

Cruise Report:

One Ocean Hub Capacity Development Cruise

East London 10 – 27 February 2023



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Citation: Citation: Adams L, Sink K, Dunga L, Shibe S, Oliver J, Segeng C, Forgus C, Sedick S, Malebatja M, Mateus N, Dube T (2023) One Ocean Hub Capacity Development Research Cruise Report, South Africa 10 – 27 February 2023.

Executive Summary

The One Ocean Hub Capacity Development Cruise aimed to build the offshore sampling capacity of emerging researchers from Southern Africa and develop the skills, relationships and multiple knowledge types to support developing ocean economies. The research cruise was designed to incorporate multiple disciplines in marine science to simultaneously collect complementing datasets to accomplish objectives across the fields of taxonomy, phylogeny, habitat, ecology, impacts, benefits and to support marine spatial planning for seafloor and pelagic habitats in the Eastern Cape. The cruise brought 10 emerging researchers together from five institutions, supported by three established scientists, building multi-disciplinary research relationships locally, using locally developed equipment aboard a local vessel and fostering a strong human capital and transformation agenda. The research cruise plan was co-developed for and by emerging researchers and led by an emerging researcher.

This report summarises the multidisciplinary field expeditions, conducted in February 2023. The team was based in East London but data was also collected during transit between Port Alfred and the East London Harbour. The Research Vessel Observer, a 15m legacy cat with twin Hamilton jet engines (2x 550HP inboards) was used to conduct offshore research. Sampling covered the area between -33.925 S 26.844 E and -33.873 S and 28.584 E. Of the 17 days of the expedition, 12 days were spent at sea. A total of 29 ROV stations (OOH001-OOH029), totalling more than 14 hours were completed in the 43 m to 230 m depth range. Of these, most were biodiversity surveys to support ecosystem description and mapping but four dives were dedicated to collections for eDNA, taxonomic, genetic and biodiscovery research. A total of 45 specimens were collected for biodiscovery and barcoding to support integrated taxonomic research. The cruise thus supported the SeaMap project funded by the NRF Foundational Biodiversity Programme and built capacity within two projects funded by the African Coelacanth Ecosystem Programme; Deep Connections and Agulhas Bank Connections. Eighteen CTD casts were strategically deployed on the East London shelf to resurvey established monitoring CTD lines and to understand the oceanography of the submarine canyon systems. Nine sediment samples were collected by cone dredge between 80-90 m deep with one opportunistically collected from one of the landers legs.

This survey extended depth capabilities by deploying deep sea landers fitted with Stereo-Baited Remote Underwater Video. The landers were deployed at ten stations between 230-1035 m for the first time in a high current environment on the East London slope. Building on previous efforts, four sponges were collected for natural product chemistry research at the Dorrington lab at Rhodes University. Many stations were to support MSc and PhD students including Sinothando Shibe at the University of KwaZulu-Natal, Mari-Lise Franken and Caroline Sejeng at the University of Cape Town and Jody Oliver from Rhodes University. All these students will benefit from the data collected. The first observations and collection of the cf. *Enallopsammia* cold water corals from the Gxulu Canyon will also support species distribution modelling for this taxon for which current capacity was under development through the team conducting research on Vulnerable Marine Ecosystems (VME). Interesting observations included deep observations of the south coast rock lobster *Palinurus gilchristi* at 230 m, dense seapen aggregations inside the Amathole Offshore marine protected area and diverse sponge dominated reefs along the submerged paleo-shoreline. Two dredges were conducted to collect specimens for SeaMap barcoding efforts. Targeted water and six sponge samples were

collected to support cutting edge molecular research for Jody's PhD. The observations from this cruise will support the developing reference image library that will be useful for future work analysing seabed imagery and can support future technological innovation such as the application of machine learning and artificial intelligence. Excellent imagery and video were collected by ROV and lander to support science engagement and communication work. Emerging science communicator Caiti Allison led the social media campaign for this research cruise. The research team utilised bad weather days to further transdisciplinary areas of work including the identification and mapping of Culturally Significant Areas and the identification of culturally important marine species. We took opportunity to visit outlets for imithi (traditional medicine), interact with traditional healers to understand the use of marine product in traditional medicine and ritual and to document indigenous knowledge in the region.



