Walters Shoal-Africana Seamount Cruise 2025

Cruise Report

2025

OXR20250130

January 30th - February 22nd

Moroni, Comoros – Cape Town, South Africa

Contents

Expedition Summary

Seamount biodiversity, geology, and eDNA survey of the Madagascar Ridge and Agulhas Plateau

This cruise entailed a survey of seamount biodiversity and geology south of Madagascar and on the Agulhas Plateau with targeted eDNA sampling and processing. This region hosts unique and poorly studied marine ecosystems, situated at a central point of significant ocean currents, which create rich habitats that support diverse species. The purpose of this project was to enhance our understanding of seamount biodiversity and geological features in this region, contributing valuable data to marine science, conservation planning, and sustainable management of oceanic resources. A total of three seamounts were mapped in high resolution namely Walters Shoal, unnamed seamount south of Walters Shoal (MAD Ridge seamount 1) and Africana Seamount with visual surveys and specimen collection being conducted at the two seamounts on the Madagascar Ridge. A persistent current speed of 3-4 knots of the Agulhas Current during the days allocated prevented visual surveys at the Africana Seamount.

Along the route through the Mozambique Channel to the seamount locations, OceanX, in partnership with the Malagasy government and NASA, conducted underway acoustic mapping, underway oceanographic measurements and sampling, CTD casts, and NASA PACE groundtruth sampling for ocean pigment, phytoplankton, and light attenuation.

OceanX

OceanX is on a mission to support scientists to explore the ocean and to bring it back to the world through captivating media. Uniting leading media, science, and philanthropy partners, *OceanX* utilizes next-gen technology, basic science, compelling storytelling, and immersive experiences to educate, inspire, and connect the world with the ocean. We seek to build a global community deeply engaged in understanding, enjoying, and protecting our oceans. OceanX is an operating program of Dalio Philanthropies, which furthers the diverse philanthropic interests of Dalio family members.

OceanQuest

The Kingdom of Saudi Arabia is establishing a new foundation called *OceanQuest* to advance deep ocean exploration to the world. The vision is to explore the ocean's secrets for the benefit of humanity. The mission is to accelerate ocean discovery, drive ocean-tech innovation, contribute to the blue innovation economy, strengthen global scientific cooperation, and excite the public.

Partners

Institutions

Global

UN Ocean Decade – Endorsed Decade Actions
Partnership for Observation of the Global Ocean (POGO)
Ocean Biomolecular Observing Network (OBON)
Challenger 150 - endorsed programme of the UN Ocean Decade

Regional

Partnership for Atlantic Cooperation
African Network of Deep-water Researchers – Challenger 150

United States

US National Oceanic and Atmospheric Administration (NOAA)
Columbia University Climate School - Lamont-Doherty Earth Observatory
City College of New York (CCNY)
US National Aeronautics and Space Administration (NASA)
US State Department
US Office of Naval Research (ONR)

Route-Specific Partnerships by Country/Transit locations

National Research Foundation – South African Environmental Observation Network (NRF-SAEON)
South African National Biodiversity Institute (SANBI)
South African National Space Agency (SANSA)
National Research Foundation - South African Institute for Aquatic Biodiversity (NRF-SAIAB)
University of Cape Town (UCT)
University of KwaZulu-Natal
Université de Toliara – Institut D'Enseignement Supérieur D'Anosy (IES-Anosy)- *Madagascar*
Université de Toliara – Institut Halieutique et des Sciences Marines (IHSM) - *Madagascar*
Universidade Lúrio - *Mozambique*
Wildlife Conservation Society (WCS) - *Mozambique*
Universidade Federal do Espirito Santo (UFES) - *Brazil*
Kenya Marine and Fisheries Research Institute (KMFRI) - *Kenya*
Universidade de Aveiro – *Portugal*
King Abdullah University of Science and Technology (KAUST) - *Kingdom of Saudi Arabia*

Scientific Cruise Participants:

OceanX Personnel:

Name	**Role**
Mattie Rodrigue	Expedition Coordinator/Science Program Director
Laura Sousa	Survey lead
Erin Heffron	Mapping Technician / Geospatial Coordinator
Hayley Drennon	Mapping Technician
Larissa Fruehe	eDNA Postdoctoral Researcher
Dave Pollock	Submersible Team Leader
Colin Wade	Submersible Technician/Pilot
Craig Foy	Submersible Technician/Pilot
Chris May	Submersible Technician/Pilot
Andrew Craig	ROV Team Leader
Ewan Basson	ROV Supervisor/Pilot
Noah Throop	Media Topside
Mario Tadinac	Media Technology Officer (MTO)
Gabriel Gonzaga	Media: Social Post
Peter Ackerman	DIT

Visiting Scientific Team:

Name	Role and Institute
Nico Augustin	Co-Lead Principal Investigator, KAUST, Saudi Arabia
Lara Atkinson	Co-Lead Principal Investigator, SAEON South Africa
Jordan Van Stavel	SAEON, South Africa
Jody-Carynn Oliver	SAIAB, South Africa
Thabo Mbuyazi	SAIAB, South Africa
Brishan Kalyan	SAEON, South Africa
Yameen Badrodien	University of Cape Town, South Africa
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Sinothando Shibe	POGO Fellow, South African National Parks
Doreen Mushi Walters	POGO Fellow, University of Dar es salaam, Tanzania
Ana Hilario	Universidade de Aveiro – Portugal
Alex Bastos	Universidade Federal do Espirito Santo (UFES) - Brazil

Expedition Research Context

The deep sea occupies 90% of the marine environment and is the world's largest biome, but it is still largely underexplored, particularly in the Indian Ocean. The Madagascar Ridge is a massive, elongated plateau in the southwest Indian Ocean stretching almost 1,130 km, formed during the breakup of Gondwana as a thickened oceanic crust at a mid-ocean ridge, possibly overlaying a mantle hot spot during its formation. However, the actual mode of emplacement is controversial.

The Agulhas Plateau is an oceanic plateau south of South Africa in the South West Indian Ocean formed during or after the separation of the Falkland Plateau from southern Africa, however, the origin of this plateau remains debated (Barret 1977, Parsiegla et al. 2008). The Agulhas Plateau represents a major bathymetric high in the region rising up to 2,500 m above the surrounding seafloor and covering an area of more than 230,000 km^2 (Parsiegla et al. 2008). It also critically redirects the Agulhas Return Current as it retroflects back towards the South West Indian Ocean and is thought to contribute to early retroflections of the Agulhas Current from time to time (Russo et al. 2021).

Several seamounts are located on the Madagascar Ridge and the Agulhas Plateau and may act as bridges for long distance dispersal and colonization of biota by way of a 'stepping stone model' (Boehlert and Genin 1987). Seamounts are vulnerable ecosystems targeted by fishing and potentially by future mineral exploitation. The heterogeneity of faunal and abiotic composition associated with seamounts requires multiscale, integrated studies to describe unique or regional spatial patterns and identify environmental drivers. Walters Shoal is a raised, isolated bathymetric feature hosting a group of seamounts located near the southern end of the Madagascar Ridge, the shallowest of which is Walters Shoal seamount, which rises from -800 m to an elevation of -15 m. Walters Shoal seamount is one of only a few structures in the Indian Ocean that reaches the photic zone, supporting algal communities, and is part of a voluntary benthic protected area, implemented in 2018 by the Southern Indian Ocean Deepwater Fishers Association (SIODFA, Marsac et al. 2022), however some fishing appears to be ongoing on Walters Shoal. Another significantly larger seamount is situated 160 km southwest of Walters Shoal seamount at the southern end of the Madagascar Ridge. It is more voluminous but does not reach as shallow (-2800 m to -688 m). Much of the Madagascan Ridge area is included in Madagascar's expanded continental shelf claim and is recognized as an Ecologically and Biologically Significant Area (EBSA) through the Convention on Biological Diversity (CBD). Zucchi et al. (2018) report that more studies have been undertaken on Walters Shoal than most other seamounts, likely due to its high levels of endemism, high productivity, shallow reach, accessibility, and commercial fisheries interests. Walters Shoal, first discovered by a South African Hydrographic Frigate *SAS Natal*, was named after its captain and has been the focus of several research expeditions with the earliest known being during the International Indian Ocean Expedition (IIOE) in 1964 when the United States *R/V Anton Bruun* sampled using a dredge, followed by the French vessel *Marion-Dufresne* in 1976 with several Russian expeditions between 1973 and 1978 (Collette and Parin, 1991). A survey conducted at Walters Shoal by Collette and Parin (1991) revealed a high proportion of endemic fish species, but overall low fish diversity in the shallow reaches. A South African led expedition surveyed the shallow fauna and algae at Walters Shoal seamount in 2014, producing detailed inventories of benthic fauna (dominated by coralline algae and sponges) and fish from the shallow reaches (Payne 2015 MSc Thesis). Although several endemic sponges were found, overall, the shallow reaches (- 15 m to -100 m) are dominated by coralline algae with low species diversity detected, similar to that of the fish fauna (Collette and Parin 1991). However no deep visual tools were available during the South African led survey, and the seabed mapping efforts were rudimentary. Apart from some baited underwater video systems (BRUVS), jump cameras and a few published images captured by SCUBA divers on the summit of Walters Shoal, no systematic, high-resolution ROV surveys and habitat mappings are known to be available from any of these large features on the Madagascan Ridge. The proposed survey using advanced multibeam seafloor mapping and deep water ROV surveys will provide first comprehensive ecosystem imagery and data from this region, to be made available to global platforms for broader application.

Very little research has been conducted on the Agulhas Plateau and most has been focused on the geological origin of the feature. There is some evidence of volcanic activity on the plateau, resulting in more rugged morphology reported in the northern area (Uenzelmann-Neben 1999). To date, there have not been any known or reported biological surveys conducted in the area and the biodiversity of the Agulhas Plateau remains unknown. The largest feature reported here is the Africana Seamount, a conical seamount with a summit reported at - 1 434 m (Avraham 1995), although this is not verified and other reports indicate a summit deeper than - 2000 m. The Africana Seamount and surrounding area is indicated to be a Vulnerable Marine Ecosystem closed area and benthic protection area implemented by SIODFA, thereby affording protection to this feature from benthic fishing activities. The South African marine ecosystem classification map (Sink et al. 2019) reveals two unique ecosystem types (Agulhas Plateau and Agulhas Rocky Plateau) forming the northern portion of the Agulhas Plateau within the South African EEZ and this feature is included in a large Ecologically and Biologically Significant Area (EBSA) spanning the high seas across this region. Although limited, the evidence available suggests the Agulhas Plateau, and specifically the Africana Seamount, are likely to include unique rocky habitat, potentially hosting a unique benthic community.

The research team selected 2-3 seamounts on and around Walters Shoal to study with ROVs and high-resolution multibeam mapping, record and describe the benthic diversity along upslope profiles, likely discovering unknown species, assess teleost and elasmobranch diversity using eDNA and testing the hypothesis of a wider spread of coelacanth populations beyond the south of Madagascar. Walters Shoal is worth investigating as a further potential habitat for the African coelacanth *Latimeria chalumnae,* including using the recent eDNA methods that successfully detected genetic material of coelacanths in a cave and other water samples (Oliver et al. 2024). Cooke et al. (2021) hypothesise that Madagascar is potentially the progenitor of the Comoros coelacanth population, considering that the Comoros are young volcanic islands and, therefore potential habitat around Madagascar could provide habitat stepping stones between Madagascar and the African mainland and Madagascar and Comoros. This hypothesis warrants further investigation.

Seabed mapping and a visual survey in the Agulhas Plateau region, targeting the Africana Seamount, would provide the first ever known imagery of the seabed and associated fauna in this region. Additionally, oceanographic data will be collected in conjunction with the seabed surveys, and we propose a further opportunity to collect pelagic plankton and nutrient samples during underway and CTD operations (requiring a dedicated team and additional berths).

These surveys will help to gain new insights into the South West Indian Ocean seamount ecosystems and the distribution of benthic and bentho-pelagic animals. Knowledge and expertise gained using the advanced technological capabilities of the *R/V OceanXplorer* will support monitoring of the South West Indian Ocean deep-sea biodiversity and will provide insights into the dispersal ability of certain species.

Expedition Research Objectives

Seamount mapping and biological/geological characterization:

1. Geological Survey: Map the geological characteristics of seamounts, including rock composition, volcanic activity, and sedimentary layers on the Madagascan Ridge and Agulhas Plateau. We would like to advance existing research in the Walters Shoal area. This will improve our knowledge of seamount formation in these regions.
2. Biodiversity Assessment: Document the biodiversity of benthic invertebrates and fish species across multiple seamount transects using ROV and submersibles as ocean conditions permit. Special attention will be paid to sampling sponges (for both taxonomy and eDNA), soft corals, and hard corals in line with regional expertise. All bycatch specimens will also be retained and identified as possible. Collect and sequence (if possible) targeted invertebrates that may be observed during seamount transects for taxonomic validation and contribution to barcode libraries.
3. Environmental DNA (eDNA): Metabarcoding analysis of sponge tissue and filtered water samples to determine the diversity profile of elasmobranchs (sharks, rays, skates) and teleost (fish) communities. Targeted genetic profiling of sponge tissue and filtered water to determine if African coelacanths are present in the sampling area.
4. Associated oceanography and pelagic sampling: Collect environmental data (temperature, salinity, pressure, oxygen, and other biogeochemical parameters) at discrete CTD stations when possible during the ships transit, as well as at the targeted seamounts. This will be conducted in conjunction with the deployment of robot technologies (i.e., ROV and submersibles) and sampling of the water column for a range of plankton, nutrients, and microbes, including further eDNA analysis as relevant.

Transit Science:

The overall goals of the transit portions of the UN Ocean Decade-endorsed Action "Around Africa" Expedition are the following:

1. To utilize the unique access opportunity in data-limited regions to conduct globally significant and scientifically relevant basin-scale scientific projects, and establish OceanX and OceanQuest as global contributors to the oceanographic and ocean biomolecular observing community;
2. To provide access opportunities for Early Career researchers represented in regions-of-study (via the Partnership for Observation of the Global Ocean (POGO), UN Ocean Decade Early Career Ocean Professional Programs, and the Ocean Biomolecular Observing Network (OBON)) to conduct research using the OceanXplorer in support of regional capacity exchange and training objectives;

3. To design a transit route that allows for maximal scientific data acquisition in international waters with the goal of submission to public repositories;
4. To establish key partnerships with global and regional organizations responsible for implementing the UN Decade of Ocean Science and other global science programs.

Expedition Timeline

Enter Comoros EEZ: 2200 January 26th
Depart Comoros: January 30th
Transit and Underway Data Acquisition: Jan 30th - Feb 5th
Walters Shoal: Feb 5th - Feb 11th
Transit to second AOI: Feb 12th
Arrival and survey MAD Ridge 1 Seamount: Feb 12th - 13th
Transit to Africana Seamount: Feb 14 - 16th
Arrive and survey Africana Seamount: Feb 17 - 18th
Transit into Cape Town: Feb 19th - 22nd
Demobe: Feb 23rd
Outreach Port Events: Feb 24th - 26th

Cruise Summary:

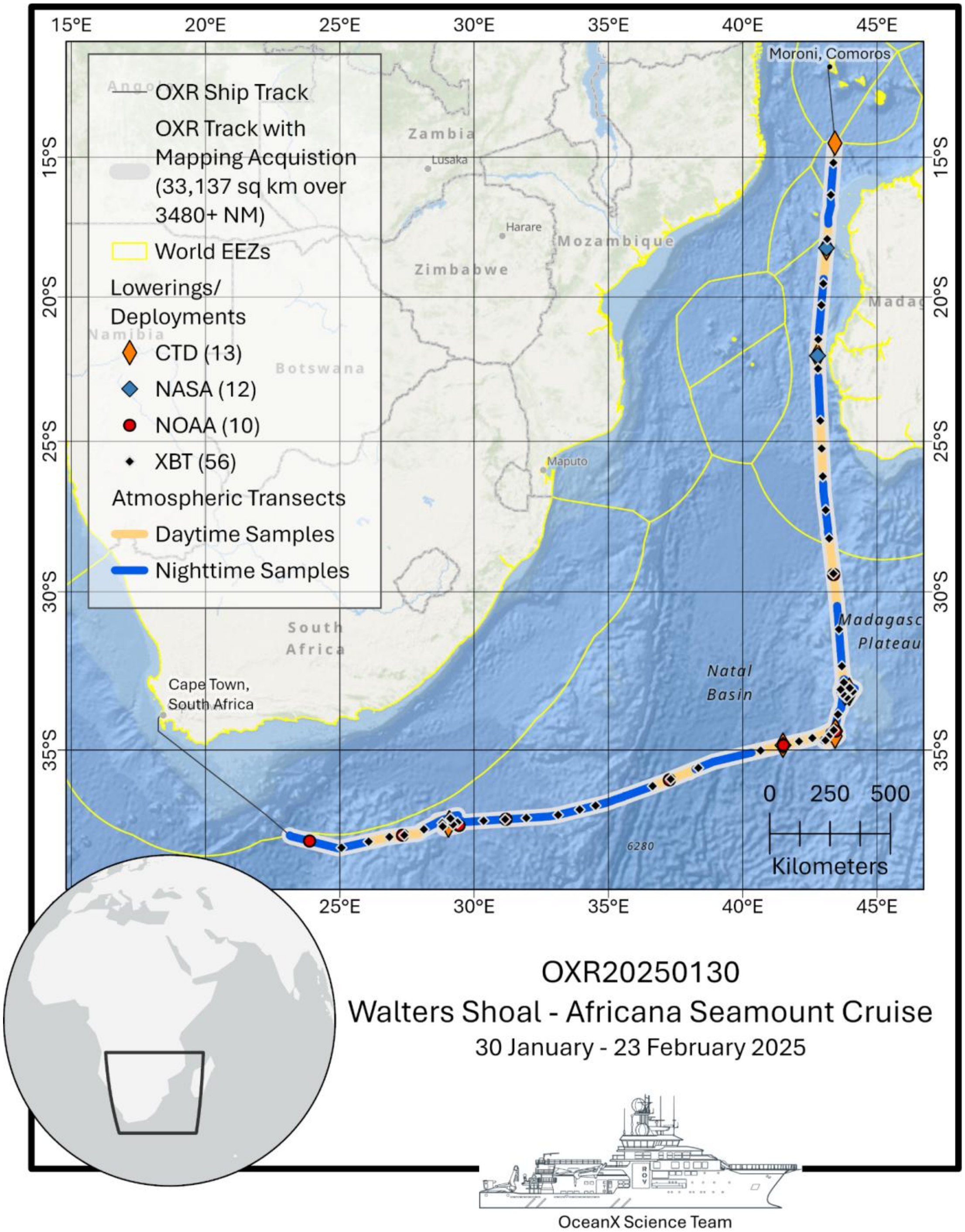


Figure 1: Overview of OXR20250130 cruise track, with underway sampling and transit science deployments including CTD, XBT, NASA, and aerosols.

OceanXplorer Metrics

Final Maps of AOIs:

Walters Shoal:

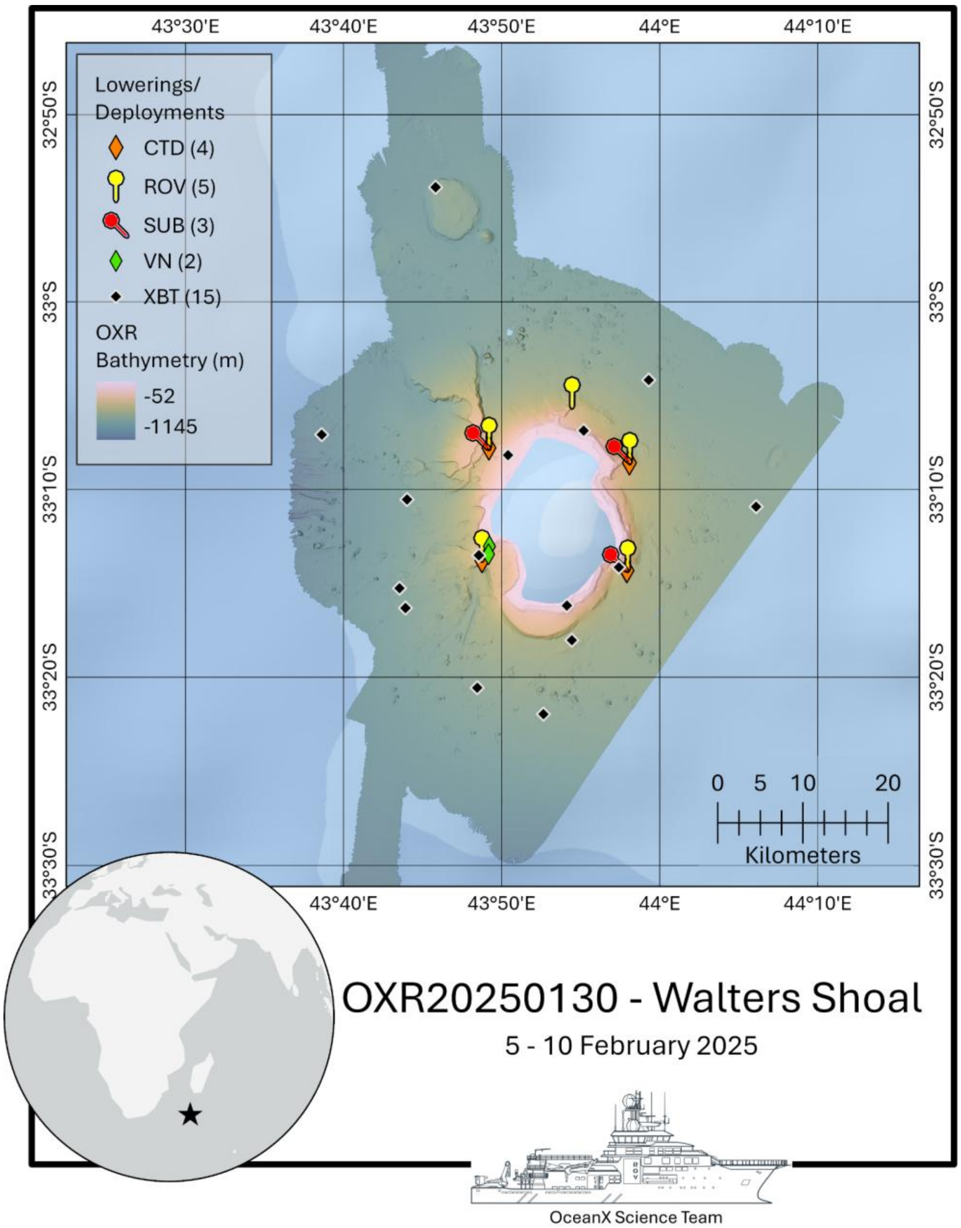


Figure 2: Summary map of Walter's Shoal Area-Of-Interest, depicting bathymetric mapping coverage, XBT and CTD deployments, and subsea asset dive locations

MAD Ridge1:

