, it was planned to place two Little MonSta on the seabed: one on the summit of a coral mounds, the other off mound but close by. This was to be supplemented by a lower frequency ADCP looking higher into the water column and a CTD cast.

The first Little MonSta was deployed by the weather unpredictably rose early and the second Little MonSta and ADCP were not deployed. It was decided to wait to see if the weather would improve and commence a 12 hour CTD casting regime with one CTD every hour. The next weather forecast informed us that a next Little MonSta deployment was unlikely and we would be advised to abandon the area and get ahead of the next storm as much as possible to maximise the rest of the survey. With hindsight this was the correct decision but disappointing the experiment could not be complete.

Nevertheless, one Little MonSta (Adele) was deployed on a cold-water coral mound summit, which was also visually inspected for megafauna, for 13 days but due to very strong currents toppled over after 3 days limiting the duration of the dataset. Nevertheless, the collection of

a 13 hour yo-yo CTD deployment and a 8 and 9 hours CTD, L-ADCP deployments will give adequate data to help determine the presence of internal waves in the area and its influence on cold-water corals and *vice versa*.

A multibeam bathymetry map was made of the area to provide a topographic context to the hydrodynamic data with reveals a series of upslope-orientated cold-water coral carbonate mounds.

Appendices

Personnel

Scientific Party

Prof Andy Wheeler	Chief Scientist	Cruise management, reporting	UCC
Dr Manfredo Capriolo	Scientist	Rock sampling	Uni Birmingham
Felix Butschek	Scientist	MBES acquisition / landers	UCC
Hazel Knight	Scientist	GIS, watch keeping	Uni Birmingham
Alexa Parimbelli	Scientist	Biological sampling	Uni of Galway
Jess Harty	Scientist	Watch keeping	Freelance
Aaron Grey	Scientist	MBES processing	UCC

Holland 1 ROV Technical crew

Paddy O'Driscoll	ROV superintendent
George Finlay	ROV pilot
Kyle Carr	ROV pilot
William Phelps	ROV pilot
Christopher Pollard	ROV pilot
Artjoma Gozins	ROV pilot

Officers and Crew of the RV Celtic Explorer

Denis Rowan	Master
John Sammon	Chief engineer
Basil Murphy	C/O & Security Officer
Lois Harvey	2/O & Safety Officer
Fintan Keating	2nd Engineer
Calmin Crowley	ETO
Tom Gilmartin	Bosun
Martin Powell	Bosun's Mate
Tommy Grealy	AB Deckhand
Peter Joyce	AB Deckhand
Nigel Dowd	AB Deckhand

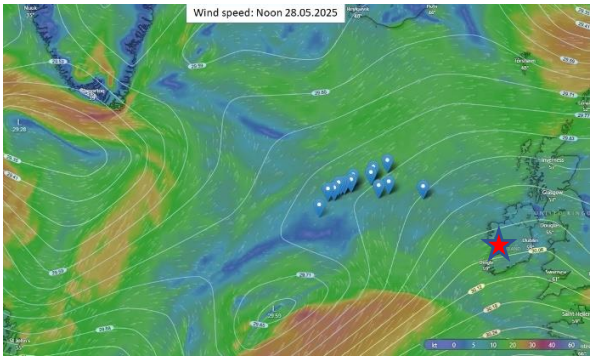
Eoin Colfer	AB Deckhand
Tony Hill	Cook
Paul Cumberford	Assistant cook
Patrick Morris	Technician
Stephen Jeffers	Technician

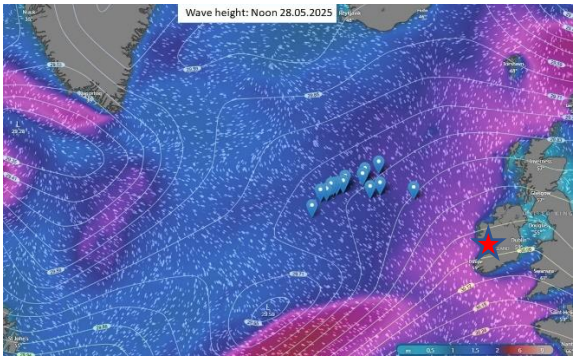
Figure 26. CE25008_VMEx2 scientific party

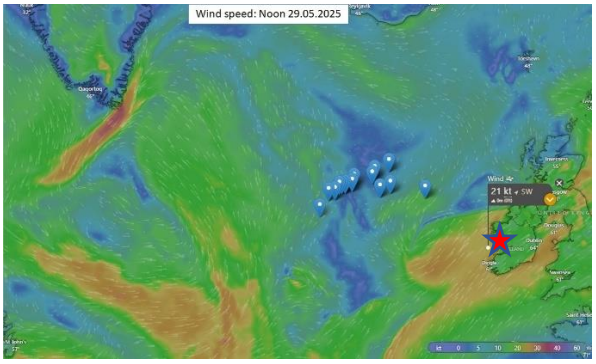
Left to Right: Manfredo Capriolo, Hazel Knight, Alexa Parimbelli, Aaron Grey, Jess Harty, Andy Wheeler, Felix Butschek