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Background

The One Ocean Hub project originally included an international cruise to sample seamounts and the deep slopes of South Africa among other potential sampling areas in Namibia and the high seas. Due to budget cuts and complications caused by the Covid 19 pandemic, this cruise was cancelled but an alternative arrangement was made for a shore-based dedicated capacity development cruise in South Africa. A team of 10 emerging researchers spanning five different institutions developed a plan for a smaller scale, emerging researcher led research cruise in collaboration with the African Coelacanth Ecosystem Program (ACEP). Two current ACEP projects were involved; ACEP Deep Connections (Principal Investigator (PI) Prof Kerry Sink) and ACEP Agulhas Bank Connections (PI Dr Natasha Karenyi). The emerging researchers were part of a working group developed through the Marine Ecosystem Committee convened by the South African National Biodiversity Institute (SANBI) and this group was co-ordinated by emerging researcher Mr Luther Adams from SANBI. This cruise was planned by early career researchers and emerging researchers to meet local needs as defined by students and early career researchers. This cruise was developed drawing from South Africa's recent insights into deep sea capacity development challenges and enablers (Sink et al. 2021) and also draws from recent and emerging publications that aim to advance more inclusive, accessible and equitable ocean research (Amon et al. 2022, Harden-Davies et al. 2022). Key principles include opportunities for underrepresented groups, clearly defined co-developed goals supporting self-identified needs, a safe and respectful working environment at sea and co-developed multi-disciplinary research plans that draw from previous experience and cater for identified barriers and enablers. It's envisaged that the cruise will support the development of more robust metrics that can track outcomes including quality and longevity of capacity development goals in the long term. ACEP are tracking capacity development and the use of research platforms provided.

The fieldwork component of the project builds on the exploration of the Amathole shelf by ROV from the ACEP Imida Frontiers and ACEP Deep Forests projects. This multidisciplinary research cruise brings together emerging researchers in the fields of fish and invertebrate ecology, oceanography, taxonomy, social science, science communication and traditional marine knowledge work to facilitate transdisciplinary knowledge exchange and build South Africa's capacity in offshore sampling techniques (Sink et al. 2021). This report summarises the dedicated Capacity Development research cruise designed, planned, led and undertaken by South African emerging researchers using Remotely Operated Vehicle (ROV), stereo baited lander, CTD and eDNA conducted in February 2023. The team was based in East London launching out of the Buffalo River mouth (the Port of East London). The RV Observer, a 15 m legacy cat with twin Hamilton jet engines (2x 550HP inboards) was used for sampling operations.

Study area:

The study area was the Southern continental shelf and slope of South Africa between Port Alfred and the Kei River mouth between 40 m and 1000 m deep. The continental shelf is narrow and terraced with defined submerged paleoshorelines. The shelf tapers in a north-easterly direction and is incised

by a series of submarine canyons with the Gxulu Canyon being the largest canyon feature in the study area. The swift moving Agulhas current, in a south-westerly direction, prevails in the offshore region.

Cruise objectives:

1. Capacity building

This expedition was focused on capacity building and transformation. One of the objectives of this fieldtrip was to provide opportunity for young professionals and students to gain skills and experience of at-sea field surveys, lead the day-to-day planning and collaboratively write this cruise report. In addition, targeted ROV collections of sponges for barcoding, eDNA and biodiscovery were planned.

2. Post graduate support

The second objective was to provide support for post-grad student in the form of:

- Nine targeted sediment sample collections in East London.
- Data acquisition (eDNA water and sponge samples)
- Oceanography data
- Coldwater coral observations or collections at Gxulu Canyon where temperature and multibeam data are available

3. Specimen collections for barcoding

The third objective was to support invertebrate specimen collection for the NRF-funded SeaMap project.