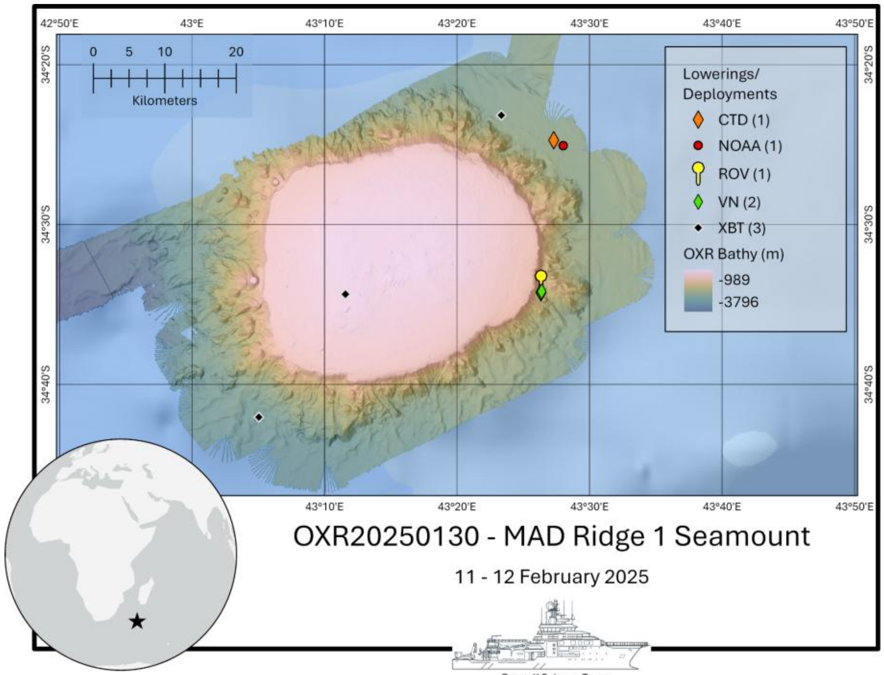


Figure 3: Summary map of MADRidge-1 Seamount complex, depicting bathymetric mapping coverage, XBT and CTD deployments, and subsea asset dive locations

Africana Seamount

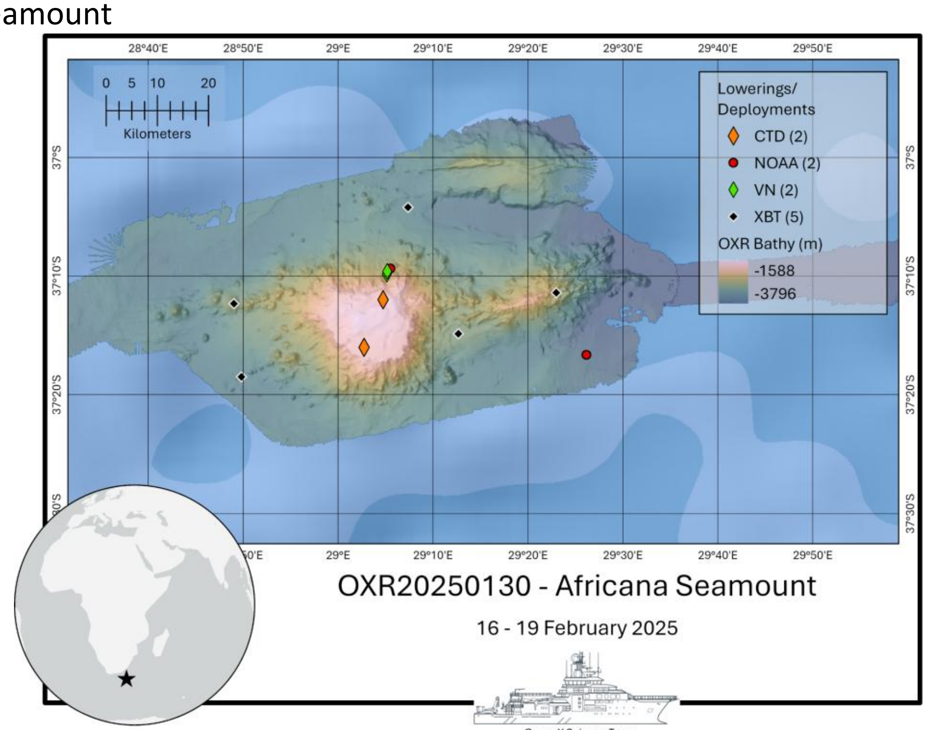


Figure 4: Africana Seamount Area-Of-Interest depicting mapping coverage and XBT/CTD deployments

Mapping and Acoustics Overview

Mapping Area Coverage

The final mapping coverage, based on final grid resolution and utilizing the WGS84 Equal Earth equal area projection (EPSG:8857) geodesic area calculation in ArcGIS Pro (v. 3.4.2) are as follows:

Madagascar EEZ	9,356.6 sq km
Juan de Nova Island EEZ (France)	97.3 sq km
International Waters	23,683.5 sq km
TOTAL	**33,137.4 sq km**

Overall, we were able to map continuously for over 3,480 linear nautical miles. Of that mapped area, we estimate the following of it to be new mapping coverage:

TOTAL NEW MAPPING COVERAGE	27,298.5 sq km
	An estimated 82% of the area mapped during OXR20250130 is believed to be new mapping coverage

Our estimate of area that is newly mapped was derived by comparing our coverage to all direct measurement data available in the GEBCO 2024 bathymetric grid, and all direct measurement data (swath polygons and contributed grid polygons) available in the Global Multi-Resolution Topography Model (GMRT) v. 4.3.0. It should be noted that these two sources do not encompass all known mapping data, and are only updated annually or bi-annually. It should also be noted that the entire Walters Shoal survey was counted as new mapping coverage. Though there is at least one known survey in this area (MD208, https://doi.org/10.17600/17002700), the data is not publicly available.

Mapping

Overview and Acoustic Objectives

Prior to the expedition, a series of planning and mapping meetings were conducted to establish the framework for the acoustic plan, which was subsequently further developed in collaboration with the onboard Geoteam. The primary objectives of the expedition, as previously outlined, involved the exploration and characterization of multiple seamounts located on the Madagascar Ridge and Agulhas Plateau. The scope of work included detailed mapping to identify potential exploration sites, analyzing geomorphological features, and providing essential data for post-expedition geological assessments and habitat characterization. This was complemented by visual transects conducted via submersible and ROV, and biota, sediment, and water column sampling for oceanographic and eDNA analysis.

The acoustic objectives set forth for the expedition were as follows:

- Transit mapping wherever possible to fill data gaps;
- Overnight mapping of seamounts utilizing the hull-mounted MBES (EM304 and EM712) and subbottom profiler (Knudsen CHIRP 3260);
- Possible daytime mapping of the shallow summit of Walters Shoal Seamount, utilizing the EM2040C MK II MBES on Metal Shark.

Expedition Route

The expedition route was designed to optimize the filling of data gaps wherever possible and to acquire mapping coverage over features of interest to the visiting science team. It was also adjusted to account for weather conditions, ensuring improved safety and comfort for the ship and crew while maximizing data acquisition despite adverse weather conditions.

Before departing Comoros, we received permits to conduct scientific operations in Malagasy waters. Last-minute adjustments were made to the planned route to put us in Malagasy waters as much as possible during our transit. There was a slight deviation into French Waters (Juan de Nova Island) due to the shallow nature of the Madagascar Shelf in that portion of the Mozambique Channel.

Following a request from the Ocean Discovery League (ODL), a deviation was made to the original route to map additional waypoints. This slight adjustment led to a change in the planned course. However, due to sea state conditions, mapping was only possible at the first waypoint, with no further mapping conducted at the other waypoint.

The final portion of the transit route was planned to cover two features of interest, called Alternative AP Seamount 2 and Alternative AP Seamount 3 in the cruise plane. Data was successfully acquired over both features.

The following table summarizes the acquisition lines associated with specific regions or requests described above:

Madagascar EEZ	0001_20250131_063807_OXR20250130_EM304.kmall - 0018_20250131_225652_OXR20250130_EM304.kmall; 0023_20250201_030818_OXR20250130_EM304.kmall* - 0103_20250204_041739_OXR20250130_EM304.kmall
Juan de Nova EEZ	0119_20250204_180135_OXR20250130_EM304.kmall - 0023_20250201_030818_OXR20250130_EM304.kmall*
Ocean Discovery League Global Exploration Target	0410_20250215_070359_OXR20250130_EM304.kmall
Alternative AP Seamount 2	0531_20250219_061856_OXR20250130_EM304.kmall - 0533_20250219_081856_OXR20250130_EM304.kmall
Alternative AP Seamount 3	0537_20250219_115515_OXR20250130_EM304.kmall - 0540_20250219_145515_OXR20250130_EM304.kmall

**line 0023_20250201_030818_OXR20250130_EM304.kmall crosses the EEZ, with data in both Madagascar and Juan de Nova Island EEZs*

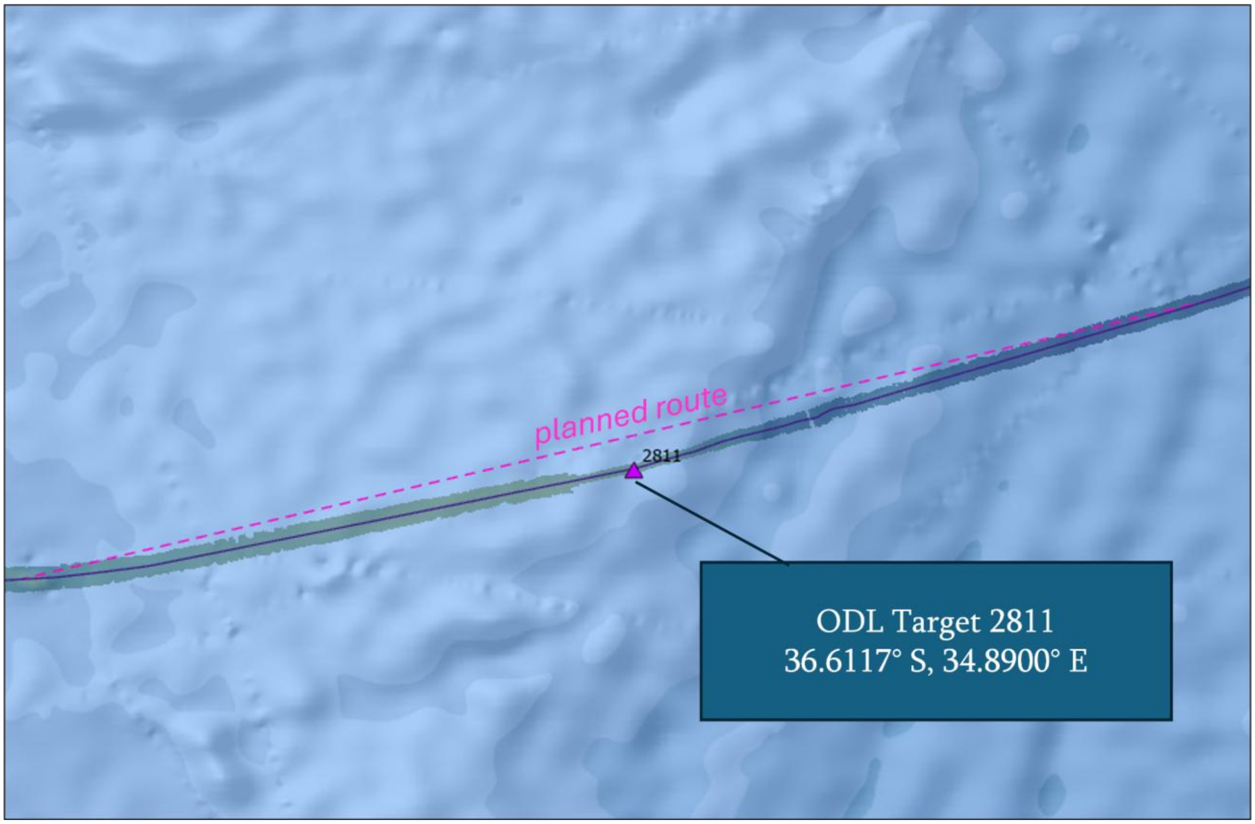


Figure 6. Deviation from the planned route to cover ODL Global Exploration Target.

Preliminary Highlights

Walters Shoal and Madagascar Ridge Seamount


Figure 7. Left, estimated bathymetry for Walters Shoal from GEBCO 2024. Right, results of the Walters Shoal survey. The survey covered approximately 2100 sq km.

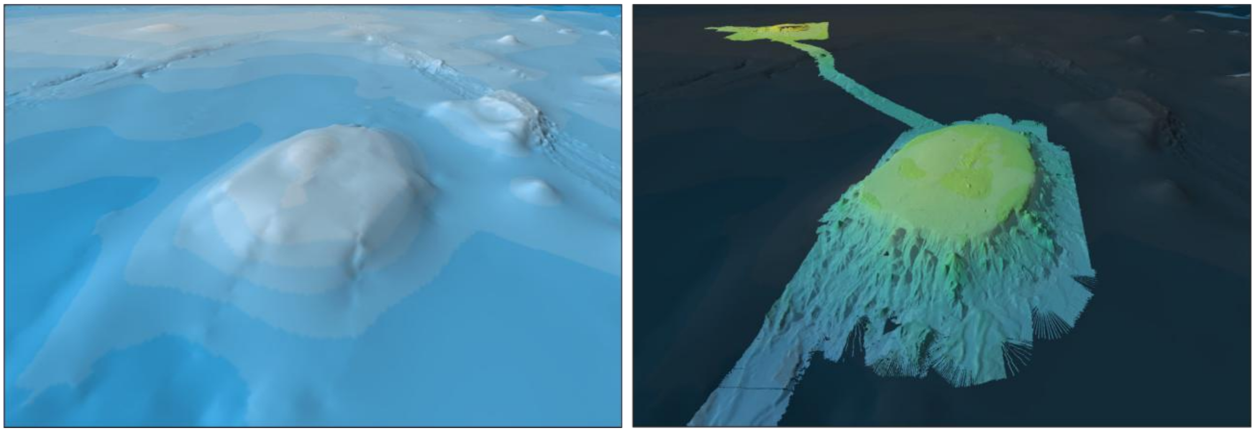


Figure 8. Left, estimated bathymetry for Madagascar Ridge Seamount 1 from GEBCO 2024. Right, results of the MAD Ridge survey; Walters Shoal can be seen in the distance. The survey covered approximately 1950 sq km.

Africana Seamount

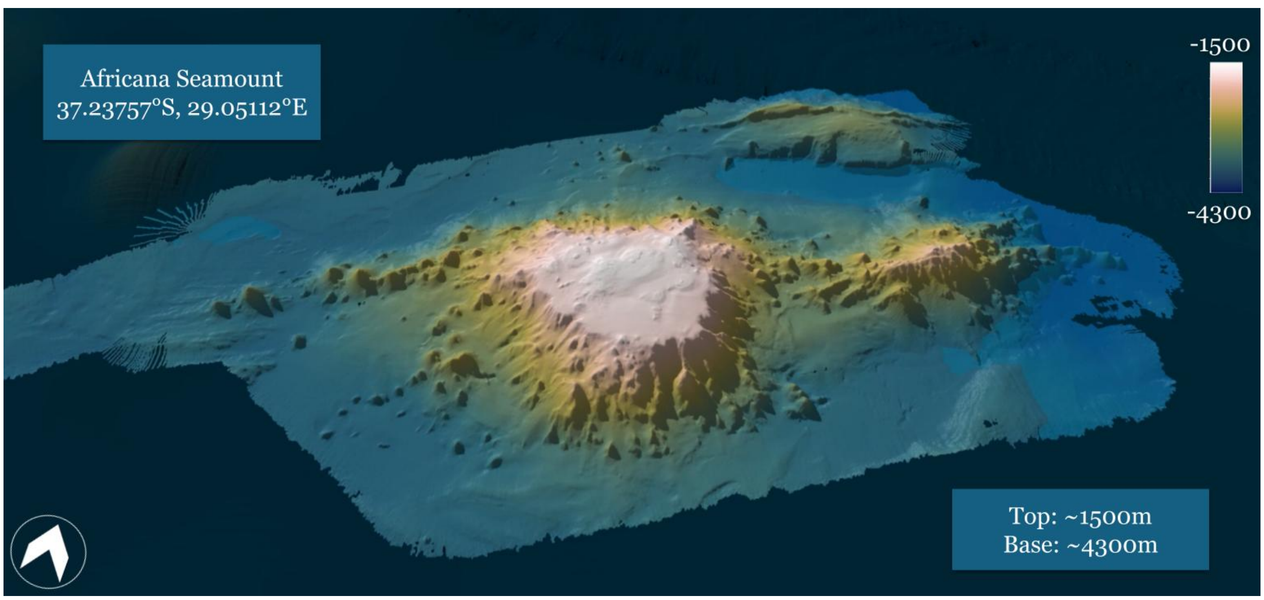


Figure 9. Africana Seamount (WE=2x). The feature was partially mapped in 2004 by the ice-breaker R/V Nathaniel B. Palmer, but since then no data have been collected or made publicly available. The structure is over 80 km in length. The Africana Seamount survey covered approximately 3000 sq km.

Agulhas Plateau

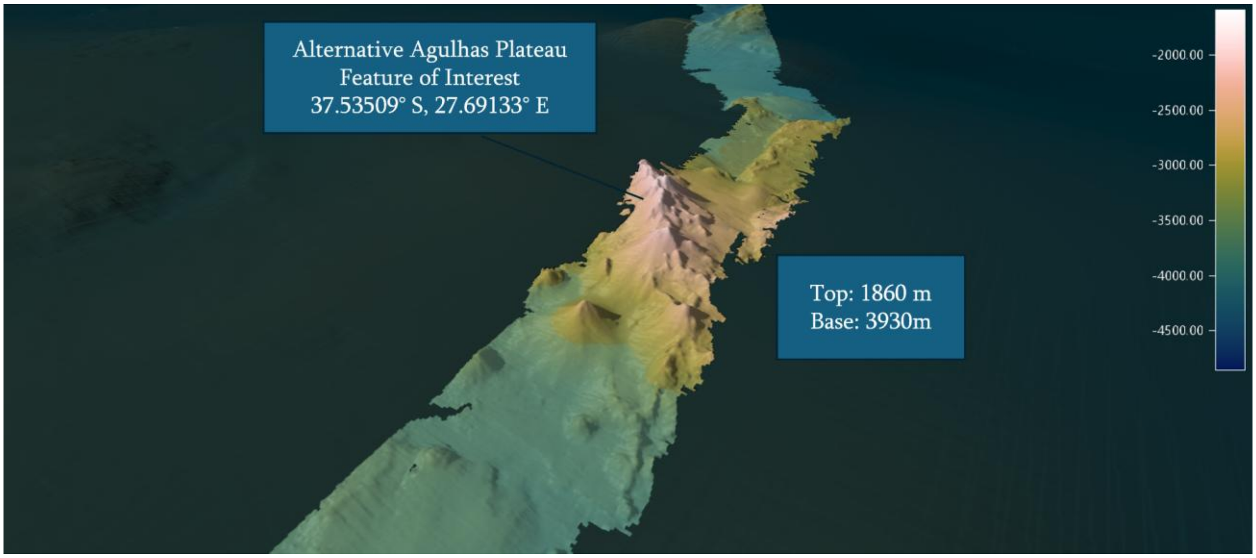


Figure 10. Alternative Agulhas Plateau Feature of Interest (VE=2x). OceanXplorer extended the existing multibeam coverage of the area, revealing the peak of the feature, which was found to be 2000m in height.

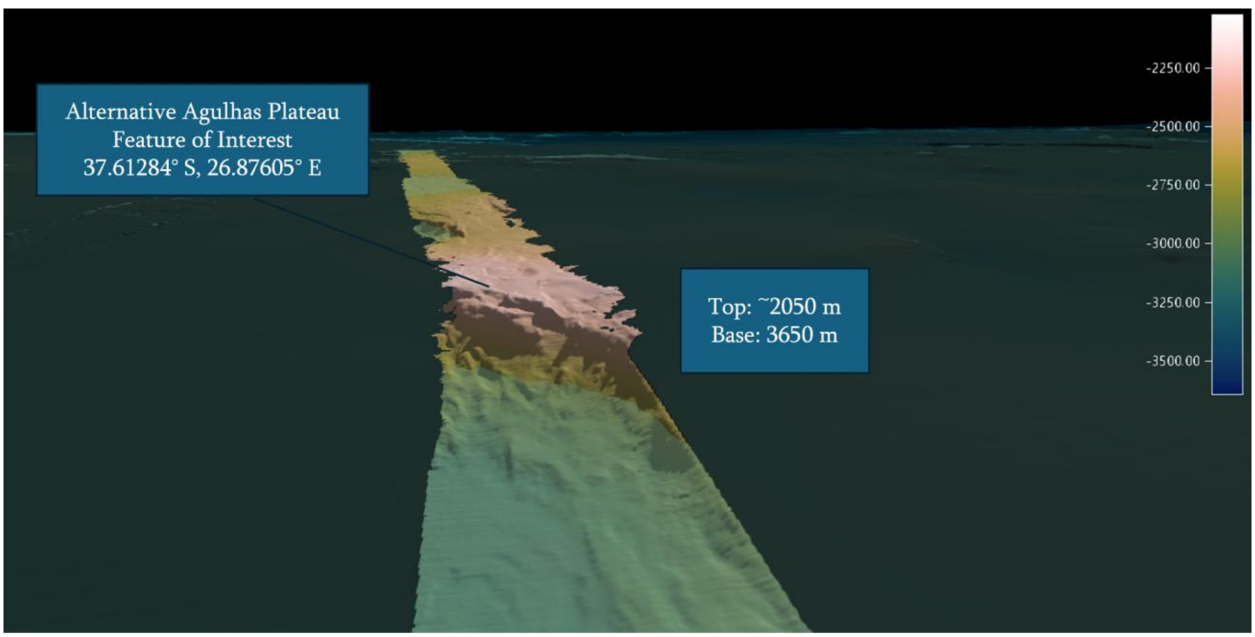


Figure 11. Alternative Agulhas Plateau Feature of Interest (VE=2x). Feature was expected to be a seamount based on satellite altimetry but was found to be the edge of a plateau (~1500m height).