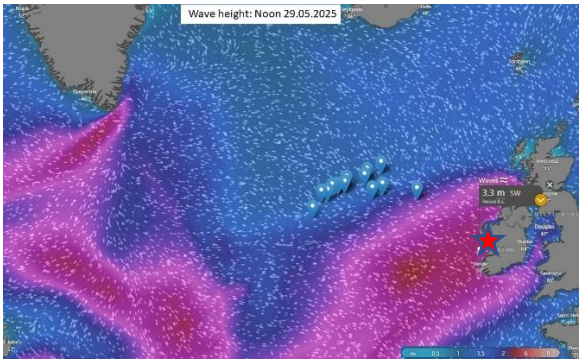
Weather Report

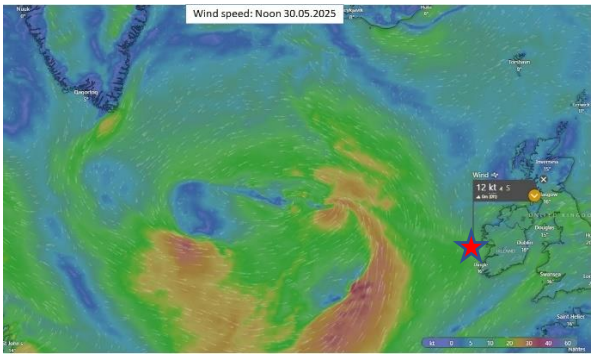
= Vessel position

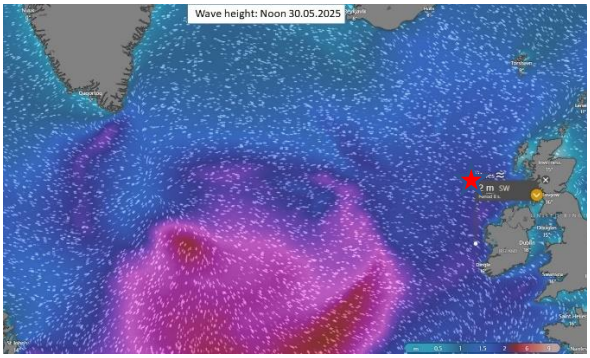


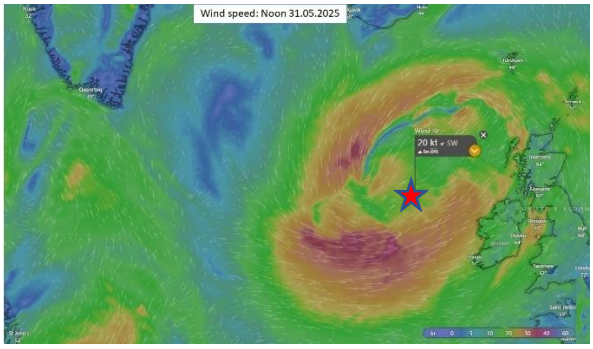


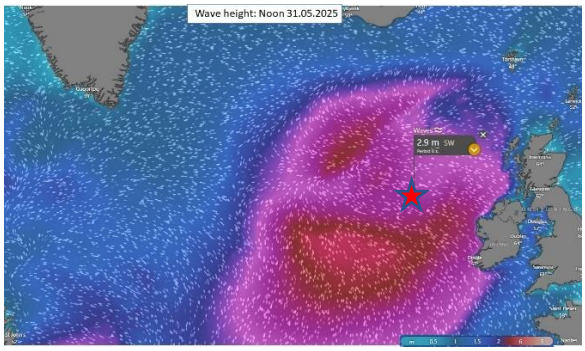


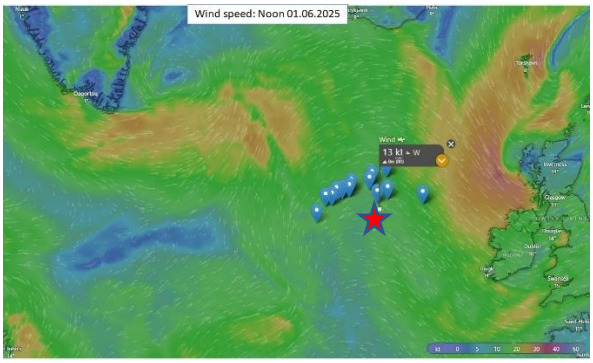


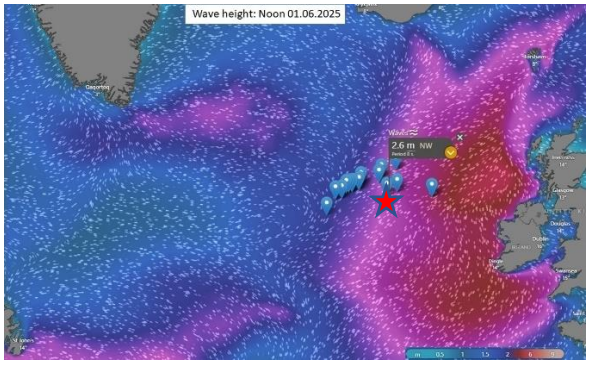


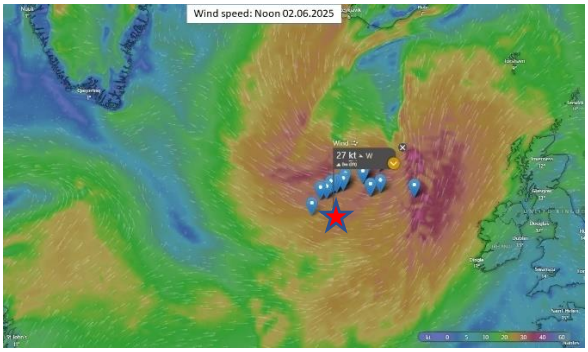


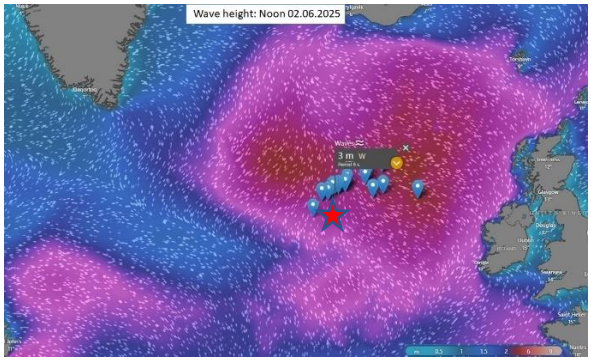

Wind speed: Noon 31.05.2025
20 kt SW

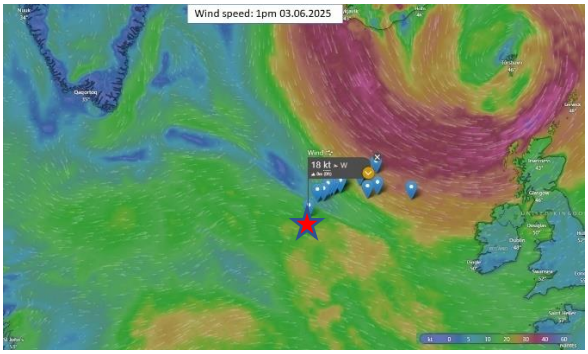

Wave height: Noon 31.05.2025
2.9 m SW

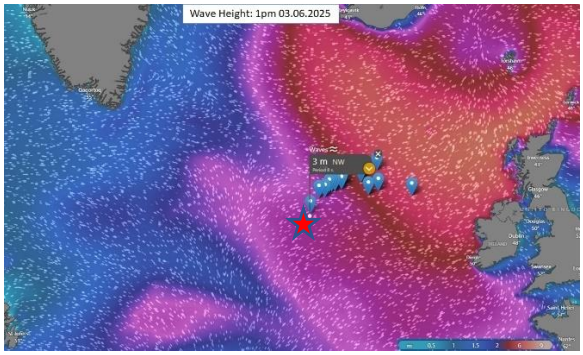

Wind speed: Noon 01.06.2025
13 kt W

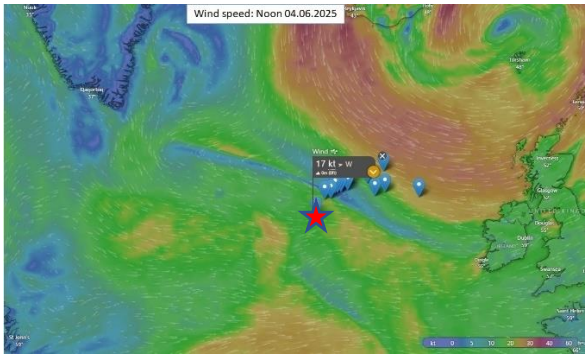

Wave height: Noon 01.06.2025
2.6 m NW

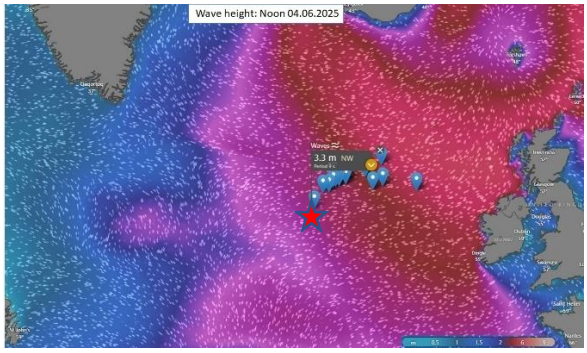

Wind speed: Noon 02.06.2025
27 kt W

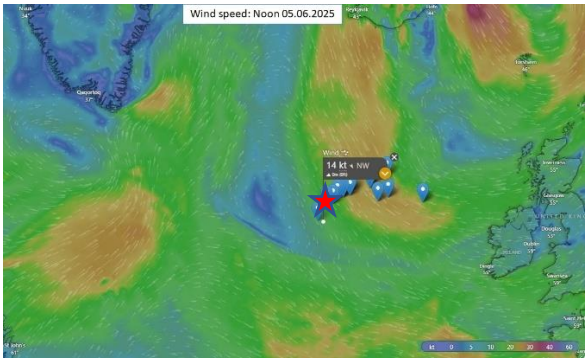

Wave height: Noon 02.06.2025
3 m W

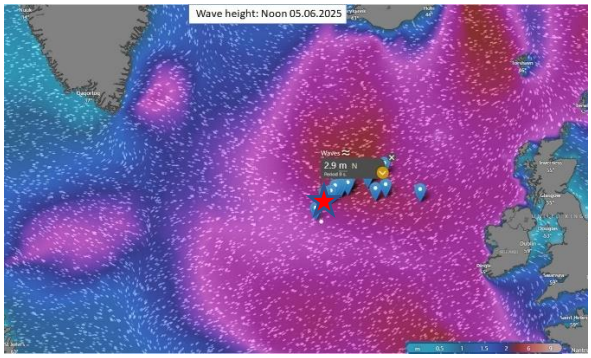

Wind speed: 1pm 03.06.2025
18 kt W

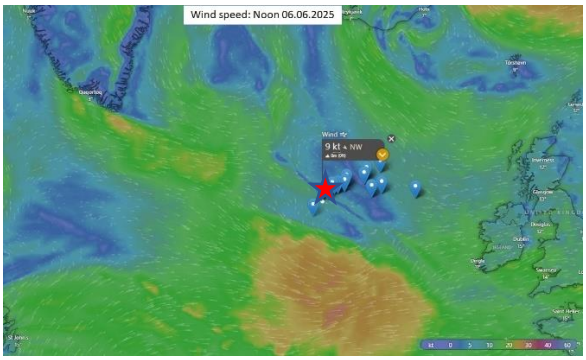

Wave Height: 1pm 03.06.2025
3 m NW

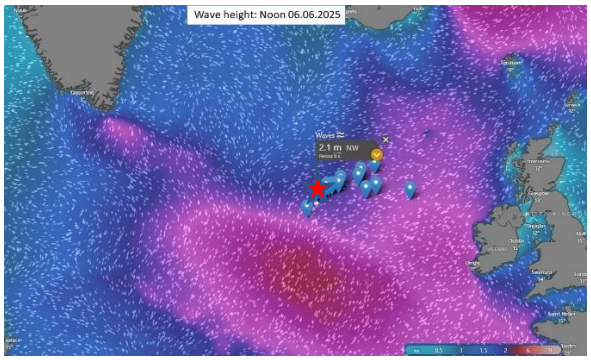

Wind speed: Noon 04.06.2025
17 kt W

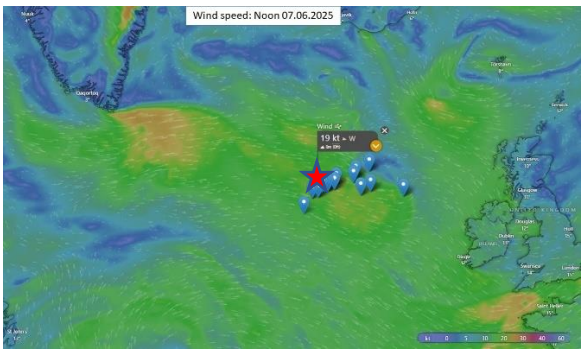

Wave height: Noon 04.06.2025
3.3 m NW

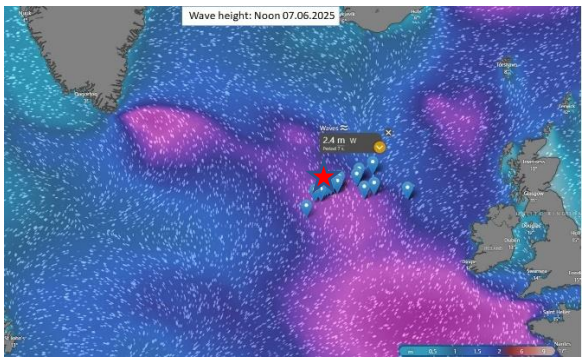

Wind speed: Noon 05.06.2025
14 kt NW

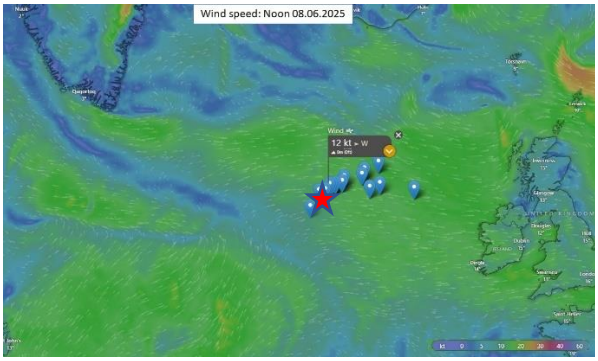

Wave height: Noon 05.06.2025
2.9 m N

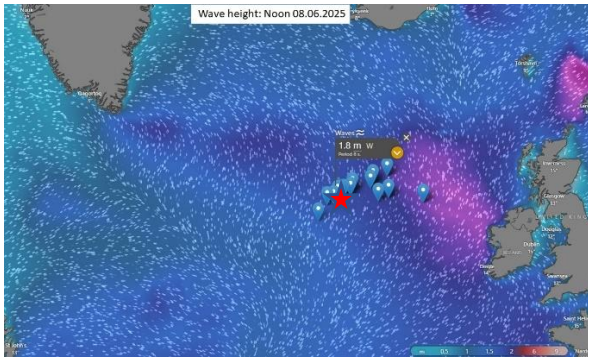

Wind speed: Noon 06.06.2025
9 kt NW

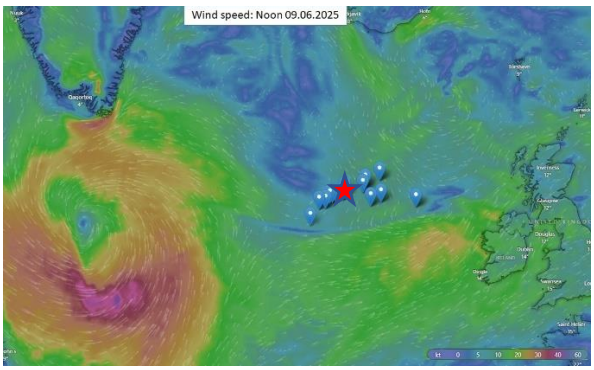

Wave height: Noon 06.06.2025
2.1 m NW

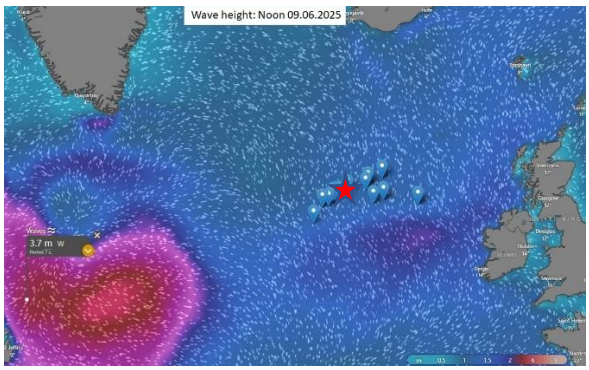

Wind speed: Noon 07.06.2025
19 kt W

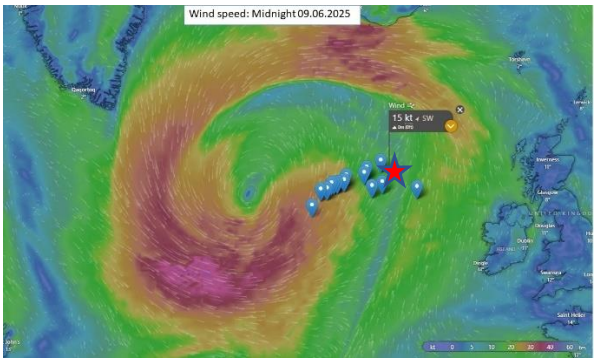

Wave height: Noon 07.06.2025
2.4 m W

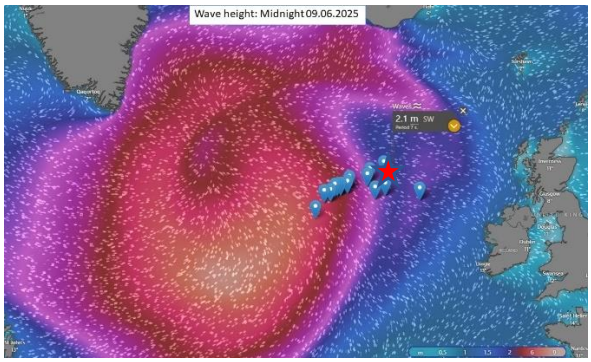

Wind speed: Noon 08.06.2025
12 kt W

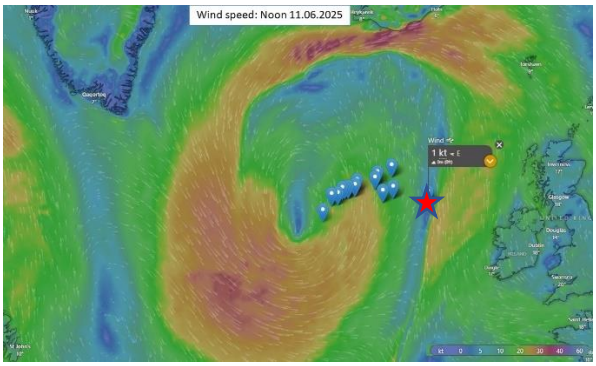

Wave height: Noon 08.06.2025
1.8 m W

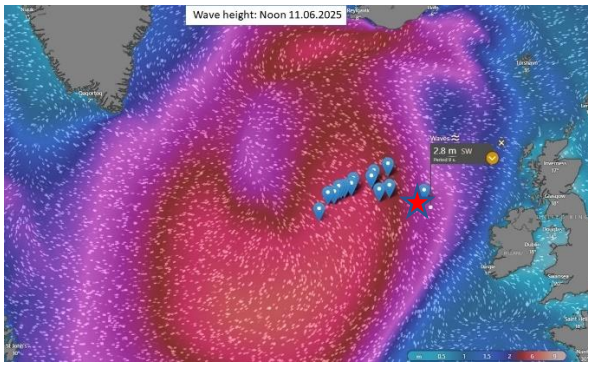

Wind speed: Noon 09.06.2025


Wave height: Noon 09.06.2025
3.7 m W


Wind speed: Midnight 09.06.2025
15 kt SW


Wave height: Midnight 09.06.2025
2.1 m SW


Wind speed: Noon 11.06.2025
1 kt E


Wave height: Noon 11.06.2025
2.8 m SW

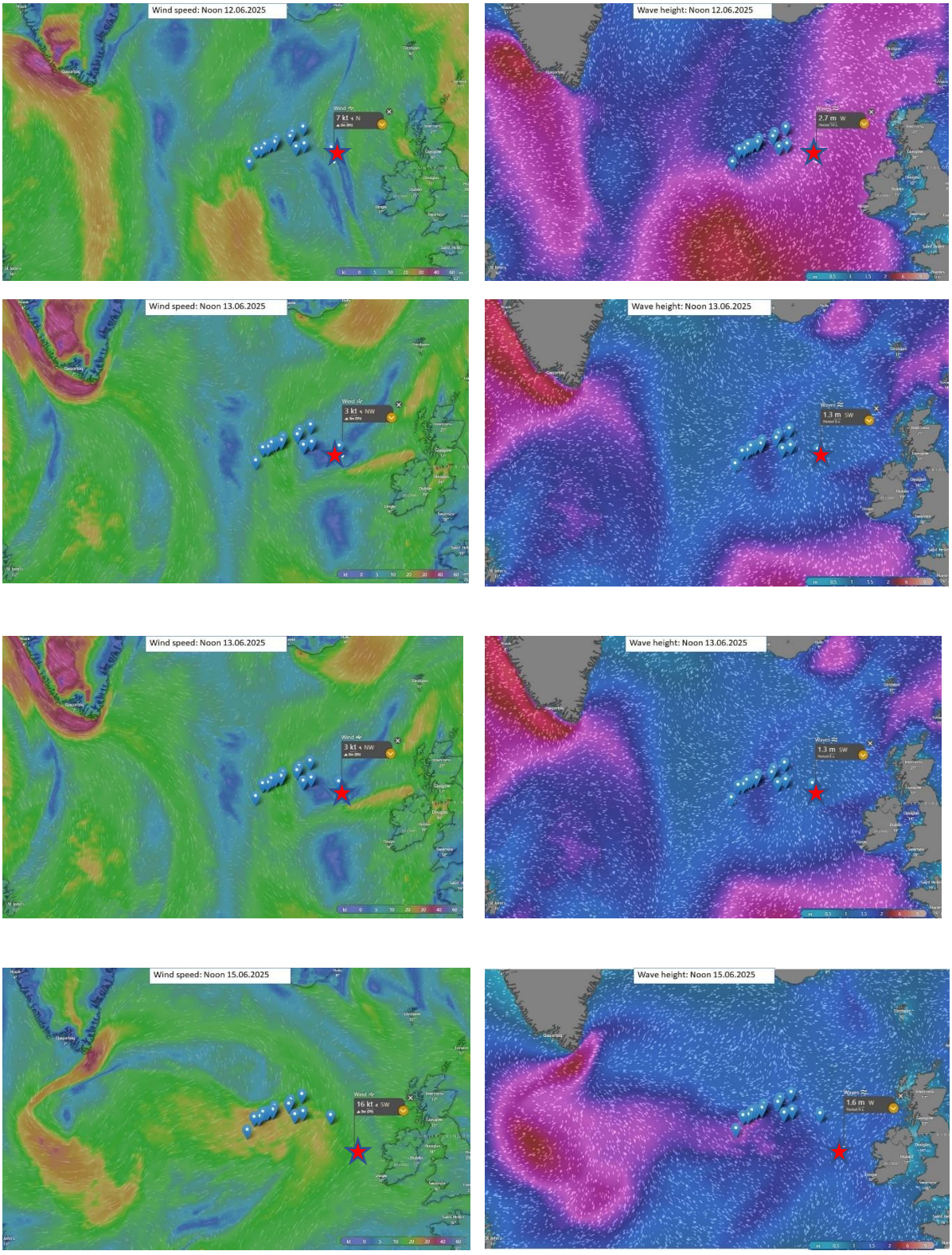


Figure 27. Daily weather charts for predicted wind and swell. Proposed stations and ship daily position are shown. In terms of wave height, the boundary between blue and purple proved workable.

Daily weather charts for predicted wind and swell for noon were downloaded every morning from windy.com. Weather system propagation is shown but Windy.com's predicted wave heights and wind speeds were often inaccurate. Strategic mission planning decision were

based on the ship's bridge downloaded weather forecasts that proved more reliable (not shown here). However, the Figure 9 shows the accurate propagation and manifestation of the weather systems. Actual sea states and wind speeds as they occurred are recorded in the survey narrative. Light purple coded wave heights indicate marginal ROV dive conditions, blue coded wave heights indicate reasonable ROV dive conditions.

Geological Samples (all time UTC)

Geological samples were collected using the ROV and using the rock dredge.

Station	Sample	Dive/Dredge	Latitude	Longitude	Depth (m)	Comment
31	ERI01	Dive 3 (983)	unclear	unclear	ca. 2450	2469 m according to multibeam data from cruise CE21008
31	ERI02	Dive 3 (983)	unclear	unclear	ca. 2450	2469 m according to multibeam data from cruise CE21008
31	ERI03	Dive 3 (983)	unclear	unclear	ca. 2450	2469 m according to multibeam data from cruise CE21008
31	ERI04	Dive 3 (983)	54° 15.75'	25° 44.80'	2433	
31	ERI05	Dive 3 (983)	54° 15.75'	25° 44.80'	2433	
31	ERI06	Dive 3 (983)	54° 15.75'	25° 44.80'	2433	
31	ERI07	Dive 3 (983)	54° 15.75'	25° 44.80'	2433	
31	ERI08	Dive 3 (983)	54° 15.74'	25° 44.74'	2418	
31	ERI09	Dive 3 (983)	54° 15.74'	25° 44.74'	2418	
31	ERI10	Dive 3 (983)	54° 15.74'	25° 44.72'	2413	
31	ERI11	Dive 3 (983)	54° 15.74'	25° 44.72'	2413	
31	ERI12	Dive 3 (983)	54° 15.73'	25° 44.68'	2388	
31	ERI13	Dive 3 (983)	54° 15.73'	25° 44.68'	2388	
31	ERI14	Dive 3 (983)	54° 15.73'	25° 44.68'	2388	
31	ERI15	Dive 3 (983)	54° 15.72'	25° 44.59'	2353	
31	ERI16	Dive 3 (983)	54° 15.72'	25° 44.59'	2353	
31	ERI17	Dive 3 (983)	unclear	unclear	ca. 2450	2469 m according to multibeam data from cruise CE21008
31	ERI18	Dive 3 (983)	54° 15.74'	25° 44.74'	2418	
31	ERI19	Dive 3 (983)	unclear	unclear	ca. 2450	2469 m according to multibeam data from cruise CE21008
37	EBW01	Dive 4 (984)	55° 25.53'	24° 37.32'	2532	
37	EBW02	Dive 4 (984)	55° 25.54'	24° 37.31'	2532	
37	EBW03	Dive 4 (984)	55° 25.54'	24° 37.31'	2532	
37	EBW04	Dive 4 (984)	55° 25.54'	24° 37.31'	2531	
37	EBW05	Dive 4 (984)	55° 25.57'	24° 37.33'	2491	
37	EBW06	Dive 4 (984)	55° 25.57'	24° 37.33'	2492	
37	EBW07	Dive 4 (984)	55° 25.57'	24° 37.33'	2492	
37	EBW08	Dive 4 (984)	55° 25.59'	24° 37.35'	2464	
37	EBW09	Dive 4 (984)	55° 25.59'	24° 37.34'	2465	
37	EBW10	Dive 4 (984)	55° 25.59'	24° 37.34'	2464	
37	EBW11	Dive 4 (984)	55° 25.59'	24° 37.35'	2465	

Station	Sample	Dive/Dredge	Latitude	Longitude	Depth (m)	Comment
37	EBW12	Dive 4 (984)	55° 25.62'	24° 37.36'	2423	
37	EBW13	Dive 4 (984)	55° 25.62'	24° 37.36'	2421	
37	EBW14	Dive 4 (984)	55° 25.61'	24° 37.36'	2421	
37	EBW15	Dive 4 (984)	55° 25.62'	24° 37.36'	2421	
37	EBW16	Dive 4 (984)	55° 25.62'	24° 37.36'	2421	
56	EBB01	Dredge 1	55° 33.66' - 55° 33.60'	23° 44.15' - 23° 44.24'	ca. 2457	7 pieces
57	EBC01	Dredge 2	54° 44.52' - 54° 44.52'	23° 45.31' - 23° 45.17'	ca. 2233	5 pieces
62	EBM01	Dive 5 (987)	55° 44.43'	23° 3.97'	2053	
62	EBM02	Dive 5 (987)	55° 44.43'	23° 3.97'	2053	
62	EBM03	Dive 5 (987)	55° 44.43'	23° 3.97'	2053	
62	EBM04	Dive 5 (987)	55° 44.43'	23° 3.97'	2053	
62	EBM05	Dive 5 (987)	55° 44.43'	23° 3.96'	2053	
62	EBM06	Dive 5 (987)	55° 44.46'	23° 3.98'	2048	
62	EBM07	Dive 5 (987)	55° 44.54'	23° 3.91'	2016	
62	EBM08	Dive 5 (987)	55° 44.54'	23° 3.91'	2016	
62	EBM09	Dive 5 (987)	55° 44.54'	23° 3.90'	2016	
62	EBM10	Dive 5 (987)	55° 44.54'	23° 3.90'	2016	
62	EBM11	Dive 5 (987)	55° 44.54'	23° 3.90'	2016	
62	EBM12	Dive 5 (987)	55° 44.55'	23° 3.68'	1881	
62	EBM13	Dive 5 (987)	55° 44.55'	23° 3.68'	1881	
62	EBM14	Dive 5 (987)	55° 44.55'	23° 3.68'	1881	
62	EBM15	Dive 5 (987)	55° 44.55'	23° 3.67'	1879	
64	EBE01	Dive 6 (988)	56o 6.19'	22o 18.60'	1279	
64	EBE02	Dive 6 (988)	56o 6.19'	22o 18.60'	1279	
64	EBE03	Dive 6 (988)	56o 6.19'	22o 18.60'	1279	
64	EBE04	Dive 6 (988)	56o 6.19'	22o 18.60'	1280	
64	EBE05	Dive 6 (988)	56o 6.17'	22o 18.64'	1265	
64	EBE06	Dive 6 (988)	56o 6.17'	22o 18.64'	1265	
64	EBE07	Dive 6 (988)	56° 6.17'	22° 18.64'	1265	
64	EBE08	Dive 6 (988)	56° 6.17'	22° 18.64'	1265	
64	EBE09	Dive 6 (988)	56° 6.17'	22° 18.64'	1265	
64	EBE10	Dive 6 (988)	56° 6.1'7	22° 18.64'	1265	
64	EBE11	Dive 6 (988)	56° 6.08'	22° 18.79'	1190	
64	EBE12	Dive 6 (988)	56° 6.08'	22° 18.79'	1191	
64	EBE13	Dive 6 (988)	56° 6.08'	22° 18.79'	1191	
64	EBE14	Dive 6 (988)	56° 6.08'	22° 18.79'	1191	

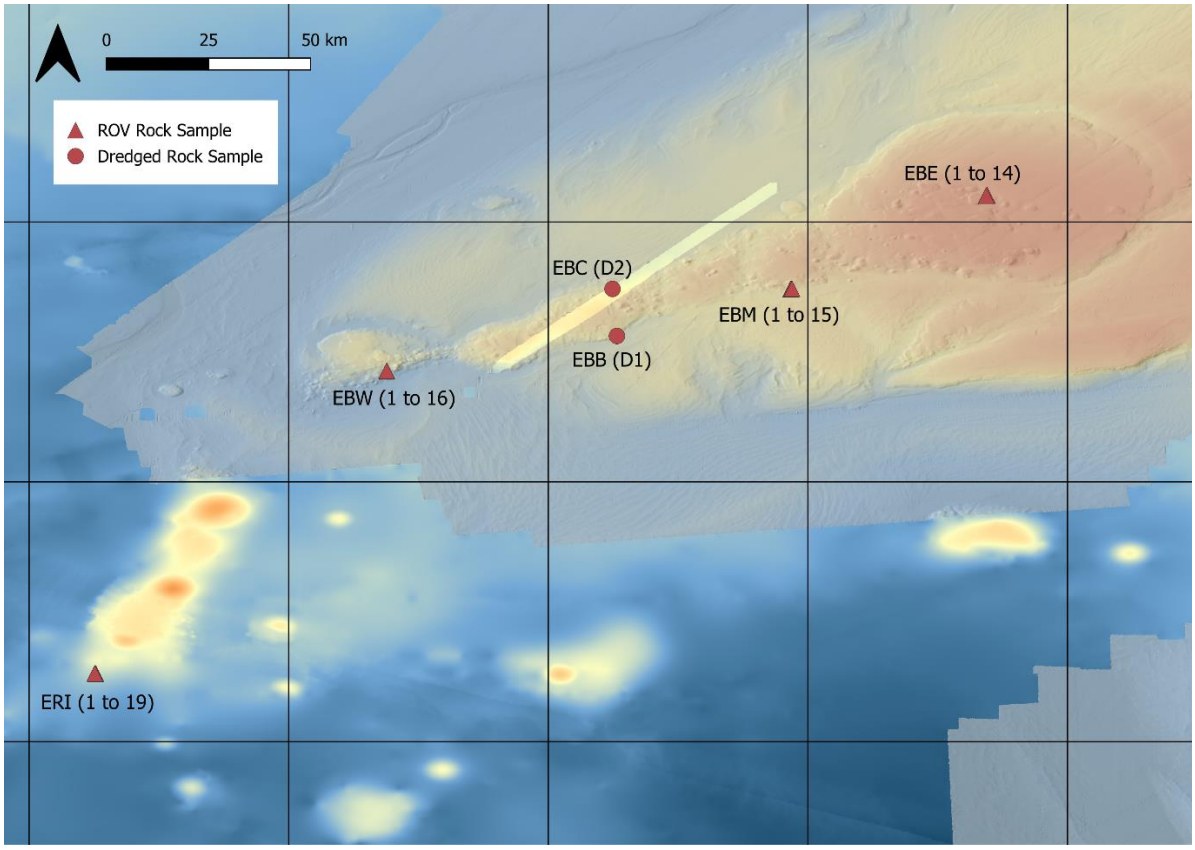


Figure 28. All rock sample locations

Figure 29. Station 31 Dive 3 Eriador ROV rock sample collection

Figure 30. Station 37 (Dive 4): Edoras Bank West ROV rock sample collection

Figure 31. Station 56: Edoras Bank Middle rock dredge samples

Figure 32. Station 57: Edoras Bank Middle rock dredge samples

Figure 33. Station 64 (Dive 5): Edoras Bank Middle ROV rock sample collection

Figure 34. Station 64 (Dive 6): Edoras Bank East ROV rock sample collection

Biological Samples (all time UTC) Note: Station as termed Event in NUIG reporting

Station	Time	Latitude	Longitude	Depth	Specimen Number	Description
31	08:18	54.2626327	-25.7473201	2472	CE25008_001	Bathypathes sp.
31	08:48	54.2626327	-25.74732	2469	CE25008_002	Briozoa (Stylasterid)
31	08:45	54.2626327	-25.74732	2461	CE25008_003	Stauropathes sp.
31	09:07	54.2625083	-25.7434183	2443	CE25008_004	Telopathes sp. (coordinate error)
31	09:29	54.2624810	-25.7465490	2433	CE25008_005	Scleractinia, LOST
31	09:39	54.2624810	-25.7465490	2433	CE25008_006	Hexactinellida
31	09:39	54.2624810	-25.7465490	2433	CE25008_007	Demosponge
31	09:48	54.262481	-25.746549	2432	CE25008_008	Stauropathes cf. punctata
31	10:29	54.2623468	-25.7453343	2413	CE25008_009	Briozoa (Stylasterid)
31	10:36	54.2623468	-25.7453343	2413	CE25008_010	Briozoa (Stylasterid)
31	09:07	54.2625083	-25.7434183	2443	CE25008_011	Ophiurida
31	09:39	54.2624810	-25.7465490	2433	CE25008_012	Ophiurida
37	04:55	55.42284127	-24.62047863	2583	CE25008_013	Stauropathes arctica
37	06:35	55.4260936	-24.6222425	2493	CE25008_014	Keratoisididae, no nodes
37	07:02	55.42608603	-24.62226695	2492	CE25008_015	Keratoisididae, no nodes LOST
37	07:46	55.42696657	-24.62258882	2421	CE25008_016	Keratoisididae, no nodes
37	08:05	55.42702242	-24.62270052	2419	CE25008_017	Bathypathes, only some pinnules collected
37	08:26	55.42702293	-24.6227073	2421	CE25008_018	Keratoisididae, no nodes, collected dead from the seafloor
37	06:35	55.4260936	-24.6222425	2493	CE25008_019	Ophiurida
37	07:46	55.42696657	-24.62258882	2421	CE25008_020	Ophiurida

Station	Time	Latitude	Longitude	Depth	Specimen Number	Description
57	NA	NA	NA	2168	CE25008_021	Zoantharia (dredge sample)
62	07:42	55.74241065	-23.06511592	2048	CE25008_022	Paramuricea
62	09:03	55.74255617	-23.06132243	1875	CE25008_023	Telopathes sp.
62	09:26	55.74254252	-23.06122087	1874	CE25008_024	Whip Keratoisididae
62	07:42	55.74241065	-23.06511592	2048	CE25008_025	Ophiurida
64	18:08	56.101317	-22.313196	1265	CE25008_026	Schizopathid
64	NA	NA	NA	NA	CE25008_027	Keratoisididae
64	17:44	56.10290077	-22.31071993	1265	CE25008_028	Caryophyllia
99	00:20	55.463025	-16.054272	748	CE25008_029	Leiopathes
99	00:32	55.463031	-16.054249	747	CE25008_030	Sibopathes
99	01:21	55.464249	-16.055720	734	CE25008_031	Sibopathes
99	02:34	55.467490	-16.052234	687	CE25008_032	Sibopathes
99	02:37	55.467489	-16.052243	687	CE25008_033	Parantipathes m2
99	03:01	55.468215	-16.051164	663	CE25008_034	Phanopathes
99	03:10	55.468216	-16.051158	663	CE25008_035	Encrusting octocoral
99	03:10	55.468216	-16.051158	663	CE25008_036	Hydrozoan
99	03:10	55.468216	-16.051158	663	CE25008_037	Anemones
99	03:10	55.468216	-16.051158	663	CE25008_038	Crinoids
99	02:37	55.467489	-16.052243	687	CE25008_039	Chyrostilid
99	02:37	55.467489	-16.052243	687	CE25008_040	Worm?
99	03:01	55.468216	-16.051158	663	CE25008_041	Crinoid
99	NA	NA	NA	NA	CE25008_042	Keratoisididae
101	14:21	55.488083	-16.130453	628	CE25008_043	Antipathes
101	15:34	55.488744	-16.137698	590	CE25008_044	Chrysopathes
101	16:07	55.488433	-16.138539	581	CE25008_045	Leiopathes

Station	Time	Latitude	Longitude	Depth	Specimen Number	Description
101	16:07	55.488433	-16.138539	581	CE25008_046	Leiopathes glaberrima
101	16:40	55.488188	-16.138833	575	CE25008_047	Chrysopathes
101	16:42	55.488183	-16.138831	575	CE25008_048	Trissopathes?
103	07:23	55.48547451	-16.03533992	544	CE25008_049	Bathypathes m2
103	07:58	55.486209	-16.032703	634	CE25008_050	Antipathes dichotoma
103	08:33	55.487228	-16.030738	618	CE25008_051	Acanthogorgia
103	09:10	55.48967835	-16.0305714	565	CE25008_052	Paramuriceidae
103	09:10	55.48967835	-16.0305714	565	CE25008_053	Acanthogorgia
103	09:10	55.48967835	-16.0305714	565	CE25008_054	Madrepora oculata
103	09:28	55.49035366	-16.03029553	560	CE25008_055	Acanthogorgia
103	10:47	55.493337	-16.031189	549	CE25008_056	Squid egg sack
103	07:58	55.486209	-16.032703	634	CE25008_057	Hydrozoan
103	09:10	55.48967835	-16.0305714	565	CE25008_058	Lophelia

See ROV maps for location of biological samples. Note: coordinates correct and correlate with ROV navigation.

Station Logs and Maps

Master Log and Maps (all time UTC)

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	ROV					CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
						Dive#	off deck	on seabed	off seabed	on deck							
CE25008_CTD_001	29/05/2025	00:30	53° 11.52'	09° 38.50'	51						X						CTD in water, 10 bottles fired
CE25008_RV_003	31/05/2025	10:20	55° 29.53'	16° 02.47'	570	1 (987)	X					X					ROV off deck
CE25008_RV_003	31/05/2025	11:41	55° 29.59'	16° 02.50'	568	1 (987)		x				X	X				Little MonSta Adele deployed at 592m depth
CE25008_RV_003	31/05/2025	11:52	55° 29.53'	16° 02.47'	569	1 (987)			X			X	X				Off seabed
CE25008_RV_003	31/05/2025	12:39	55° 29.53'	16° 02.47'	568	1 (987)				X		X					On surface
CE25008_CTD_004	31/05/2025	15:13	55° 30.20'	16° 02.56'	672						X						CTD in water
CE25008_CTD_004	31/05/2025	15:40	55° 30.20'	16° 02.57'	672						X						CTD on deck
CE25008_CTD_005	31/05/2025	16:14	55° 30.19'	16° 02.57'	672						X						CTD in water
CE25008_CTD_005	31/05/2025	16:45	55° 30.20'	16° 02.56'	672						X						CTD on deck
CE25008_CTD_006	31/05/2025	17:09	55° 30.21'	16° 02.58'	672						X						CTD in water
CE25008_CTD_006	31/05/2025	17:37	55° 30.20'	16° 02.55'	672						X						CTD on deck
CE25008_CTD_007	31/05/2025	18:10	55° 30.20'	16° 02.57'	672						X						CTD in water
CE25008_CTD_007	31/05/2025	18:38	55° 30.20'	16° 02.56'	672						X						CTD on deck
CE25008_CTD_008	31/05/2025	19:09	55° 30.20'	16° 02.55'	673						X						CTD in water

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_CTD_008	31/05/2025	19:36	55° 30.20'	16° 02.56'	677						X						CTD on deck
CE25008_CTD_008	31/05/2025	19:36	55° 30.20'	16° 02.56'	677						X						CTD on deck
CE25008_MB_010	03/06/2025	00:12	55° 21.59'	25° 48.62'	3036											X	SOL, Multibeam at 3036 m
CE25008_MB_010	03/06/2025	02:20	54o 20.75'	25° 30.00'	2309											X	EOL, Multibeam at 2309 m
CE25008_MB_011	03/06/2025	02:22	54o 20.59'	25° 30.03'	2314											X	SOL, Multibeam at 2314m
CE25008_MB_011	03/06/2025	03:54	54o 16.12'	25° 45.32'	2563											X	EOL, arrived at Eriador ROV site
CE25008_RV_012	03/06/2025	05:51	54° 15.91'	25° 45.32'	2256	2 (988)	X										ROV off deck, with MBES
CE25008_RV_012	03/06/2025	07:54	54° 15.91'	25° 45.32'	2564	2 (988)		X					X				ROV on seabed at 2564 m depth (internal nav error) SOL with no MBES, composite video only
CE25008_RV_012	03/06/2025	10:39	54° 15.66'	25° 44.55'	2365	2 (988)		X					X				ROV on EOL at 2365m depth
CE25008_RV_012	03/06/2025	13:03	54° 15.65'	25° 44.55'	2365	2 (988)				X							ROV on deck (tested USBL on way up)
CE25008_MB_013	03/06/2025	13:41	54° 16.42'	25° 42.34'	2504											X	SOL Multibeam, heading back to line 010
CE25008_MB_013	03/06/2025	14:38	54° 20.72'	25° 30.77'	2280											X	EOL Multibeam, back to line 010
CE25008_CTD_014	03/06/2025	14:51	54° 20.80'	25° 30.78'	2266						X						CTD in water

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_CTD_014	03/06/2025	15:54	54° 20.80'	25° 30.78'	2260						X						CTD on deck
CE25008_MB_015	03/06/2025	16:07	54° 20.74'	25° 30.08'	2309											X	SOL Multibeam, Multibeam at 2309 m
CE25008_MB_015	03/06/2025	16:50	54° 20.87'	25° 22.24'	2753											X	EOL Multibeam, Multibeam signal lost
CE25008_MB_016	03/06/2025	21:02	54° 20.90'	25° 24.38'	2450											X	
CE25008_MB_016	03/06/2025	21:36	54° 20.98'	25° 16.37'	2873											X	
CE25008_MB_017	03/06/2025	22:33	54° 21.06'	25° 22.80'	2707											X	
CE25008_MB_017	03/06/2025	23:51	54° 22.88'	25° 11.09'	2960											X	
CE25008_MB_018	04/06/2025	00:28	54° 25.24'	25° 14.93'	2932											X	
CE25008_MB_018	04/06/2025	03:47	54° 24.16'	25° 42.82'	2208											X	
CE25008_MB_019	04/06/2025	03:54	54° 24.28'	25° 43.51'	2258											X	
CE25008_MB_019	04/06/2025	05:00	54° 24.57'	25° 49.98'	2993											X	
CE25008_MB_020	04/06/2025	05:25	54° 27.61'	25° 49.09'	2993											X	
CE25008_MB_020	04/06/2025	08:06	54° 27.44'	25° 22.54'	2558											X	
CE25008_MB_021	04/06/2025	08:30	54° 26.04'	25° 20.83'	2776											X	
CE25008_MB_021	04/06/2025	10:45	54° 25.15'	25° 36.58'	1927											X	
CE25008_MB_022	04/06/2025	11:15	54° 26.30'	25° 41.57'	2078											X	
CE25008_MB_022	04/06/2025	11:42	54° 27.44'	25° 45.51'	2386											X	EOL
CE25008_MB_024	04/06/2025	14:01	54° 30.43'	25° 49.40'	3311											X	SOL
CE25008_CTD_023	04/06/2025	12:26	54° 30.39'	25° 49.65'	3300						X						CTD cast to 2000m