4. Support ecosystem and species research for the national biodiversity assessment

The fourth objective was to conduct ROV and stereo-BRUV landers surveys in support of the National Classification and Map of Marine Ecosystems to help advance this area of work. This map supports the spatial assessment of marine biodiversity and spatial planning to feed into national marine spatial planning processes and marine protected area expansion. This included the increase in information about the Amathole MPA and collect data that may be useful in terms of assessing the biodiversity assets within the MPA, management planning for the MPA and to inform future research and monitoring efforts. A key goal was to survey for seapen aggregations inside the Amathole MPA. Improving knowledge about canyon and mud habitat were also planned with an additional sub-goal of searching for coelacanths.

5. Specimen collections to support biodiscovery

The fifth objective was to support marine bio-discovery research and surveys for *Cephalodiscus gilchristi*. Collection of physical specimens of sponges and other fauna were planned for the fieldtrip. Rosie Dorrington's lab leads molecular taxonomic and bio-medical prospecting work in the Deep Forests project, while Kerry Sink was interested in collecting unidentified specimens to further taxonomic work. As such, certain species and unidentified taxa were targeted for collection. Collections using the ROV were done using its manipulator arm to grab a sample and retrieve it to the surface. Other fauna were collected using benthic sled (dredge) and sediment samples were collected using a cone dredge for sediment grain size and actinobacteria.

6. Science communication

The sixth objective was to create press releases and generate media around the research cruise.

7. Culturally Significant Area (CSA) and species research

The final objective was to build on the research on Culturally Significant Areas (CSA) and the use of marine species in medicine and ritual in South Africa.

Participants

Full name, acronym and affiliation per participant are provided. The cruise provided opportunities for eleven emerging researchers from 10 institutes with five different institutions collaborating in the research. Sampling was also conducted for a further student who was not able to participate in the Cruise Mari-Lise Franken (ML, University of Cape Town and South African National Biodiversity Institute). Luther Adams (LA, South African National Biodiversity Institute), Sinothando Shibe (SS, University of Kwa-Zulu Natal), Jody-Carynn Oliver (JO, Rhodes University), Juan-Jacques Forgas (JF, South African Environmental Observation Network), Safiyya Sedick (SS, South African Environmental Observation Network), Matsobane Malebatja (MM, South African Institute for Aquatic Biodiversity), Thembelihle Dube (TD, Rhodes University and South African Institute for Aquatic Biodiversity), Caroline Sejeng* (CS, University of Cape Town and Cape Peninsula University of Technology), Ndamonoghenda Mateus* (NM, University of Cape Town), Loyiso Dunga* (LD, Parley and South African National Biodiversity Institute), Caitlin Allison* (CA, Rhodes University MSc student and Blue Purpose). Emerging researchers were supported by Kerry Sink (KS, South African National Biodiversity Institute and Nelson Mandela University), Ryan Palmer (RP), Koos Smith & Ferdinand Jacobs (FJ) (all from African Coelacanth Ecosystem Programme/ South African Institute for Aquatic Biodiversity), and Anthony Bernard (AB, South African Institute for Aquatic Biodiversity).

[Second leg participants*]

Equipment and roles

Luther Adams was the chief scientist supported by Kerry Sink- the principal investigator and Ryan Palmer- ACEP manager, SAIAB platform manager and ROV pilot. The SAIAB vessel, RV Observer, skippered by Koos Smith. Ryan Palmer assisted with footage and sample data management. Sinothando Shibe, a UKZN MSc student was conducting research on soft sediment epifauna and the drivers of these communities including the potential role of submarine canyons.