Transit

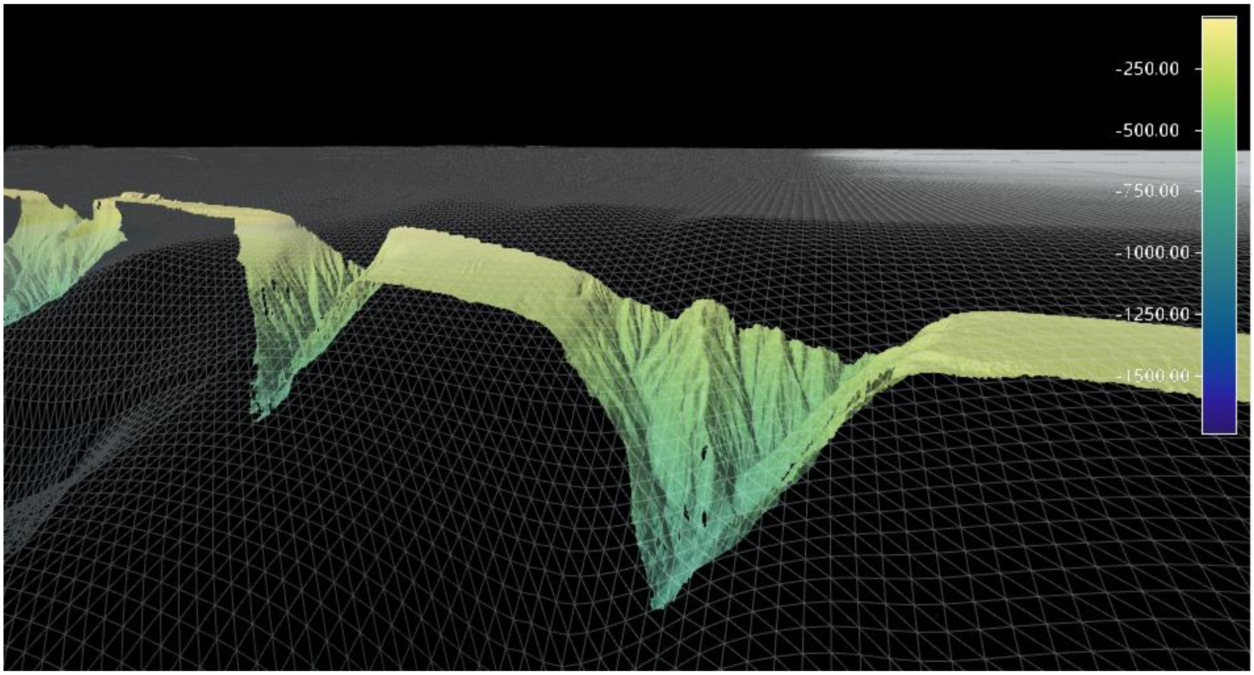


Figure 12: Transit mapping along Madagascar Continental Shelf revealing previously unmapped canyons (VE=4x).

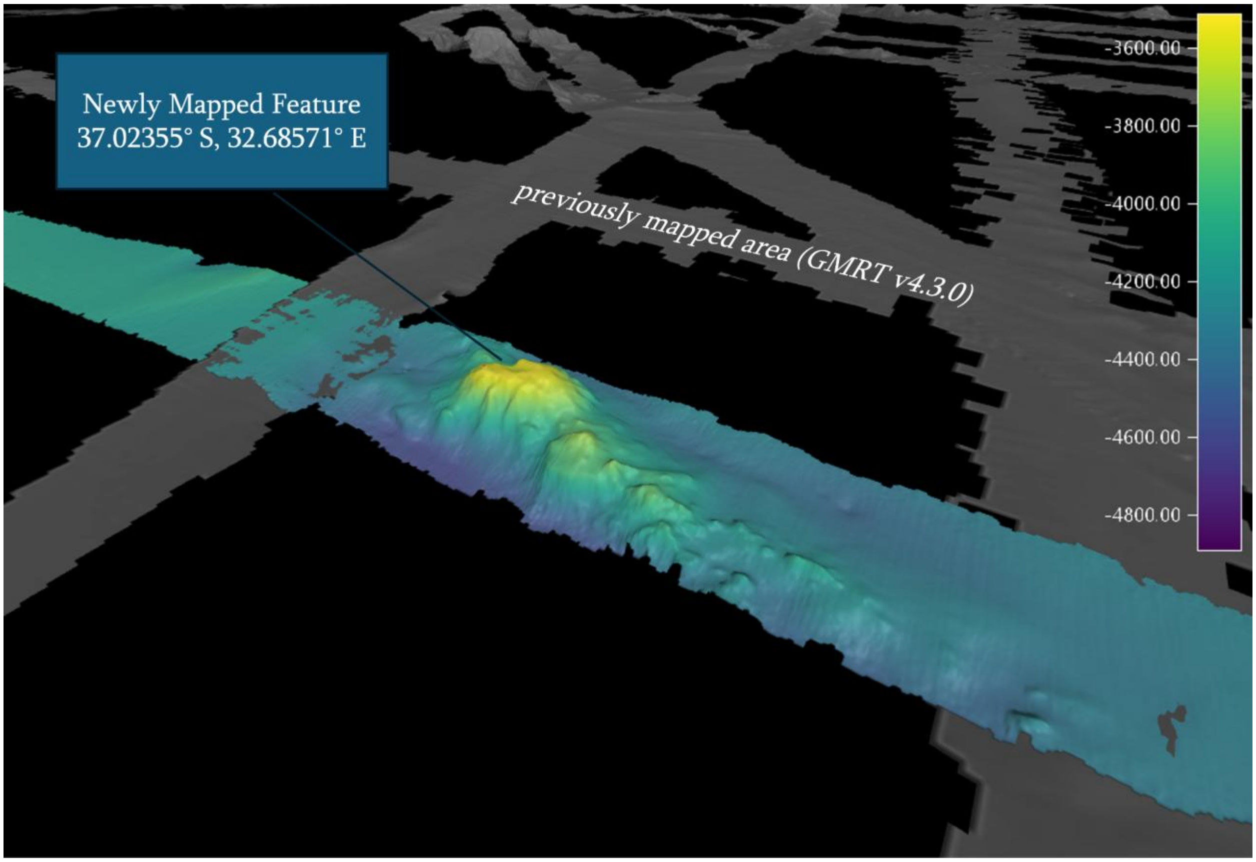


Figure 13. Walters Shoal to Agulhas Plateau (16 February 2025) Transit. Example of transit mapping revealing previously unmapped features.

Remarks

Throughout the cruise, in addition to the MBES, the ADCP 300, EK80 and SBP were also operational. However, adverse weather conditions, high transit speeds, very deep waters, and challenging seafloor substrates hindered the effectiveness of these “single-beam” echosounders.

Several minor adjustments were made to the Acoustic Plan during the course of the expedition. While surveying Walters Shoal, the KM EM 304 was prioritized, as it produced higher-quality backscatter data. Specific SBP lines were also run at this station, but the data appeared to be too noisy, likely due to the very hard seafloor substrate.

During the Walters Shoal survey, attempts were made to operate the KM EM 2040C MK II mounted on the Metal Shark, but a complete failure of the Hydrographic Workstation resulted in the loss of an afternoon's weather window for this task.

A rough sea state persisted throughout most of the cruise, requiring a more methodical approach to data processing. Overall, the data quality, particularly at greater depths, did not appear to be significantly impacted by the conditions.

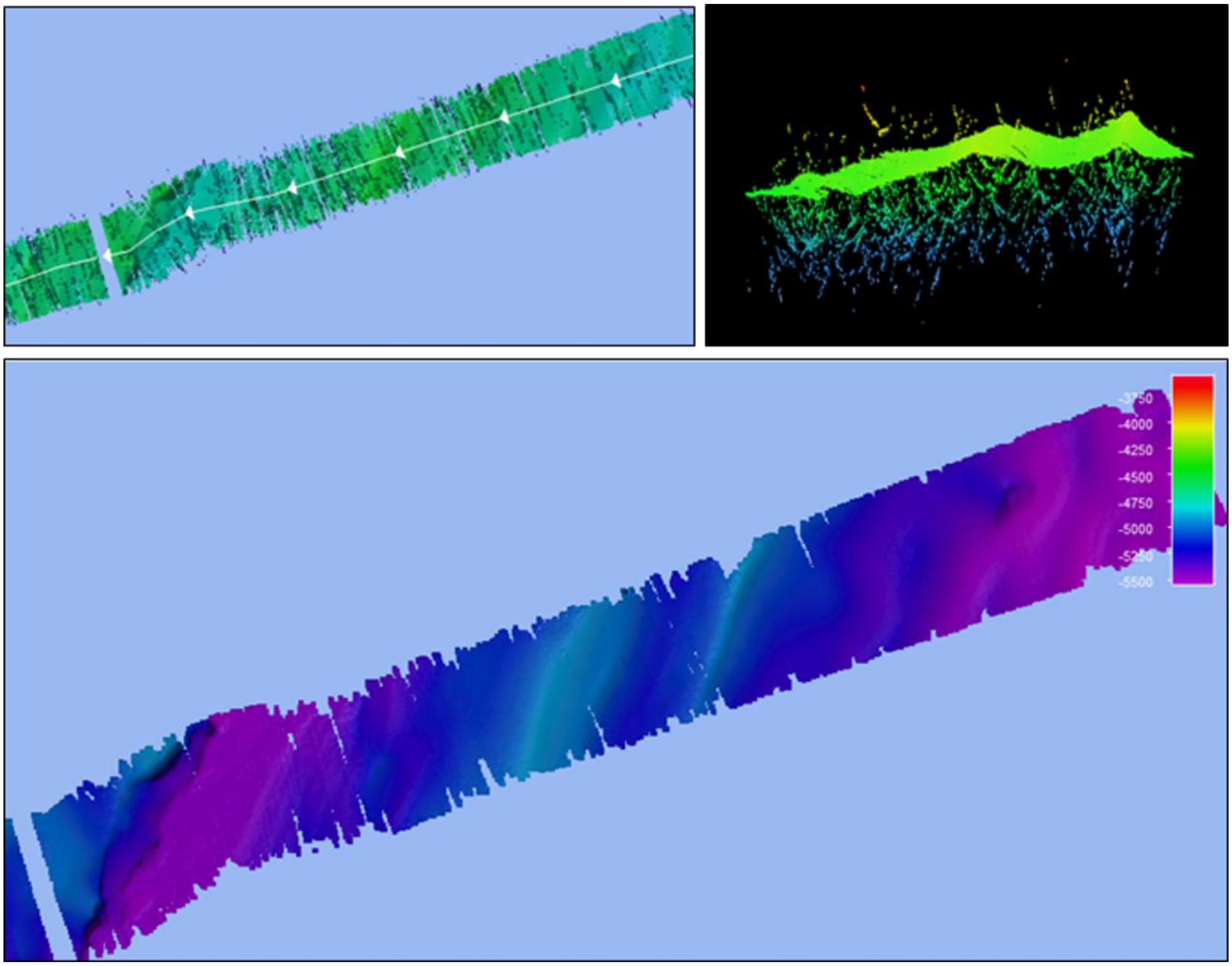


Figure 14: Top, images of data collected in rough weather, prior to processing. Bottom, resulting bathymetric surface after processing.

The following software programs were used during the cruise:

<u>Acquisition</u>

SIS v.5.12.2

EK80 v23.6, 22 9 2023

K-Sync v.1.9.0

Knudsen v 4.09

ADCP VmDas v1.52.2

Qinsy v.9.7.4

Processing software
Qimera v.2.6.3
Fledermaus v.8.6.1
FMGT v.7.11.1

Underwater Visual Census of Seamounts Using Submersibles and ROV:

Objectives:

Document the biodiversity of benthic invertebrates and fish species across multiple seamount transects on Walters Shoal, Africana Seamount, and other seamounts in the region if time allows. Special attention was paid to sponges (Porifera), soft corals (Octocorallia), and hard corals (Hexacorallia), aligning with the key research focus of the participants and regional experts. Collect and sequence (if possible) select targeted invertebrates that may be observed during seamount transects for taxonomic validation and contribution to barcode libraries. Visual transects and collections were conducted using the Argus work-class ROV *Chimaera* and submersibles *Neptune* and *Nadir.* All associated data and videos were systematically logged in Sealog v2.3.8.

Methods:

Visual ROV transects of approximately 200 m long were performed at three depths (± 500, 300 and 150 m) on four flanks of Walters Shoal: southeast (CHR0535), southwest (CHR0536), northeast (CHR0537) and north (CHR0540); on the northern flank the 150 m depth transect was not performed due to time constraints. Each transect was carried out at 1 to 1.5 m from the seafloor at a speed of 0.2Kn; the laser scale on the ROV (10 cm) was turned on for the duration of the transect.
A transect from 2000 m to 1600 m depth was performed on the southeast flank of an unnamed seamount located south of Walters Shoal (Madagascar Ridge Seamount 1). Up to approximately 1800 m depth, the transect was performed at 1 to 1.5 m from the seafloor; from 1800 to approximately 1600 m at an average of 5.6 m from the seafloor.

Samples of the targeted megafauna groups were collected during all ROV dives and during two submersible dives (NTN0339 and NTN0340, on the southeast and northeast flanks of Walters Shoal, respectively). Before collection, all specimens were photographed in situ with lasers on and off. Sponges for eDNA analyses were kept isolated from other collected samples to avoid cross-contamination.
Once the ROV was onboard, every specimen was photographed, subsampled for genetic tissue, and preserved as needed for future analyses (e.g., ethanol for barcoding). Any fauna incidentally caught associated with targeted specimens were also photographed and preserved. A unique ID was given to each collected specimen. Annexure A lists all collected fauna.

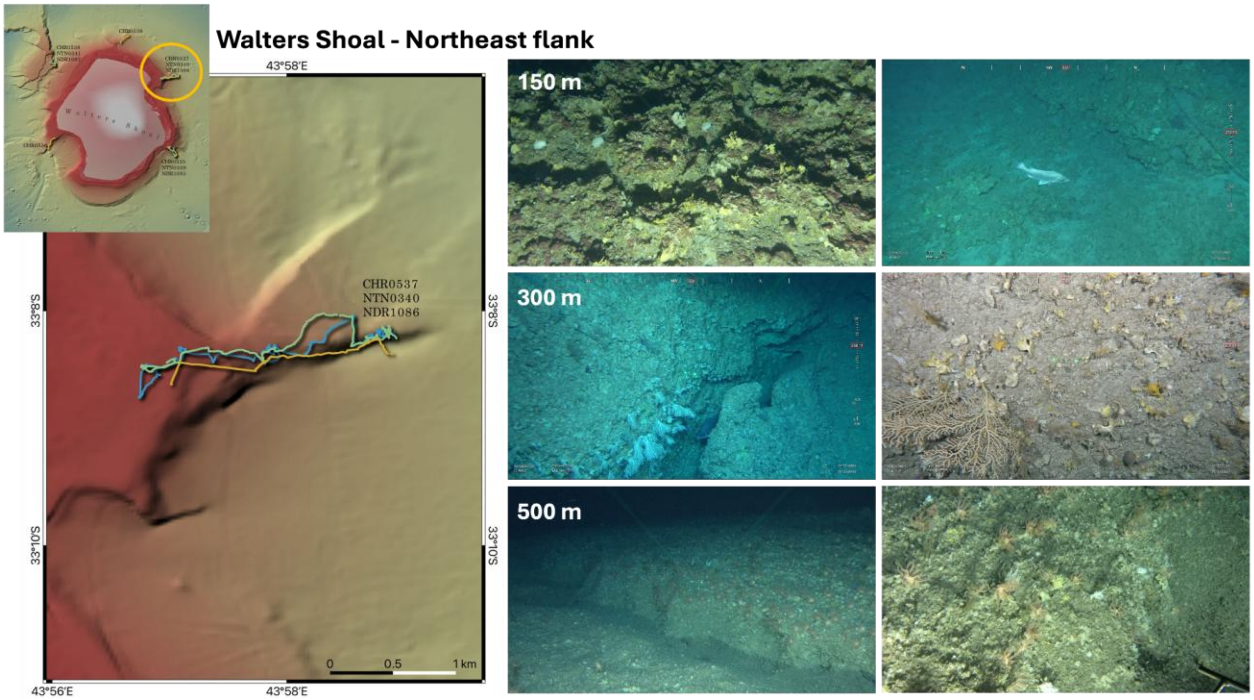
For meiofauna characterization, sediment was collected using a scoop or a push core at the deepest sampled depth or in locations of interest (e.g., entrance of cave). The push cores were, when possible, sliced vertically in two layers of 2 and 3 cm (0-2 and 2-5 cm) (Annexure B). All sediment samples were fixed and preserved in 4% formaldehyde in seawater.

Preliminary Results/Metrics:

The video transects conducted at Walters Shoal seamount revealed different faunal composition between the east flank (SE and NE) and the southwest and north flanks (Figure 15 a to d). Differences are particularly evident at the 500 m depth, where on the eastern flank, high densities of brisingid sea stars and patches of scleractinian hard corals (*Madrepora* sp. and Dendrophylliidae) were evident. These are, however, preliminary observations, and detailed analyses have to be performed. Topography seems to be an important driver for species distribution within Walters Shoal seamount, as rough areas appear to have a higher abundance of species, including fish species (e.g. 300 m depth at the northern flank).
Lost fishing gear was observed in several locations across all depths, confirming the importance of Walters Shoal as a fishing ground. Preliminary video analyses identified 9 families of fish at Walters Shoal seamount: Anthiadidae, Caproidae, Chaunacidae, Macroramphosidae, Macrouridae, Muraenidae, Polyprionidae, Priacanthidae, and Scorpaenidae. Examples of species of these families are given in Figure 16.

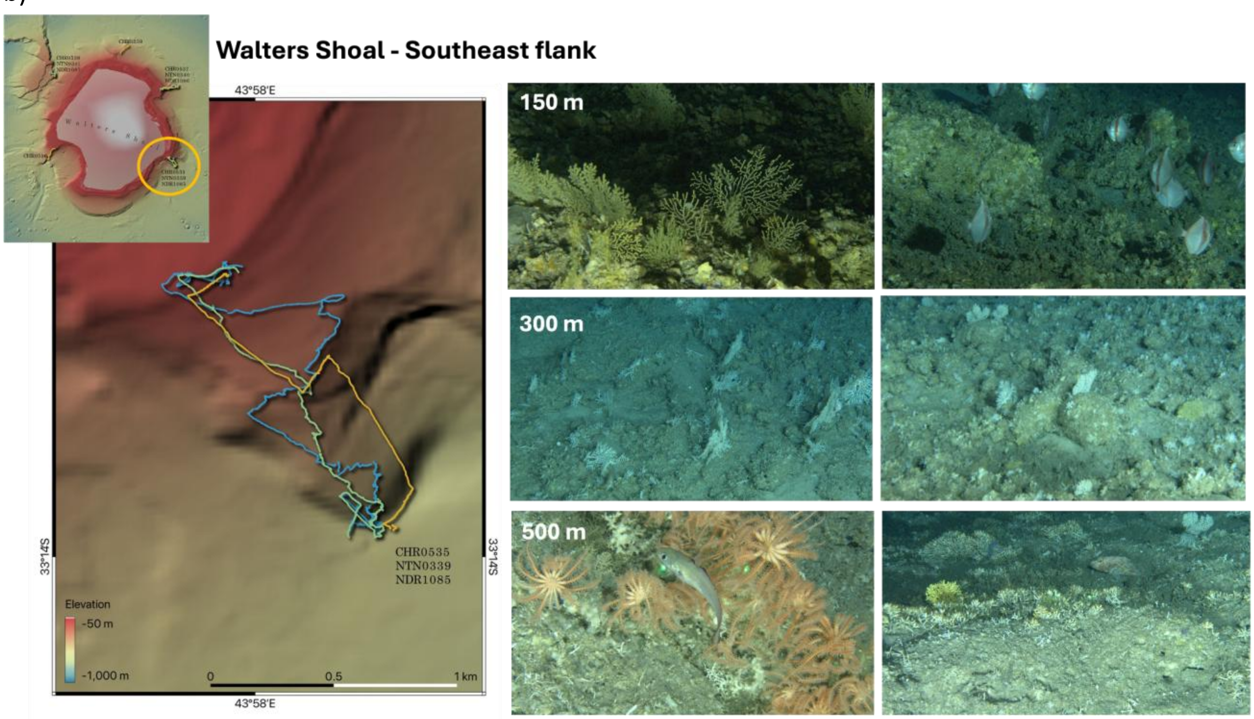
The video survey at Madagascar (MAD) Ridge Seamount 1 showed typical deep-sea fauna living mainly on hard substrate, including hexactinellid sponges, stalked crinoids, and anthozoans (Figure 17).

a)



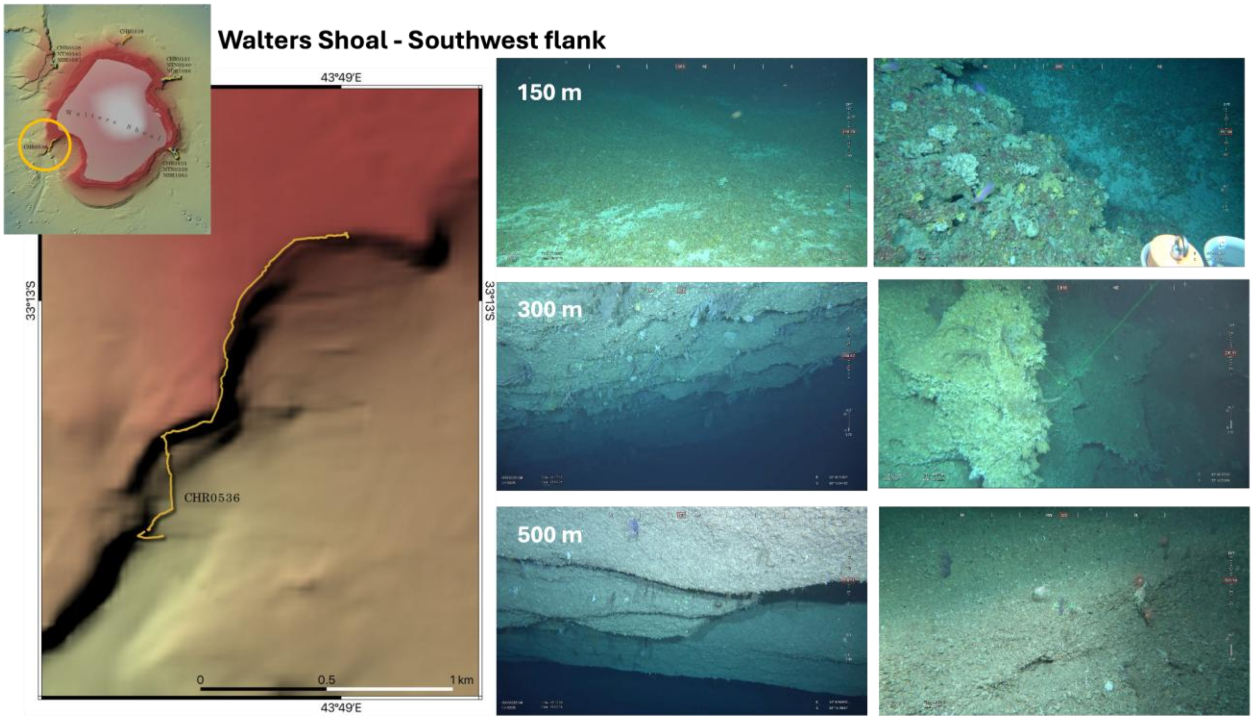
Walters Shoal - Northeast flank
43°58'E
33°8'S
33°10'S
CHR0537
NTN0340
NDR1086
0
0.5
1 km
43°56'E
150 m
300 m
500 m

b)



Walters Shoal - Southeast flank
43°58'E
33°14'S
CHR0535
NTN0339
NDR1085
Elevation
-50 m
-1,000 m
0
0.5
1 km
150 m
300 m
500 m

c)



d)