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)		ROV										Notes
						Dive#	off deck	on seabed	off seabed	on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	
CE25008_MB_024	04/06/2025	16:01	54° 29.19'	25° 27.70'	2097											X	EOL
CE25008_MB_025	04/06/2025	16:18	54° 30.57'	25° 27.36'	2049											X	SOL
CE25008_MB_025	04/06/2025	20:12	54° 54.38'	25° 26.05'	2569											X	EOL
CE25008_MB_026	04/06/2025	20:35	54° 54.25'	25° 20.83'	2034											X	SOL (down to Eriador site) heading S
CE25008_MB_026	04/06/2025	23:12	54° 31.88'	25° 21.96'	2442											X	EOL
CE25008_MB_027	04/06/2025	23:15	54° 31.66'	25° 22.41'	2443											X	SOL (East-West transit)
CE25008_MB_027	04/06/2025	23:46	54° 32.87'	25° 28.47'	1930											X	EOL (system crash)
CE25008_MB_028	04/06/2025	23:54	54° 33.06'	25° 29.54'	1934											X	SOL
CE25008_MB_028	05/06/2025	00:27	54° 33.59'	25° 35.18'	2174											X	EOL
CE25008_MB_029	05/06/2025	00:38	54° 33.18'	25° 37.06'	2216											X	SOL
CE25008_MB_029	05/06/2025	03:19	54° 17.05'	25° 29.00'	2474											X	EOL
CE25008_MB_030	05/06/2025	03:24	54° 16.87'	25° 29.57'	2533											X	SOL
CE25008_MB_030	05/06/2025	04:25	54° 15.77'	25° 44.89'	2403											X	EOL
CE25008_RV_031	05/06/2025	06:01	54° 15.77'	25° 44.98'	2442	3 (983)	X										ROV of deck @ Surface
CE25008_RV_031	05/06/2025	07:43	54° 15.77'	25° 44.98'	2482	3 (983)		X									ROV on seabed @ 2482.1m
CE25008_RV_031	05/06/2025	13:48	54° 15.72'	25° 44.62'	2365	3 (983)				X							ROV on deck
CE25008_RV_031	05/06/2025	11:35	54° 26.18'	25° 74.31'	2357	3 (983)			X								ROV off seabed
CE25008_MB_032	05/06/2025	16:27	54° 32.11'	25° 46.04'	2776											X	SOL
CE25008_MB_032	05/06/2025	17:12	54° 31.72'	25° 29.05'	2105											X	EOL

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_MB_033	05/06/2025	17:48	54° 34.14'	25° 31.93'	2019											X	SOL
CE25008_MB_033	05/06/2025	19:29	54° 44.54'	25° 29.87'	2601											X	EOL
CE25008_MB_034	05/06/2025	19:31	54° 44.53'	25° 29.85'	2615											X	SOL (Eriador)
CE25008_MB_034	05/06/2025	20:34	54° 43.07'	25° 13.29'	2453											X	EOL
CE25008_MB_035	05/06/2025	20:34	54° 43.12'	25° 13.09'	2535											X	SOL (Eriador)
CE25008_MB_035	05/06/2025	22:02	54° 54.64'	25° 15.35'	1948											X	EOL
CE25008_MB_036	05/06/2025	22:04	54° 54.83'	25° 15.23'	1930											X	SOL (transit to Edoras Bank)
CE25008_MB_036	06/06/2025	02:24	55° 25.31'	24° 37.16'	2601											X	EOL
CE25008_RV_037	06/06/2025	03:01	55° 25.31'	24° 37.16'	2601	4 (984)	X										ROV off deck
CE25008_RV_037	06/06/2025	04:33	55° 25.31'	24° 37.16'	2601	4 (984)		X					X	X			ROV on seabed
CE25008_RV_037	06/06/2025	08:57	55° 25.67'	24° 37.32'	2397	4 (984)			X				X	X			ROV coming off seabed
CE25008_RV_037	06/06/2025	10:30	55° 25.67'	24° 37.32'	2397	4 (984)				X							ROV on deck
CE25008_MB_038	06/06/2025	10:45	55° 25.22'	24° 37.11'	2589											x	SOL
CE25008_MB_038	06/06/2025	10:53	55° 26.33'	24° 37.32'	2346											x	EOL
CE25008_MB_039	06/06/2025	10:56	55° 26.06'	24° 37.32'	2346											x	SOL (transit line)
CE25008_MB_039	06/06/2025	12:28	55° 34.44'	24° 14.61'	2299											x	EOL
CE25008_MB_040	06/06/2025	12:28	55° 34.44'	24° 14.61'	2299											x	SOL (Dive 5 line)
CE25008_MB_040	06/06/2025	12:33	55° 34.83'	24° 14.29'	2118											x	EOL
CE25008_MB_041	06/06/2025	12:38	55° 34.83'	24° 14.29'	2211											x	SOL (Dive 5 line repeat)
CE25008_MB_041	06/06/2025	12:43	55° 34.43'	24° 14.70'	2301											x	EOL

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_MB_042	06/06/2025	17:45	55° 33.28'	24° 14.27'	2279											x	SOL (transit line) Edoras Bank
CE25008_MB_042	06/06/2025	18:31	55° 25.82'	24° 14.30'	2279											x	EOL
CE25008_MB_043	06/06/2025	18:35	55° 25.99'	24° 13.62'	2279											x	SOL infomar data gap in fill
CE25008_MB_043	07/06/2025	00:38	56° 09.45'	23° 06.33'	2311											x	EOL
CE25008_MB_044	07/06/2025	01:01	56° 08.59'	23° 04.12'	2322											x	SOL
CE25008_MB_044	07/06/2025	10:08	55° 24.49'	24° 12.31'	2279											x	EOL
CE25008_MB_045	07/06/2025	10:31	55° 22.64'	24° 09.06'	?											x	SOL
CE25008_MB_045	07/06/2025	11:05	55° 25.36'	24° 04.72'	?											x	EOL
CE25008_MB_046	07/06/2025	11:08	55° 25.60'	24° 04.35'	?											x	SOL
CE25008_MB_046	07/06/2025	15:43	55° 48.90'	24° 28.44'	1910											x	EOL
CE25008_MB_047	07/06/2025	15:43	55° 48.90'	24° 28.44'	?											x	SOL
CE25008_MB_047	07/06/2025	16:12	55° 51.45'	24° 24.5'	?											x	EOL
CE25008_MB_048	07/06/2025	16:44	55° 49.47'	24° 22.64'	?											x	SOL
CE25008_MB_048	07/06/2025	17:36	55° 52.58'	24° 29.87'	?											x	EOL
CE25008_MB_049	07/06/2025	17:47	55° 52.58'	24° 29.87'	?											x	SOL
CE25008_MB_049	07/06/2025	18:29	55° 48.88'	23° 23.06'	?											x	EOL
CE25008_MB_050	07/06/2025	18:39	55° 48.24'	23° 23.30'	1916											x	SOL
CE25008_MB_050	07/06/2025	19:28	55° 51.48'	23° 30.85'	?											x	EOL
CE25008_MB_051	07/06/2025	19:40	55° 49.56'	24° 29.87'	?											X	SOL

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	ROV											Notes
						Dive#	off deck	on seabed	off seabed	on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	
CE25008_MB_051	07/06/2025	20:33	55° 48.86'	23° 23.01'	?											X	EOL
CE25008_MB_052	07/06/2025	21:55	55° 54.05'	23° 35.16'	2378											X	SOL
CE25008_MB_052	07/06/2025	22:55	55° 54.17'	23° 35.89'	2375											X	EOL
CE25008_MB_053	07/06/2025	22:00	55° 54.17'	23° 35.89'	2375											X	SOL
CE25008_MB_053	08/06/2025	02:38	55° 29.32'	24° 14.21'	2179											X	EOL
CE25008_MB_054	08/06/2025	02:44	55° 28.84'	24° 13.56'	2176											X	SOL
CE25008_MB_054	08/06/2025	03:53	55° 23.38'	24° 02.11'	2650											X	EOL
CE25008_MB_055	08/06/2025	03:58	55° 23.69'	24° 00.86'	2645											X	SOL
CE25008_MB_055	08/06/2025	08:52	55° 50.24'	23° 19.93'	1877											X	EOL
CE25008_DR_056	08/06/2025	13:08	55° 34.54'	23° 43.03'	?										X		off deck - ship's position
CE25008_DR_056	08/06/2025	14:51	55° 33.66*	23° 44.15'	?										X		on seabed start dredge (dredge position)
CE25008_DR_056	08/06/2025	15:09	55° 33.6*	23° 44.24'	2457										X		off seabed dredge finished (dredge position)
CE25008_DR_056	08/06/2025	16:00	55° 33.18*	23° 44.23'	2460										X		on deck (ship's position)
CE25008_DR_057	08/06/2025	18:22	54° 44.48	23° 44.89'	2219										X		dredge off deck (ship's position)
CE25008_DR_057	08/06/2025	18:50	54° 44.52*	23° 45.31'	2233										X		on seabed start dredge (dredge position)
CE25008_DR_057	08/06/2025	19:29	54° 45.17	23° 47.12'	2233										X		off seabed dredge finished (dredge position)

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_DR_057	08/06/2025	20:48	54° 44.58	23° 47.20'	2187										X		on deck ship's position)
CE25008_MB_058	08/06/2025	22:13	54° 44.43'	23° 27.73'	1871											X	SOL
CE25008_MB_058	08/06/2025	23:34	55° 44.35'	23° 03.44'	2072											X	EOL
CE25008_MB_059	09/06/2025	02:50	54° 44.35'	23° 03.55'	2073											X	SOL
CE25008_MB_059	09/06/2025	03:09	55° 44.33'	22° 59.20'	2010											X	EOL
CE25008_MB_060	09/06/2025	03:24	55° 45.85'	22° 59.24'	1964											X	SOL
CE25008_MB_060	09/06/2025	03:53	55° 45.90'	23° 45.90'	2065											X	EOL (TURN FOR DIVE SITE)
CE25008_MB_061	09/06/2025	03:53	55° 45.76'	23° 05.95'	1965											X	SOL
CE25008_MB_061	09/06/2025	04:09	55° 44.32'	23° 04.20'	2072											X	EOL
CE25008_RV_062	09/06/2025	04:32	55° 44.31'	23° 04.14'	2074	5 (987)	X										ROV OFF DECK
CE25008_RV_062	09/06/2025	05:50	55° 44.31'	23° 04.14'	2068	5 (987)		X					X	X			ROV ON SEABED
CE25008_RV_062	09/06/2025	09:35	55° 44.53'	23° 07.71'	1836	5 (987)			X				X	X			ROV OFF SEABED
CE25008_RV_062	09/06/2025	10:48	55° 44.53'	23° 03.71'	1898	5 (987)				X							ROV ON DECK
CE25008_MB_063	09/06/2025	11:12	55° 44.51'	23° 03.64'	1834											X	TRANSIT LINE BETWEEN ROV DIVES
CE25008_MB_063	09/06/2025	14:47	56° 06.52'	22° 17.92'	1398											X	EOL
CE25008_RV_064	09/06/2025	15:17	56° 06.25'	22° 18.52'	1324	6 988)	X										ROV OFF DECK
CE25008_RV_064	09/06/2025	16:36	56° 06.28'	22° 18.48'	1325	6 988)		X					X	X			ROV ON SEABED
CE25008_RV_064	09/06/2025	20:07	56° 06.08'	22° 18.69'	1228	6 988)			X				X	X			ROV OFF SEABED

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_RV_064	09/06/2025	20:07	56° 06.08'	22° 18.69'	1226	6 988)				X							ROV ON DECK
CE25008_MB_065	09/06/2025	20:33	56° 06.27'	22° 18.09'	1383											X	TRANSIT TO OWLSGARD AT 7.7KTS
CE25008_MB_065	10/06/2025	11:54	56° 59.50'	19° 11.10'	1494											X	EOL
CE25008_MB_066	10/06/2025	12:19	56° 59.60'	19° 11.57'	1491											X	SOL
CE25008_MB_066	10/06/2025	13:03	56° 55.06'	19° 11.85'	1482											X	SIS restart, small gap
CE25008_MB_066	10/06/2025	13:20	56° 53.65'	19° 11.86'	1531											X	EOL
CE25008_MB_067	10/06/2025	13:33	56° 54.36'	19° 14.38'	1312											X	SOL
CE25008_MB_068	10/06/2025	14:55	57° 07.61'	19° 18.08'	1133											X	EOL
CE25008_MB_068	10/06/2025	15:12	57° 06.84'	19° 20.59'	1482											X	SOL
CE25008_MB_068	10/06/2025	16:29	56° 59.27'	19° 15.62'	2458											X	EOL
CE25008_MB_069	11/06/2025	07:58	55° 35.79'	16° 04.47'	?800											X	SOL south over Logachev Mounds. NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all of line
CE25008_MB_069	11/06/2025	09:50	55° 18.12'	15° 58.80'	?1423											X	EOL NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all lines

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_MB_070	11/06/2025	10:04	55° 17.90'	15° 55.13'	?1438											X	SOL NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all of linelines
CE25008_MB_070	11/06/2025	11:27	55° 31.07'	16° 00.72'	890											X	EOL NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all of linelines
CE25008_MB_071	11/06/2025	11:28	55° 31.12'	16° 01.50'	?1292											X	SOL NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all of linelines
CE25008_MB_071	11/06/2025	11:30	55° 31.24'	16° 00.84'	?1292											X	EOL NB: depths may be wrong with MBES not tracking seabed. Need to delete some or all of linelines
CE25008_MB_072	11/06/2025	11:35	55° 35.42'	15° 59.67'	669.4											X	SOL
CE25008_MB_072	11/06/2025	12:02	55° 33.08'	15° 53.05'	635.6											X	EOL
CE25008_MB_073	11/06/2025	12:13	55° 32.18'	15° 52.58'	685											X	SOL
CE25008_MB_073	11/06/2025	13:16	55° 29.54'	16° 02.47'	573											X	EOL
CE25008_DG_074	11/06/2025	14:52	55o 29.53'	16° 02.51'	579												Day grab on seafloor

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	ROV Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_DG_074	11/06/2025	15:02	55o 29.53'	16° 02.51'	579												Day grab on deck
CE25008_MB_075	11/06/2025	15:21	55o 29.84'	16° 02.35'	613											X	SOL to the west
CE25008_MB_075	11/06/2025	16:33	55o 26.75'	16° 15.20'	815											X	EOL
CE25008_MB_076	11/06/2025	16:40	55o 25.69'	16° 14.71'	864											X	SOL to the east
CE25008_MB_076	11/06/2025	18:37	55o 31.17'	15° 51.76'	806											X	EOL
CE25008_MB_077	11/06/2025	18:47	55o 30.23'	15° 50.51'	860											X	SOL
CE25008_MB_077	11/06/2025	20:02	55o 26.89'	16° 04.46'	800											X	EOL
CE25008_MB_078	11/06/2025	20:16	55o 26.03'	16° 03.67'	780											X	SOL
CE25008_MB_078	11/06/2025	20:21	55o 28.13'	16° 01.39'	1186											X	EOL
CE25008_CTD_079	11/06/2025	21:04	55o 28.13'	16° 01.39'	798						X						CTD in water (2.1:12 started descent). Start of yo-yo CTD campaign
CE25008_CTD_079	11/06/2025	21:33	55o 28.13'	16° 01.39'	770						X						CTD at 770,
CE25008_CTD_079	11/06/2025	21:51	55o 28.13'	16° 01.39'	798						X						CTD on deck
CE25008_CTD_080	11/06/2025	22:12	55o 28.13'	16° 01.39'	798						X						CTD in water (22:12 started descent)
CE25008_CTD_080	11/06/2025	22:34	55o 28.13'	16° 01.39'	765						X						CTD at 765m
CE25008_CTD_080	11/06/2025	22:48	55o 28.13'	16° 01.39'	798						X						CTD on deck
CE25008_CTD_081	11/06/2025	23:10	55o 28.13'	16° 01.39'	798						X						CTD in water (23:12 started descent)
CE25008_CTD_081	11/06/2025	23:32	55o 28.14'	16° 01.39'	798						X						CTD at 790m

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_CTD_081	11/06/2025	23:49	55o 28.14'	16° 01.39'	795						X						CTD on deck
CE25008_CTD_082	12/06/2025	00:09	55o 28.14'	16° 01.39'	795						X						CTD in water (00:11 started descent)
CE25008_CTD_082	12/06/2025	00:27	55o 28.14'	16° 01.39'	795						X						CTD @ 790m (00:31 started ascent)
CE25008_CTD_082	12/06/2025	00:44	55o 28.14'	16° 01.39'	795						X						CTD on deck
CE25008_CTD_083	12/06/2025	01:09	55o 28.14'	16° 01.39'	795						X						CTD in water (01:12 started descent)
CE25008_CTD_083	12/06/2025	01:29	55o 28.14'	16° 01.39'	795						X						CTD at 780m
CE25008_CTD_083	12/06/2025	01:45	55o 28.14'	16° 01.39'	795						X						CTD on deck
CE25008_CTD_084	12/06/2025	02:08	55o 28.14'	16° 01.39'	795						X						CTD in water (02:11 start descent)
CE25008_CTD_084	12/06/2025	02:25	55o 28.14'	16° 01.39'	798						X						CTD at bottom at 776m
CE25008_CTD_084	12/06/2025	02:44	55o 28.14'	16° 01.39'	798						X						CTD back on deck
CE25008_CTD_085	12/06/2025	03:10	55o 28.14'	16° 01.39'	798						X						CTD in water (03:12 started descent)
CE25008_CTD_085	12/06/2025	03:27	55o 28.14'	16° 01.39'	798						X						CTD at 792 (03:31 start ascent)
CE25008_CTD_085	12/06/2025	03:46	55o 28.14'	16° 01.39'	797						X						CTD on deck
CE25008_CTD_086	12/06/2025	04:09	55o 28.14'	16° 01.39'	797						X						CTD in water (04:12 start descent)
CE25008_CTD_086	12/06/2025	04:28	55o 28.14'	16° 01.39'	782						X						CTD on bottom (04:31 start ascent)
CE25008_CTD_086	12/06/2025	04:45	55o 28.14'	16° 01.39'	797						X						CTD on deck

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_CTD_087	12/06/2025	05:11	55o 28.14'	16° 01.39'	797						X						CTD in water (05:13 start descent)
CE25008_CTD_087	12/06/2025	05:32	55o 28.14'	16° 01.39'	782						X						CTD on bottom (straight up)
CE25008_CTD_087	12/06/2025	05:46	55o 28.14'	16° 01.39'	797						X						CTD on deck
CE25008_CTD_088	12/06/2025	06:10	55o 28.14'	16° 01.39'	797						X						CTD in water (06:12 start descent)
CE25008_CTD_088	12/06/2025	06:32	55o 28.14'	16° 01.39'	782						X						CTD on bottom (straight up)
CE25008_CTD_088	12/06/2025	06:46	55o 28.14'	16° 01.39'	797						X						CTD on deck
CE25008_CTD_089	12/06/2025	07:12	55o 28.14'	16° 01.39'	798						X						CTD in water (07:12 start descent)
CE25008_CTD_089	12/06/2025	07:34	55o 28.14'	16° 01.39'	781						X						CTD at 781m
CE25008_CTD_089	12/06/2025	07:48	55o 28.14'	16° 01.39'	800?						X						CTD on deck
CE25008_CTD_090	12/06/2025	08:12	55o 28.14'	16° 01.39'	800?						X						CTD in water (08:14 start descent)
CE25008_CTD_090	12/06/2025	08:31	55o 28.14'	16° 01.39'	800?						X						CTD at 770m
CE25008_CTD_090	12/06/2025	08:45	55o 28.13'	16° 01.37'	800?						X						CTD on deck
CE25008_CTD_091	12/06/2025	09:11	55o 28.13'	16° 01.37'	798						X						CTD in water (09:14 start descent)
CE25008_CTD_091	12/06/2025	09:34	55o 28.13'	16° 01.37'	782						X						CTD at 782m & fired bottle 1-4, 9-15
CE25008_CTD_091	12/06/2025	10:00	55o 28.13'	16° 01.37'	798						X						CTD on deck. End of yo-yo CTD campaign
CE25008_MB_092	12/06/2025	10:10	55o 27.79'	16° 01.93'	739											X	SOL

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_MB_092	12/06/2025	10:19	55o 26.70'	16° 03.74'	816											X	EOL
CE25008_MB_093	12/06/2025	10:21	55o 26.77'	16° 03.84'	818											X	SOL
CE25008_MB_093	12/06/2025	11:26	55o 35.69'	16° 05.47'	509											X	EOL
CE25008_MB_094	12/06/2025	11:37	55° 35.74'	16° 03.80'	512											X	SOL
CE25008_MB_094	12/06/2025	12:35	55° 29.03'	16° 02.50'	652											X	EOL
CE25008_MB_095	12/06/2025	12:37	55° 28.85'	16o 02.55'	651											X	SOL
CE25008_MB_095	12/06/2025	12:53	55° 27.11'	16° 03.55'	706											X	EOL
CE25008_MB_096	12/06/2025	12:54	55° 27.09'	16° 03.62'	752											X	SOL
CE25008_MB_096	12/06/2025	13:50	55° 24.67'	16° 14.62'	?											X	EOL
CE25008_MB_097	12/06/2025	14:15	55° 27.76'	16° 16.70'	690											X	SOL
CE25008_MB_097	12/06/2025	15:10	55° 30.31'	16° 05.36'	653											X	EOL
CE25008_RV_098	12/06/2025	16:06	55o 29.53'	16° 02.48'	569	7 (989)	X					X					ROV in water
CE25008_RV_098	12/06/2025	16:42	55o 29.53'	16° 02.48'	568	7 (989)		X				X					ROV at seabed (no video)
CE25008_RV_098	12/06/2025	16:44	55° 28.58	16° 02.54'	594	7 (989)						X					ROV at Adele (no video)
CE25008_RV_098	12/06/2025	19:09	55o 29.59'	16° 02.50'	597	7 (989)			X			X					ROV off seabed with Adele (no video)
CE25008_RV_098	12/06/2025	19:52	55o 29.53'	16° 02.48'	594	7 (989)				X		X					ROV on deck with Adele :)
CE25008_RV_099	12/06/2025	23:14	55° 27.90'	16° 03.33'	726	8 (990)		X					X	X			ROV off deck
CE25008_RV_099	13/06/2025	00:00	55° 27.86'	16° 03.32'	724	8 (990)			X				X	X			ROV on seabed

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_RV_099	13/06/2025	04:07	55° 28.15'	16° 02.98'	594	8 (990)				X							ROV on deck
CE25008_CTD_100	13/06/2025	05:04	55o 29.59'	16° 02.51'	578						X						CTD and L-ADCP off deck
CE25008_CTD_100	13/06/2025	05:22	55o 29.59'	16° 02.51'	578						X						CTD & L-ADCP at 485m - holding at this depth for 8 hrs
CE25008_CTD_100	13/06/2025	12:32	55o 29.59'	16° 02.51'	577						X						CTD and ADPC recovery started
CE25008_RV_101	13/06/2025	13:26	55o 29.27'	16° 07.69'	592	9(991)	X						X	X			ROV off deck
CE25008_RV_101	13/06/2025	14:04	55o 29.28'	16° 07.69'	628	9(991)		X					X	X			ROV at seabed
CE25008_RV_101	13/06/2025	17:48	55o 29.04'	16° 08.26'	577	9(991)			X				X	X			ROV off seabed
CE25008_RV_101	13/06/2025	18:31	55o 29.04'	16° 08.29'	575	9(991)				X			X	X			ROV on deck
CE25008_CTD_102	13/06/2025	19:41	55o 28.13'	16° 01.39'	798						X						CTD & L-ADCP in water
CE25008_CTD_102	13/06/2025	10:19	55o 28.13'	16° 01.39'	798						X						CTD & L-ADCP starting descent
CE25008_CTD_102	13/06/2025	19:59	55o 28.13'	16° 01.39'	787						X						CTD & L-ADCP @787 m
CE25008_CTD_102	13/06/2025	20:01	55o 28.13'	16° 01.39'	708						X						CTD & L- ADCP @ 708m - holding at this depth for 9 hrs
CE25008_CTD_102	14/06/2025	06:00	55o 28.14'	16° 01.38'	709						X						CTD and ADPC recovery started
CE25008_CTD_102	14/06/2025	06:13	55o 28.14'	16° 01.38'	709						X						CTD and L-ACDP on deck