The SAIAB SAAB Seaeye Falcon 12177 ROV was the main tool used to investigate seafloor habitats, biota and collect samples for taxonomic and molecular analyses. The ROV has a depth rating of 300 m. Operating off the RV Observer, which has dynamic positioning abilities, the ROV was used with a 50 m tether connected to a clump weight that was suspended 5-10 m off the seafloor. When the jet anchor was deployed, the ROV can move in a radius of just under 50 m. It requires relatively calm conditions to deploy and retrieve from the vessel and cannot operate in very strong currents (>3 knots). The footage collected includes high-definition video and 12MP stills through a 37 mm lens. Still images to characterise the seafloor have been traditionally taken by 'parking' the ROV on the seafloor and rotating the camera lens to 45 degrees downwards from the horizontal before taking the image. Video was recorded for the entire dive, while stills were taken on demand. New software (Digital Edge) was used to record and annotate video footage of the surface screen in the cabin of the vessel, which overlays the meta-data, such as depth, heading, time and camera angle.

Dr Anthony Bernard, an instrument scientist from SAIAB, also supported the chief scientist and developed three Stereo-BRUV landers that were used to sample the study area in a stratified design 300 m, 600 m and 900 m. The landers, rated to 950 m, were each equipped with two GoPro cameras and two LED lights setup in a stereo configuration. This allowed for accurate measurements of fish and other biota. A 50kg railway section was attached to an acoustic release mechanism and a magnesium weak link in the event the acoustic release malfunctions. Four high density buoyancy floats were attached to the frame to keep the lander in an upright position and enables the system to float to the surface once released from the seabed. The landers were also equipped with radio and satellite tracking beacons for relocation with a 5km radius. The satellite beacon was primarily used when the system was beyond the range of the radio beacon.

Molecular samples were preserved using DNA barcoding kits and the taxonomic samples were preserved using methods relevant to the taxon (ethanol, formalin and freezing). Samples collected for biodiscovery were fixed in RNAlater. The SAIAB CTD, a SeaBird SBE19plusV2 was used to collect oceanographic data. The SAIAB cone dredge and benthic sled were used to collect sediment and epifauna samples, respectively.

Inventory of activities and samples achieved

During the 17 days spent on this expedition, the team spent 12 days at sea (four days lost due to wind or swell) (Table 1) and conducted 29 ROV dives in the 53 m to 230 m depth range, 10 Stereo-BRUV landers at 300 m, 600 m and 900 m (Tables 1 and 2), and 18 CTD casts (Table 3). Of the 29 ROV dives, most were biodiversity surveys to support ecosystem description and mapping but 4 dives were dedicated to collections for taxonomic, genetic and biodiscovery research (Table 4a-b). In total, two dredges were conducted to collect low relief reef benthos (Table 5a-b). A total of 45 specimen were collected. Nine actinobacteria sediment samples were collected for SeaMap (Table 6)

Table 1. Overview of survey activities during the 2023 OOH Capacity Development Cruise. Main objectives relate to fish (including potential coelacanth) surveys, ecosystem and habitat surveys, detecting Vulnerable Marine Ecosystems and building the data for a more data-informed national map of marine ecosystem types. The surveys included site verification, biodiscovery, taxonomic reference images and associated collections.

Date	Stations	Instruments	Objectives
10 February	OOH001 OOH002 OOH003 OOH004	ROV, cone dredge	Port Alfred deep reef exploration from known and opportunistic reef marks
11 February	OOH005 OOH006 OOH007 OOH008 OOH009 OOH010	ROV,	Deep reefs inshore of Gxulu exploration deep reef exploration from known and opportunistic reef marks
12 February	OOH011 OOH012 OOH013 OOH014	ROV, cone dredge	Soft sediment surveys and collection for Shibe MSc at DFR039. Survey to ascertain sea pen distribution in surrounding area
13 February			In port to refuel, restock food supplies and arrival of all 1 st leg participants