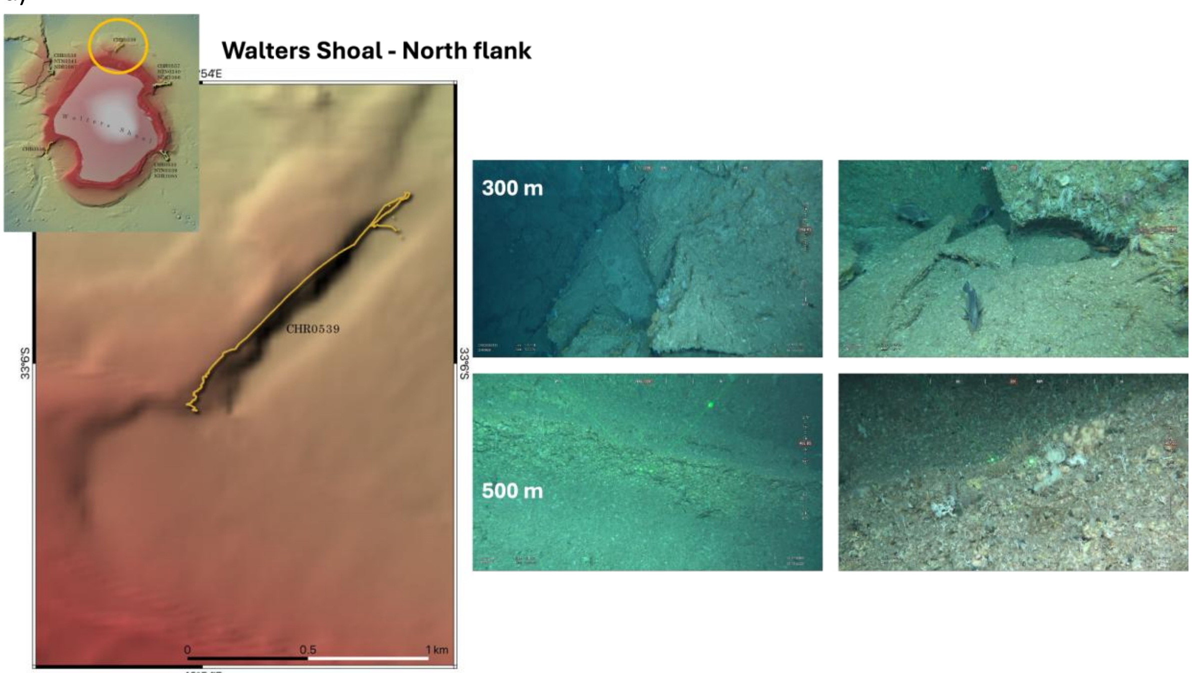


Figure 15 a-d. Differences in faunal compositions from east, southwest, and north flanks at Walters Shoal

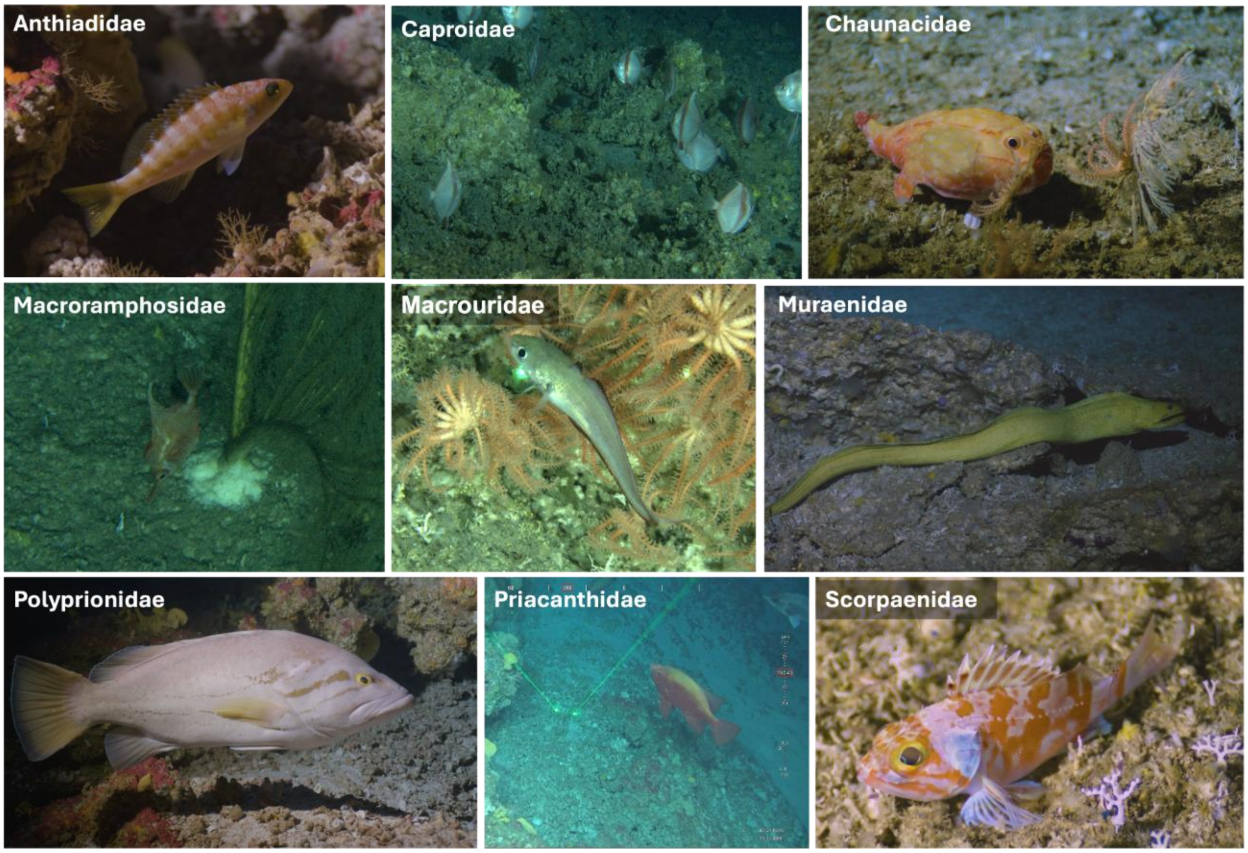


Figure 16. Examples of Species from the different fish families encountered in Walters Shoal

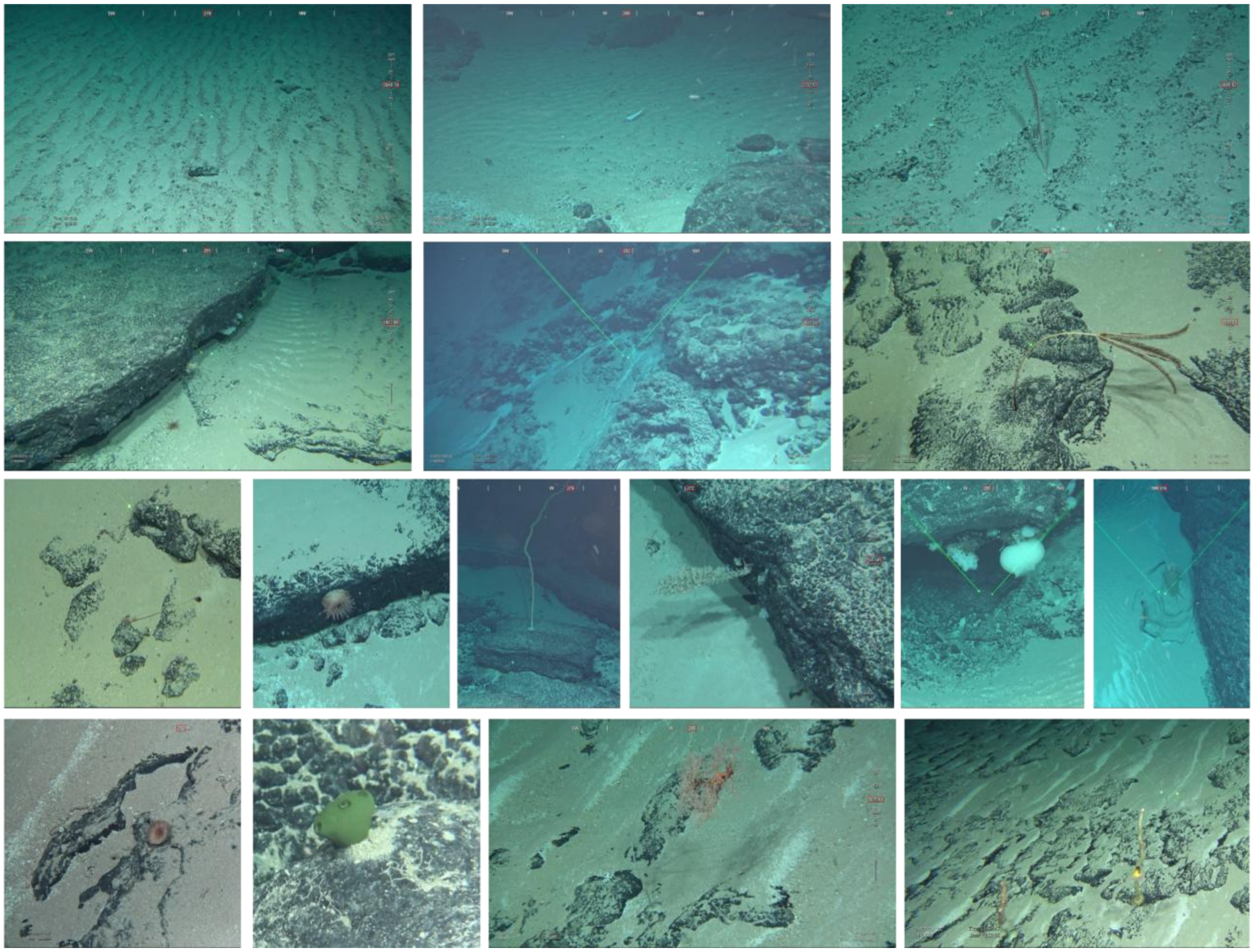


Figure 17. Examples of the geological features and associated megafauna observed at MAD Ridge 1 Seamount.

A total of 209 samples were collected during all ROV and submersible dives (Table 1): 86 megafauna targeted specimens and 122 associated macrofauna specimens. The specimens collected belong to 9 different phyla: Annelida, Arthropoda, Bryozoa, Chordata, Cnidaria, Echinodermata, Mollusca and Porifera (Table 1, Figure 18).

Table 1: Number of individual specimens per taxon collected per dive at each site.

	SE Walters Shoal		SW Walters Shoal	SW Walters Shoal		N Walters Shoal	SE MADRidge1
Taxa	CHR0535	NTN0339	CHR0536	CHR0537	NTN0340	CHR0539	CHR0540
Annelida	2	4	3	3			1
Arthropoda - Crustacea	2	10	4	6	5	1	2
Brachiopoda		2		1			
Bryozoa	1	5			1		
Chordata - Tunicata				1		1	
Cnidaria - Hexacorallia	2	8	4	2	2	3	1
Cnidaria - Octocorallia	5	8	5	6	4	3	4
Cnidaria Hydrozoa	1	7		1	2		
Echinodermata - Asteroidea	2	2					
Echinodermata - Ophiuroidea	1	3	4	1	3		1
Echinodermata - Crinoidea			1				1
Mollusca - Gastropoda		5			4	1	
Mollusca - Bivalvia		1		1			
Mollusca - Ind.				1			
Porifera	7	5	10	12	11	6	3
Total	**23**	**60**	**31**	**35**	**32**	**15**	**13**

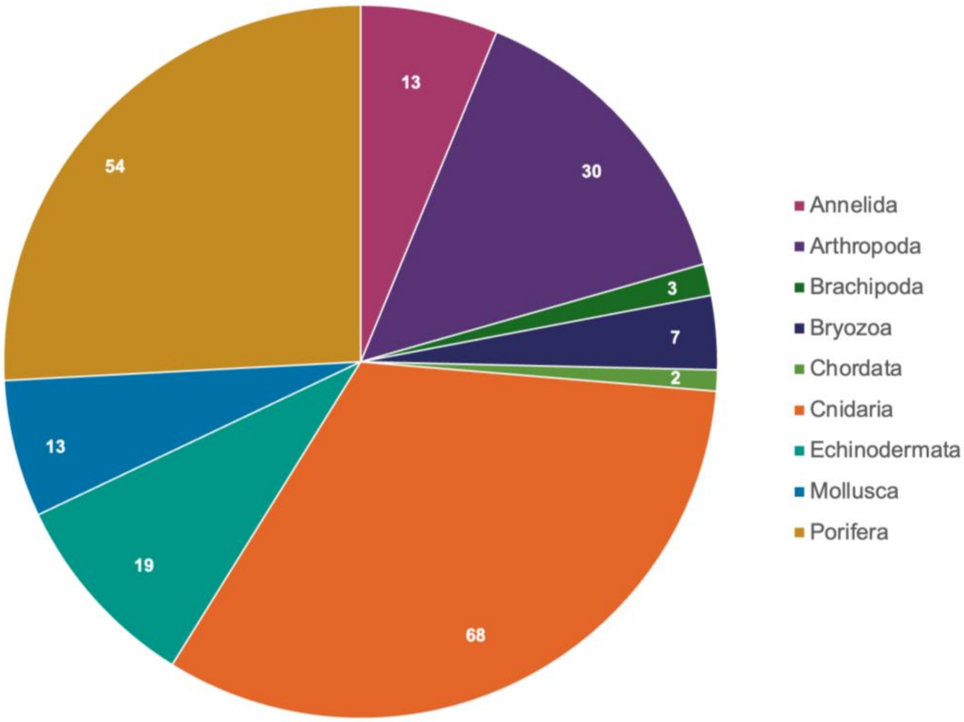


Figure 18. Number of samples per Phyla collected during the expedition.

In situ and on-deck photographs of each specimen collected are compiled in Annexure C.

Of the 35 specimens of the class Octocorallia collected, 31 could be identified to the family level and belong to seven different families (Figure 19).

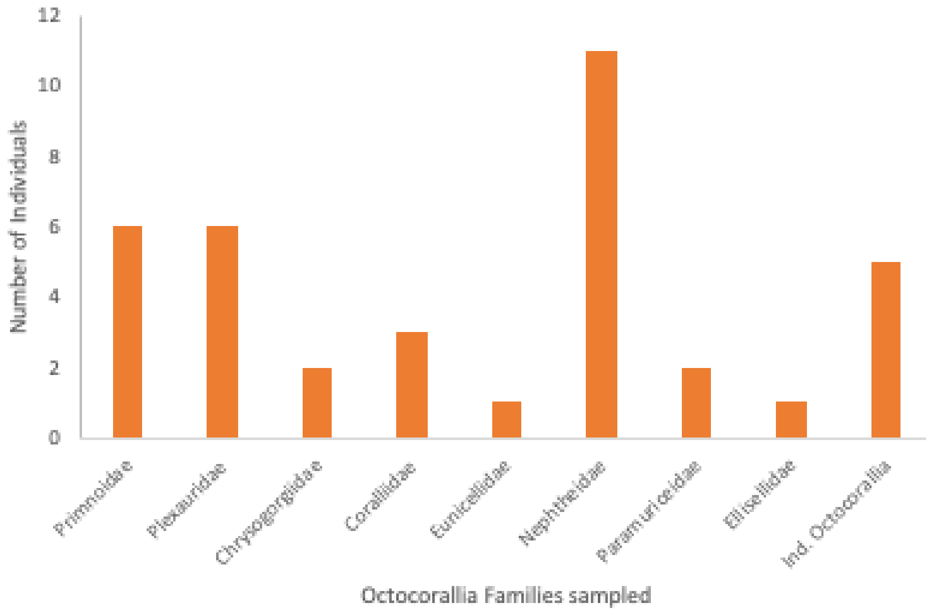


Figure 19. Number of individuals of Octocorallia Families sampled during ROV and submersible collections at Walters Shoal and MAD Ridge Seamount 1.

Geological Characterization

Objectives

One aspect of the expedition is to improve the understanding of seamount formation along the Madagascan Ridge and Agulhas Plateau, focusing on the Walters Shoal area and Africana Seamount, respectively. A high-resolution multibeam bathymetric survey aims to map the detailed seafloor topography in both regions, revealing the geomorphological features and structural characteristics. Additionally, identify and characterize key geomorphic and geological structures to interpret their formation, evolution, and interactions with oceanographic processes and biodiversity distribution. Determine the rock formations and types that build the seamounts at Madagascar Ridge and Agulhas Plateau, providing primary insights into the lithological composition and geological origins. This knowledge will support investigating the local tectonic settings of the Walters Shoal and Africana Seamount areas and the broader tectonic process that shaped the South Western Indian Ocean. Specific scientific targets are:

1. Conduct a high-resolution multibeam bathymetry survey to map the geological characteristics of Walters Shoal Seamount and Africana Seamount.

2. Identify and characterize key geomorphic features and geological structures at the Walters Shoal and Africana Seamount areas.
3. Describe the lithological composition of Walters Shoal to determine rock composition.
4. Determine the relationship of the formation of Walters Shoal and Africana Seamount in the tectonic framework of the South West Indian Ocean.

Methods

1. Multibeam Bathymetry Mapping

Hull-mounted multibeam echosounder systems (MBES) were used to achieve high-resolution bathymetric maps of the seafloor topography of the Walters Shoal area, an unnamed seamount southwest at the southwestern edge of the Madagascar Ridge (MAD Ridge Seamount 1), and Africana Seamount at the eastern edge of the Agulhas Plateau. Hydroacoustic data were acquired using the Kongsberg EM304 and EM712, optimized for different depth ranges. EM304, operating at frequencies between 26-34 kHz, was used for deeper water mapping, while EM712, operating at 40-100 kHz, was used for shallower regions within the study, both functioning within their respective depth ranges. All acoustic systems, including EK-80 version 23.6 and Knudsen Chirp 260 Single beam sub-bottom profile,r operated simultaneously, synchronized using K-Sync version 1.9.0 to prevent signal interference.

The survey used Kongsberg's Seafloor Information System (SIS) version 5.12.2, for data acquisition, monitoring, and initial quality control. The raw data were recorded as *.kmall files and exported for post-processing and further refinement to the QPS Qimera version 2.6.3 for ping correction, noise removal, visualization, georeferencing, and quality control. The processed data and bathymetry maps were made available as *.asc, *.xyz , geoTiffs, and floating point geoTiffs, which could be visualized and analyzed using QPS Fledermaus version 8.6.1 and QGIS version 3.28.0 to display and analyze geomorphological features. Multibeam backscatter mosaics were generated with QPS FMGT and exported as georeferenced geoTiff images for use in GIS.
To complement bathymetry mapping, the Knudsen Chirp 260 Single beam sub-bottom profiler, operating at 3.5kHz and 12kHz, was used to investigate shallow seafloor substrate and subsurface sediment layers, to provide insights into sediment thickness and potential subseafloor formations, and to identify optimal locations for sediment coring.

2. Seafloor Imaging and Sampling

Seafloor imaging and direct rock and sediment sampling were employed using the Argus work-class ROV *Chimaera* and submersibles *Neptune* and *Nadir* along predetermined transects. High-resolution underwater imaging was conducted to observe and identify rock types in situ, with all associated data systematically logged in Sealog v2.3.8 for documentation.

Rock samples were collected through targeted grab sampling by both the ROV and submersibles. Each sample was visually examined for physical characteristics, such as texture, color, and mineral composition, before being stored in sealed bags for further analysis onshore.
Recoverable sediments were collected through coring, stored intact in a sealed sediment tube, and immediately frozen to -20ºC for further analysis onshore, focusing on the carbonate composition, organic matter composition, and grain size distribution.

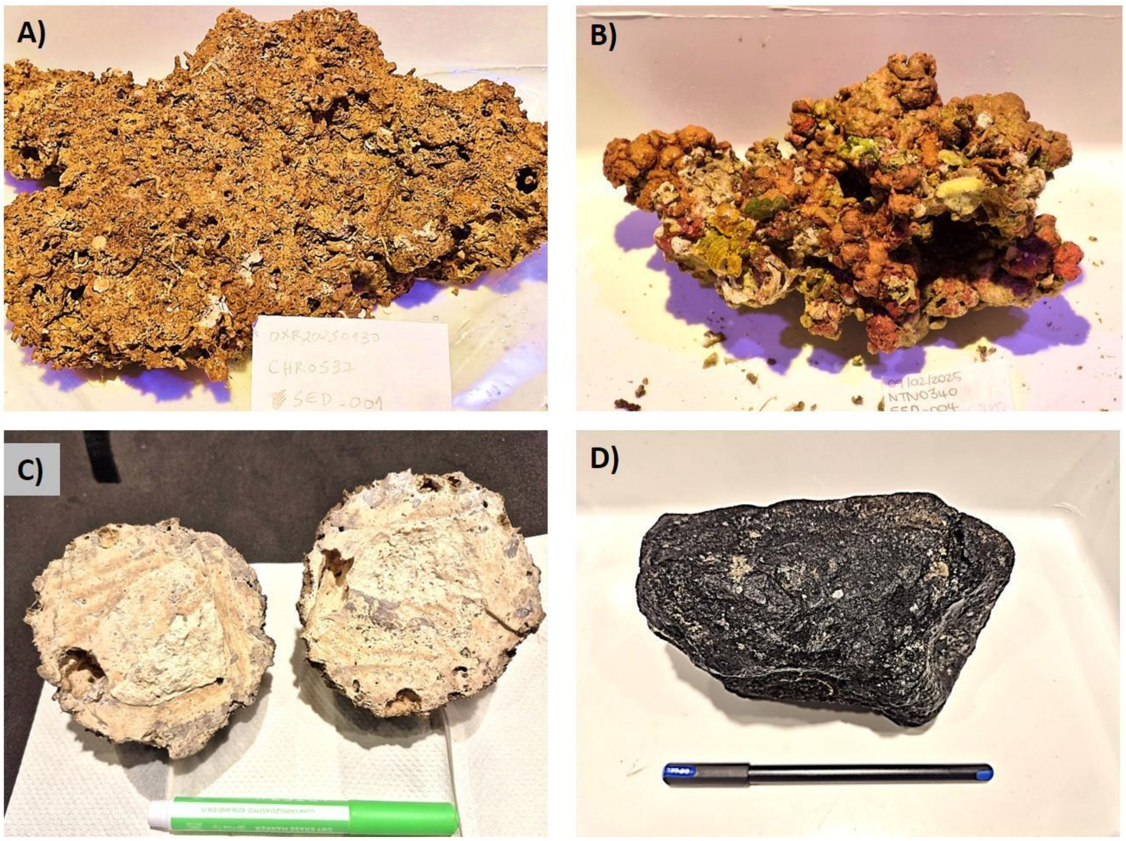


Figure 20: Geological samples: A) Boundstone that characterize the Walters Shoal flanks (300 - 500m deep), with a framework of annelids/serpulids, bryozoans, undetermined small fragments, and borings, ; B) Fragile boundstone composed of Crustose coralline algae (CCA), bryozoans, serpulids, a few mollusks, and borings (Waters Shoal at 139m deep), with living CCA on the surface; C) Carbonate nodule with a core composed of a limestone (Walters Shoal, 500m deep); D) Basalt collected at the unnamed seamount (MAD Ridge Seamount 1) at 1990m

Preliminary Results/Metrics:

Walters Shoal Seamount

The Walters Shoal seamount rises from the surrounding abyssal plain from a depth of approximately 700 meters and rises steeply to a summit reportedly at about 15 meters below the sea surface (Collette & Parin 1991, Marsac et al. 2020). However, during this survey, the shallowest mapped depth was approximately 50 meters, due to shallow depth ranges observed from preliminary survey results, ship's constraints in navigating shallower waters, and challenging weather conditions. The summit is relatively flat, likely due to prolonged exposure to hydrodynamic forces, which have led to erosion and smoothing of the surface over time.