Station	Date	Time (UTC)	Latitude	Longitude	Depth (m)	Dive#	ROV off deck	ROV on seabed	ROV off seabed	ROV on deck	CTD	Lander	ROV video	ROV biobox	Dredge	Hull MBES	Notes
CE25008_RV_103	14/06/2025	06:55	55o 29.12'	16° 02.18'	642	10 (992)	X						X	X			ROV off deck
CE25008_RV_103	14/06/2025	07:29	55o 29.12'	16° 02.18'	638	10 (992)		X					X	X			ROV at seabed
CE25008_RV_103	14/06/2025	10:59	55o 29.59'	16° 01.91'	628	10 (992)			X				X	X			ROV off seabed
CE25008_RV_103	14/06/2025	11:24	55o 29.59'	16° 01.91'	628	10 (992)				X			X	X			ROV on deck

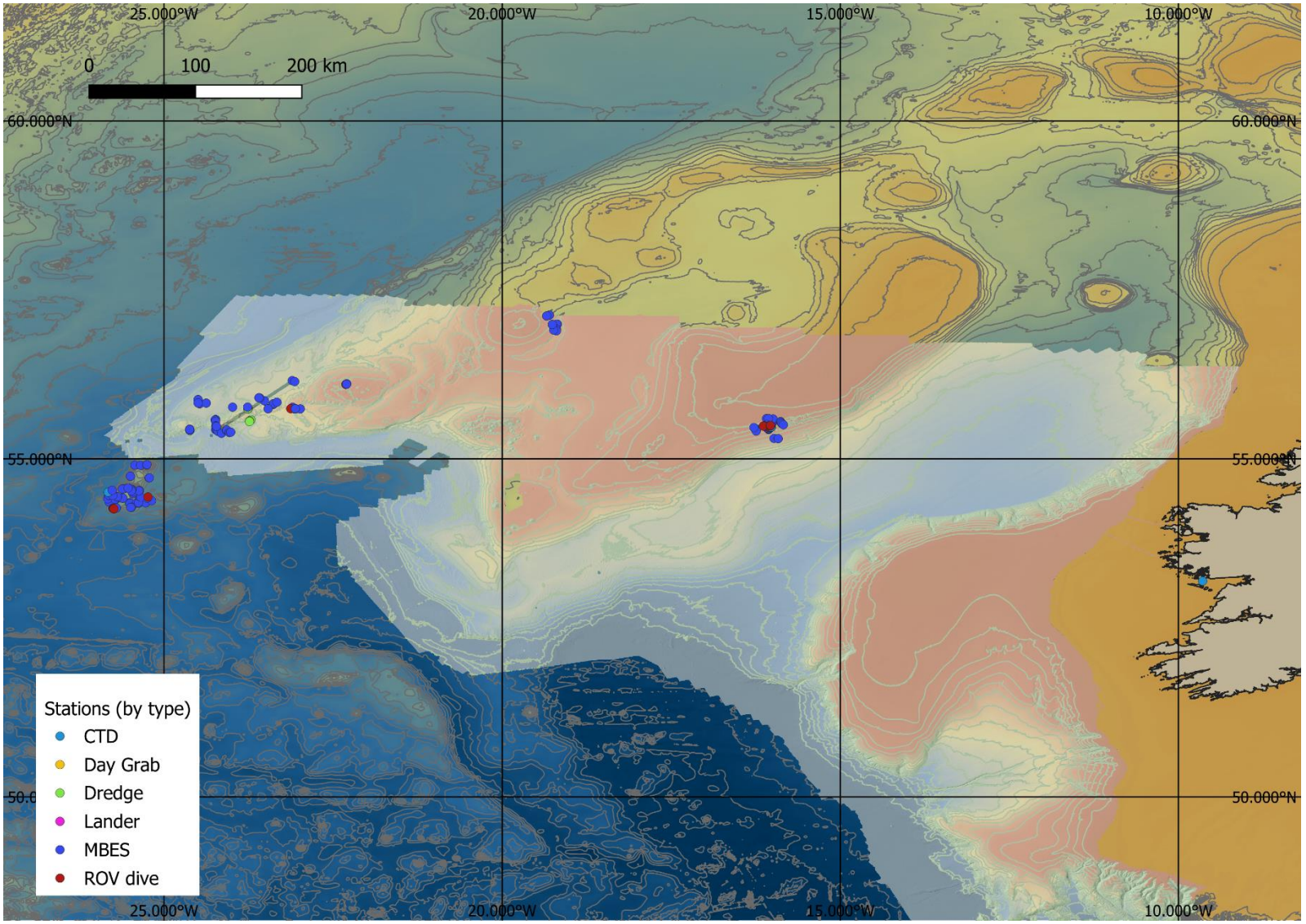


Figure 35 Map showing all locations. See maps below for more details

ROV Dive Log and Maps (all time UTC)

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
31/05/2025	CE25008_003	1 (981)		11:06	55° 29.60	16°02.502	593.9		No	No	No	Reached Logachev mound
31/05/2025	CE25008_003	1 (981)		11:06					No	No	No	Video on
31/05/2025	CE25008_003	1 (981)		11:22	55° 29.59	16°02.497	591		No	No	No	Adele deployed
31/05/2025	CE25008_003	1 (981)							No	No	No	Adele fell + must be redeployed
31/05/2025	CE25008_003	1 (981)		11:45	55° 29.59	16°02.497	591		No	No	No	Adele re-righted and final location
31/05/2025	CE25008_003	1 (981)		12:33	55°29.52	16°02.47	0		No	No	No	ROV at surface
31/05/2025	CE25008_003	1 (981)		12:39	55°29.52	16°02.47	NA		No	No	No	Recovered to deck
03/06/2025	CE25008_012	2 (982)	SOL	08:23	54°45.90	25°45.29	2558	68	No	No	No	SOL - No sampling, no HD
03/06/2025	CE25008_012	2 (982)						68	No	No	No	Start of dive is IRD and mud
03/06/2025	CE25008_012	2 (982)						68	No	No	No	?IRD boulder field
03/06/2025	CE25008_012	2 (982)		09:21	54°15.76	25°44.89	2485	68	No	No	No	Potential sampling bedrock site 1
	CE25008_012						2464	68	No	No	No	Possible bedrock / IRD
03/06/2025	CE25008_012	2 (982)			54°15.72	25°44.77		68	No	No	No	Potential sampling bedrock site 2
03/06/2025	CE25008_012	2 (982)			54°15.70	25°44.72	2412	68	No	No	No	Potential sampling bedrock site 3
03/06/2025	CE25008_012	2 (982)	EOL	10:39	54°15.66	25°44.55	2365	68	No	No	No	EOL

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
03/06/2025	CE25008_012	2 (982)	ROV on deck	13:03	54°15.65	25°44.55	NA		No	No	No	Recovered to deck
05/06/2025	CE25008_031	3	ROV on surface	6.01	54º 15.77	25º 44.98	2442		yes	No	No	ROV on surface
05/06/2025	CE25008_031	3	at Bottom of seabed	7.43	54º 15.77'	25º 44.98	2482.1		yes	yes	yes	at Bottom of seabed
05/06/2025	CE25008_031	3	Leaving Seabed	11.35	54º 15.72	25º 44.62	2365.2		No	No	No	Leaving Seabed
05/06/2025	CE25008_031	3	ROV on Deck	13.48	54º 26.18	25º 74.31	2357		No	No	No	ROV on Deck
06/06/2025	CE25008_037	4	ROV off deck	03:01	55º 25.31	24º 37.16	2601		No	No	No	ROV off deck
06/06/2025	CE25008_037	4	ROV on bottom	04:33	55º 25.31	24º 37.15	2601		No	No	No	ROV on bottom
06/06/2025	CE25008_037	4	Bio sample 1	04:56	55º 25.78	24º 37.24	2586		No	yes	No	CE25008_013
06/06/2025	CE25008_037	4	Rock sample 1	05:35	55º 25.53	24º 37.32	2532		No	No	yes	EBW01
06/06/2025	CE25008_037	4	Rock sample 2	05:45	55º 25.54	24º 37.31	2531		No	No	yes	EBW02
06/06/2025	CE25008_037	4	Rock sample 3	05:49	55º 25.54	24º 37.31	2530		No	No	yes	EBW03
06/06/2025	CE25008_037	4	Rock sample 4	05:57	55º 25.54	24º 37.31	2531		No	No	yes	EBW04
06/06/2025	CE25008_037	4	Bio sample 2	06:34	55º 25.57	24º 37.33	2491		No	yes	no	CE25008_014
06/06/2025	CE25008_037	4	Rock sample 5	06:45	55º 25.57	24º 37.33	2491		No	No	yes	EBW05

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
06/06/2025	CE25008_037	4	Rock sample 6	06:48	55° 25.57	24° 37.33	2492		No	No	yes	EBW06
06/06/2025	CE25008_037	4	Rock sample 7	06:52	55° 25.57	24° 37.33	2492		No	No	yes	EBW07
06/06/2025	CE25008_037	4	Rock sample 8	07:20	55° 25.59	24° 37.35	2464		No	No	yes	EBW08
06/06/2025	CE25008_037	4	Rock sample 9	07:23	55° 25.59	24° 37.34	2464		No	No	yes	EBW09
06/06/2025	CE25008_037	4	Rock sample 10	07:30	55° 25.59	24° 37.34	2463		No	No	yes	EBW10
06/06/2025	CE25008_037	4	Rock sample 11	07:33	55° 25.59	24° 37.34	2465		No	No	yes	EBW11
06/06/2025	CE25008_037	4	Bio sample 3	07:48	55° 25.62	24° 37.36	2423		No	yes	No	CE25008_016
06/06/2025	CE25008_037	4	Rock sample 12	07:58	55° 25.62	24° 37.36	2423		No	No	yes	EBW12
06/06/2025	CE25008_037	4	Bio sample 4	08:08	55° 25.62	24° 37.36	2422		No	yes	No	CE25008_017
06/06/2025	CE25008_037	4	Rock sample 13	08:15	55° 25.62	24° 37.36	2421		No	No	yes	EBW13
06/06/2025	CE25008_037	4	Rock sample 14	08:20	55° 25.61	24° 37.36	2421		No	No	yes	EBW14
06/06/2025	CE25008_037	4	Rock sample 15	08:20	55° 25.62	24° 37.36	2412		No	No	yes	EBW15
06/06/2025	CE25008_037	4	Rock sample 16	08:26	55° 25.62	24° 37.36	2412		No	No	yes	EBW16
06/06/2025	CE25008_037	4	Rock sample 17	08:30	55° 25.58	24° 37.37	2412		No	No	yes	EBW17

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
06/06/2025	CE25008_037	4	End of dive	08:57	55° 25.66	24° 37.36	2396		No	No	No	Leaving seabed
06/06/2025	CE25008_037	4	ROV on deck	10:30	55° 25.67	24° 37.32	2396		No	No	No	ROV on deck
09/06/2025	CE25008_062	5(987)	ROV off deck	04:32	55° 44.31	23° 04.14	2074		No	No	No	ROV off deck
09/06/2025	CE25008_062	5(987)	ROV on seabed	05:45	55° 44.31	23° 04.11	2074		No	No	No	ROV on seabed
09/06/2025	CE25008_062	5(987)	Dive narrative	05:59								Sea cucumbers
09/06/2025	CE25008_062	5(987)	Dive narrative	06:06								Steeper-IRD gravel
09/06/2025	CE25008_062	5(987)	Dive narrative	06:15								Bedrock (volcanic) pillows
09/06/2025	CE25008_062	5(987)	Dive narrative	06:20								Sample site 1 (geo) 5 samples
09/06/2025	CE25008_062	5(987)	Geo sample 1	06:31	55° 44.43	23° 03.97	2053		No	No	yes	EMB01
09/06/2025	CE25008_062	5(987)	Geo sample 2	06:34	55° 44.43	23° 03.97	2053		No	No	yes	EMB02
09/06/2025	CE25008_062	5(987)	Geo sample 3	06:39	55° 44.43	23° 03.97	2053		No	No	yes	EMB03
09/06/2025	CE25008_062	5(987)	Geo sample 4	06:45	55° 44.43	23° 03.97	2053		No	No	yes	EMB04
09/06/2025	CE25008_062	5(987)	Geo sample 5	06:48	55° 44.43	23° 03.96	2053		No	No	yes	EMB05
09/06/2025	CE25008_062	5(987)	Dive narrative	06:53					No	No	No	off outcrop & onto IRD gravel

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
09/06/2025	CE25008_062	5(987)	Bio+Geo Sample	07:03	55° 44.46	23° 03.98	2048		No	yes	yes	EMB06 IRD and coral
09/06/2025	CE25008_062	5(987)	OFOP crashed	07:12					No	No	No	OFOP crash. 07:15 back on
09/06/2025	CE25008_062	5(987)	Dive narrative	07:15					No	No	No	bedrock
09/06/2025	CE25008_062	5(987)	Dive narrative	07:26					No	No	No	pillow-like bedrock
09/06/2025	CE25008_062	5(987)	Geo sample 7&8	07:42	55° 44.54	23° 03.91	2016		No	No	yes	EBM07 & 08
09/06/2025	CE25008_062	5(987)	Geo sample 9	07:59	55° 44.54	23° 03.90	2016		No	No	yes	EBM09
09/06/2025	CE25008_062	5(987)	Geo sample 10	08:06	55° 44.54	23° 03.90	2016		No	No	yes	EBM10
09/06/2025	CE25008_062	5(987)	Geo sample 11	08:11	55° 44.54	23° 03.90	2016		No	No	yes	EBM11
09/06/2025	CE25008_062	5(987)	Bio sample	09:03	55° 44.55	23° 03.90	2016		No	yes	No	23 Bathypatnes
09/06/2025	CE25008_062	5(987)	Geo sample 12	09:05	55° 44.55	23° 03.68	2016		No	No	yes	EBM12
09/06/2025	CE25008_062	5(987)	Geo sample 13	09:10	55° 44.55	23° 03.68	2016		No	No	yes	EBM13
09/06/2025	CE25008_062	5(987)	Dive narrative	09:11					No	No	No	cover of cruise report
09/06/2025	CE25008_062	5(987)	Geo sample 14	09:16	55° 44.55	23° 03.68	2016		No	No	yes	EBM14
09/06/2025	CE25008_062	5(987)	Bio sample	09:20	55° 44.55	23° 03.67	2016		No	yes	No	24 whip bamboo
09/06/2025	CE25008_062	5(987)	Geo sample 15	09:28	55° 44.55	23° 03.67	2016		No	No	yes	EBM15

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
09/06/2025	CE25008_062	5(987)	Dive narrative	09:32					No	No	No	Stop HD video
09/06/2025	CE25008_062	5(987)	ROV off seabed	09:32	55° 44.53	23° 03.71	2074		No	No	No	ROV off seabed
09/06/2025	CE25008_062	5(987)	ROV on deck	10:48	55° 44.53	23° 03.71	2074		No	No	No	ROV on deck
09/06/2025	CE25008_064	6(988)	ROV off deck	15:17	56° 06.25	22° 18.52			No	No	No	ROV off deck
09/06/2025	CE25008_064	6(988)	ROV on seabed	16:36	56° 06.28	22° 18.48			No	No	No	ROV on seabed
09/06/2025	CE25008_064	6(988)	Dive narrative	16:42					No	No	No	gravel seabed with IRD
09/06/2025	CE25008_064	6(988)	Dive narrative	16:50					No	No	No	slabs & boulders, steeper slopes commencing
09/06/2025	CE25008_064	6(988)	Dive narrative	16:55					No	No	No	gravel & coral rubble among patchy bedrock
09/06/2025	CE25008_064	6(988)	Dive narrative	17:16					No	No	No	stopped to collect loose rock incase upslope is reef
09/06/2025	CE25008_064	6(988)	Geo sample 1	17:20	56° 06.19	22° 18.60			No	No	yes	EBE01
09/06/2025	CE25008_064	6(988)	Geo sample 2	17:22	56° 06.19	22° 18.60			No	No	yes	EBE02
09/06/2025	CE25008_064	6(988)	Geo sample 3	17:24	56° 06.19	22° 18.60			No	No	yes	EBE03
09/06/2025	CE25008_064	6(988)	Geo sample 4	17:27	56° 06.19	22° 18.60			No	No	yes	EBE04

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
09/06/2025	CE25008_064	6(988)	Dive narrative	17:34					No	No	No	small amount of bedrock
09/06/2025	CE25008_064	6(988)	Dive narrative	17:39					No	No	No	stop at isolated outcrop-collected black coral
09/06/2025	CE25008_064	6(988)	Geo sample 5	17:44	56° 06.17	22° 18.64			No	No	yes	EBE05
09/06/2025	CE25008_064	6(988)	Geo sample 6	17:47	56° 06.17	22° 18.64			No	No	yes	EBE06
09/06/2025	CE25008_064	6(988)	Geo sample 7	17:49	56° 06.17	22° 18.64			No	No	yes	EBE07
09/06/2025	CE25008_064	6(988)	Geo sample 8	17:54	56° 06.17	22° 18.64			No	No	yes	EBE08
09/06/2025	CE25008_064	6(988)	Geo sample 9	17:57	56° 06.17	22° 18.64			No	No	yes	EBE09
09/06/2025	CE25008_064	6(988)	Geo sample 10	17:59	56° 06.17	22° 18.64			No	No	yes	EBE10
09/06/2025	CE25008_064	6(988)	Bio sample 1	18:08	56° 06.17	22° 18.64			No	yes	No	26 dendrobathypathes
09/06/2025	CE25008_064	6(988)	Geo sample 11	18:48	56° 06.08	22° 18.79			No	No	yes	EBE11
09/06/2025	CE25008_064	6(988)	Geo sample 12	18:55	56° 06.08	22° 18.79			No	No	yes	EBE12
09/06/2025	CE25008_064	6(988)	Geo sample 13	18:57	56° 06.08	22° 18.79			No	No	yes	EBE13
09/06/2025	CE25008_064	6(988)	Geo sample 14	19:03	56° 06.08	22° 18.79			No	No	yes	EBE14
09/06/2025	CE25008_064	6(988)	off seabed	19:06	56° 06.08	22° 18.69			No	No	No	ROV off seabed

Date	Station	Dive #	Event	Time	Latitude	Longitude	Depth	Bearing	Lasers	Bio sample	Rock sample	Notes
09/06/2025	CE25008_064	6(988)	on deck	20:07	56° 06.08	22° 18.69			No	No	No	ROV on deck
12/06/2025	CE25008_098	7(989)	off deck	16:06	55° 29.53	16° 02.48	569		No	No	No	ROV in water
12/06/2025	CE25008_098	7(989)	lander sighted	16:44	55° 29.59	16° 02.50	594		No	No	No	Adele position
12/06/2025	CE25008_098	7(989)	on seabed	16:50	55° 29.59	16° 02.50	595		No	No	No	ROV on seabed
12/06/2025	CE25008_098	7(989)	off seabed with lander	19:08	55° 29.59	16° 02.51	596		No	No	No	ROV off seabed (with lander)
12/06/2025	CE25008_098	7(989)	on deck	19:52	55° 29.53	16° 02.48	594		No	No	No	ROV on deck (with lander)
12/06/2025	CE25008_099	8(990)	off deck	23:14	55° 27.90	16° 03.33	726		No	No	No	ROV in water
13/06/2025	CE25008_099	8(990)	on seabed	00:00	55° 27.86	16° 03.32	724		No	No	No	ROV on seabed
13/06/2025	CE25008_099	8(990)	off seabed	03:34					No	No	No	ROV off seabed
13/06/2025	CE25008_099	8(990)	on deck	04:07	55° 28.15	16° 02.98	594		No	No	No	ROV on deck

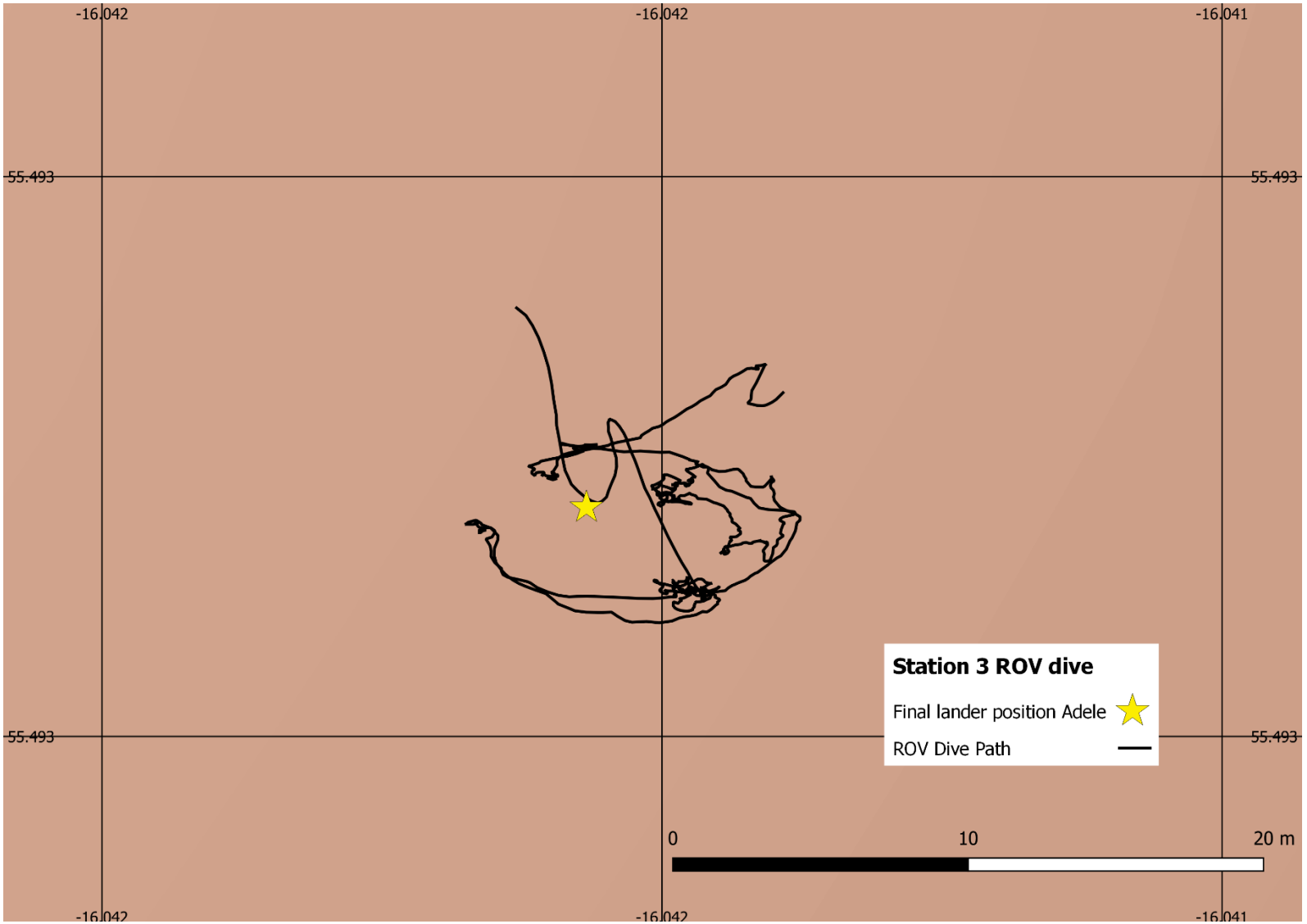


Figure 36. ROV dive 1 Station 3.