Date	Stations	Instruments	Objectives
14 February	OOH015 OOH016 OOH017 OOH018 OOH019	ROV, niskin	Three water and complementing sponge replicates for eDNA collected on MBES_12 Multibeam from marks provided by Andrew Green.
15 February	OOH020 OOH021 OOH022 CAP_01	ROV, Stereo-BRUV lander	Explore Gxulu Canyon using baited landers at 300m. Water and sponge collections using ROV and manipulator arm.
16 February			On shore due to weather
17 February	CAP_02 CAP_03 CAP_04	Stereo-BRUV lander	Explore the Ncera line using Stereo-BRUV lander
18 February	OOH023 CAP_05 CAP_06 CAP_07	ROV, Stereo-BRUV lander	Explore the Kei line inside the restricted zone of the Amathole MPA using Stereo-BRUV lander and ROV
19 February	OOH024 OOH025 CAP_08 CAP_09 CAP_10	ROV, Stereo-BRUV lander	Explore the Cintsa line inside the Amathole restricted zone of the MPA using Stereo-BRUV lander and ROV
20 February			On shore due to weather
21 February			On shore due to weather. Leg 1 and leg 2 participant changeover.
22 February	OOH026 OOH027	ROV	Explore the Ncera canyon and Buffalo multibeam
23 February	OOH-D-001 OOH-D-002	Dredge	Collect benthic fauna using a dredge
24 February	OOH028 OOH029	ROV, CTD	Collect water and sponge samples at Goosen Superbowl and explore the Gxulu Canyon. CTD line at the Gxulu Canyon
25 February			On shore due to weather
26 February			Deployed CTD at Sable Cops
27 February			End of expedition

Table 2: Site descriptions and field notes for the 29 stations sampled by ROV (OOH001-OOH0029) and ten stations sampled by lander (OOH_CAP_01-OOH_CAP_10).

Station ID	Site name	Depth (m)	Bottom Temp	Salinity	Site observations and collections
OOH001	Kenton Whips	84-86	13	35.28	High relief rocky reef dominated by sea whips and seafans. Sponges present but not dominant. Black coral and <i>Petrus rupestris</i> present. [Twilight]
OOH002	Kenton Fans	75-76	13.2		High relief rocky reef dominated by seafans, whips, pink lace corals <i>Errina capensis</i> . Diverse assemblage of ascidians present. <i>Tethya</i> sponge, Gilchrist's urchin and south coast rock lobster present. [Dark]
OOH003	Port Alfred Mud Clumps	63	11.5	35.12	Muddy with mud clumps. <i>Actinoptilum molle</i> seapens, gurnards and squid present. Surface covered with ~10% bivalve shells