Surrounding the summit, the bathymetry data reveals steep slopes and escarpments around the seamount, with the most prominent scarp observed at the southwestern flank of the seamount. These escarpments suggest submarine landslides or mass-wasting events, likely caused by slope instability. The large debris blocks and scour marks at the base of the seamount and within the surrounding abyssal plain provide further evidence of these past mass-wasting events.

Several channel-like depressions extend outward from the seamount, suggesting sediment transport pathways that direct materials from the seamount flanks toward the abyssal plain. The features suggest active sediment movement, possibly influenced by gravity-driven flows and bottom currents. The surrounding abyssal plains are characterized by sand furrows and undulating seafloor features, which are commonly associated with high-energy bottom currents and possibly part of the Agulhas Current.

A flat knoll and a small volcanic cone are observed in the northern part of Walters Shoal, which show multiple phases of volcanic activity contributing to the seamounts' formation.

Madagascar (MAD) Ridge Seamount 1

An unnamed, but significant, seamount 86 nautical miles southwest of Walters Shoal was entirely mapped during this expedition. Madagascar Ridge Seamount 1 - a temporary, working name for this report - is a classical example of a guyot, a submarine table mountain with a flat summit area. It is slightly oval-shaped, with a maximum summit diameter of 34 km and a basal diameter of about 45 km. It rises about 2000 to 2500 m from the surrounding seafloor to a depth of about 1000 m. The flat summit is relatively even and does not show much significant structure, indicating that this seamount may have never risen above the sea surface but had a long phase of coral reef formation. No carbonate samples from the higher areas have been collected, however, ROV footage showed coral fragments in the sediments - possibly eroded from the top. The slopes of the seamount show numerous erosion channels and collapse traces. Some smaller cones are also visible close to the flanks. ROV footage also shows sediment accumulations between the large slabs of basaltic sheet flows. The basalt is coated in manganese-cobalt crusts. One sample (probably basalt) was recovered from the SE flank but not cut open during the expedition (Figure 20 D). The bathymetry also indicates larger areas of sediment rafts (conturites) around the seamount.

Africana Seamount

The third target of the expedition was Africana Seamount, located at the eastern edge of the Agulhas Plateau. The structure has been known from literature for some time (e.g., in maps from *Barret (1977) GSA Bulletin*) but was never mapped in entirety in high resolutionl. Multibeam bathymetry of Africana Seamount revealed that the guyot-shaped seamount is not a singular structure rising from the seafloor but is part of a rather complex volcanic ridge system resembling the appearance of mid-ocean ridges. The ridge spans 80 km from East to West, containing numerous volcanic cones (2-3 km diameter and up to 900 m high). The main structure, Africana Seamount, has a maximum summit diameter of 13 km and a basal diameter of about 26 km. It rises to a minimum depth of <1600 m from almost 4000 m basal depth. The guyot shape of the Africana Seamount main structure suggests that it must have been just below or even above the sea surface at some point in time, supporting coral reef growth and flattening the summit area. The age of Africana Seamount remains unclear; however, thermal subsidence calculations for the Agulhas Plateau suggest that a 100-80 Ma old crust with a paleo depth of 10-140 m which should be at about 3000 m depth today (*Parsiegla et al. 2008) Geophys J. Int.*). Thus, as the Africana Seamount is barely half as deep, it is possible that the Africana Seamount ridge is significantly younger than the Agulhas Plateau itself.

Even though Africana Seamount is the dominant volcano on the Agulhas Plateau, the ridge contains a second, less focused, volcanic center east of Africana Seamount. Remarkably, this area shows traces of ridge-parallel lineations or cliffs facing northwards and southwards, depending on whether they are situated on the South or North flank, respectively. This strongly indicates ridge-parallel normal faulting along the summit area. Further towards its eastern end, the ridge splits into two 10-13 km long branches. A significant half-round bathymetric high, 15-20 km north of the Africana Seamount ridge, shows prominent south-facing, east-west striking cliffs that also can be interpreted as normal faults. Opposite to the northern bathymetric high, available data from the Global Multi-Resolution Topography (GMRT) database show comparable structures (elongated, half round, with steeper north-facing slopes). Interpretation of this geomorphological, surprisingly complex system in relation to the Agulhas Plateau will need closer examination of all available data. Unfortunately, ROV dives were not conducted, and thus, sampling of volcanic rocks was not possible during our expedition due to strong ocean currents (3-4 knots) in the area at the time. However, to reveal the volcanic and tectonic history of this remarkable structure, which indicates that it might be decoupled from the formation of the Agulhas Plateau, more seafloor mapping of the surrounding structures and seafloor sampling will be needed.

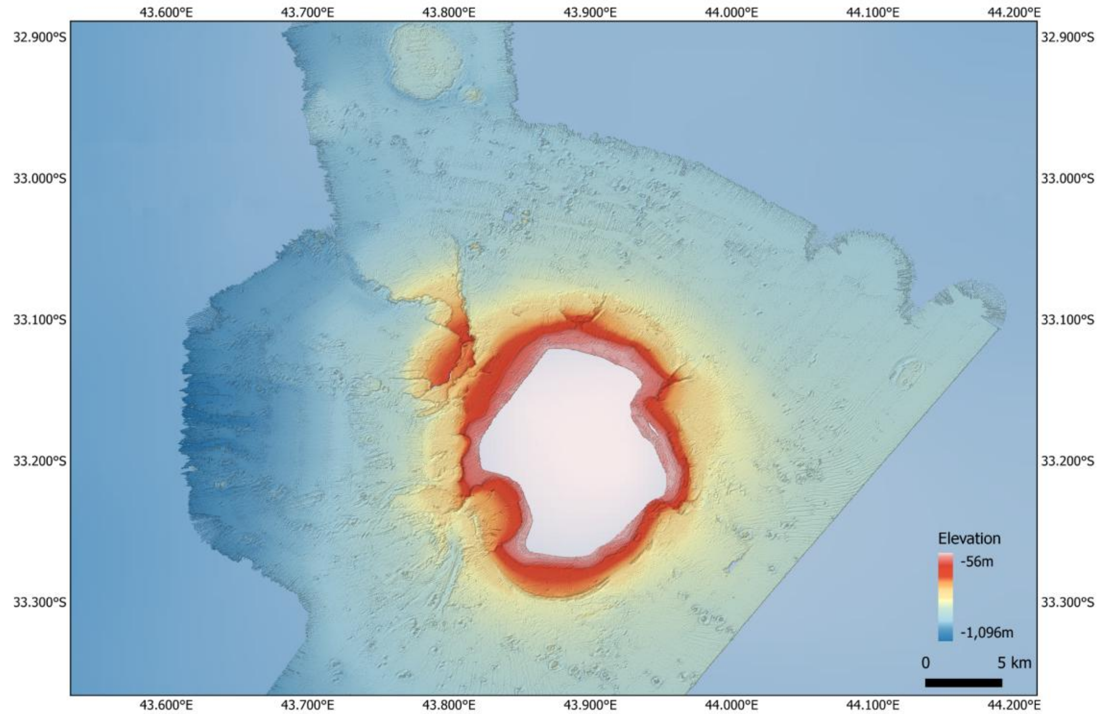


Figure 21: Bathymetry map of Walters Shoal Seamount, showing the key morphological features of the seamount

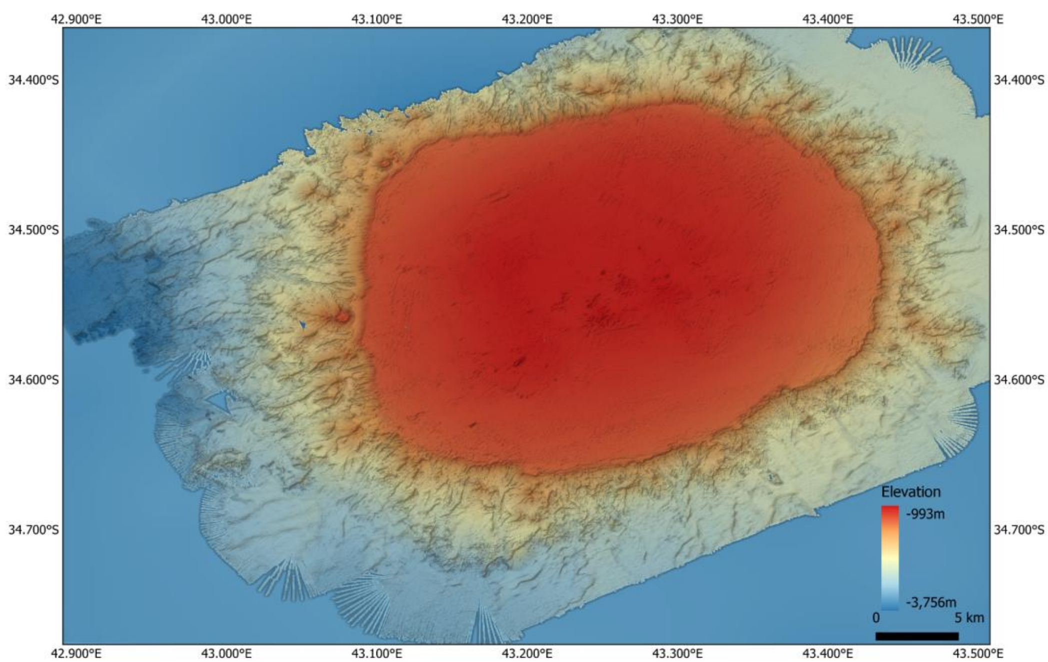


Figure 22: Bathymetry map of Madagascar Ridge Seamount 1, showing the key morphological features of the seamount

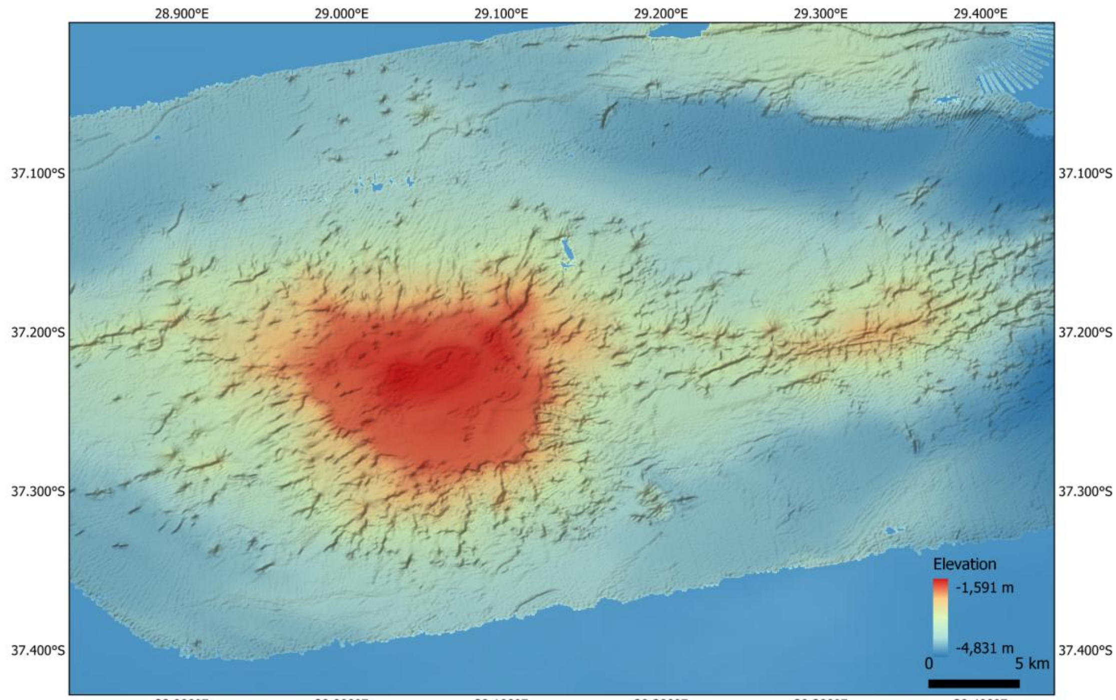


Figure 23: Bathymetry map of Africana Seamount, showing the key morphological features of the seamount

Pico and Nanoplankton Community Assessment Overview:

Objectives:
Integrate flow cytometry analyses and 16S rRNA amplicon sequencing to provide a more comprehensive understanding of the phylogenetic connectivity of bacterial populations within the water columns (surface, Fmax, 200m and sea floor) of various seamounts across the Madagascar Ridge and the Agulhas Plateau.

Samples needed:
Flow Cytometry: Triplicate flow cytometry samples for each depth of each CTD cast, frozen at -80°C. Summary: Walters Shoal (16 X 3 samples), Madagascar Ridge (8 x 3 samples), and Africana Seamount (8 x 3 samples).

16S/18S amplicon sequencing: 5 liters of water filtered through a 142 mm diameter filter (0.2 um membrane) and stored at -80 degrees celsius till further processing. Summary: Walters Shoal (16 samples), Madagascar Ridge (8 samples), and Africana seamount (8 samples).

Sample Processing:
1) **Flow Cytometry:** 2 ml of prefiltered (200 micron) seawater from each depth (surface, Fmax, 200m, and sea floor) were added to a 2 ml cryovial and preserved with 20 ul Glutaraldehyde and an equal volume of Poloxamer, and frozen at -80°C until further processing. These samples will then be thawed and filtered through a 50 um mesh and stained with DAPI (final concentration <1 ug/mL), and analysed with a BD Symphony Flow Cytometer until 100,000 events are acquired. A second unstained run will be conducted in the same manner, in triplicate for each sample. The resulting dot plots will be analyzed using the method described by Marie et al. (1997) to classify heterotrophic bacteria, picoeukaryotes, nanoeukaryotes, *Prochlorococcus*, and *Synechococcus*.
2) **16S/18S:** DNA will be extracted from the 142mm filters using the E.Z.N.A Water DNA Kit (Omega). The extracted DNA will be quantified using a Qubit Fluorometer and a Nanodrop Spectrophotometer. It will then be prepared for sequencing on an OXford Nanopore MK1C platform using the 16S Barcoding Kit 24 V14, following the manufacturer's instructions.
3) **Bioinformatics Processing:** The resulting DNA sequences will be base-called using Dorado and further processed through our in-house bioinformatics pipeline.
4) **Data Analyses:** Both datasets will be analysed by integrating network features with microbial biogeography and environmental variables (nutrients that have been processed by CTD sampling effort and other physical parameters)

The above would offer us an improved understanding of the role of interspecific associations in shaping the distribution and assembly of the complex microbiome within these seamount ecosystems.

Environmental DNA (eDNA) Sampling Overview:

Objectives:

1) Metabarcoding analysis of sponge tissue, sediment, and/or filtered seawater samples to determine the diversity profile of elasmobranchs (sharks, rays, skates) and teleost (fish) communities. 2) Targeted genetic profiling of sponge tissue and/or filtered seawater to determine if African coelacanths are present in the sampling area.

Methods:

For the active filtration of seawater from 10L Niskins collected by CTD rosette, triplicate biological samples were filtered per depth per CTD cast (Transit CTD cast: 100 and 200m; Walters Shoal seamount CTD cast: Fmax, 200m and ~500m). For each replicate, 5L of seawater was filtered through 0.2 µm PES filters using a peristaltic pump. Filters were stored at -20°C until further processing.

In all instances, sterile techniques were used in collecting eDNA to avoid cross-contamination and false positive results. Suitable controls (field controls and laboratory controls) were implemented to monitor this (standard procedure). Purified eDNA will be subjected to targeted amplification using (a) universal fish primers, (b) primers specific for elasmobranchs, and (c) primers targeting coelacanth eDNA. For each sample (filter, sponge, and control), three technical replicates per primer set will be conducted. Purified amplicons will then be sequenced on the Illumina MiSeq, available at the NRF South African Institute for Aquatic Biodiversity (NRF-SAIAB, Makhanda, South Africa).

Preliminary Results/Metrics:

Transit CTD casts (seawater) in the Madagascan EEZ:
18 samples collected (90L filtered seawater)
Walters Shoal seamount:
Seawater: 36 samples collected (180L filtered seawater)
Sponges: 43 sponge subsamples collected
Sediment: 2 x 15ml
MAD1 seamount:
Sponges: 3 sponge subsamples collected

Underway Sampling (PC/TSM, Chlorophyll-a, Nutrients and Phytoplankton):

Objectives:

Underway samples were obtained when possible to gather information on the surface of the water column to compare with satellite data.
Samples were also taken, when possible, in tandem with CTD sampling and ROV transect lines to determine a complete overview of the water column from the surface to deep.

Methods:

3 x 10L of water were collected from the underway system for filtering for particulate carbon (inorganic and organic) (PC), total suspended matter (TSM), and chlorophyll-a. From the 10L, 5L were used for PC and TSM, and 5L were used for chlorophyll-a.

> 3 x 5L of underway water was filtered onto 3 x pre-combusted and pre-weighed GF/F filter papers for PC and TSM.
> 3 x 5L of underway water was filtered onto 3 x GF/F filter papers for chlorophyll-a.
> Nutrient samples were taken in triplicate by filtering water through a 0.22µm syringe filter into 3 x 15ml centrifuge tubes.

All samples were stored in the freezer at -20°C. The PC/TSM samples were stored in individual petri slides, and the chlorophyll-a samples were folded onto themselves and stored in aluminum foil. Each set of underway samples were stored in their own ziplock bags.
When possible bulk phytoplankton was collected by collecting ~20L of underway water and filtering onto a 20µm nylon mesh net. Samples were stored in filtered seawater and preserved with Glutaraldehyde.

Preliminary Results/Metrics:

At Walters Shoal underway samples occurred in tandem with the transact lines of the ROV together with nutrients collected from the ROV Niskin bottles.

> 36 samples were collected for PC/TSM underway
> 36 samples were collected for chlorophyll-a underway
> 36 samples were collected for nutrients underway
> 36 samples were collected from the ROV

At Madagascan Ridge Seamount, underway samples occurred in tandem with the CTD.

> 6 samples were collected for PC/TSM underway
> 6 samples were collected for chlorophyll-a underway
> 6 samples were collected for nutrients underway

At Africana Seamount, underway samples occurred in tandem with the CTD.

6 samples were collected for PC/TSM underway
6 samples were collected for chlorophyll-a underway
6 samples were collected for nutrients underway

Bulk Phytoplankton

14 samples collected during underway samples 1-14.

Plankton Net Tows:

Figure 24: a) Brishan Kalyan rinsing down the phytoplankton net to collect the phytoplankton sample. b) Thabo Mbuyazi and Jordan Van Stavel rinsed down the zooplankton net to collect the sample.

Objectives:

Phytoplankton:

Understand what species of phytoplankton are present around seamounts. The use of the phytoplankton net is to identify rare and less abundant phytoplankton species that may not be sampled during discrete samples collected from the CTD.

Zooplankton:

To establish baseline diversity and metabolic potentials across scales, which will advance the understanding of zooplankton-bacteria symbioses and their biogeochemical roles under global change.

Methods:

Phytoplankton:

A Hydro-bios 20µm mesh size (25cm diameter, 50cm long) phytoplankton net is vertically towed at the seamounts sampled and when weather and sea conditions allowed. The depth of the tow was determined by the fluorescence maximum of the CTD deployment prior to the tow (generally ~80m).
The sample is preserved at 1-2% glutaraldehyde at final volume and kept in a cool dark space until later analysis on an inverted light microscope.

Zooplankton:
Collect a zooplankton sample from a 200µm mesh, vertical Bongo net deployed to 200 meters at one location per seamount. Empty the cod end via the tap over a clean mesh sieve (200µm mesh) and rinse twice with filtered seawater. The sample was transferred into a 50 mL Falcon tube and stored at -20°C.

Preliminary Results/Metrics:

Phytoplankton:
Walters Shoal seamount: 1 sample collected
Madagascan Ridge seamount: 1 sample collected
Africana seamount: 1 sample collected

Zooplankton:
Walters Shoal seamount: 1 sample collected
Madagascan Ridge seamount: 1 sample collected
Africana seamount: 1 sample collected

CTD Sampling (Visiting Scientist Team)

Figure 25: The CTD 'Carl' during its deployment from the starboard side of the vessel.

Objectives:

Provide an overview of the local biogeochemistry, oceanography and associated phytoplankton around the sampled seamounts. Additionally, collect salinity samples to validate conductivity sensors on the CTD.

Methods:

Collect 3 x 1L of water for total suspended matter (TSM) and particulate carbon (PC) (inorganic and organic) at the surface, chlorophyll maximum and bottom depths. Each 1L is filtered onto pre-combusted and preweighed GF/F filter papers and stored at -20℃.
Collect 1L of water from surface and chlorophyll maximum Niskin bottles for phytoplankton taxonomy, preserve samples at ~1-2% glutaraldehyde final volume and store samples in a cool, dark area until later analysis on an inverted microscope.
Collect 3 x 1L of water and filter each 1L sample onto a GF/F filter for chlorophyll-a at the surface and chlorophyll maximum depths, filter papers were folded onto themselves and stored in foil at -20℃.
Collected 3 x 15mL of water filtered through 0.22µm filter for nutrients (silicate, phosphate, nitrate, nitrite and ammonium) at all depths. Samples were frozen at -20℃.
Collect 3 x 200 mL salinity samples from three depths (surface, middle, and bottom) from various CTD casts in transit and at seamount locations.

Preliminary Results/Metrics:

At the Walters Shoal seamount 4 CTD casts were conducted.