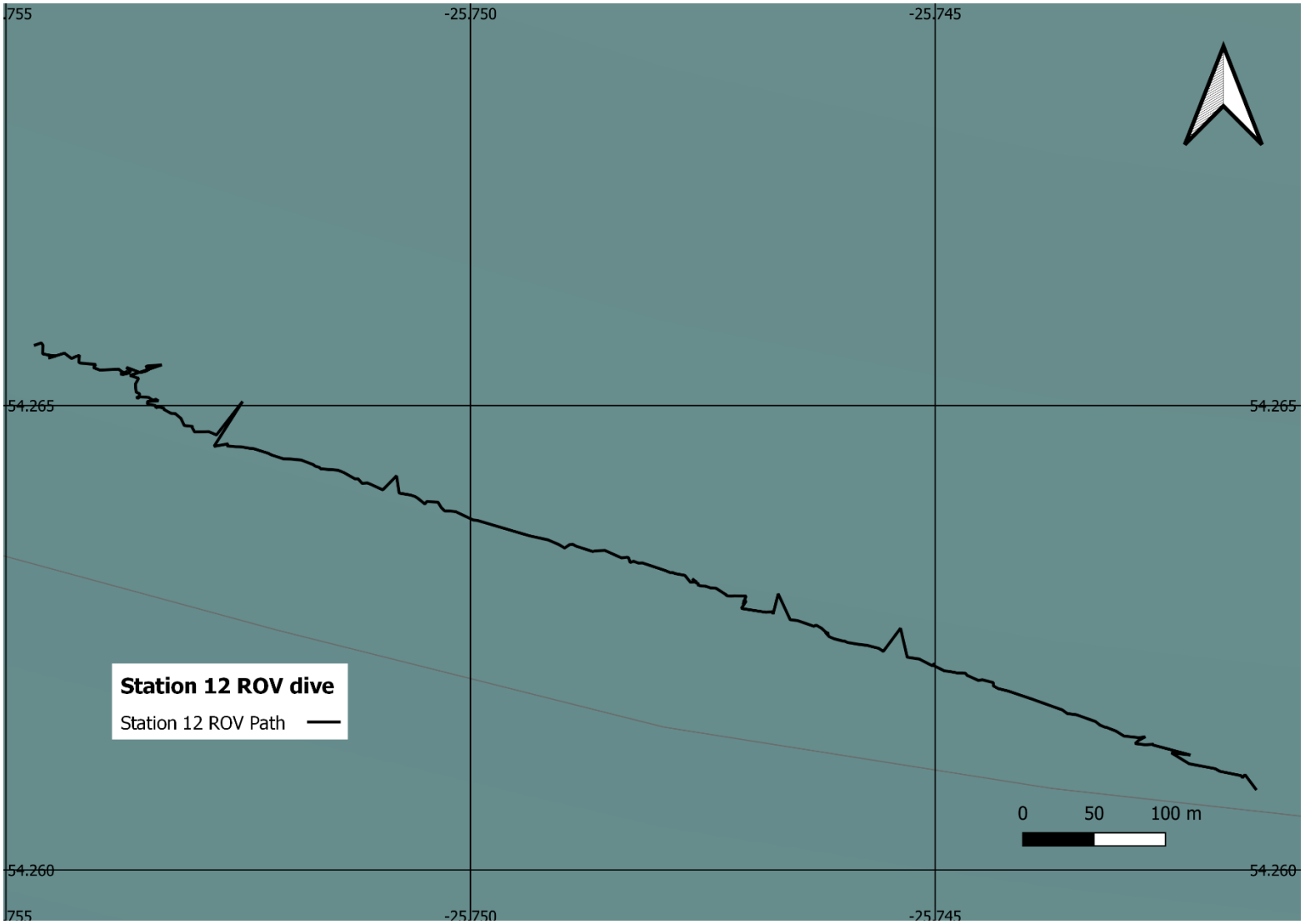


Figure 37. ROV dive 2 Station 12.

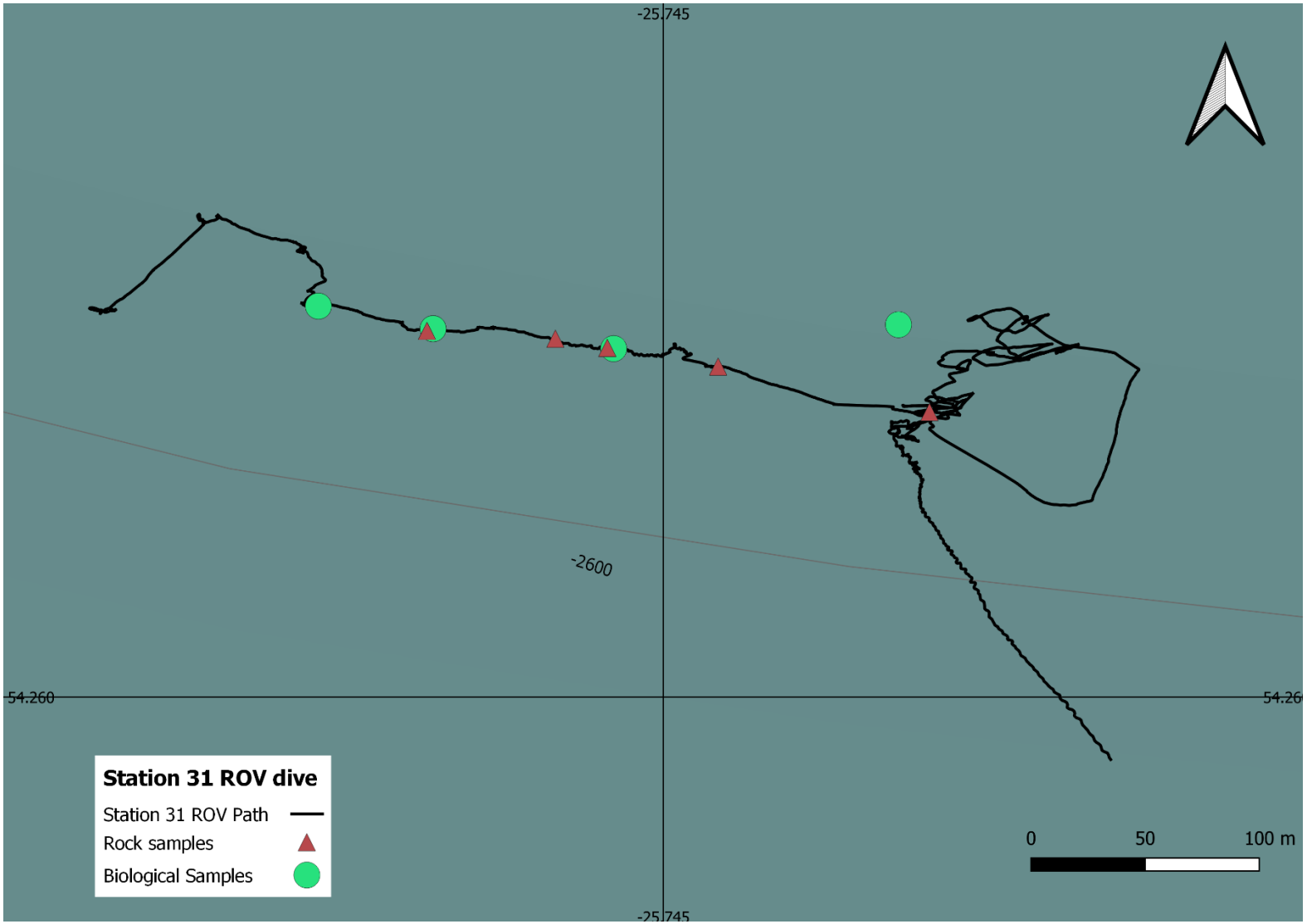


Figure 38. ROV dive 3 Station 31. Warning positional error on map for a biological sample, samples should follow ROV track.

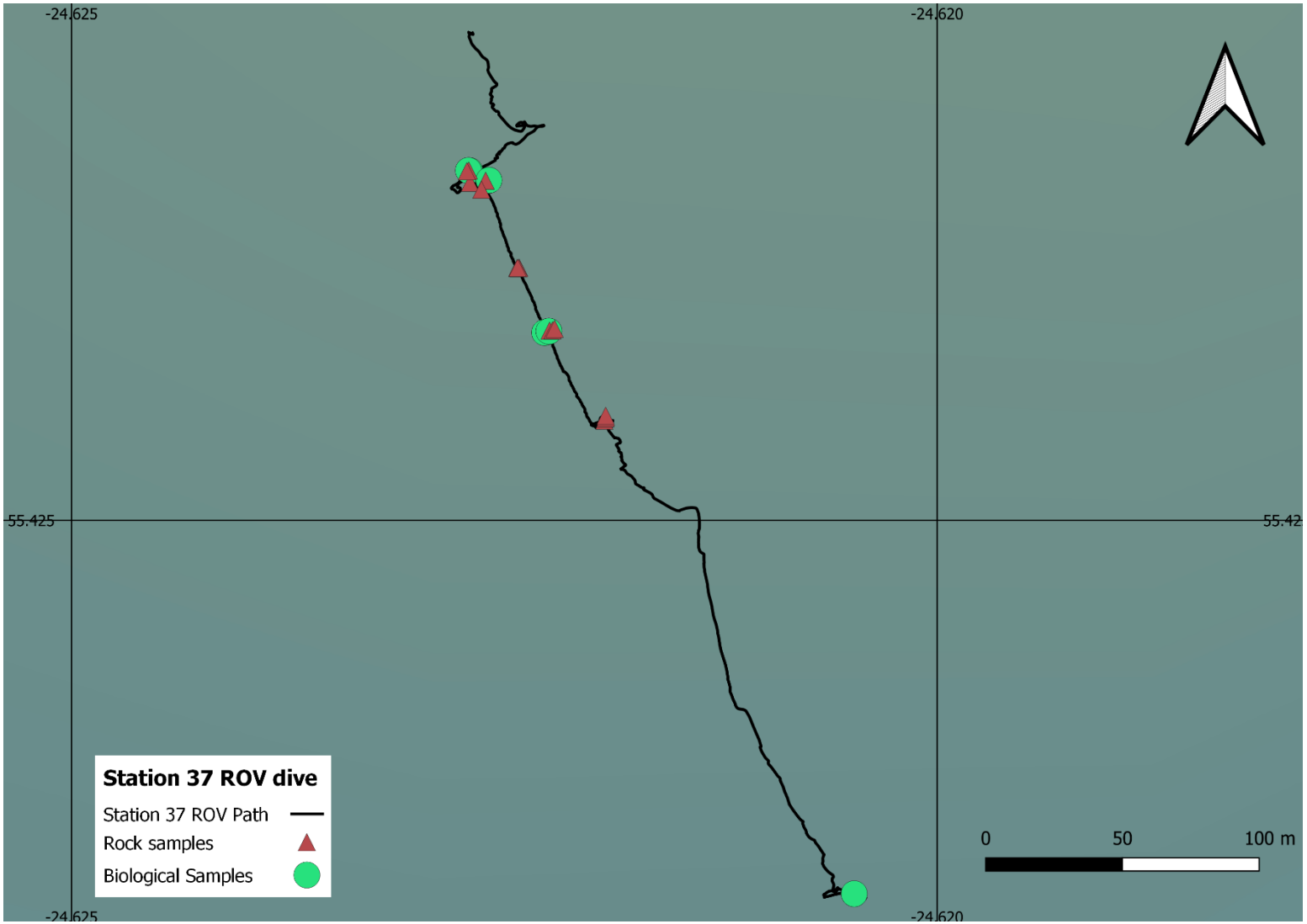


Figure 39. ROV dive 4 Station 37.

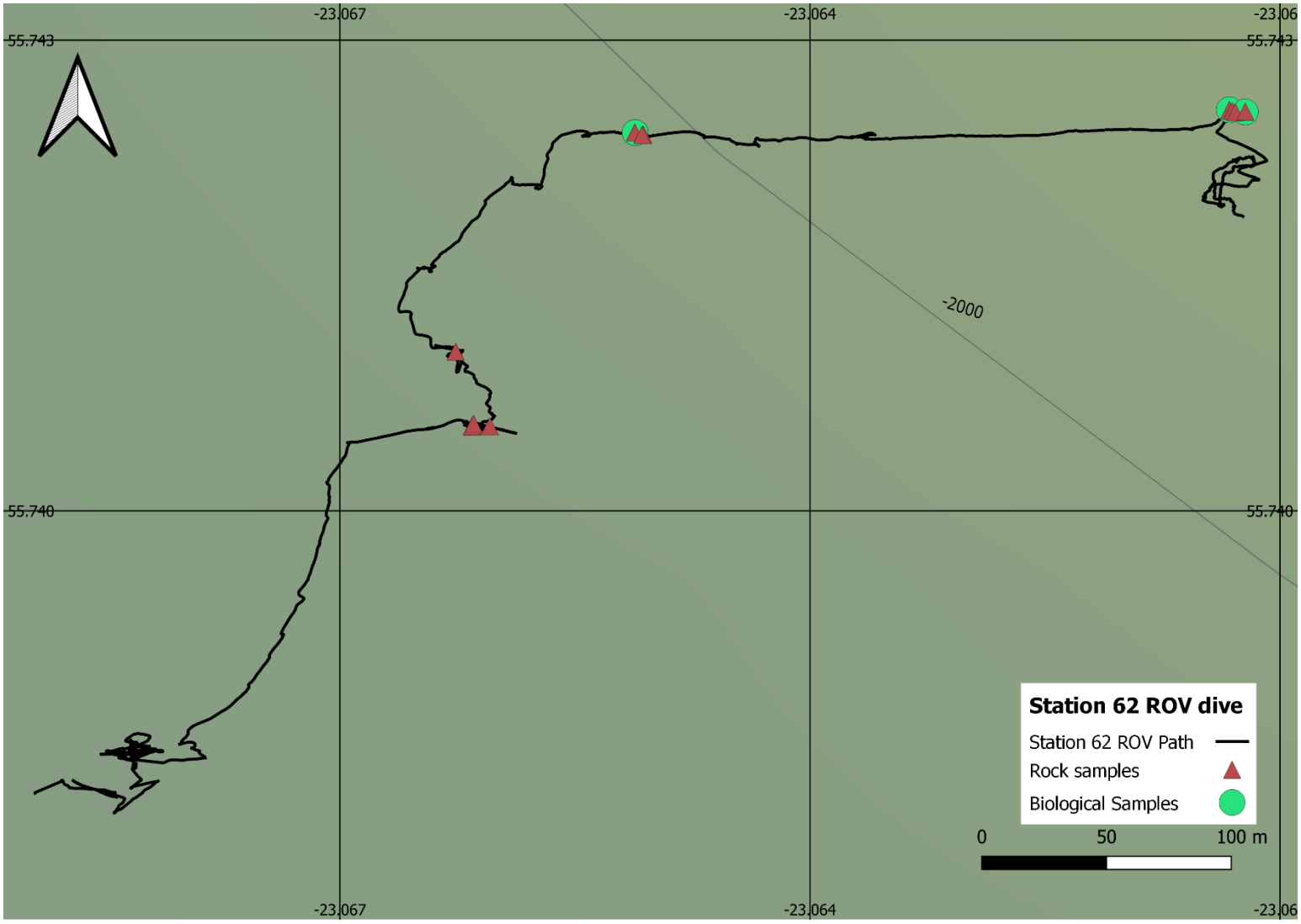


Figure 40. ROV dive 5 Station 62.

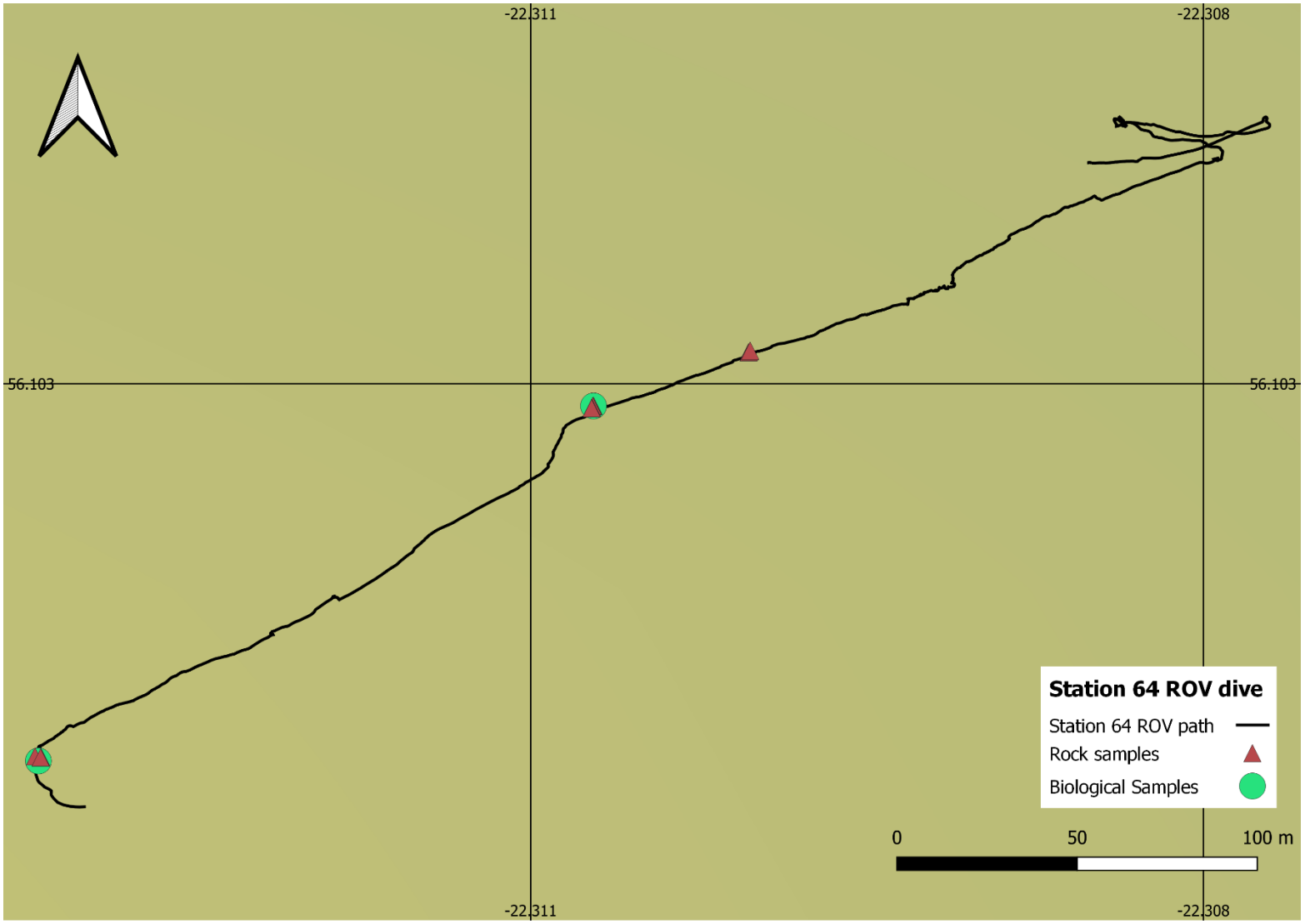


Figure 41. ROV dive 6 Station 64.

Figure 42. ROV dive 7 Station 98.

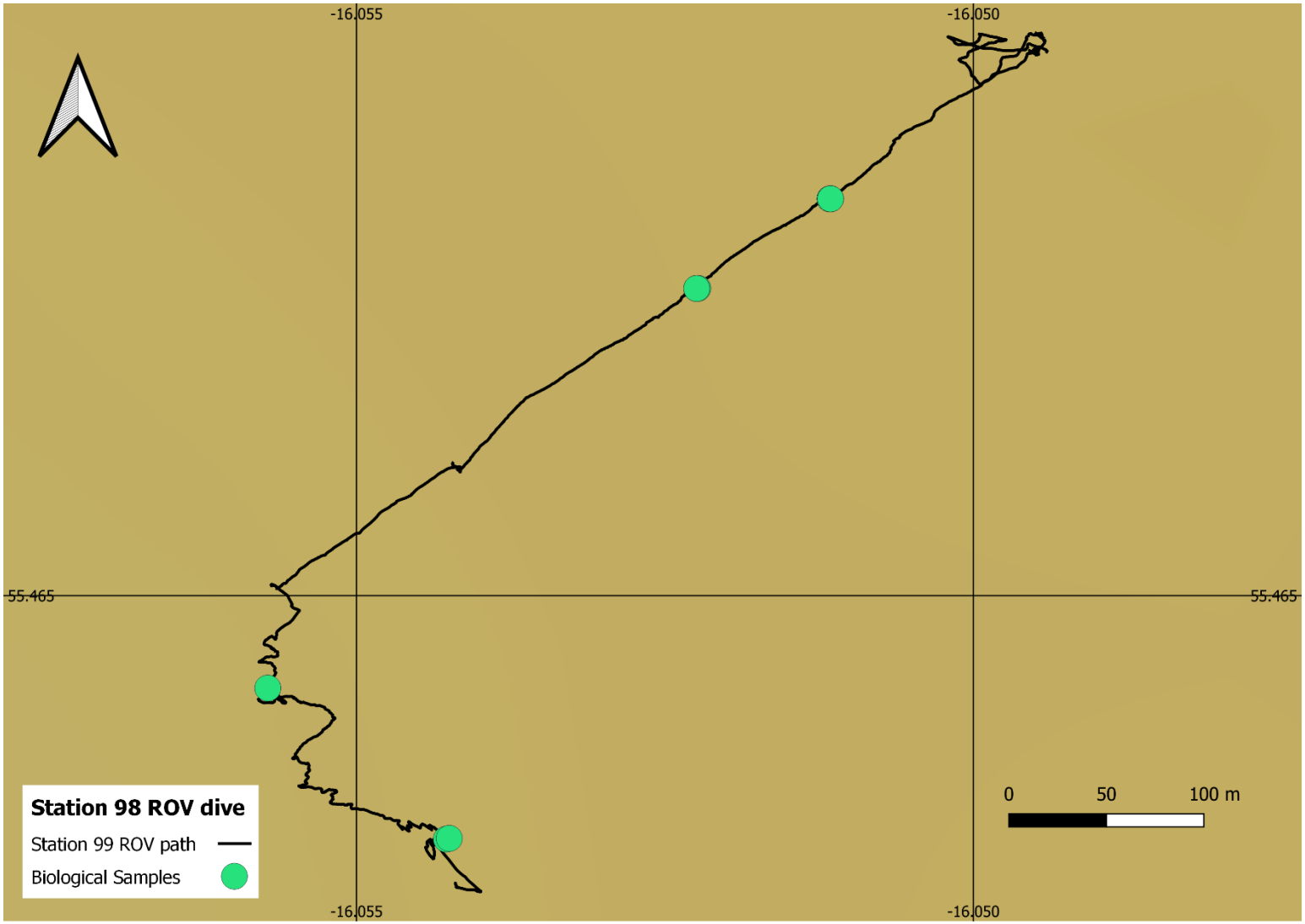


Figure 43. ROV dive 8 Station 99.

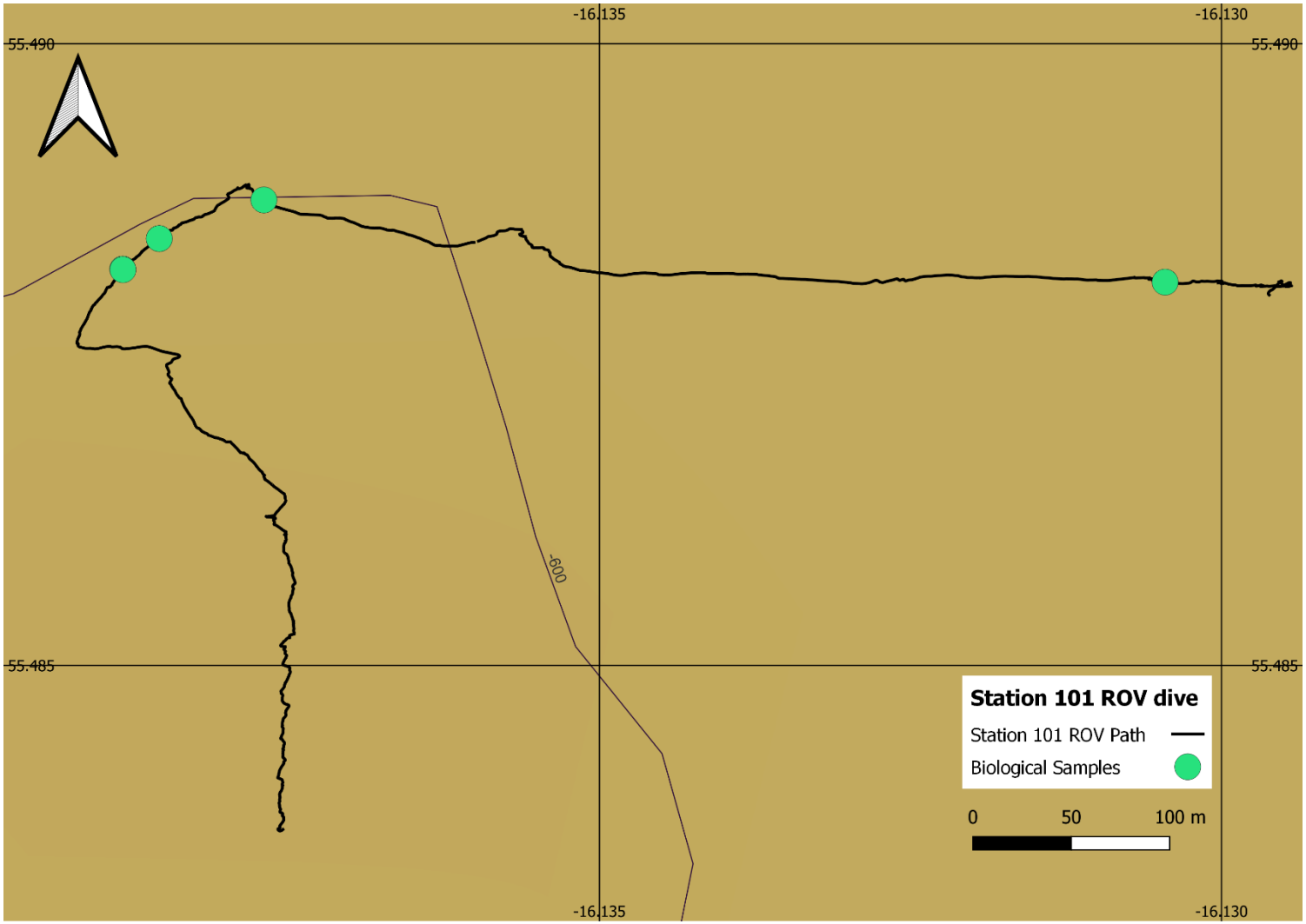


Figure 44. ROV dive 9 Station 101.