Station ID	Site name	Depth (m)	Bottom Temp	Salinity	Site observations and collections
OOH004	Port Alfred Beige	69	11.3		Low relief reef covered in sandy mud sediment with <i>Homophyton verrucosum</i> , some encrusted by yellow sponges. <i>Schizammia</i> forams, <i>Astropecten irregularis pontopureus</i> , basket and feather stars present. Multi-finger yellow soft coral present.
OOH005	Shwele-Shwele Cerianthids	72	10	35.01	Flat muddy sand. High density of cerianthids. <i>Pteroides</i> , <i>A molle</i> , <i>Mursia</i> crabs, basket and feather stars present.
OOH006	Gxulu TFR	100	9.5		Moderate relief reef covered in <i>Thouarella</i> and pale pore plated bryozoan. Galaxy spotted catshark cf. <i>Haploblepharus</i> , rock lobster and goldies <i>Callanthias legras</i> present.
OOH007	Gxulu Cups	102	8.9		Flat current swept coarse sand-shell hash and ripples. Clown cup corals present. Gurnards, pycnigonid, <i>Mursia</i> and <i>Calliaster baccatus</i> .
OOH008	Gxulu Panga	106-107	8.7	34.94	Low relief reef mosaic with yellow seafans, <i>Cladopsamnia</i> , one galaxy seapen, goldies, rock lobster, jacobever and purple soft coral. Lots of panga present.
OOH009	Sable Cops (IFR31)	78	15	35.43	Moderate relief reef covered in purple and yellow gorgonians, concentric ribbon sponge, Arnold's bell ascidians and <i>Flustramorpha</i> .
OOH010	Winterstrand Dune	79-81	13.6	35.37	Ten metre high, current scoured dune system. The surface sediment seemed compacted and coarse with ~80 % bivalve shell coverage. Benthic foram, <i>Schizammia</i> , abundant, bioturbation holes, gurnards, cup corals and <i>A molle</i> .
OOH011	Kidd's Gap	92	16		Flat coarse sand. Martha startfish, hermit crab, <i>C baccatus</i> . Small white glass sponge. Strange turnip-shaped sponge, ascidian or anemone?
OOH012	Gxulu Seapens	75	9.7	35.04	Dense <i>Pteroides</i> aggregations inside the Amathole MPA. Lots of brittle stars, <i>Luidia sarsi</i> , sea cucumber.
OOH013	Gxulu Gloom	60-61			Mixed reef sight with <i>Homophyton verrucosum</i> , <i>A. molle</i> , green spot sponge. Low visibility.
OOH014	Gxulu Turbid	54	13.5	35.04	Mixed reef, orange sponge covered seafans with <i>Homophyton verrucosum</i> covered in sponge. Sponge diversity higher than seafans.
OOH015	Buffalo Crystal	76-78	17	35.48	Moderate relief mixed reef with crystal clear water. High sponge diversity with some purple and yellow gorgonians and seawhips. <i>Polysteganus undulosus</i> . <i>Errina capensis</i>
OOH016	Buffalo Breams	77-78	17.1	33.5	Landward facing paleo-shorelines with high sponge diversity. High abundance of purple and yellow gorgonians too. High sponge diversity and density with many of large <i>Polysteganus undulosus</i> and other seabreams. Sponges were collected for eDNA, biodiscovery and taxonomy. Many sunset seafans, white and orange sea whips, government sponges, <i>Lithochela conica</i> , sponge covered <i>Homophyton verrucosum</i> , <i>Topsentia</i> , Chicken bone sponge, Urn ascidians, dark brown <i>Aspidistoma</i> bryozoan, Green superbowl sponge with white and black speckled seaslugs, <i>Echinoclathria dichotoma</i> tree sponge, <i>Didemnum</i> encrusting urchins, green bryozoan that form a mass of branches resembling coral.
OOH017	Buffalo Breams	79-78	17	33.5	
OOH018	Buffalo Breams	78-79	17	33.5	
OOH019	Buffalo Breams	78-80	17	33.5	
OOH020	Goosens Superbowl	53	15.9	35.42	Attempted to revisit high relief reef site but visibility was less than 1m. <i>Homophyton verrucosum</i> , sponges and bryozoans present.
OOH021	Gxulu Dunes	77-81	14.6	35.4	Low dune feature with silty sand on the surface with 3d bedforms. <i>Astropecten irregularis pontopureus</i> , white and red