- 36 samples were collected for PC/TSM
- 24 samples were collected for chlorophyll-a
- 8 samples were collected for phytoplankton taxonomy
- 75 nutrient samples were collected

2 more CTD casts were conducted at the Madagascan (MAD) Ridge Seamount 1

- 18 samples were collected for PC/TSM
- 12 samples were collected for chlorophyll-a
- 4 samples were collected for phytoplankton taxonomy
- 42 nutrient samples were collected

2 more CTD casts were conducted at the Africana Seamount

- 18 samples were collected for PC/TSM
- 12 samples were collected for chlorophyll-a
- 4 samples were collected for phytoplankton taxonomy
- 42 nutrient samples were collected

Additionally during transit before and between seamounts 4 CTD casts occurred, with one cast being a deep cast at ~ 5000m

36 samples were collected for PC/TSM

24 samples were collected for chlorophyll-a

9 samples were collected for phytoplankton taxonomy

87 nutrient samples were collected

Salinity samples were collected from 2 transit CTD casts en route to Walters Shoal seamount:

18 samples = 3 x 200 mL samples at 3 depths per CTD cast

Salinity samples were collected from a CTD cast at each surveyed flank of Walters Shoal seamount:

36 samples = 3 x 200 mL samples at 3 depths per CTD cast

Salinity samples collected from 1 transit CTD cast between Walters Shoal and Africana seamounts:

9 samples = 3 x 200 mL samples at 3 depths

Salinity samples were collected from 1 CTD cast at Africana seamount:

9 samples = 3 x 200 mL samples at 3 depths

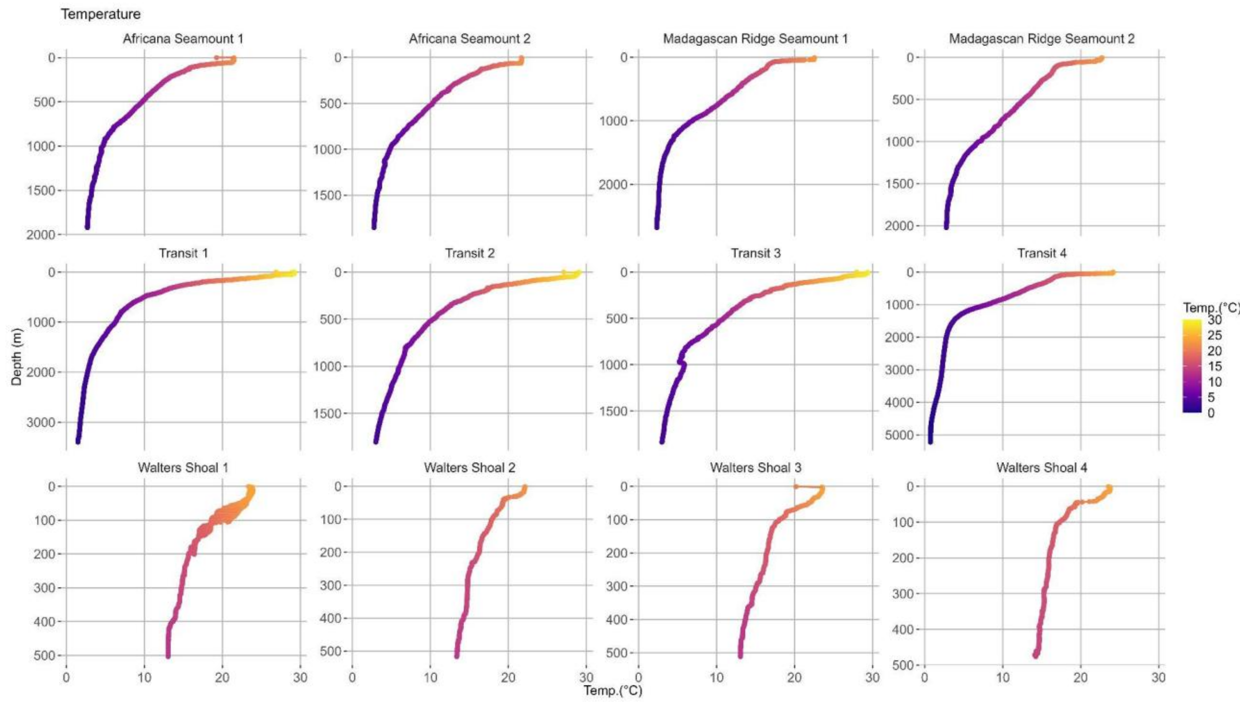


Figure 26. Temperature profiles of CTDs during cruise from Comoros to Cape Town

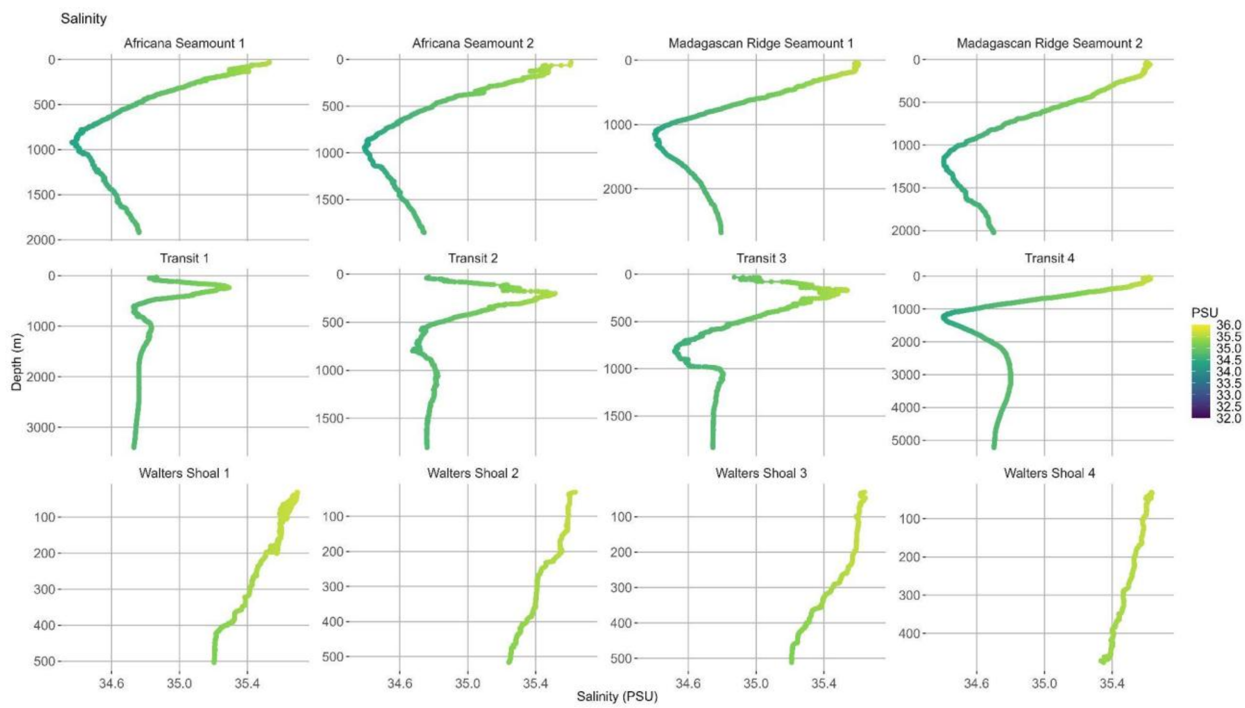


Figure 27. Salinity profiles of CTDs during cruise from Comoros to Cape Town

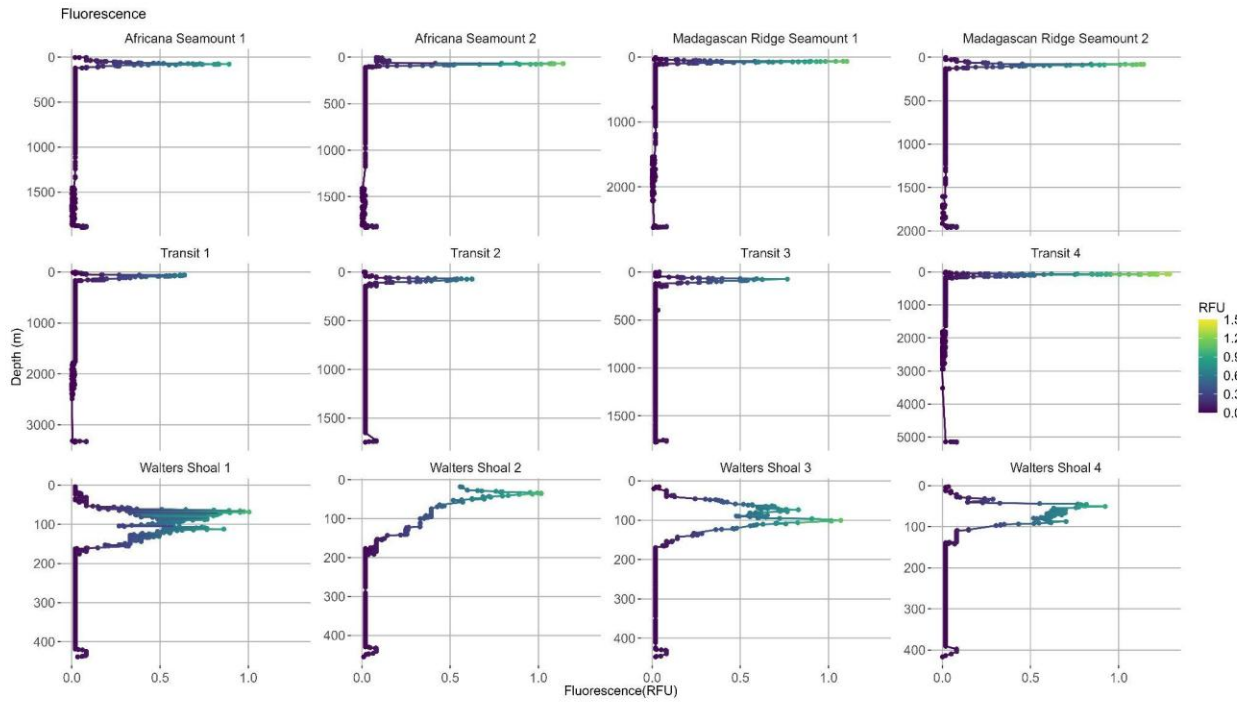


Figure 28. Fluorescence profiles of CTDs during cruise from Comoros to Cape Town

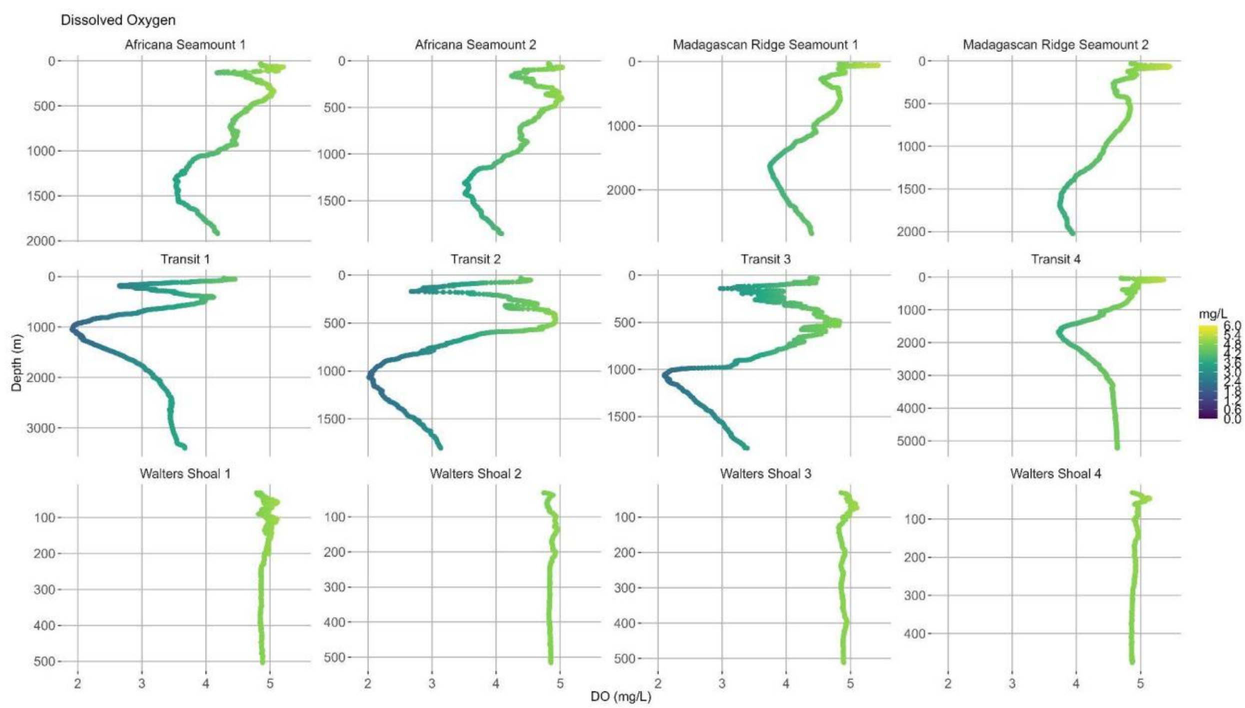


Figure 29. Dissolved oxygen profiles of CTD's during cruise from Comoros to Cape Town

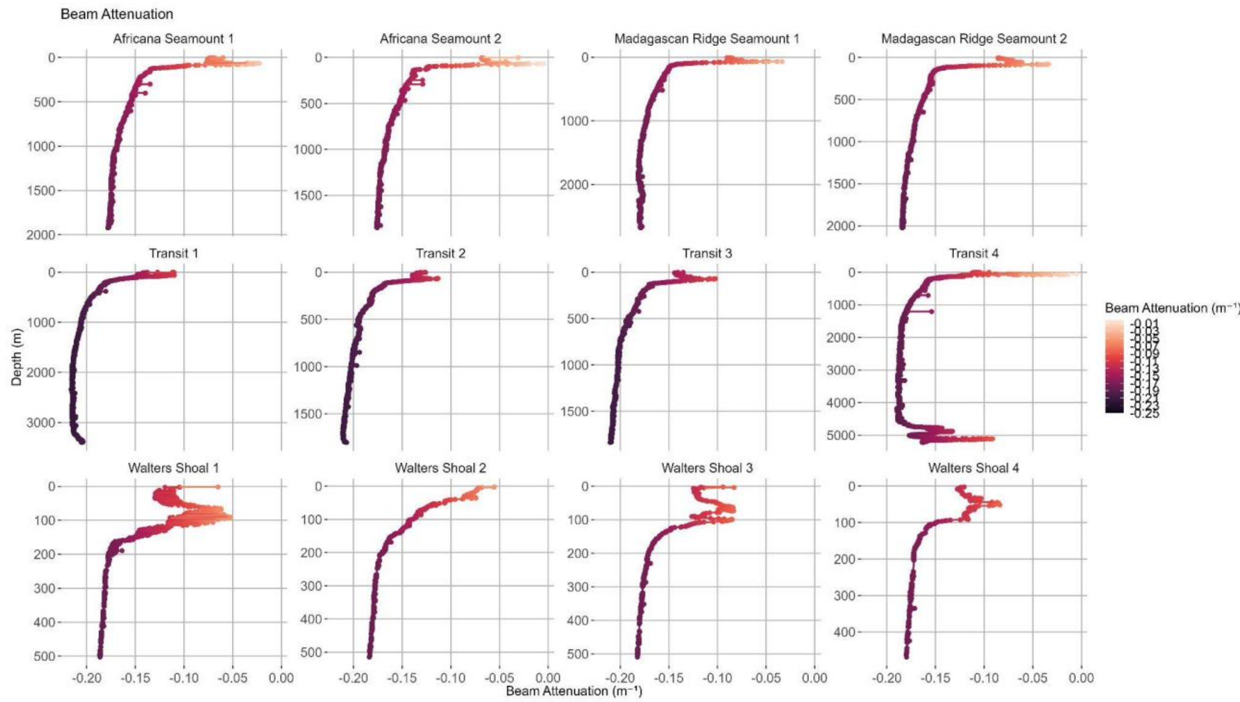


Figure 30. Beam Attenuation profiles of CTDs during cruise from Comoros to Cape Tow

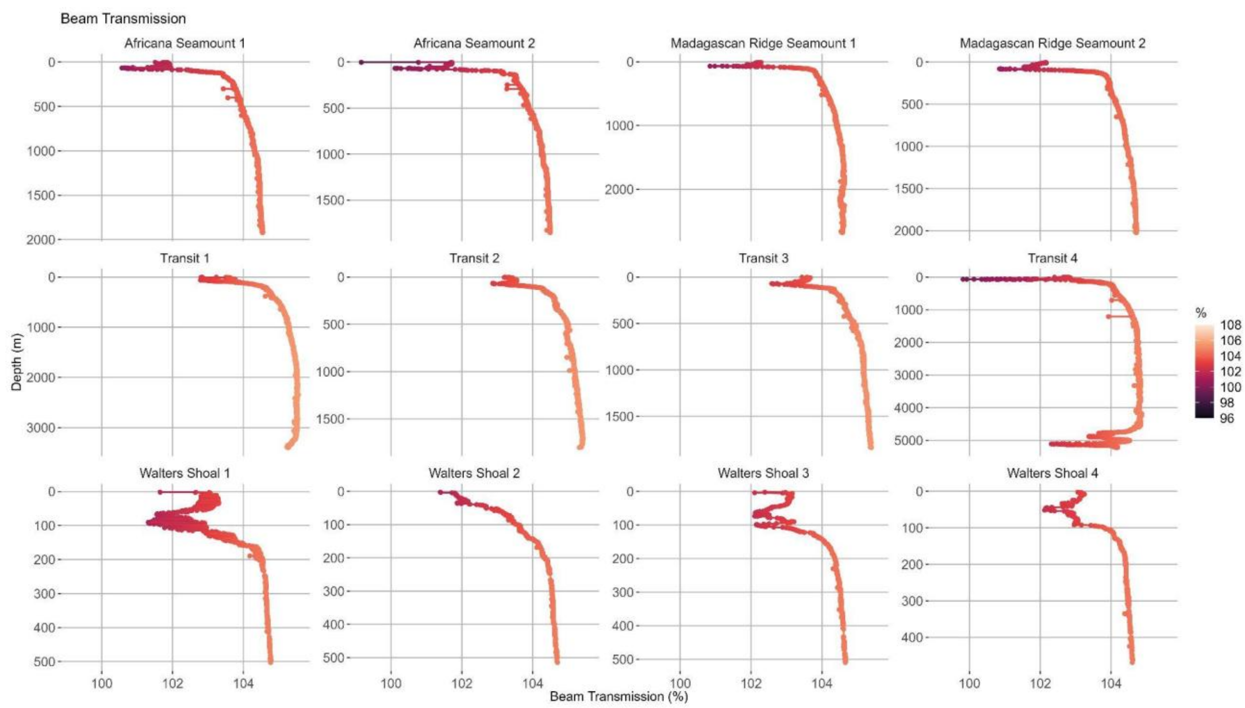


Figure 31. Beam Transmission profiles of CTDs during cruise from Comoros to Cape Town

OceanX Bacterioplankton:

Objectives:

Characterisation of bacterioplankton communities and observation of global patterns of those, as well as biogeographic patterns and depth patterns along the water column.

Methods:

Using 10L Niskin bottles mounted to the CTD rosette, 3L of water from the surface (1-3m), 3L from the deep chlorophyll maximum (DCM) layer, the mesopelagic layer at 200m depth, 3L from max depth/2 deep and the bottom layer (max depth -1) of the water column were used. Immediately after returning to the ship, the water was filtered through 0.2 µm pore size MCE filters using a peristaltic pump. All equipment was sterilised using Ethanol and Bleach before and after each use. After filtering, the filters were stored at -20℃ until further processing. Environmental DNA was extracted using the Qiagen DNeasy PowerWater Kit without changing the manufacturer's protocol. eDNA was eluted in 50 µl of elution buffer and stored at -80℃. The quantity and quality of eDNA were assessed using the Nanodrop spectrophotometer and Qubit V4 fluorometer.

Preliminary Results/Metrics:

63 samples were collected.

NASA PACE:

Objectives: In the context of NASA's PACE program, surface seawater is used to ‘ground-truth’ phytoplankton community composition and their physicochemical properties.

Methods: Particle absorption: 1L of seawater from the surface either collected via CTD or underway system was filtered through combusted 25 diameter glass fiber filters and then stored at -80 dgC, two replicates were taken. Pigments: 2L of seawater from the surface either collected via CTD or underway system was filtered through 25 diameter glass fiber filters and then stored at -80 dgC.

Preliminary Results/Metrics: 60 samples - 30 for particle absorption, 30 for pigments. 16.02.2025

OceanX Atmospheric Sampling:

Objectives:

Explore atmospheric aerosol number concentrations and size distributions from coastal waters to the open ocean. By integrating continuous aerosol particle measurements with discrete sampling for atmospheric microbial biodiversity analysis, this initiative seeks to establish a long-term data series. The collected data will contribute to global measurement networks and support efforts to monitor and investigate climatic conditions and the atmospheric dispersal of species on local, regional, and global scales.

Methods:

Particle number size distributions are continuously measured using a combination of 3 devices (Grimm EDM 180-F, SMPS+C 5420, CPC 5421) covering particle sizes between 5 nm and 32 µm. In addition, total suspended particles are collected using a high volume sampler (Riemer, DHA-80) collecting air with 1000 L min^{-1}. Two filters per day are collected to investigate the diel cycle of aerial microbial communities.
Details:
Continuous measurements:

- Scanning mobility particle sizer + condensation particle counter (SMPS+C) measuring particles 5 – 350 nm
- Environmental dust monitor (EDM 180-F) measuring particles 0.25 – 32 µm
- Condensation particle counter (CPC 5421) measuring total particle concentration, D_{50} = 4 nm
- Temperature, Relative humidity, Air pressure, Wind direction and speed, Precipitation type and quantity

Discrete Atmospheric Sampling

- High volume aerosol sampler, 2 filters per day (sunrise to sunset, sunset to sunrise) at 1000 lpm.

Preliminary Results/Metrics:

36 samples collected

Ship-to-shore live streaming outreach event:

On Monday, 10th February, the OceanX Media Team and NRF-SAEON Egagasini Node facilitated a live streaming event sharing ROV operations at Walters Shoal with a group of Cape Town high school learners. The learners and educators participating were from Luhlaza, Ocean View, Bulumko, Masiphumelele, and Usasazo High Schools. NRF-SAEON Egagasini's science engagement officer, Mr Thomas Mtontsi, hosted the learners and educators at NRF-SAEON's Egagasini Node in Cape Town. As the OceanXplorer vessel connected via a Zoom link with the learners in Cape Town, Sinothando Shibe was ready to give the learners a welcome introduction while she walked from the aft deck and introduced the learners Thabo Mbuyazi who introduced the two submersibles, Neptune and Nadir, and explained the importance of ensuring high levels of maintenance of all science equipment. Sinothando then brought the audience into the Wet Lab and introduced them to Jody Oliver and Yameen Badroedien, who were in the process of filtering water for eDNA and microbes extraction. Sinothando then showed the learners where the ROV (Chimaera) would usually be stationed, when not deployed onto the seabed (which it was at the time) and brought them into Mission Control where Lara Atkinson guided them through the action happening on the seafloor 461 m below, on the northern flank of Walters Shoal. The ROV was in the process of using the scoop to collect a sediment sample and then proceeded along the pre-set transect. The learners were then introduced to Nico Augustin, who shared the part of Mission Control where the high-resolution multibeam data are converted into seafloor maps. These maps are critical to provide detailed information about the seafloor prior to any instruments (CTD, ROV, or submersibles) being deployed. The learners were then “taken” along with Thabo to see the bridge and had a brief introduction to what it looks like on the bridge. On returning to Mission Control the ROV pilots demonstrated turning the lasers on and off and explained how the lasers are used to measure the size of animals seen in the video. The ROV then passed over two soft corals on the seafloor, and Lara explained to the learners about the species we see and what we aim to collect and why. Sinothando ended off the live-streaming session by taking the learners up to the helideck and reminding them that they too can be a part of science, even if they don’t want to become a scientist, by being a technician, a ROV pilot or an engineer building the equipment needed to do the science.

Overall, the live-streaming event was highly successful and the recording has been saved to be shared with others.