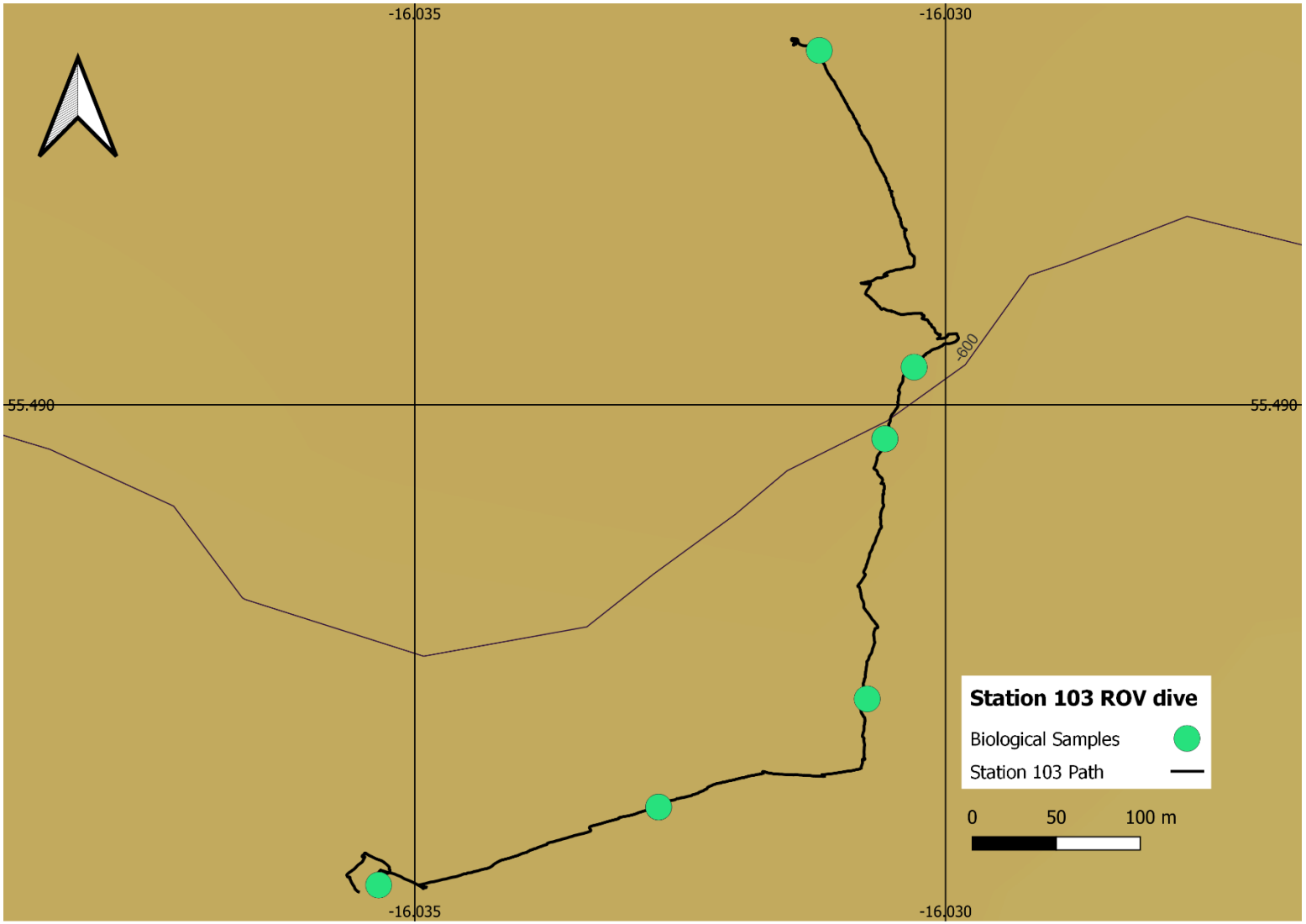


Figure 45. ROV dive 10 Station 103.

Rock Dredge Log and Maps (all time UTC)

Station	Date	Event	Time	Latitude	Longitude	Depth m	Bearing	Notes
CE25008_MB_056	08/06/2025	off deck	13:08	55° 34.54	23° 43.03		252	Ship's position
CE25008_MB_056	**08/06/2025**	**SOL Dredge position**	**14:51**	**55° 33.66**	**23° 44.15**		**239**	**on seabed start dredge**
CE25008_MB_056	**08/06/2025**	**EOL Dredge position**	**15:09**	**55° 33.60**	**23° 44.16**	**2457**	**241**	**off seabed dredge finished**
CE25008_MB_056	08/06/2025	on deck	16:00	55° 33.18	23° 44.23	2460		Ship's position EOL
CE25008_MB_057	08/06/2025	dredge off deck	18:22	55° 44.48	23° 44.89	2219	240	Ship's position
CE25008_MB_057	**08/06/2025**	**SOL Dredge position**	**18:50**	**54° 44.52**	**23° 45.31**	**2233**	**278**	**on seabed start dredge**
CE25008_MB_057	**08/06/2025**	**EOL Dredge position**	**19:29**	**54° 44.52**	**23° 45.17**	**2233**	**275**	**off seabed dredge finished**
CE25008_MB_057	08/06/2025	on deck	20:48	54° 44.58	23° 47.02	2186.8	274	Ship's position EOL

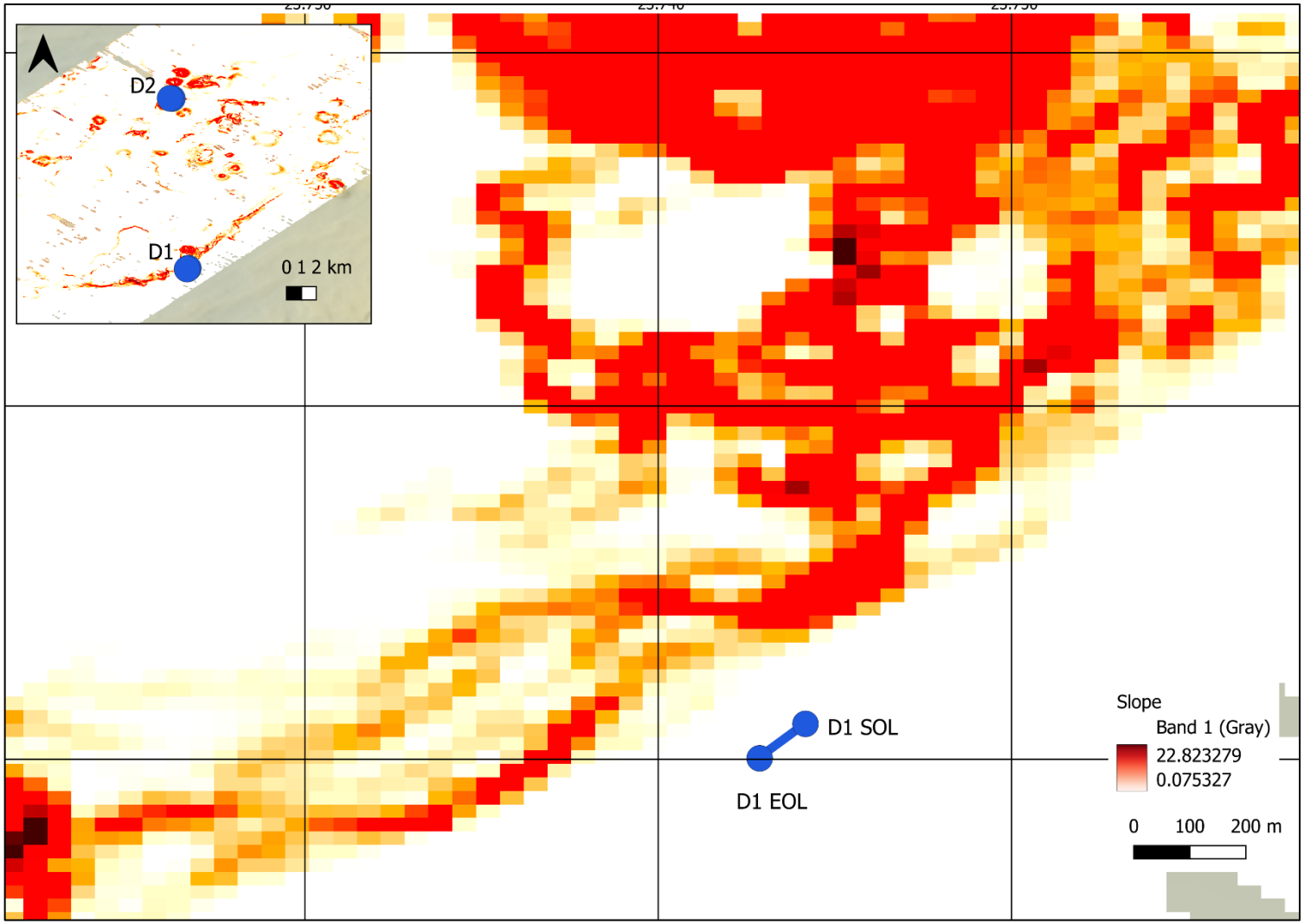


Figure 46. Rock dredge station 56 plotted against slope angle and was deployed at the base of a steep slope with the best prospect of recovery rocks that had tumbled down

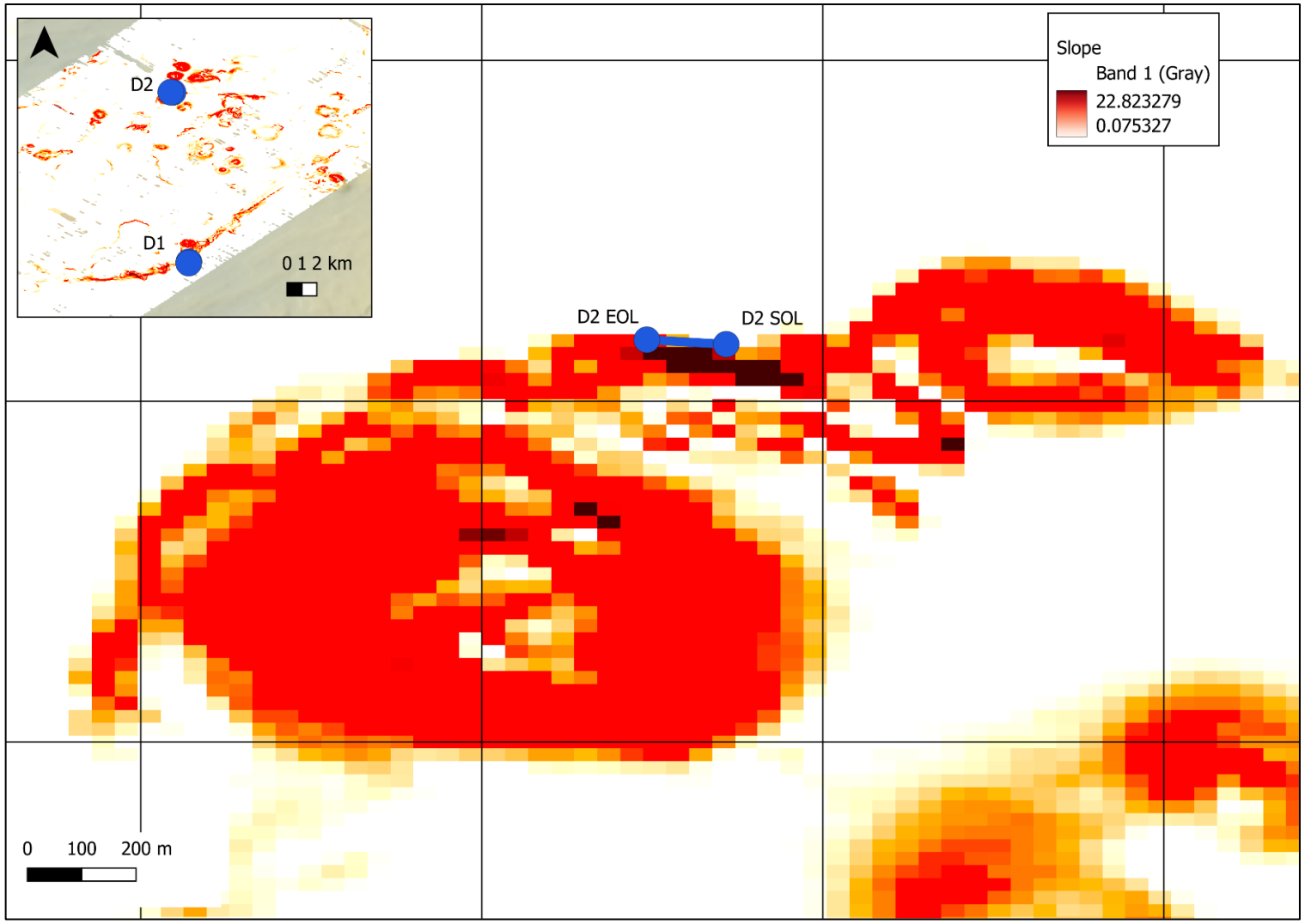


Figure 47. Rock dredge station 57 plotted against slope angle and was deployed at the base of a steep slope with the best prospect of recovery rocks that had tumbled down

Day Grab Log and Map (all time UTC)

Date	Station #	Time	Lat	Long	Depth m	Notes
11/06/2025	CE25008_DG_74	14.52	55° 29.53	16° 02.51	579	On bottom

Note: for location map see Master Log map and Little MonSta deployment map.

Hull-mounted Multibeam Echosounder Log and Maps (all time UTC)

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
01/06/2025	CE25008_MB_009	SOL	20:54	54° 54.42'	21° 45.31'	1327.3	271	SOL - poor due to speed Software issues due to setting changes
01/06/2025	CE25008_MB_009	EOL	09:27	54° 30.55'	24° 08.30'	3990	271	EOL - poor due to weather/speed
03/06/2025	CE25008_MB_010	SOL	00:12	54° 21.59'	25° 48.62'	3036	98.5	SOL, Multibeam at 3036 m
03/06/2025	CE25008_MB_010	Midpoint	01:41	59° 20.64'	25° 35.67'	2163.6	85.8	Reached Midpoint of ridge
03/06/2025	CE25008_MB_010	EOL	02:20	54° 20.75'	25° 30.00'	2309	99.2	EOL, Multibeam at 2309 m
03/06/2025	CE25008_MB_011	SOL	02:22	54° 20.59'	25° 30.03'	2314	243.9	SOL, Multibeam at 2314 m
03/06/2025	CE25008_MB_011	EOL	03:54	54° 16.12'	25° 45.32'	2563	262.7	EOL, arrived at Eriador ROV site
03/06/2025	CE25008_MB_013	SOL	13:41	54° 16.42'	25° 42.34'	2504.3	61.3	SOL, heading back to line 010
03/06/2025	CE25008_MB_013	EOL	14:38	54° 20.72'	25° 30.77'	2279.7	27.4	EOL, back to line 010
03/06/2025	CE25008_MB_015	SOL	16:07	54° 20.74'	25° 30.08'	2309.1	100	SOL, Multibeam at 2309 m
03/06/2025	CE25008_MB_015	Data error, EOL	16:50	54° 20.87'	25° 22.24'	2753.4	100	EOL, Multibeam signal lost
03/06/2025	CE25008_MB_016	SOL	21:02	54° 20.90'	25° 24.38'	2450	89	SOL (SIS back working)
03/06/2025	CE25008_MB_016	EOL	21:36	54° 20.98'	25° 16.37'	2873	85	EOL (SIS crash)
03/06/2025	CE25008_MB_017	SOL	22:33	54° 21.06'	25° 22.80'	2707	88	SOL (line restarted, likely the same data was acquired for station 016 and 017)
03/06/2025	CE25008_MB_017	EOL	23:51	54° 22.88'	25° 11.09'	2960	70.5	EOL
04/06/2025	CE25008_MB_018	SOL	00:28	54° 25.24'	25° 14.93'	2932	265	SOL (fixed issue with displaced ship heading)

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
04/06/2025	CE25008_MB_018	EOL	03:47	54° 24.16'	25° 42.82'	2208	287	Data error. Computer crashed and line was restarted from the crash point.
04/06/2025	CE25008_MB_019	SOL	03:54	54° 24.28'	25° 43.51'	2258	303	Continued logging
04/06/2025	CE25008_MB_019	EOL	05:00	54° 24.57'	25° 49.98'	2993	277	EOL
04/06/2025	CE25008_MB_020	SOL	05:25	54° 27.61'	25° 49.09'	2993	89	SOL
04/06/2025	CE25008_MB_020	EOL	08:06	54° 27.44'	25° 22.54'	2558	12.3	EOL
04/06/2025	CE25008_MB_021	SOL	08:30	54° 26.04'	25° 20.83'	2776	262	SOL
04/06/2025	CE25008_MB_021	EOL	10:45	54° 25.15'	25° 36.58'	1927	275	EOL
04/06/2025	CE25008_MB_022	SOL	11:15	54° 26.30'	25° 41.57'	2078	297	SOL
04/06/2025	CE25008_MB_022	EOL	11:42	54° 27.44'	25° 45.51'	2386	297	EOL
04/06/2025	CE25008_MB_024	SOL	14:01	54° 30.43'	25° 49.40'	3311	118.6	SOL
04/06/2025	CE25008_MB_024	EOL	16:01	54° 29.19'	25° 27.70'	2097	73.4	EOL
04/06/2025	CE25008_MB_025	SOL	16:18	54° 30.57'	25° 27.36'	2049	5.1	SOL
04/06/2025	CE25008_MB_025	EOL	20:12	54° 54.38'	25° 26.05'	2569	352.7	EOL
04/06/2025	CE25008_MB_026	SOL	20:35	54° 54.25'	25° 20.83'	2034	198.6	SOL (down to Eriador site) heading S
04/06/2025	CE25008_MB_026	EOL	23:12	54° 31.88'	25° 21.96'	2442	190.4	EOL
04/06/2025	CE25008_MB_027	SOL	23:15	54° 31.66'	25° 22.41'	2443	286	SOL (East-West transit)
04/06/2025	CE25008_MB_027	EOL	23:46	54° 32.87'	25° 28.47'	1930	293	EOL (sysem crash)
04/06/2025	CE25008_MB_028	SOL	23:54	54° 33.06'	25° 29.54'	1934	293	SOL
05/06/2025	CE25008_MB_028	EOL	00:27	54° 33.59'	25° 35.18'	2174	273	EOL
05/06/2025	CE25008_MB_029	SOL	00:38	54° 33.18'	25° 37.06'	2216	182	SOL

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
05/06/2025	CE25008_MB_029	EOL	03:19	54° 17.05'	25° 29.00'	2474	166	EOL
05/06/2025	CE25008_MB_030	SOL	03:24	54° 16.87'	25° 29.57'	2533	262	SOL
05/06/2025	CE25008_MB_030	EOL	04:25	54° 15.77'	25° 44.89'	2403	263	EOL
05/06/2025	CE25008_MB_032	SOL	16:27	54° 32.11	25° 46.04	2776	98.7	SOL
05/06/2025	CE25008_MB_032	EOL	17:12	54° 31.72	25° 29.05	2105	98.7	EOL
05/06/2025	CE25008_MB_033	SOL	17:48	54° 34.14	25° 31.93'	2019	5.9	SOL
05/06/2025	CE25008_MB_033	EOL	19:29	54° 44.54	25° 29.87	2601.1	3	EOL
05/06/2025	CE25008_MB_034	SOL	19:31	54° 44.53	25° 29.85	2615.1	102.8	SOL
05/06/2025	CE25008_MB_034	EOL	20:34	54° 43.07	25° 13.29	2452.7	97.7	EOL
05/06/2025	CE25008_MB_035	SOL	20:34	54° 43.12	25° 13.09	2534.5	353	SOL
05/06/2025	CE25008_MB_035	EOL	22:02	54° 54.64	25° 13.10	1948.2	345	EOL
05/06/2025	CE25008_MB_036	SOL	22:04	54° 54.83	25° 15.23	1930	32	SOL (TRANSIT TO DIVE LOCATION)
06/06/2025	CE25008_MB_036	EOL	02:24	55° 25.31	24° 37.16	2601	45	EOL
06/06/2025	CE25008_MB_038	SOL	10:45	55° 25.22	24° 37.11	2589.1	300	SOL
06/06/2025	CE25008_MB_038	EOL	10:53	55° 26.06	24° 37.54	2306.7	349	EOL
06/06/2025	CE25008_MB_039	SOL	10:56	55° 26.32	24° 37.32	2346	55	SOL
06/06/2025	CE25008_MB_039	EOL	12:28	55° 34.44	24° 14.61	2299.4	33.8	EOL
06/06/2025	CE25008_MB_040	SOL	12:28	55° 34.44	24° 14.61	2299.4	33.8	SOL (DIVE 5 LOCATION)
06/06/2025	CE25008_MB_040	EOL	12:33	55° 34.83	24° 14.29	2118	31.1	EOL (DIVE 5 LOCATION)
06/06/2025	CE25008_MB_041	SOL	12:38	55° 34.85	24° 14.30	2211		SOL
06/06/2025	CE25008_MB_041	EOL	12:43	55° 34.43	24° 14.70	2301	2216	EOL
06/06/2025	CE25008_MB_042	SOL	17:45	55° 33.28	24° 14.27	2279	177	SOL (TRANSIT)

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
06/06/2025	CE25008_MB_042	EOL	18:31	55° 25.82	24° 14.30	2279	40	EOL (TRANSIT)
06/06/2025	CE25008_MB_043	SOL	18:35	55° 25.99	24° 13.62	2279	44	SOL
07/06/2025	CE25008_MB_043	EOL	00:38	56° 09.45	23° 06.33	2311	42	EOL
07/06/2025	CE25008_MB_044	SOL	01:01	56° 08.59	24° 06.12	2322	222	SOL
07/06/2025	CE25008_MB_044	EOL	10:08	55° 24.49	24° 12.31	2278.8	133	EOL (PLANNING MODULE NOT WORKING)
07/06/2025	CE25008_MB_045	SOL	10:31	55° 22.64	24° 09.06	2278.8	50.7	SOL
07/06/2025	CE25008_MB_045	EOL	11:05	55° 25.36	24° 04.72	2278	40	EOL (RESTARTING SIS)
07/06/2025	CE25008_MB_046	SOL	11:08	55° 25.60	24° 04.35	2278	37.9	SOL (SIS RESTARTED)
07/06/2025	CE25008_MB_046	EOL	15:45	55° 48.9	23° 28.44	2278	42.6	EOL(REBOOT SIS)
07/06/2025	CE25008_MB_047	SOL	15:45	55° 25.60	24° 04.35	2278	42.6	SOL
07/06/2025	CE25008_MB_047	EOL	16:12	55° 51.45	23° 24.5	2133		EOL
07/06/2025	CE25008_MB_048	SOL	16:44	55° 49.47	23° 22.64	1910	307.3	SOL
07/06/2025	CE25008_MB_048	EOL	17:36	55° 52.58	23° 29.87	No data	306.5	EOL
07/06/2025	CE25008_MB_049	SOL	17:47	55° 51.95	23° 30.18	No data	129.6	SOL
07/06/2025	CE25008_MB_049	EOL	18:29	55° 48.88	23° 23.06	No data	128.9	EOL
07/06/2025	CE25008_MB_050	SOL	18:39	55° 48.24	23° 23.30	1915.5	307.6	SOL
07/06/2025	CE25008_MB_050	EOL	19:28	55° 51.48	23° 30.85	No data	306	EOL
07/06/2025	CE25008_MB_051	SOL	19:40	55° 52.57	23° 29.92	No data	131	SOL
07/06/2025	CE25008_MB_051	EOL	20:24	55° 49.56	23° 22.84	1922	131	EOL
07/06/2025	CE25008_MB_052	SOL	20:33	55° 48.86	23° 23.01	1911	313	SOL
07/06/2025	CE25008_MB_052	EOL	21:55	55° 54.05	23° 35.16	2378	306	EOL

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
07/06/2025	CE25008_MB_053	SOL	22:00	55° 54.17	23° 35.89	2375	219	SOL
08/06/2025	CE25008_MB_053	EOL	02:38	55° 29.32	24° 14.21	2179	220.6	EOL
08/06/2025	CE25008_MB_054	SOL	02:44	55° 28.84	24° 13.56	2176	132	SOL
08/06/2025	CE25008_MB_054	EOL	03:53	55° 23.38	24° 02.11	2650	41	EOL
08/06/2025	CE25008_MB_055	SOL	03:58	55° 23.69	24° 00.86	2645	41	SOL
08/06/2025	CE25008_MB_055	EOL	08:32	55° 50.24	23° 19.93	1877	35	EOL
08/06/2025	CE25008_MB_058	SOL	22:13	55° 44.43	23° 27.73	1870.9	88	SOL
08/06/2025	CE25008_MB_058	EOL	23:34	55° 44.35	23° 03.49	2072	7	EOL
09/06/2025	CE25008_MB_059	SOL	02:52	55° 44.35	23° 03.65	2073	93	SOL MULTIBEAM OVER DIVE SITE
09/06/2025	CE25008_MB_059	EOL	12:32	55° 44.33	22° 59.20	2010	89	EOL
09/06/2025	CE25008_MB_060	SOL	13:32	55° 45.85	22° 59.4	1964	269	SOL
09/06/2025	CE25008_MB_060	EOL	14:32	55° 45.96	23° 05.93			EOL
09/06/2025	CE25008_MB_061	SOL	15:32	55° 45.76	23° 05.99	1963		SOL
09/06/2025	CE25008_MB_061	EOL	16:32	55° 44.32	23° 04.20	2072		EOL
09/06/2025	CE25008_MB_063	SOL	17:32	55° 44.51	23° 03.64	1834		SOL
09/06/2025	CE25008_MB_063	EOL	18:32	56° 06.52	22° 17.91	1397.8	68	EOL
09/06/2025	CE25008_MB_065	SOL	20:33	56° 06.27	22° 18.09	1383	66	SOL to OWLSGARD
10/06/2025	CE25008_MB_065	EOL	11:54	56° 59.50	19° 11.10	1494	92	EOL
10/06/2025	CE25008_MB_066	SOL	12:18	56° 59.60	19° 11.57	1491	180	SOL
10/06/2025	CE25008_MB_066	GAP	13:02	56° 55.06	19° 11.85	1482		RESTARTING SIS SMALL GAP
10/06/2025	CE25008_MB_066	EOL	13:20	56° 53.65	19° 11.86	1530.6	190.2	EOL
10/06/2025	CE25008_MB_067	SOL	13:33	56° 54.36	19° 14.38	1312	318	SOL