Station ID	Site name	Depth (m)	Bottom Temp	Salinity	Site observations and collections
					soft coral, cone shell, long worm on surface with slime trail makes me think it's an unusually long nudibranch.
OOH022	Igoda Seapens	72-72	14.8	35.32	Low visibility. Site covered in a thick veneer of silt and mud over <i>Schizammia</i> and potentially a single <i>Pteroides</i> seapen.
OOH023	Kei Corallines	43	17	35.46	Could not reach the bottom due to current. Low relief mixed reef with coralline and foliose algal cover. Many <i>Polysteganus undulosus</i> and a couple of <i>Seriola lanlandi</i> .
OOH024	Cintsa Blow	87-91	16.6	35.5	Could not reach the bottom due to current. Coarse sand with coarser rocky rubble sparsely covered in erect sponges
OOH025	Cintsa West Blow	80	16.1	35.47	Low visibility. Site covered in a thick veneer of silt and mud. <i>Virgularia</i>
OOH026	Buffalo Angel	79-80	16.5	35.46	Low relief reef with high sponge diversity. Very few small seafans. Sunset seafan, Arnold sponge, milk bottle sponge, coralline algae on rocks, angelshark, gurnard.
OOH027	KweleraRoo	92-89	16.3	35.47	Coarse sand and shell hash with rocky outcrops covered in sponges. FL fish and Arnold sponge.
OOH028	Goosen's overhangs	66-65	NA	NA	Coarse sandy bottom with zero visibility.
OOH029	(Marge) Gxulu	188-230	9	35.04	Flat silty sea bottom, with bioturbation. Many small shrimp in the water column. Large solitary cup corals, thin white sea whips (cf <i>Vimnella</i> sp.) scattered on rocky outcrops. Jacopever present. Dead <i>Desmophyllum</i> fragment collected. Deep sea rock lobsters under rounded flat boulders. Many thin white sea whips, elongated <i>Thouarella</i> thistle corals, <i>Ennolapsomnia</i> CWC with pale peach basket stars <i>Astrothorax waitei</i> attached, peach cup corals of varying sizes attached to the side of flat boulders. Looks similar to the size trawled up on the Agulhas bank AFR303 T026 (Ask Luther Adams for image). Orange right angled corals <i>Cladopsammia</i> , <i>Echinus gilchristi</i> also observed, squat lobster under a rock, a single <i>Callanthias</i> cf. <i>legras</i> , lantern fish, mottled brown and white goby also noted in Deep forest expedition. Evidence of kelp export to the deep sea with a frond observed on the seabed. A pale, light peach <i>Lophaster quadrispinus</i> sea star, <i>Anthomastus giganteus</i> , pale orange <i>Didemnum</i> were also observed.
OOH-CAP_01	Gxulu Shallow	312	9	NA	Silty bottom. Many Jacopever and many hagfish. Lots of shrimp and krill in the water column. One squid and two multiple Wreckfish. Short deployment due to bad weather
OOH-CAP_02	Ncera Deep	950	NA	NA	Silty bottom. First fish was an Eel in the distance attracted to the light then swam away. High-fin rat tail, small hatchet fish, <i>Chaceon macphersoni</i> , <i>Merluccius paradoxus</i> deep-water hake, large white prawn with golden eye and long upturned red rostrum, red legs and red underside, a pair of <i>Lithodes ferox</i> . Right at the end of the deployment a long slender fish, possibly a smelt with pointed shovel-like head, pronounced forked tailfin with black band on each finlet (cf. <i>Notocanthus</i>) was observed.
OOH-CAP_03	Ncera Mid	700	NA	NA	Hard ground, high relief terraces. Numerous thin spiral whip corals, silt covered bottom. Mating <i>Chaceon macphersoni</i> were the first to arrive, squat lobster, unmistakably <i>Projasus parkeri</i> Cape jagged lobster with smooth carapace and jagged rows of spines, small orange crab with pronounced right claw.