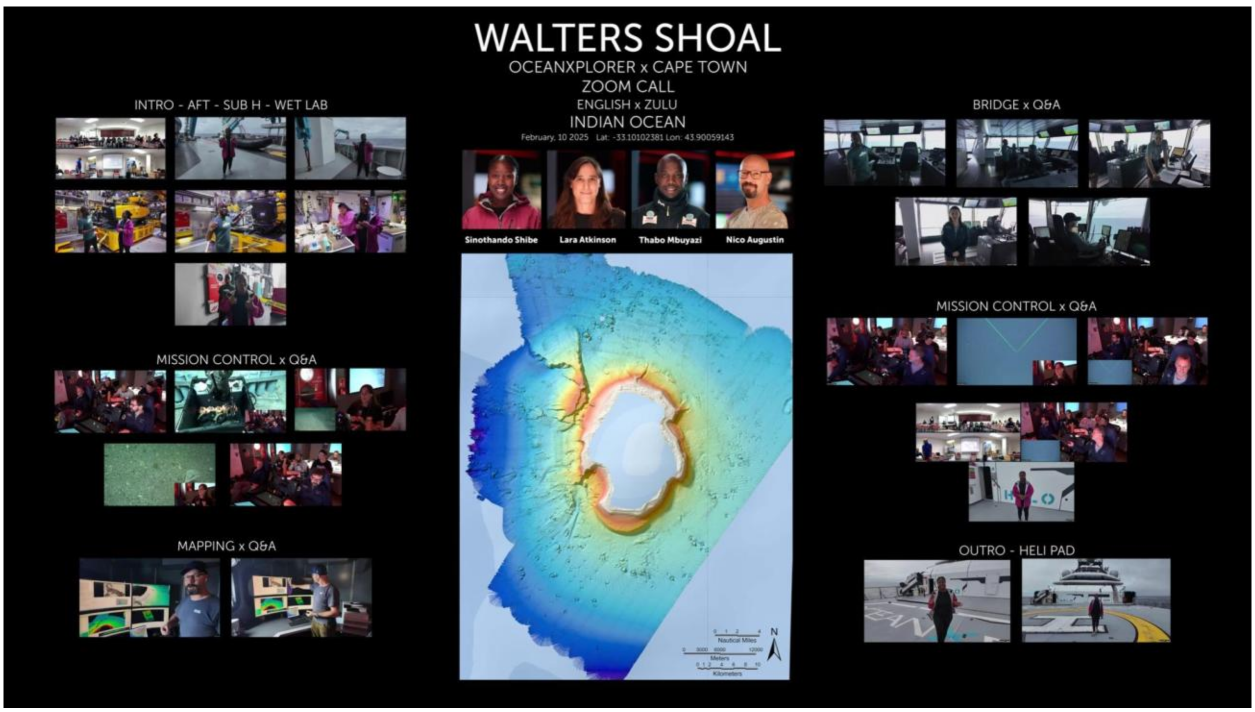


Figure 31. Summary graphic of the Live Streaming Ship-to-Shore event compiled by Mario Tadinac (OX).

Weekly Cruise Narrative:

Week 1
Monday – Tuesday, 27-28 Jan 2025

The first days were all about traveling, settling in, and getting our equipment onboard the RV OceanXplorer. The participating science team arrived in Moroni, Grande Comore (Ngazidja), Comoros, in several batches. Some arrived Monday afternoon, others Tuesday, and the largest group landed Wednesday afternoon. Grande Comore is the largest of four islands making up the Comoros, an Indian Ocean nation off the coast of East Africa, dominated by Mount Karthala. This active volcano last erupted in January 2007. Our starting port for this expedition, Moroni, is a vibrant city with a rich history and Swahili-Arab influences.

Wednesday, 29 Jan 2025

Wednesday morning was dedicated to a visit to the University of the Comoros. There, Nico Augustin (OceanQuest) introduced the Around Africa Expedition, representing OceanQuest, OceanX, and the international science party, to an audience of students and scientists from the Faculty of Science and Technology. The event was well-attended, with an engaged audience showing great interest in the mission. The presentation was followed by a Q&A session, where participants had the opportunity to discuss the expedition in more detail. The visit concluded with a short tour of the marine ecology laboratory, offering insights into local marine research initiatives.

Since the port of Moroni is too shallow for the OceanXplorer, the ship was waiting just outside, anchored offshore. On Wednesday afternoon, all arriving scientists and crew were transferred to the vessel via tender boat, and by 4 PM local time, the full team was onboard. From the very beginning, the crew welcomed us warmly, ensuring that we felt at home on board. Everyone has been incredibly friendly and helpful, making the transition smooth.

The RV OceanXplorer is not just a research vessel - it's an impressive floating laboratory packed with some of the most cutting-edge oceanographic equipment, such as submersibles, ROVs (remotely operated vehicles), advanced DNA laboratories, multibeam sonar, and CTD systems for analyzing the ocean environment. Seeing this technology firsthand is thrilling, and the ship itself is comfortable and well-equipped for life at sea.

Of course, a research vessel is a working platform, and right after arrival, everyone onboard started familiarization sessions. This included safety briefings, introductions to lab spaces and equipment, and learning about ship facilities - such as the crew mess, workspaces, lounge, laundry, and shared cabins. Since this ship will be our home and workplace for the next three weeks, settling in was a priority on the first evening. After long journeys - some over 24 hours of travel - many of us turned in early to rest, though a few stayed up chatting, excited about the mission ahead.

Thursday, 30 Jan 2025

One of the day's highlights was the fantastic news that we received permission to sample and collect data within Madagascar's Exclusive Economic Zone (EEZ)! This is a huge bonus for our transit, as it allows us to conduct daily CTD casts, collecting crucial water column data like temperature, salinity, oxygen levels, and chlorophyll concentrations. Additionally, we'll take water samples from different depths and record multibeam sonar data to map the seafloor. This makes the long journey scientifically valuable and allows us to maximize our research efforts.

Thursday afternoon, just before setting sail for our first main working area, 1300 nautical miles south of Comoros, we received the final equipment shipments from South Africa and additional ship supplies and food - just as crucial as the lab gear for a long expedition! Thanks to the efficiency of the port agent, everything cleared customs in record time and was swiftly transported to the ship via multiple tender boat runs from the port. Scientists and crew worked together seamlessly, ensuring all equipment and supplies were safely loaded onboard.

With everything in place, we officially set sail toward Walters Shoal at 5:30 PM, ready to begin the next phase of our journey!

Friday - Saturday, 31 Jan – 01 Feb 2025

We entered Madagascar’s Exclusive Economic Zone (EEZ) at approximately 9:30 a.m. As soon as we crossed into the EEZ, we activated all shipboard sensors to full recording mode, collecting water column data, atmospheric measurements, seafloor mapping, and sub-bottom sediment profiling, as we had received permission from the Madagascan government to allow sampling.

The hydroacoustic mapping team provided an excellent introduction to seabed mapping and data processing, particularly for early-career scientists, while even senior researchers picked up new insights. This was followed by the launch of our first CTD rosette water sampler. A CTD (Conductivity-Temperature-Depth) is an essential oceanographic instrument that also measures oxygen concentration, chlorophyll levels, and turbidity. The collected data are critical for multiple departments on board, including sound velocity corrections for echosounders and detailed water column analyses for our oceanographers and biologists. Additionally, the system’s 24 ten-liter bottles allowed us to collect water samples from specific depths for further physical, chemical, and biological analyses. The onboard team filtered the samples for microorganisms and particulate matter, adding valuable data to our study of oceanic water masses.

Week 2

Sunday – Monday, 02-03 Feb 2025

Sunday was dedicated to getting acquainted with the different diving systems. The morning began with an introduction to the 6,000-meter-rated work-class ROV Chimaera. The team learned about the vehicle's components, launch and recovery procedures, piloting operations, and sample storage systems. For many participants, this was their first exposure to ROV operations, making it an exciting learning experience.

After the daily CTD station and water sampling, we tested the plankton sampling nets. The Bongo net, with a 200-micron mesh, was deployed for zooplankton sampling, followed by the smaller Hydrobios net, which has a 20-micron mesh for phytoplankton collection. Both were lowered to 200 meters, and the collected material was processed in the onboard lab. The afternoon brought a new highlight: an introduction to the 1,000-meter-rated manned submersibles Nadir and Neptune. The team received detailed briefings on safety, operation, sampling procedures, and launch and recovery techniques. Of course, a key question was also addressed: what to do when nature calls during a dive? Well, let’s say it´s better to not eat and drink too much before a long dive. A particular highlight was the opportunity for everyone to climb into the submarines, experience the confined space firsthand, and engage in discussions with the pilots.

The weather picked up significantly on Sunday night, with waves reaching nearly 3 meters. This slowed our transit considerably and led to the decision to temporarily suspend daily CTD stations. Our goal was to maximize good weather conditions for mapping the shallower parts of Walters Shoal and preparing for the first ROV dive.

Tuesday, 04 Feb 2025

Tuesday became a dedicated transit day, with an abandon-ship emergency drill and fire hose testing scheduled after lunch. Meanwhile, scientific discussions continued, including briefings on dive planning, sampling strategies, and data logging. We were introduced to the dive logging system, which ensured that all participants were familiar with protocols for recording observations and samples during long ROV operations.

Wednesday, 05 Feb 2025

By Wednesday morning, we reached Walters Shoal Seamount. At around 10:00 a.m., we adjusted our heading and began a clockwise circumnavigation at a safe distance from the shallowest areas. The exact depth of the plateau remained uncertain—estimates in literature range from 18 to 12 meters, but these data had not been independently verified. Previous bathymetric data from a 2017 expedition were unavailable, so we relied on published maps to assist with our initial planning. To identify our first dive site, we needed a location with steep slopes, sufficient hard substrate (such as rock formations and crusts) for sessile organisms, and potentially significant geological features like caves and paleo-shorelines. Mapping continued throughout the day, with a focus on refining our understanding of the plateau's geomorphology. By sunset, we had completed mapping of the shallowest regions and shifted to deeper areas overnight.

Thursday, 06 Feb 2025

Thursday marked the first deployment of all diving assets. With weather conditions favorable, we assigned Bibiana Nassongole (Lúrio University, Mozambique), Masimana Gaidi Marenjaka, and Andrinirina Mbony Jovial (University of Toliara, Madagascar) as science observers in the submersibles. The submarines were in the water and diving by 9:00 a.m., reaching the seafloor at the base of Walters Shoal shortly after. The ROV followed, entering the water at 9:40 a.m.

Upon reaching the seafloor, the subs and ROV reported a rocky landscape composed of carbonate pebbles and debris from the shallower reef structures above. The team observed various marine life, including brisingid sea stars, soft corals, hard corals, sponges, fish, and tiny crabs. A striking sight at 150 meters was a beautiful moray eel nestled within the rocky terrain. The ROV conducted three survey transects at 550m, 300m, and 150m depths, each being 200 m in length, systematically collecting video footage and samples. Meanwhile, the submersibles operated more freely within the survey zone, accessing sites that the tethered ROV could not reach.

The ROV was back on deck by 4 pm, and the subs were back one hour later. There was little time to welcome our deep-sea divers back because the time-critical sample processing started immediately after the vehicles were back on deck. This will take time till the late evening. Before continuing seafloor mapping and sub-bottom profiling, one more CTD station (only till 200m) will collect more water samples. Of course, the planning of the following dives and days is also continuing.

Despite some weather challenges, the week was a major success. The team adapted well to the constraints of shipboard work, and our first dives at Walters Shoal provided valuable geological and ecological insights. The new high-resolution bathymetric data will be instrumental for future dives and analysis.

Friday, 07 Feb 2025

Friday started with strong winds, high swells of up to 3.5 meters, and rain, which created challenging conditions for launching OceanXplorer's diving assets. Since deploying the ROVs and submersibles was not an option on Friday, we focused on seafloor mapping around Walters Shoal, to expand our high-resolution bathymetric coverage.

Saturday, 08 Feb 2025

By Saturday, the weather had improved enough for us to resume active operations. We conducted a CTD cast, deployed the ROV, and carried out plankton net sampling. The dive took place along the escarpment of a significant landslide on the south-western flank of Walters Shoal. The seafloor here was stunning, featuring steep cliffs and a rugged, heavily eroded landscape teeming with marine life. While the overall diversity of species was comparable to our first dive, the density of organisms appeared to be significantly higher, providing exciting insights into the ecological distribution in this region.

Week 3

Sunday, 09 Feb 2025

With the improved sea conditions, we launched both submersibles and the ROV on Sunday to explore a striking cliff formation on the northeastern flank of Walters Shoal. Aboard the submersibles were Jorge Sitoe (Wildlife Conservation Society, Mozambique), Lara Atkinson (SAEON, South Africa), and Sinothando Shibe (SANParks, South Africa). This site also revealed a higher density of marine life, potentially influenced by its morphology and ocean currents. The first dive followed the steep outward shoulder of the escarpment, while the two subsequent dives were planned along the inside - an aspect to be studied in greater detail in the coming months.

Monday - Tuesday, 10-11 Feb 2025

Monday marked our last operational day at Walters Shoal as worsening weather conditions loomed over the Agulhas Plateau and our current location. Our final dive targeted a seafloor valley between the main Walters Shoal structure and a large northwestern block, believed to have broken off from the main shoal due to ancient tectonic activity, possibly predating the extinction of dinosaurs.

As the submersibles and ROV descended, they encountered unexpectedly strong currents exceeding 2 knots (1 m/s), significantly affecting maneuverability. This forced us to shorten the dive and recover the assets earlier than planned. We quickly adjusted our strategy and shifted operations to an alternative dive site at a northern Y-shaped structure, deploying only the ROV to maximize our remaining time at Walters Shoal.

Simultaneously, we hosted a live-streamed educational event for high school children in South Africa. Due to the delayed ROV descent, the young audience had to wait longer than expected, but the media team delivered an engaging and immersive experience. Scientists and crew members gave live insights from different locations aboard OceanXplorer, including the ROV operations room, the seafloor mapping control center, the bridge and the ship's deck, where they described the exciting research underway.

Following the live stream, we completed our final ROV sampling and wrapped up operations at Walters Shoal. The collected data will be instrumental in ecosystem characterization, especially as the region recovers from decades of commercial fishing, which ceased in 2018. Our findings will provide a fresh understanding of erosion-driven seabed formations and marine biodiversity in this underexplored part of the ocean.

Interesting Fact: To be classified as a seamount, an underwater mountain must rise at least 1000 meters above the surrounding seafloor. Walters Shoal, which stands at approximately 700 meters, is technically a knoll rather than a seamount, making it a fascinating subject for geomorphologists.

We left Walters Shoal by Monday evening and set sail 85 nautical miles southwest to explore a much larger and deeper seamount located on the southern edge of the Madagascar Ridge. Due to persistent rough seas, our activities were initially limited to CTD sampling while we continued to map the structure.

Wednesday, 12 Feb 2025

By Wednesday, the weather had improved enough for further CTD casts and the first ROV dive at this newly mapped seamount. While global bathymetric models suggested its general shape, our detailed mapping confirmed its massive size: rising 2000 meters above the seafloor, with an extensive 32-kilometer-wide flat summit – a characteristic feature of a so-called guyot.

Guyots like this one, with a flat summit, were once close to the sea surface shortly after their formation – possibly even existing as tropical islands for a few million years. As they gradually subsided into the abyss, coral reefs formed along their slopes, and wave erosion contributed to shaping their flat tops. Eventually, these seamounts became atolls, and when they sank too deep for coral growth and wave action, they largely retained their shape. This marks this seamount's first complete high-resolution bathymetric survey and the first video documentation via ROV.

Thursday – Sunday, 13-23 Feb 2025

After finishing mapping of the unnamed Seamount, we set sail to the Africana Seamount, about three days away. A bad weather front with high winds and waves of up to 6m from the West slowed our speed to only 5 knots and less. Thus, despite continuously steaming westwards, the travel time to Africana Seamount became longer.

Week 4 (and 5)

Sunday – Monday, 16-17 Feb 2025

We continued the transit to Africana Seamount and catched up some time while the weather increased over Sunday. The swell became significantly less (only about 3.5 m), and also the wind was less. After a longer transit than initially expected, we eventually arrived at Africana Seamount early Monday morning. We had a 48-hour window to do our work program and started by collecting bathymetric data on the top of this volcanic system. The first bathymetric line over this seamount was already a surprise as it revealed a complex volcanic system with an elongated ridge in the East, plenty of volcanic cones, and a guyot-shaped main structure. Africana Seamount is part of an elongated, 80 km long volcanic ridge with plenty of interesting geomorphological features. However, a CTD cast on top of the seamount showed us that the backstream of the Agulhas current is very strong at this position, a disappointing moment for us as we hoped to see the seamount in ROV footage. At least for Monday, the current was too strong to save ROV operations, and we continued the bathymetric mapping of Africana Seamount and its surroundings. At 2:30 p.m., we made another stop for a plankton net station before we continued mapping over the night.

Tuesday - Sunday, 18-23 Feb 2025

The large eddy that causes the strong currents over Africana Seamount did not move much eastwards, and thus, ROV operations weren't possible on Tuesday either. Instead, we did a second drift-CTD cast over the seamounts summit area and continued bathymetric mapping. We left the area towards Cape Town in the early morning hours of Wednesday 19th, and we are expected to arrive in Cape Town by Sunday morning 23rd February. We continued to collect bathymetric underway data during transit until we reached the South African EEZ.

Over the past weeks, we collected over 209 biological samples, several carbonate and volcanic rocks, and numerous water samples. Our four planned dive sectors at Walters Shoal were completed, ensuring a comprehensive biological assessment of the area. Beyond that, we have mapped the entire Walters Shoal knoll (± -15 to 700 m) and its surroundings with unprecedented detail. We also collected high-resolution mapping of a second, larger seamount southwest of Walters Shoal. While not a primary target of the expedition, this fully mapped structure (± -990 to -3700 m)will contribute valuable data to global bathymetric datasets, and the biological ROV dive provided key insights into its deep-sea ecosystem. The third structure we studied was the Africana Seamount (± -1600 to -4800 m). Even though no ROV dives were possible, it is now fully mapped in high resolution for the first time, and we explored the water column at Africana with CTD and plankton nets.

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Annexure A: List of all faunal specimens collected and preserved during the research expedition indicating the unique identifier label allocated to each.

Unique ID	Taxon	Description	Preservation	Subsample	Depth (m)
OXR20250130_CHR0535_BIO_001	Asteroidea	Brisingid sea star on sponge BIO_003	Whole specimen, ethanol, -20C		559,66
OXR20250130_CHR0535_BIO_002	Asteroidea	Brisingid sea star on sponge BIO_003	Whole specimen, ethanol, -20C		559,79
OXR20250130_CHR0535_BIO_003	Hydrozoa	Dead Stylaster	Whole specimen, ethanol, -20C		559,75
OXR20250130_CHR0535_BIO_004	Hexacorallia	Scleratian cup coral	Whole specimen, ethanol, -80C		559,82
OXR20250130_CHR0535_BIO_005	Hexacorallia	Yellow scleractinian	Whole specimen, ethanol, -80C		572,79
OXR20250130_CHR0535_BIO_006	Octocorallia	Purple octocoral	Ethanol, -20C	Barcode, ethanol, -20C	572,99
OXR20250130_CHR0535_BIO_007	Bryoza	White bryozoan	Whole specimen, ethanol, -20C		303,72
OXR20250130_CHR0535_BIO_008	Octocorallia	Pink octocoral	Ethanol, -20C	Barcode, ethanol, -20C	303,36
OXR20250130_CHR0535_BIO_009	Porifera	Grey/brown sponge	Ethanol, -20C	eDNA, ethanol, -20C	304,01
OXR20250130_CHR0535_BIO_010	Porifera	Roundish white sponge	Ethanol, -20C	eDNA, ethanol, -20C	303,39
OXR20250130_CHR0535_BIO_011	Octocorallia	Octocoral with blue base	Ethanol, -20C	Barcode, ethanol, -20C	304,90
OXR20250130_CHR0535_BIO_012	Porifera	Yellow tubular sponge	Ethanol, -20C	eDNA, ethanol, -20C	304,23
OXR20250130_CHR0535_BIO_013	Porifera	white stalked sponge	Ethanol, -20C	eDNA, ethanol, -20C	303,43
OXR20250130_CHR0535_BIO_014	Porifera	Yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	149,73
OXR20250130_CHR0535_BIO_015	Porifera	Finger sponge	Ethanol, -20C	eDNA, ethanol, -20C	149,79
OXR20250130_CHR0535_BIO_016	Octocorallia	Orange soft coral	Ethanol, -20C	Barcode, ethanol, -20C	149,91
OXR20250130_CHR0535_BIO_017	Annelida	2 x polychaetes	Whole specimen, ethanol, -20C		304,01
OXR20250130_CHR0535_BIO_018	Octocorallia	orange soft coral	Ethanol, -20C	Barcode, ethanol, -20C	149,79
OXR20250130_CHR0535_BIO_019	Ophiuroidea	ophiuroid	Whole specimen, ethanol, -20C		303,39
OXR20250130_CHR0535_BIO_020	Crustacea	10 x Mysid shrimp	Whole specimen, ethanol, -20C		303,39
OXR20250130_CHR0535_BIO_021	Porifera	white sponge	Whole specimen, ethanol, -20C		303,39
OXR20250130_CHR0535_BIO_022	Crustacea	11 x Mysid shrimp	Whole specimen, ethanol, -20C		
OXR20250130_CHR0535_BIO_023	Annelida	Polychaeta	Whole specimen, ethanol, -20C		559,75
OXR20250130_NTN0339_BIO_001	Octocorallia	Primoid octocoral	Ethanol, -20C	Barcode, ethanol, -20C	543,62