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
10/06/2025	CE25008_MB_067	TURN	14:21	57° 02.47	19° 14.40	1482	337	TURN TO RESTART HEADING
10/06/2025	CE25008_MB_067	EOL	14:55	57° 07.61	19° 18.08	1133	266	EOL
10/06/2025	CE25008_MB_068	SOL	15:12	57° 06.84	19° 20.59	1482	187	SOL
10/06/2025	CE25008_MB_068	EOL	16:29	56° 59.62	19° 15.62	2458	167	EOL
11/06/2025	CE25008_MB_069	SOL	07:58	55° 35.79	16° 04.47	1800	170	SOL OVER LOGACHEV MOUTS
11/06/2025	CE25008_MB_069	EOL	09:50	55° 18.12	15° 58.80	1423	171	EOL
11/06/2025	CE25008_MB_070	SOL	10:04	55° 19.90	15° 55.13	1438	1	SOL
11/06/2025	CE25008_MB_070	DIVERSION START	11:03	55° 27.45	15° 59.37		324	MINOR DIVERSION TO MULTIBEAM
11/06/2025	CE25008_MB_070	DIVERSION END	11:09	55° 27.45	16° 00.72		353	MINOR DIVERSION TO MULTIBEAM
11/06/2025	CE25008_MB_070	EOL	11:27	55° 28.07	16° 04.47	890	39	EOL
11/06/2025	CE25008_MB_071	SOL	11:28	55° 28.07	16° 00.14	1292	63.1	SOL
11/06/2025	CE25008_MB_071	EOL	?	?	?	?	?	?
11/06/2025	CE25008_MB_072	SOL	11:35	55° 35.42	15° 59.67	699.4	68	SMALL GAP @ START DUE TO CRASH
11/06/2025	CE25008_MB_072	EOL	12:02	55° 33.08	16° 00.72	635.6	91	EOL
11/06/2025	CE25008_MB_073	SOL	12:13	55° 32.18	15° 52.58	685	890.9	SOL
11/06/2025	CE25008_MB_073	EOL	13:16	55° 29.54	16° 02.47			EOL
11/06/2025	CE25008_MB_075	SOL	15:21	55° 29.84	16° 02.35	612.6	240.9	SOL
11/06/2025	CE25008_MB_075	EOL	16:33	55° 24.75	16° 15.20	815	240	EOL
11/06/2025	CE25008_MB_076	SOL	16:40	55° 25.69	16° 14.71	864	77	SOL TO WEST
11/06/2025	CE25008_MB_076	EOL	18:37	55° 31.17	15° 51.76	806	66	EOL
11/06/2025	CE25008_MB_077	SOL	18:47	55° 30.23	15° 50.51	860	251	SOL

Date	Station	Event	Time	Latitude	Longitude	Depth m	Heading	Notes
11/06/2025	CE25008_MB_077	EOL	20:02	55° 29.89	16o 04.46	800	243	EOL
11/06/2025	CE25008_MB_078	SOL	20:16	55° 26.03	16o 03.67	780	351	SOL
11/06/2025	CE25008_MB_078	EOL	20:21	55° 26.61	16o 03.82	1186	352	EOL
12/06/2025	CE25008_MB_092	SOL	10:10	55° 27.79	16° 01.93	739	222	SOL
12/06/2025	CE25008_MB_092	EOL	10:19	55° 26.70	16° 03.74	816	274	EOL
12/06/2025	CE25008_MB_093	SOL	10:21	55° 26.77	16° 03.84	818	358	SOL
12/06/2025	CE25008_MB_093	EOL	11:26	55° 35.69	16° 05.74	509	17	EOL
12/06/2025	CE25008_MB_094	SOL	11:37	55° 35.74	16° 03.80	512	192	SOL
12/06/2025	CE25008_MB_094	EOL	12:35	55° 29.03	16° 02.50	652	184	EOL
12/06/2025	CE25008_MB_095	SOL	12:37	55° 28.85	16° 02.55	651	191	SOL
12/06/2025	CE25008_MB_095	EOL	12:53	55° 27.11	16° 03.55	706	240	EOL
12/06/2025	CE25008_MB_096	SOL	12:54	55° 27.09	16° 03.62	752	247	SOL
12/06/2025	CE25008_MB_096	EOL	13:50	55° 24.62	16° 14.62	915	259	EOL
12/06/2025	CE25008_MB_097	SOL	14:15	55° 27.76	16° 16.70	690	71	SOL
12/06/2025	CE25008_MB_097	EOL	15:10	55° 30.31	16° 05.36	653	71	EOL

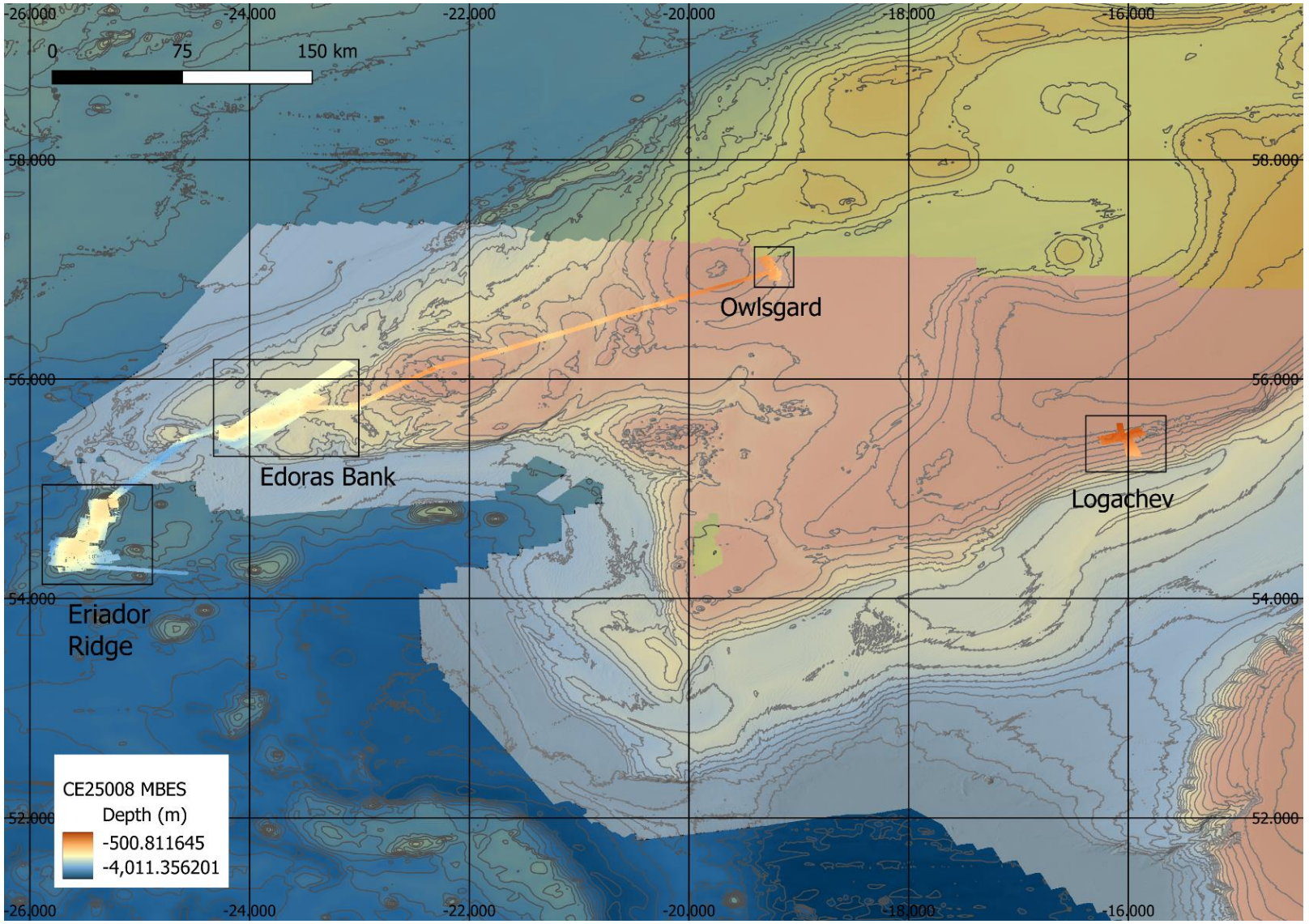


Figure 48. All hull-mounted multibeam echosounder bathymetry overlying GEBCO and Infomar public-domain bathymetric datasets.

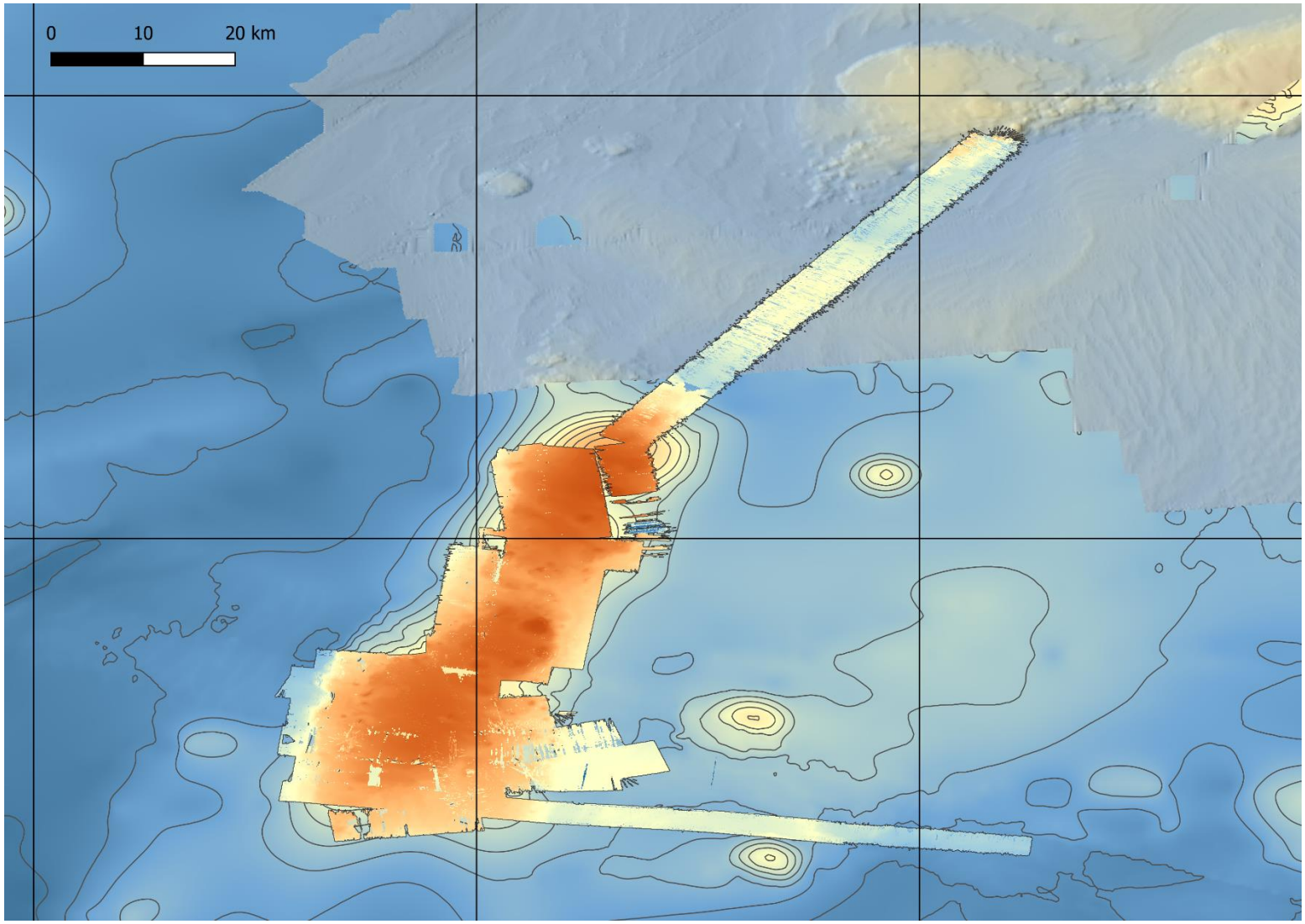


*Figure 49. Hull-mounted multibeam echosounder bathymetry of **Eriador Ridge** overlying GEBCO and Infomar public-domain bathymetric datasets.*

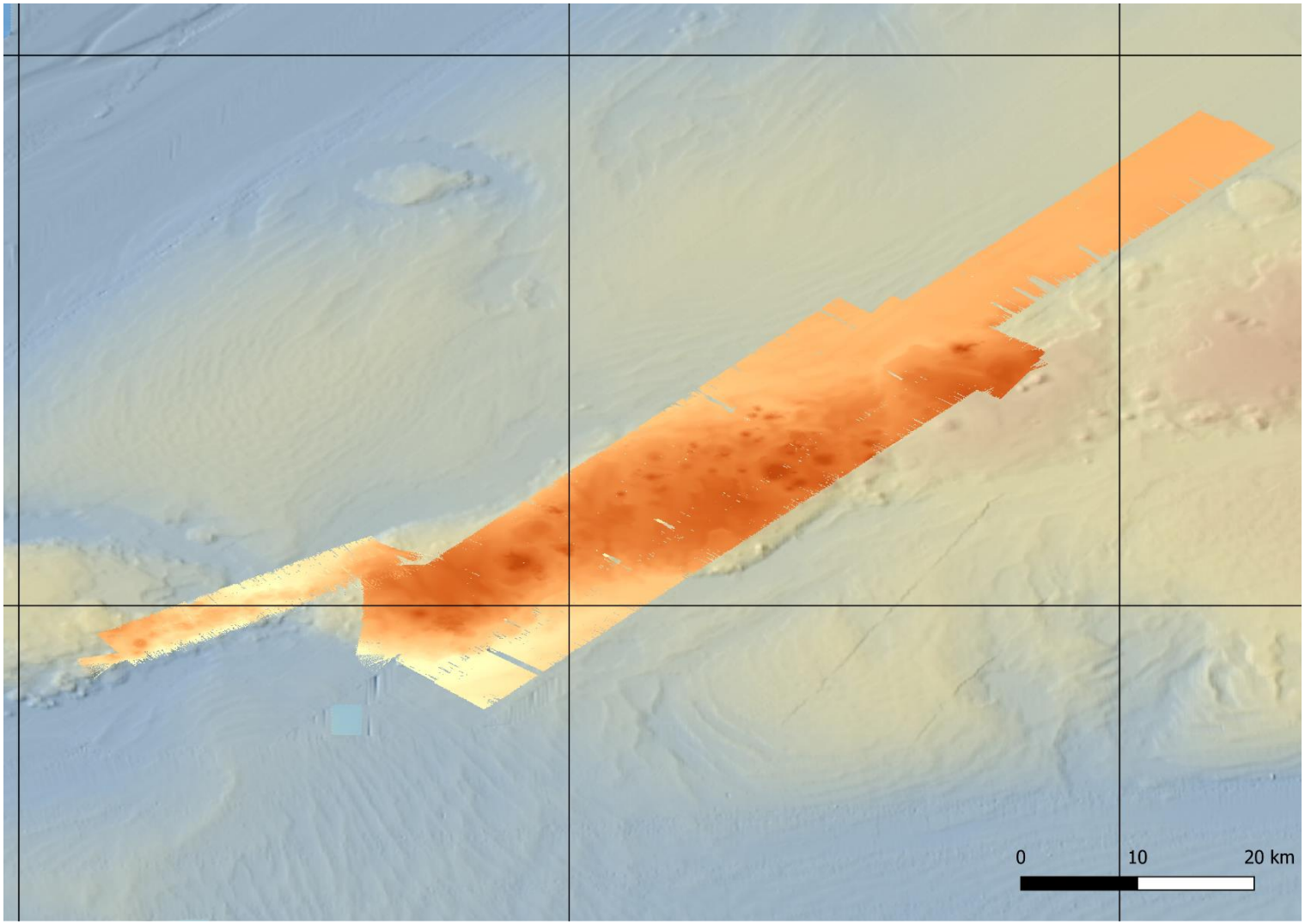


*Figure 50. Hull-mounted multibeam echosounder bathymetry of **Edoras Bank** infilling a gap in the Infomar bathymetry and overlaying.*

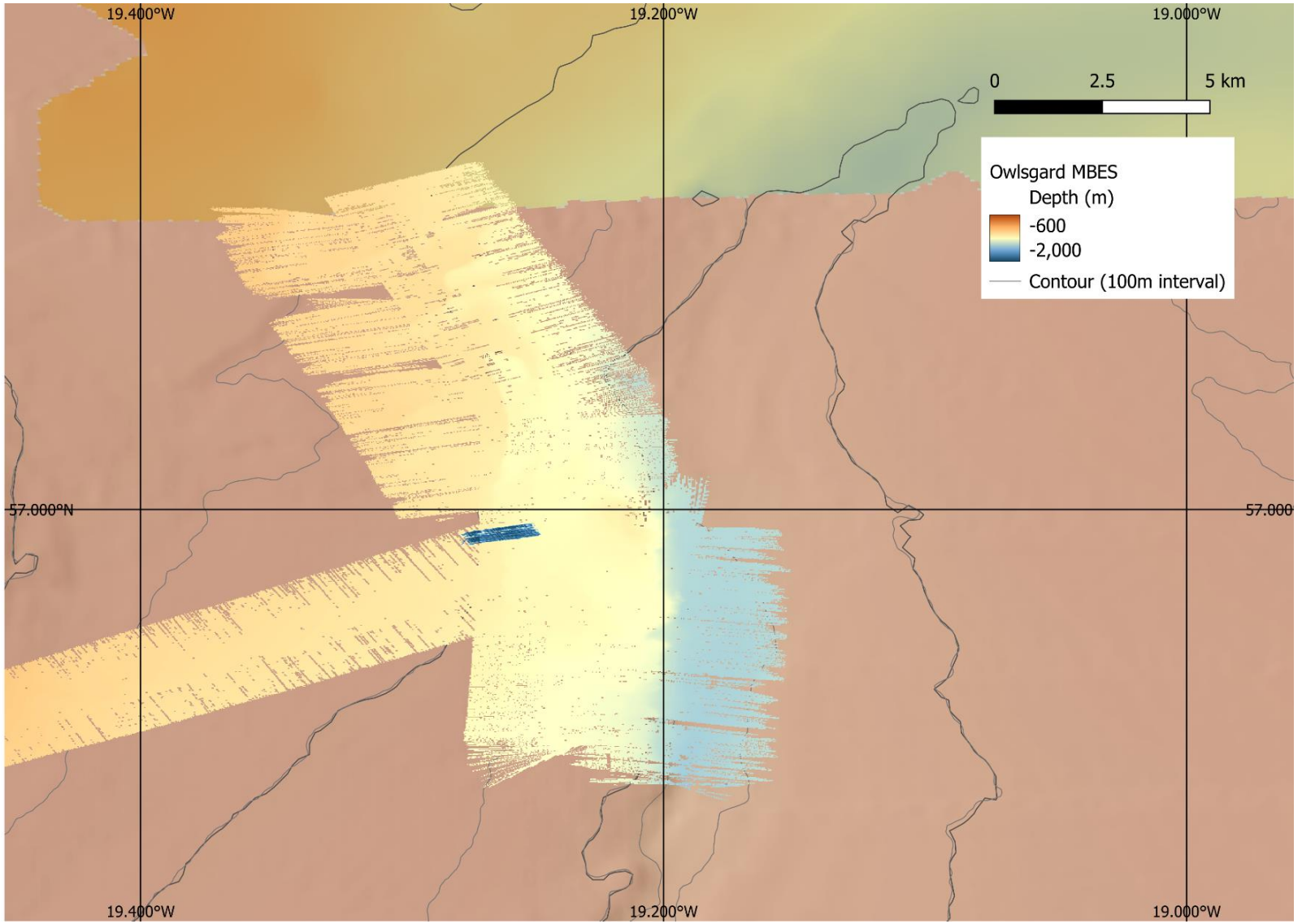


*Figure 51. Hull-mounted multibeam echosounder bathymetry of **Owlsgard Bank** overlaying Infomar bathymetry. Poor data quality due to sea conditions.*

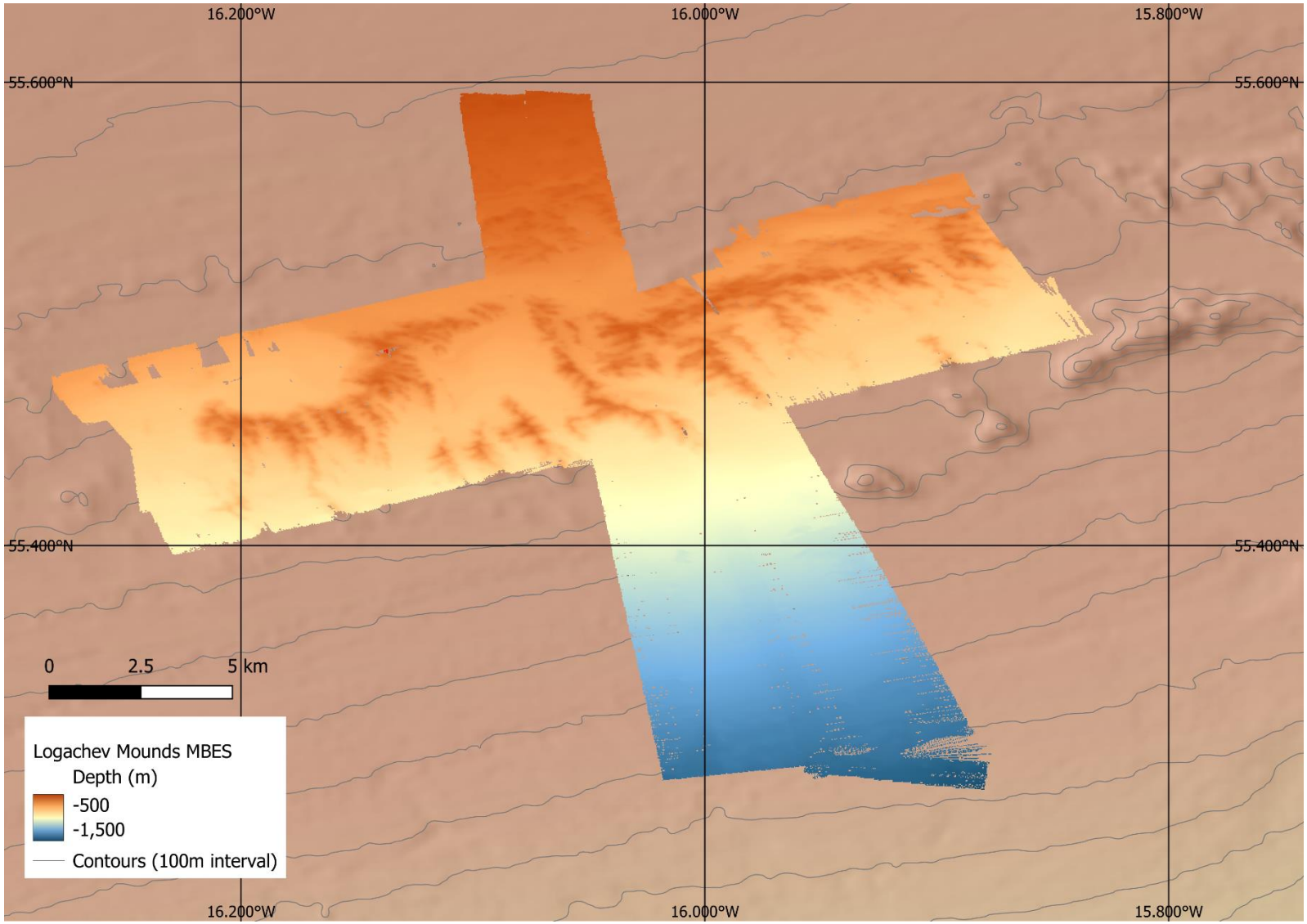


*Figure 52 Hull-mounted multibeam echosounder bathymetry of **Logachev Mounds** overlaying Infomar bathymetry*