OXR20250130_NTN0339_BIO_002	Octocorallia	White and red soft coral	Ethanol, -20C	Barcode, ethanol, -20C	535,92
OXR20250130_NTN0339_BIO_003	Hydrozoa	White Stylaster	Whole specimen, ethanol, -20C		532,00
OXR20250130_NTN0339_BIO_004	Octocorallia	Purple octocoral coral	Ethanol, -20C	Barcode, ethanol, -20C	533,28
OXR20250130_NTN0339_BIO_005	Hexacorallia	Piece of Madrepora	Whole specimen, ethanol, -80C		529,35
OXR20250130_NTN0339_BIO_006	Octocorallia	Yellow Plexaurid Octocoral	Ethanol, -20C	Barcode, ethanol, -20C	523,59
OXR20250130_NTN0339_BIO_007	Hydrozoa	White stylaster	Whole specimen, ethanol, -20C		514,13
OXR20250130_NTN0339_BIO_008	Hexacorallia	Madrepora	Ethanol, -20C	Branch, ethanol, -80C	507,13
OXR20250130_NTN0339_BIO_009	Octocorallia	Thouarela	Ethanol, -20C	Barcode, ethanol, -20C	504,62
OXR20250130_NTN0339_BIO_010	Octocorallia	White octocoral	Ethanol, -20C	Barcode, ethanol, -20C	504,43
OXR20250130_NTN0339_BIO_013	Hexacorallia	Red whip coral	Ethanol, -20C	Barcode, ethanol, -20C	412,88
OXR20250130_NTN0339_BIO_014	Hexacorallia	Black coral	Ethanol, -20C	Barcode, ethanol, -20C	391,90
OXR20250130_NTN0339_BIO_015	Porifera	Yellow Sponge	Ethanol, -20C	eDNA, ethanol, -20C	368,72
OXR20250130_NTN0339_BIO_017	Porifera	Light yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	312,69
OXR20250130_NTN0339_BIO_018	Porifera	Purple sponge	Whole specimen, ethanol, -20C		312,34
OXR20250130_NTN0339_BIO_019	Octocorallia	Yellow soft coral/Black coral ?	Ethanol, -20C	Barcode, ethanol, -20C	180,52
OXR20250130_NTN0339_BIO_020	Annelida	1 Polychaete	Whole specimen, ethanol, -20C		532,00
OXR20250130_NTN0339_BIO_021	Crustacea	Hermit crab	Whole specimen, seawater, -20C		
OXR20250130_NTN0339_BIO_022	Crustacea	11 x Squat lobster short arms	Whole specimen, seawater, -20C		
OXR20250130_NTN0339_BIO_023	Crustacea	2 x Squat lobster long arms	Whole specimen, seawater, -20C		
OXR20250130_NTN0339_BIO_024	Hydrozoa	Hydroid	Whole specimen, ethanol, -20		312,34
OXR20250130_NTN0339_BIO_025	Bryoza	Bryozoa	Whole specimen, ethanol, -20		312,34
OXR20250130_NTN0339_BIO_026	Crustacea	Dromid crab	Whole specimen, ethanol, -20		312,34
OXR20250130_NTN0339_BIO_027	Gastropoda	Gastropod	Whole specimen, ethanol, -20		312,34
OXR20250130_NTN0339_BIO_028	Gastropoda	Gastropod	Whole specimen, ethanol, -20		368,72
OXR20250130_NTN0339_BIO_029	Crustacea	2 x Squat lobster long arms	Whole specimen, seawater, -20C		533,28
OXR20250130_NTN0339_BIO_030	Crustacea	2 x Squat lobster long arms	Whole specimen, seawater, -20C		504,62
OXR20250130_NTN0339_BIO_031	Asteroidea	Brisingid seastar	Whole specimen, ethanol, -20C		504,62

OXR20250130_NTN0339_BIO_032	Annelida	3 x Polychaeta	Whole specimen, ethanol, -20C		504,62
OXR20250130_NTN0339_BIO_033	Asteroidea	2 x Brisingid sea star	Whole specimen, ethanol, -20C		533,28
OXR20250130_NTN0339_BIO_034	Crustacea	3 x Mysid	Whole specimen, ethanol, -20C		533,28
OXR20250130_NTN0339_BIO_035	Hydrozoa	Hydrozoa	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_036	Bryoza	Bryozoa	Whole specimen, ethanol, -20C		297,08
OXR20250130_NTN0339_BIO_037	Annelida	2 x Polychaeta	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_038	Ophiuroidea	Ophiuroid	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_039	Gastropoda	Gastropod	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_040	Hydrozoa	White Stylaster with paddles	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_041	Hydrozoa	White Stylaster	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_042	Crustacea	2 x Mysid	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_043	Porifera	small white sponge	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_044	Porifera	small white sponge	Whole specimen, ethanol, -20C		535,92
OXR20250130_NTN0339_BIO_045	Octocorallia	Small orange octocoral	Molecular ethanol, -20C	Barcode, ethanol, -20C	535,92
OXR20250130_NTN0339_BIO_046	Crustacea	Squat lobster short arms	Whole specimen, seawater, -20C		
OXR20250130_NTN0339_BIO_047	Hexacorallia	Madrepora	4 % Formaldehyde		507,13
OXR20250130_NTN0339_BIO_048	Bryoza	White bryozoan	Whole specimen, ethanol, -20C		
OXR20250130_NTN0339_BIO_049	Brachiopoda	3 x Brachiopoda	Whole specimen, ethanol, -20C		297,08
OXR20250130_NTN0339_BIO_050	Hexacorallia	Yellow Cigar coral	Whole specimen, ethanol, -80C		297,08
OXR20250130_NTN0339_BIO_051	Hexacorallia	Scleratinian cup coral	Whole specimen, ethanol, -80C		297,08
OXR20250130_NTN0339_BIO_052	Hexacorallia	Scleratinian cup coral	Whole specimen, ethanol, -80C		297,08
OXR20250130_NTN0339_BIO_053	Gastropoda	Gastropoda	Whole specimen, ethanol, -20C		297,08
OXR20250130_NTN0339_BIO_054	Crustacea	Squat lobster long arms	Whole specimen, seawater, -20C		297,08
OXR20250130_NTN0339_BIO_055	Ophiuroidea	2 x Ophiuroid	Whole specimen, seawater, -20C		297,08
OXR20250130_NTN0339_BIO_056	Gastropoda	5 x Gastropoda	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_057	Brachiopoda	2 x Brachiopoda	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_058	Bivalvia	2 x Bivalve	Whole specimen, seawater, -20C		422,92

OXR20250130_NTN0339_BIO_059	Ophiuroidea	Small ophiuroid	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_060	Annelida	6 x Polychaeta (3 species)	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_061	Hydrozoa	Hydrozoa	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_062	Bryoza	Small reticulate Bryozoa	Whole specimen, seawater, -20C		422,92
OXR20250130_NTN0339_BIO_063	Bryoza	White small Bryozoa	Whole specimen, seawater, -20C		422,92
OXR20250130_CHR0536_BIO_001	Octocorallia	Soft coral with Blue base	Ethanol, -20C	Barcode, ethanol, -20C	500,67
OXR20250130_CHR0536_BIO_002	Porifera	Cream sponge	Whole specimen, ethanol, -20C	eDNA, ethanol, -20	499,85
OXR20250130_CHR0536_BIO_003	Octocorallia	Orange soft coral	Ethanol, -20C	Barcode, ethanol, -20C	299,78
OXR20250130_CHR0536_BIO_004	Porifera	White sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,34
OXR20250130_CHR0536_BIO_006	Octocorallia	Pink soft coral	Ethanol, -20C	Barcode, ethanol, -20C	300,40
OXR20250130_CHR0536_BIO_007	Crinoidea	feather star	Whole specimen, ethanol, -20C		300,97
OXR20250130_CHR0536_BIO_008	Hexacorallia	Black coral	Whole specimen, ethanol, -20C		300,10
OXR20250130_CHR0536_BIO_009	Porifera	Purple sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,36
OXR20250130_CHR0536_BIO_010	Porifera	Yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	152,41
OXR20250130_CHR0536_BIO_011	Porifera	White sponge	Ethanol, -20C	eDNA, ethanol, -20C	153,44
OXR20250130_CHR0536_BIO_012	Porifera	Large yellow porous sponge	Ethanol, -20C	eDNA, ethanol, -20C	151,15
OXR20250130_CHR0536_BIO_013	Porifera	Small white jelly sponge	Whole specimen, eDNA, ethanol, -20C		152,41
OXR20250130_CHR0536_BIO_014	Porifera	Yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	153,44
OXR20250130_CHR0536_BIO_015	Hexacorallia	small pale pink anemone	Whole specimen, ethanol, -20C		300,10
OXR20250130_CHR0536_BIO_016	Hexacorallia	purple hard coral	Whole specimen, ethanol, -80		300,36
OXR20250130_CHR0536_BIO_017	Hexacorallia	white hard cup coral	Whole specimen, ethanol, -80		151,15
OXR20250130_CHR0536_BIO_018	Ophiuroidea	brittle star	Whole specimen, ethanol, -20C		152,41
OXR20250130_CHR0536_BIO_019	Octocorallia	Nephthydae soft coral	Ethanol, -20C	Barcode, ethanol, -20C	153,44
OXR20250130_CHR0536_BIO_020	Annelida	scale worm	Whole specimen, ethanol, -20C		153,44
OXR20250130_CHR0536_BIO_021	Annelida	Polychaeta	Whole specimen, ethanol, -20C		299,78
OXR20250130_CHR0536_BIO_022	Crustacea	isopod	Whole specimen, ethanol, -20C		300,40
OXR20250130_CHR0536_BIO_023	Crustacea	long arm squat lobster	Whole specimen, seawater, -20C		300,34

OXR20250130_CHR0536_BIO_024	Crustacea	Mysid	Whole specimen, ethanol, -20C		300,40
OXR20250130_CHR0536_BIO_025	Crustacea	Small shrimp	Whole specimen, ethanol, -20C		300,40
OXR20250130_CHR0536_BIO_026	Porifera	Small pinkish golf ball sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,40
OXR20250130_CHR0536_BIO_027	Porifera	Small white golf ball sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,40
OXR20250130_CHR0536_BIO_028	Ophiuroidea	White brittle star	Whole specimen, ethanol, -20C		299,78
OXR20250130_CHR0536_BIO_029	Ophiuroidea	Feathery banded brittle star	Whole specimen, ethanol, -20C		299,78
OXR20250130_CHR0536_BIO_030	Annelida	Polychaeta	Whole specimen, ethanol, -20C		299,78
OXR20250130_CHR0536_BIO_031	Ophiuroidea	Feathery banded brittle star	Whole specimen, ethanol, -20C		
OXR20250130_CHR0536_BIO_032	Octocorallia	Nephthydae soft coral	Whole specimen, ethanol, -20C		
OXR20250130_CHR0537_BIO_001	Hexacorallia	Dead Madrepora	Whole specimen, ethanol, -20C		500,94
OXR20250130_CHR0537_BIO_002	Porifera	White round sponge	Ethanol, -20C	eDNA, ethanol, -20C	501,26
OXR20250130_CHR0537_BIO_003	Porifera	Yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	500,89
OXR20250130_CHR0537_BIO_004	Octocorallia	Small red Anthomasthus	Ethanol, -20C	Barcode, ethanol, -20C	501,94
OXR20250130_CHR0537_BIO_005	Porifera	White bowl sponge	Ethanol, -20C	eDNA, ethanol, -20C	500,37
OXR20250130_CHR0537_BIO_006	Hydrozoa	stylaster	Whole specimen, ethanol, -20		500,38
OXR20250130_CHR0537_BIO_007	Octocorallia	Octocorallia	Ethanol, -20C	Barcode, ethanol, -20C	298,83
OXR20250130_CHR0537_BIO_008	Porifera	brown/grey sponge	Ethanol, -20C	eDNA, ethanol, -20C	299,41
OXR20250130_CHR0537_BIO_009	Porifera	purple sponge	Ethanol, -20C	eDNA, ethanol, -20C	298,47
OXR20250130_CHR0537_BIO_010	Hexacorallia	cigar coral	Whole specimen, ethanol, -80C		299,03
OXR20250130_CHR0537_BIO_011	Octocorallia	orange soft coral nephthyd	Ethanol, -20C	Barcode, ethanol, -20C	299,81
OXR20250130_CHR0537_BIO_012	Porifera	white sponge	Ethanol, -20C	eDNA, ethanol, -20C	299,27
OXR20250130_CHR0537_BIO_013	Porifera	yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	149,38
OXR20250130_CHR0537_BIO_014	Porifera	dirt- white sponge	Ethanol, -20C	eDNA, ethanol, -20C	149,22
OXR20250130_CHR0537_BIO_015	Octocorallia	red soft coral	Ethanol, -20C	Barcode, ethanol, -20C	149,53
OXR20250130_CHR0537_BIO_016	Octocorallia	yellow soft coral	Ethanol, -20C	Barcode, ethanol, -20C	150,88
OXR20250130_CHR0537_BIO_017	Porifera	purple sponge	Ethanol, -20C	eDNA, ethanol, -20C	149,38
OXR20250130_CHR0537_BIO_018	Porifera	small oblong yellow sponge	Whole specimen, eDNA, ethanol, -20C		299,41

OXR20250130_CHR0537_BIO_019	Porifera	dark yellow sponge	Whole specimen, ethanol, -20	eDNA, ethanol, -20C	149,38
OXR20250130_CHR0537_BIO_020	Porifera	swiss cheese sponge	Whole specimen, ethanol, -20	eDNA, ethanol, -20C	149,22
OXR20250130_CHR0537_BIO_021	Crustacea	Squat lobster long arms	Whole specimen, seawater, -20C		501,94
OXR20250130_CHR0537_BIO_022	Annelida	Polychaeta	Whole specimen, ethanol, -20C		299,81
OXR20250130_CHR0537_BIO_023	Crustacea	Squat lobster long arms	Whole specimen, seawater, -20C		299,81
OXR20250130_CHR0537_BIO_024	Bivalvia	Pectinidae	Whole specimen, ethanol, -20C		150,88
OXR20250130_CHR0537_BIO_025	Brachiopoda	small brachiopod	Whole specimen, ethanol, -20C		500,94
OXR20250130_CHR0537_BIO_026	Ophiuroidea	small brittle star	Whole specimen, ethanol, -20C		500,94
OXR20250130_CHR0537_BIO_027	Mollusca	Undetermined	Whole specimen, ethanol, -20C		501,26
OXR20250130_CHR0537_BIO_028	Crustacea	2 x Dromid crab	Whole specimen, seawater, -20C		149,38
OXR20250130_CHR0537_BIO_029	Octocorallia	Yellow Nephthydae soft coral	Whole specimen, ethanol, -20C		149,38
OXR20250130_CHR0537_BIO_030	Crustacea	long arm squat lobster	Whole specimen, seawater, -20C		
OXR20250130_CHR0537_BIO_031	Crustacea	long arm squat lobster	Whole specimen, seawater, -20C		149,22
OXR20250130_CHR0537_BIO_032	Annelida	Polychaeta scale worm	Whole specimen, ethanol, -20C		501,94
OXR20250130_CHR0537_BIO_033	Annelida	Polychaeta	Whole specimen, ethanol, -20C		501,94
OXR20250130_CHR0537_BIO_034	Crustacea	20 x mysid shrimps	Whole specimen, ethanol, -20C		501,94
OXR20250130_CHR0537_BIO_035	Tunicata		Whole specimen, ethanol, -20C		500,61
OXR20250130_NTN0340_BIO_001	Hexacorallia	Yellow cigar hard coral "small colony"	Whole specimen, ethanol, -80C		459,93
OXR20250130_NTN0340_BIO_002	Octocorallia	yellow soft coral	Ethanol, -20C	Barcode, ethanol, -20C	457,28
OXR20250130_NTN0340_BIO_003	Porifera	white golf ball sponge	Ethanol, -20C	eDNA, ethanol, -20C	449,32
OXR20250130_NTN0340_BIO_004	Octocorallia	Pink octocoral, anthomasthus	Ethanol, -20C	Barcode, ethanol, -20C	449,11
OXR20250130_NTN0340_BIO_005	Porifera	folded cream sponge	Ethanol, -20C	eDNA, ethanol, -20C	468,86
OXR20250130_NTN0340_BIO_006	Porifera	white fluffy sponge	Ethanol, -20C	eDNA, ethanol, -20C	391,04
OXR20250130_NTN0340_BIO_007	Porifera	white-grey sponge	Ethanol, -20C	eDNA, ethanol, -20C	276,92
OXR20250130_NTN0340_BIO_008	Octocorallia	yellow soft coral, Acanthogorgia	Ethanol, -20C	Barcode, ethanol, -20C	205,43
OXR20250130_NTN0340_BIO_009	Porifera	white gum sponge	Ethanol, -20C	eDNA, ethanol, -20C	199,06
OXR20250130_NTN0340_BIO_010	Porifera	yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	150,06

OXR20250130_NTN0340_BIO_011	Porifera	small white sponge	Ethanol, -20C	eDNA, ethanol, -20C	468,86
OXR20250130_NTN0340_BIO_012	Ophiuroidea	small white ophiuroid	Whole specimen, ethanol, -20C		457,28
OXR20250130_NTN0340_BIO_013	Ophiuroidea	banded feathery arms	Whole specimen, ethanol, -20C		457,28
OXR20250130_NTN0340_BIO_014	Crustacea	small yellow squat lobster	Whole specimen, seawater, -20C		457,28
OXR20250130_NTN0340_BIO_015	Crustacea	long arm squat lobster	Whole specimen, seawater, -20C		457,28
OXR20250130_NTN0340_BIO_016	Porifera	small round sponge	Whole specimen, ethanol, -20C		449,11
OXR20250130_NTN0340_BIO_017	Ophiuroidea	brittle star	Whole specimen, ethanol, -20C		205,43
OXR20250130_NTN0340_BIO_018	Crustacea	Orange crab	Whole specimen, seawater, -20C		150,06
OXR20250130_NTN0340_BIO_019	Octocorallia	Nephthydae orange soft coral	Whole specimen, ethanol, -20C		150,06
OXR20250130_NTN0340_BIO_020	Crustacea	Chocolate-tip crab	Whole specimen, seawater, -20C		449,32
OXR20250130_NTN0340_BIO_021	Gastropoda	3 x Gastropoda	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_022	Gastropoda	Turbo shell 1	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_023	Gastropoda	Turbo shell 2	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_024	Hydrozoa	Hydroid	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_025	Porifera	Small white sponge	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_026	Hexacorallia	Yellow corallimorpharia ?	Whole specimen, ethanol, -20C		449,32
OXR20250130_NTN0340_BIO_027	Crustacea	Squat lobster long arms	Whole specimen, seawater, -20C		
OXR20250130_NTN0340_BIO_028	Mollusca	2 x nudibranchs	Whole specimen, ethanol, -20C		280,88
OXR20250130_NTN0340_BIO_029	Porifera	small round sponge	Whole specimen, ethanol, -20C		280,88
OXR20250130_NTN0340_BIO_030	Porifera	yellow hairy sponge	Whole specimen, ethanol, -20C		280,79
OXR20250130_NTN0340_BIO_031	Hydrozoa	Stylaster white blob	Whole specimen, ethanol, -20C		280,79
OXR20250130_NTN0340_BIO_032	Bryoza	Lace bryozoan	Whole specimen, ethanol, -20C		280,79
OXR20250130_CHR0539_BIO_001	Porifera	white/yellowish sponge	Ethanol, -20C	eDNA, ethanol, -20C	456,48
OXR20250130_CHR0539_BIO_002	Porifera	dark yellow sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,29
OXR20250130_CHR0539_BIO_003	Porifera	round white sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,26
OXR20250130_CHR0539_BIO_004	Octocorallia	big white nephthid soft coral	Ethanol, -20C	Barcode, ethanol, -20C	298,03
OXR20250130_CHR0539_BIO_005	Porifera	lollipop sponge	Ethanol, -20C	eDNA, ethanol, -20C	297,18

OXR20250130_CHR0539_BIO_006	Hexacorallia	purple folded cup coral	Ethanol, -20C		299,53
OXR20250130_CHR0539_BIO_007	Hexacorallia	dead cup coral	Whole speccimen, ethanol, -80C		299,53
OXR20250130_CHR0539_BIO_008	Mollusca	nudibranch	Whole specimen, ethanol, -20		300,29
OXR20250130_CHR0539_BIO_009	Octocorallia	yellow soft coral	Ethanol, -20C	Barcode, ethanol, -20C	300,29
OXR20250130_CHR0539_BIO_010	Octocorallia	small white nephthid soft coral	Whole specimen, ethanol, -20		300,26
OXR20250130_CHR0539_BIO_011	Hexacorallia	small white dendrophyllia	Whole speccimen, ethanol, -80C		300,26
OXR20250130_CHR0539_BIO_012	Porifera	yellow hairy sponge	Whole specimen, ethanol, -20		300,26
OXR20250130_CHR0539_BIO_013	Crustacea	2 x long arm squat lobster	Whole specimen, seawater, -20C		298,03
OXR20250130_CHR0539_BIO_014	Porifera	2 x sucker white sponge	Ethanol, -20C	eDNA, ethanol, -20C	300,26
OXR20250130_CHR0539_BIO_015	Tunicata	Transparent tunicate	Whole specimen, ethanol, -20		300,29
OXR20250130_CHR0540_BIO_001	Octocorallia	Seapen - Funiculina ?	Ethanol, -20C	Barcode, ethanol, -20C	2048,36
OXR20250130_CHR0540_BIO_002	Octocorallia	Umbellulla	Ethanol, -20C	Barcode, ethanol, -20C	1989,81
OXR20250130_CHR0540_BIO_003	Hexacorallia	purple cup coral	Lost during collection not in slurp box		1896,39
OXR20250130_CHR0540_BIO_004	Crinoidea	Stalked crinoid	Ethanol, -20C	Barcode, ethanol, -20C	1895,71
OXR20250130_CHR0540_BIO_005	Octocorallia	Chrysogorgia	Ethanol, -20C	Barcode, ethanol, -20C	1888,98
OXR20250130_CHR0540_BIO_006	Ophiuroidea	big ophiuroid	Whole specimen, ethanol, -20		1888,74
OXR20250130_CHR0540_BIO_007	Porifera	White glass sponge	Ethanol, -20C	eDNA, ethanol, -20C	1843,75
OXR20250130_CHR0540_BIO_008	Crustacea	Amphipod cf. Amathillopsis	Whole specimen, seawater, -20C		1844,67
OXR20250130_CHR0540_BIO_009	Porifera	Green sponge Latrunculiidae	Ethanol, -20C	eDNA, ethanol, -20C	1844,22
OXR20250130_CHR0540_BIO_010	Porifera	Tubular sponge	Ethanol, -20C	eDNA, ethanol, -20C	1598,18
OXR20250130_CHR0540_BIO_011	Annelida	Polychaeta	Whole specimen, ethanol, -20C		1843,75
OXR20250130_CHR0540_BIO_012	Octocorallia	Primoid octocoral ?	Ethanol, -20C	Barcode, ethanol, -20C	1844,67
OXR20250130_CHR0540_BIO_013	Crustacea	2 x small amphipods cf. Amathillopsis	Whole specimen, seawater, -20C		1844,67

Annexure B: List of all sediment samples collected during the research expedition including the unique identifier label allocated to each.

Unique ID	Description	Preservation	Depth (m)
OXR20250130_CHR535_SED_001	3 x sediment scoop	4% Formaldehyde	555.0
OXR20250130_NTN0339_SED_011	Sediment scoop	4% Formaldehyde	497.52
OXR20250130_CHR0536_SED_001	3 x sediment scoop	4% Formaldehyde	151.38
OXR20250130_CHR0536_SED_002	3 x sediment scoop	4% Formaldehyde	151.4
OXR20250130_CHR0537_SED_003	2 x sediment scoop	4% Formaldehyde	149.43
OXR20250130_NTN0340_SED_001	Sediment scoop from the base of small cave	4% Formaldehyde, eDNA	278.47
OXR20250130_NTN0340_SED_005	Sediment scoop	4% Formaldehyde, eDNA	130.37
OXR20250130_CHR0539_SED_001	Sediment scoop	4% Formaldehyde	461.35
OXR20250130_CHR0540_SED_001	0-2 cm (SED_001_1), 2-5 cm (SED_001_2)	4% Formaldehyde	2051.33
OXR20250130_CHR0540_SED_003	0-2 cm (SED_003_1)		2051.21
OXR20250130_CHR0540_SED_004	0-2 cm (SED_004_1), 2-5 cm (SED_004_2)	4% Formaldehyde	2051.25

Annexure C: In Situ and ex situ photographs of each specimen collected during the research expedition with allocated unique identifier labels.