CTD Log and Maps (all time UTC)

Date	Station #	Bottle fired	Time	Latitude	Longitude	Depth m	Notes
29/05/2025	CE25008_CTD_001	1 to 10	00:30:00	53° 11.52'	09° 38.50'	51	CTD in water, all bottled at 40 m
31/05/2025	CE25008_CTD_002	n/a	07:05:00	55° 29.53'	16° 02.47'	572	CTD in water
31/05/2025	CE25008_CTD_002	n/a	07:19:00	55° 19.57'	16° 02.48'	572	CTD at 550 m
31/05/2025	CE25008_CTD_002	n/a	07:33:00	55° 19.57'	16° 02.48'	572	CTD at of water
31/05/2025	CE25008_CTD_004	n/a	15:13:00	55° 30.20'	16° 02.56'	672	CTD in water
31/05/2025	CE25008_CTD_004	n/a	15:28:00	55° 30.20'	16° 02.56'	672	CTD at 653 m, ~20 m of seafloor
31/05/2025	CE25008_CTD_004	n/a	15:40:00	55° 30.20'	16° 02.57'	672	CTD on deck
31/05/2025	CE25008_CTD_005	n/a	16:14:00	55° 30.19'	16° 02.57'	672	CTD in water
31/05/2025	CE25008_CTD_005	n/a	16:31:00	55° 30.19'	16° 02.57'	672	CTD at 665 m, ~21 m of seafloor
31/05/2025	CE25008_CTD_005	n/a	16:45:00	55° 30.20'	16° 02.56'	672	CTD on deck
31/05/2025	CE25008_CTD_006	n/a	17:09:00	55° 30.21'	16° 02.58'	672	CTD in water
31/05/2025	CE25008_CTD_006	n/a	17:24:00	55° 30.20'	16° 02.57'	672	CTD at 665 m, ~20.8 m of seafloor. Outlier @ ~450 m recorded in Sensor 1
31/05/2025	CE25008_CTD_006	n/a	17:37:00	55° 30.20'	16° 02.55'	672	CTD on deck
31/05/2025	CE25008_CTD_007	n/a	18:10:00	55° 30.20'	16° 02.57'	672	CTD in water
31/05/2025	CE25008_CTD_007	n/a	18:25:00	55° 30.20'	16° 02.56'	672	CTD at 665 m, ~21.8 m of seafloor
31/05/2025	CE25008_CTD_007	n/a	18:38:00	55° 30.20'	16° 02.56'	672	CTD on deck
31/05/2025	CE25008_CTD_008	n/a	19:09:00	55° 30.20'	16° 02.56'	673	CTD in water
31/05/2025	CE25008_CTD_008	n/a	19:24:00	55° 30.20'	16° 02.56'	673	CTD at 653 m

Date	Station #	Bottle fired	Time	Latitude	Longitude	Depth m	Notes
31/05/2025	CE25008_CTD_008	n/a	19:36:00	55° 30.20'	16° 02.56'	673	CTD on deck
03/06/2025	CE25008_CTD_014	n/a	14:51:00	54° 20.80'	25° 30.78'	2260	CTD in water
03/06/2025	CE25008_CTD_014	n/a	15:25:00	54° 20.80'	25° 30.78'	2260	CTD at 1575 m
03/06/2025	CE25008_CTD_014	n/a	15:54:00	54° 20.80'	25° 30.78'	2260	CTD on deck
04/06/2025	CE25008_CTD_023	n/a	12:26:00	54° 30.40'	25° 49.64'	3300	CTD in water
04/06/2025	CE25008_CTD_023	n/a	13:13:00	54° 30.40'	25° 49.64'	3300	CTD at 2000 m
04/06/2025	CE25008_CTD_023	n/a	13:50:00	54° 30.39'	25° 49.64'	3300	CTD on deck
11/06/2025	CE25008_CTD_079	n/a	21:04:00	55° 28.13'	16° 01.39'	798	CTD in water (21:12 start descending)
11/06/2025	CE25008_CTD_079	n/a	21:33:00	55° 28.13'	16° 01.39'	770	CTD at 770 m
11/06/2025	CE25008_CTD_079	n/a	21:51:00	55° 28.13'	16° 01.39'	798	CTD on deck
11/06/2025	CE25008_CTD_080	n/a	22:12:00	55° 28.13'	16° 01.39'	798	CTD in water (22:13 start descending)
11/06/2025	CE25008_CTD_080	n/a	22:31:00	55° 28.13'	16° 01.39'	765	CTD at 765 m
11/06/2025	CE25008_CTD_080	n/a	22:48:00	55° 28.13'	16° 01.39'	798	CTD on deck
11/06/2025	CE25008_CTD_081	n/a	23:10:00	55° 28.13'	16° 01.39'	798	CTD in water (23:12 start descending)
11/06/2025	CE25008_CTD_081	n/a	23:32:00	55° 28.14'	16° 01.39'	798	CTD at 790 m
11/06/2025	CE25008_CTD_081	n/a	23:49:00	55° 28.14'	16° 01.39'	795	CTD on deck
12/06/2025	CE25008_CTD_082	n/a	00:09:00	55° 28.14'	16° 01.39'	795	CTD in water (00:11 start descending)
12/06/2025	CE25008_CTD_082	n/a	00:27:00	55° 28.14'	16° 01.39'	795	CTD at 790 m (00:31 start ascending)
12/06/2025	CE25008_CTD_082	n/a	00:44:00	55° 28.14'	16° 01.39'	795	CTD on deck
12/06/2025	CE25008_CTD_083	n/a	01:09:00	55° 28.14'	16° 01.39'	795	CTD in water (01:12 start descending)

Date	Station #	Bottle fired	Time	Latitude	Longitude	Depth m	Notes
12/06/2025	CE25008_CTD_083	n/a	01:31:00	55° 28.14'	16° 01.39'	795	CTD at 780 m (01:31 start ascending)
12/06/2025	CE25008_CTD_083	n/a	01:45:00	55° 28.14'	16° 01.39'	795	CTD on deck
12/06/2025	CE25008_CTD_084	n/a	02:08:00	55° 28.14'	16° 01.39'	795	CTD in water (02:11 start descending)
12/06/2025	CE25008_CTD_084	n/a	02:25:00	55° 28.14'	16° 01.39'	798	CTD at 776 m (02:31 start ascending)
12/06/2025	CE25008_CTD_084	n/a	02:44:00	55° 28.14'	16° 01.39'	798	CTD on deck
12/06/2025	CE25008_CTD_085	n/a	03:10:00	55° 28.14'	16° 01.39'	797	CTD in water (03:12 start descending)
12/06/2025	CE25008_CTD_085	n/a	03:27:00	55° 28.14'	16° 01.39'	792	CTD at 792 m (03:32 start ascending)
12/06/2025	CE25008_CTD_085	n/a	03:46:00	55° 28.14'	16° 01.39'	797	CTD on deck
12/06/2025	CE25008_CTD_086	n/a	04:09:00	55° 28.14'	16° 01.39'	797	CTD in water (04:12 start descending)
12/06/2025	CE25008_CTD_086	n/a	04:28:00	55° 28.14'	16° 01.39'	782	CTD at 782 m (04:31 start ascending)
12/06/2025	CE25008_CTD_086	n/a	04:45:00	55° 28.14'	16° 01.39'	797	CTD on deck
12/06/2025	CE25008_CTD_087	n/a	05:11:00	55° 28.14'	16° 01.39'	797	CTD in water (05:13 start descending)
12/06/2025	CE25008_CTD_087	n/a	05:32:00	55° 28.14'	16° 01.39'	782	CTD at 782 m (straight up)
12/06/2025	CE25008_CTD_087	n/a	05:46:00	55° 28.14'	16° 01.39'	797	CTD on deck
12/06/2025	CE25008_CTD_088	n/a	06:10:00	55° 28.14'	16° 01.39'	797	CTD in water (06:12 start descending; outlier in sensor 1 at ca. 508 m)
12/06/2025	CE25008_CTD_088	n/a	06:32:00	55° 28.14'	16° 01.39'	782	CTD at 782 m (straight up)
12/06/2025	CE25008_CTD_088	n/a	06:46:00	55° 28.14'	16° 01.39'	797	CTD on deck
12/06/2025	CE25008_CTD_089	n/a	07:12:00	55° 28.14'	16° 01.39'	798	CTD in water (07:14 start descending)
12/06/2025	CE25008_CTD_089	n/a	07:34:00	55° 28.14'	16° 01.39'	781	CTD at 781 m
12/06/2025	CE25008_CTD_089	n/a	07:48:00	55° 28.14'	16° 01.39'	800	CTD on deck

Date	Station #	Bottle fired	Time	Latitude	Longitude	Depth m	Notes
12/06/2025	CE25008_CTD_090	n/a	08:12:00	55° 28.14'	16° 01.39'	800	CTD in water (08:14 start descending)
12/06/2025	CE25008_CTD_090	n/a	08:31:00	55° 28.14'	16° 01.39'	770	CTD at 770 m
12/06/2025	CE25008_CTD_090	n/a	08:45:00	55° 28.13'	16° 01.37'	798	CTD on deck
12/06/2025	CE25008_CTD_091	n/a	09:14:00	55° 28.13'	16° 01.37'	798	CTD in water (09:14 start descending)
12/06/2025	CE25008_CTD_091	1-4, 9-15 (↑)	09:34:00	55° 28.13'	16° 01.37'	782	CTD at 782 m + fired bottles 1 to 4 and 9 to 15 on the way up
12/06/2025	CE25008_CTD_091	n/a	10:00:00	55° 28.13'	16° 01.37'	798	CTD on deck
13/06/2025	CE25008_CTD_100	n/a	05:01:00	55° 29.59'	16° 02.51'	576	CTD off deck
13/06/2025	CE25008_CTD_100	n/a	05:04:00	55° 29.59'	16° 02.51'	578	CTD start descent
13/06/2025	CE25008_CTD_100	01-03	05:18:00	55° 29.59'	16° 02.51'	577	3x bottles fired (1-3) at 560m
13/06/2025	CE25008_CTD_100	n/a	05:22:00	55° 29.59'	16° 02.51'	577	CTD & ADCP at 485m - hold at this depth
13/06/2025	CE25008_CTD_100	n/a	06:42:00	55° 29.59'	16° 02.51'	577	Ship ADCP turned off
13/06/2025	CE25008_CTD_100	n/a	12:32:00	55° 29.59'	16° 02.51'	577	CTD recovery
13/06/2025	CE25008_CTD_100	n/a	12:39:00	55° 29.59'	16° 02.51'	577	CTD on deck
13/06/2025	CE25008_CTD_102	n/a	19:41:00	55° 28.13'	16° 01.39'	798	CTD in water
13/06/2025	CE25008_CTD_102	n/a	19:43:00	55° 28.13'	16° 01.39'	798	CTD cast starts downwards
13/06/2025	CE25008_CTD_102	n/a	19:59:00	55° 28.13'	16° 01.39'	798	CTD at 787m
13/06/2025	CE25008_CTD_102	n/a	20:01:00	55° 28.13'	16° 01.39'	798	CTD at 708m for long deployment just above water mass boundary
14/06/2025	CE25008_CTD_102	n/a	06:00:00	55° 28.14'	16° 01.38'	798	CTD starts ascent
14/06/2025	CE25008_CTD_102	n/a	06:13:00	55° 28.14'	16° 01.38'	798	CTD on deck

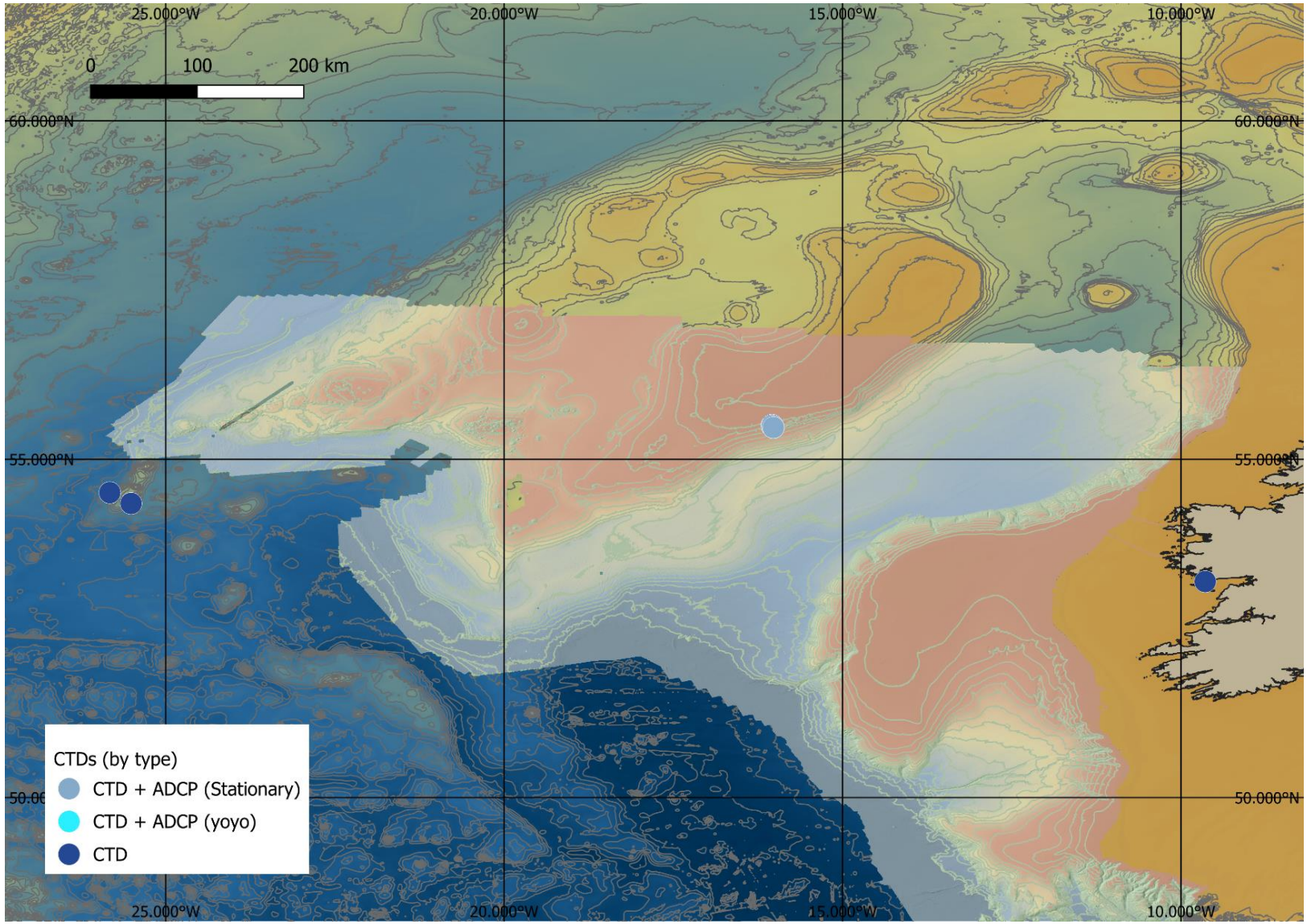


Figure 53. Map showing the location of all CTD deployments. See detailed maps below.

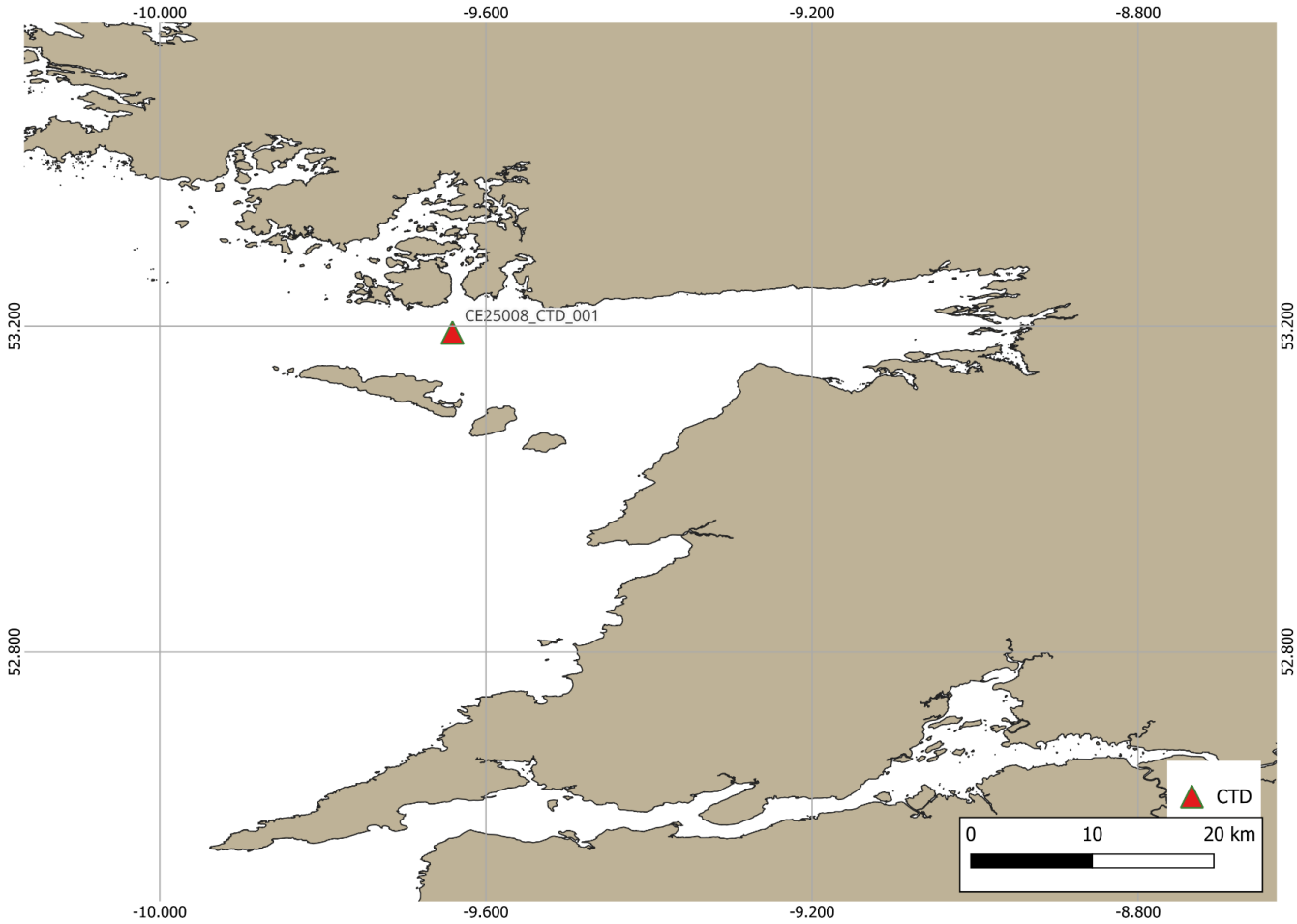


Figure 54. CTD station 001 in the Galway Bay

See map below for CTD locations on the Logachev Mounds Province.

Little MonSta Deployment and Recover Log and Map (all time UTC)

Station	Lander Name	Date	Time UTC	ADCP	Sed trap	CTD	Beacon	ROV Lat	ROV Long	Depth m	Note
CE25008_LM_3	Adele	31/05/25	11:06:00	Yes	Yes	Yes	n/a	55° 29.598	16° 02.502	593	Seabed visible
CE25008_LM_3	Adele	31/05/25	11:22:00	Yes	Yes	Yes	n/a	55° 29.59337	16° 02.49847	593	Fell + Uprighted; Adele deployed
CE25008_LM_98	Adele	12/06/25	16:47:00	Yes	Yes	Yes	n/a	55° 29.58976	16° 02.49843	594	Adele on seafloor, recovered.
CE25008_LM_98	Adele	12/06/25	19:52:00	Yes	Yes	Yes	n/a	55° 29.53	**16° 02.48**	594	Adele on deck

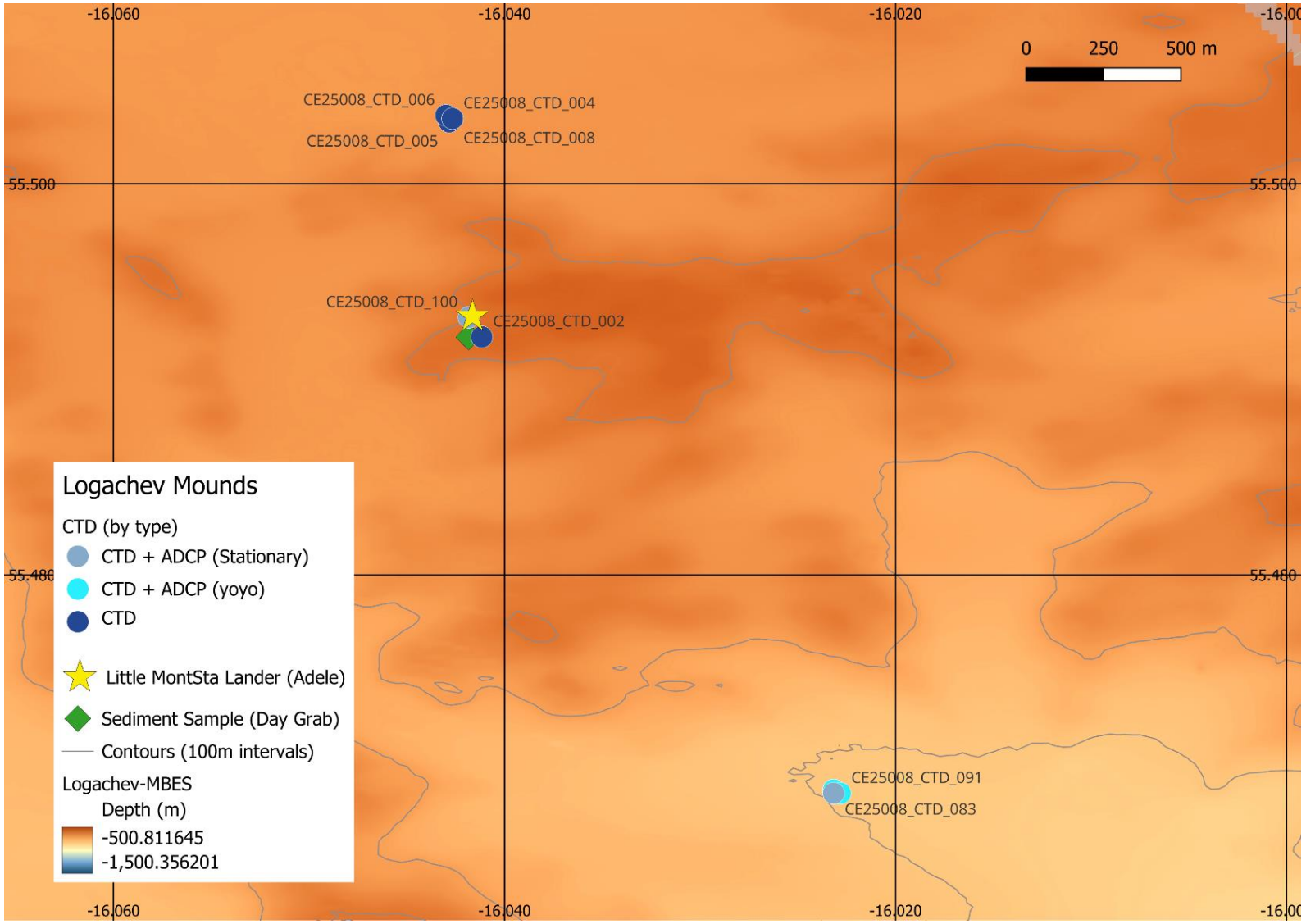


Figure 55. Little MonSta Adele deployment location with nearby CTD deployments and sediment sample. Bathymetry courtesy of Infomar.

Acknowledgements

This research survey is carried out with the support of the Marine Institute, funded under the National Research Vessel 2025 Shiptime Programme. The initial seismic site survey over Eriador and Gondor and Hazel Knight received funding from the European Union H2020 research and innovation programme (grant agreement No.824077) for Project PORO-CLIM: Deep Structure of Porcupine and Rockall margins. Dr Manfredo Capriolo is funded by UK NERC/US NSF project NE/W009625/1 C-FORCE: Carbon-Cycle Feedbacks from Responses to Carbon Emissions. Felix Butschek is funded by a Marine Institute Cullen Scholarship (Grant-Aid Agreement No. CS/21/010) under the Marine Research Programme by the Irish Government. Alexa Parimbelli is funded by Research Ireland Government of Ireland Postgraduate scholarship (GOIPG/2022/765).

We would like to thank the Master Denis Rowan, the crew and officers of the RV Celtic Explorer, Paddy O' Driscoll and technical staff of the Holland 1 ROV, as well as P&O Maritime and Marine Institute shore-side support. We are also grateful for the shore side assistance from Dr John Hopper, Dr Mohit Tunwal and Professor Stephen Jones.

The Little MonStas were developed through funding from Science Foundation Ireland Investigator Programme, Marine Institute's Infrastructure Programme and the Research Ireland Centre for Applied Geosciences.