Station ID	Site name	Depth (m)	Bottom Temp	Salinity	Site observations and collections
					Jacopever, big eye, eel, Big eye with frilled fins, <i>Squalus</i> , hagfish. Jacopever ambush attack on hagfish and regrets it with a mouth full of slime 11:30 on video (10).
OOH-CAP_04	Ncera Shallow	260	NA	NA	Coarse sandy bottom with lots of shell hash. A single seapen in the frame. Strong current with many small and many large <i>Squalus</i> swimming around. The smaller of the two has a black tip on the dorsal fin. Up to ten small cf. puffadder sharks in the frame, two <i>Palinurus gilchristi</i> South Coast rock lobster, squid, <i>Scyllarides elisabethae</i> Slipper lobster, a single jacopever.
OOH-CAP_05	Kei Shallow	300	NA	NA	Gravel, coral rubble and shell hash with some coarse sand. Numerous cup corals and one cf. <i>Tethya</i> sponge that rolled across the frame over several hours and as the current picked up. Multiple transparent seapens cf, <i>Virgularia</i> . Many Jacopever present with juveniles observed. <i>Squalus</i> with pronounced spines, wreckfish. Lander tilted forward until it was propped up on the bait canister due to increased current speed. Dark blue-grey crab with pale legs and smooth carapace, large robust claws. A number of Puffadder catsharks with almost uniform white spots on dorsal surface arrived at the end of the deployment.
OOH-CAP_06	Kei Mid	630	NA	NA	Soft sediment with bioturbation and a number of stalked tulip sponges. Cf. Lancet fish was the first vertebrate observed. Krill in water column. Brilliant red prawn swimming in water column, many hagfish, eel with fins of dorsal only and smelt-like fish with a flat head, many Jacopever, big eye with frilled fins, rat tail. Interesting jellyfish 07:30 video (7). Three <i>Lithodes ferox</i> , high fin rat tail, a single <i>Chaceon macphersoni</i> .
OOH-CAP_07	Kei Deep	970	NA	NA	Soft sediment with bioturbation. Black fish with reflective eye in the distance has been on the seabed since lander touched the bottom and moved away an hour later. Long tailed rat tail with pointed dorsal fin. This fish was different to all the others observed. Pelagic prawn with candy cane long antenna 3 times length of body. Brilliant red pelagic prawn swimming with rostrum as long as body. Rat tail with rounded dorsal fin, eel, multiple <i>Chaceon macphersoni</i> , peculiar eel again that looks like a ling, deep water dark <i>Squalus</i> -like shark, high fin rat tail, many golden eye prawn, hake-like fish looks very pregnant. Two <i>Lithodes ferox</i> ,
OOH-CAP_08	Cintsa Deep	1035	NA	NA	Flat sandy bottom with some bedform/topography. Dumbo octopus was the first organism in the observed and left the seabed once the sediment had settled. The first fish was a cut-throat eel. <i>Chaceon macphersoni</i> , tiny eel, shovel-nose rat-tail with rounded dorsal fin, black sharks (cf <i>Etmopterus</i>) of various sizes. Rat tail with long dorsal fin. Stalked barnacle covered <i>Chaceon chuni</i> with distinct black mottled colouration. Large red prawn with golden reflective eye, long rostrum and white pereopods (cf. <i>Plesionika martia</i>), <i>Lithodes ferox</i> observed near the end of the deployment.
OOH-CAP_09	Cintsa Mid	600	NA	NA	Coarse sand with small dark pebbles dotted on the seabed. Short white sea whips scattered on seabed. Many Jacopever, puffadder and leopard catshark, <i>Squalus</i> with white fringes on

Station ID	Site name	Depth (m)	Bottom Temp	Salinity	Site observations and collections
					tailfin, multiple <i>Chaceon macphersoni</i> with distinct white pereopods with orange tips fighting for access to bait canister, unidentified small stingray, bronze cat shark with large stoat head (larger than <i>Squalus</i>) and three to four dark bars on dorsal and lateral surface. All other sharks disappeared from the frame once this one arrived. Puffadder shy shark with almost uniform white spots of dorsal surface. Dark grey ray with large dark spots of dorsal surface used ventral fins as “feet” to walk across seabed. <i>Chaceon chuni</i> with distinct black mottled colouration. <i>Lithodes ferox</i> arrived near the end of the deployment.
OOH-CAP_10	Cintsa Shallow	210	NA	NA	Flat, current scoured coarse sand with shell fragments. Soft coral or anemone with long purple tentacles visible in frame. Current strong; evident on video. <i>Squalus</i> shark first to appear, <i>Daranus arrosor</i> hermit crab near the end of the 8h. <i>Squalus acanthias</i> with white spots on dorsal surface at the end of deployment.

Table 3. CTD stations on the Amathole Shelf as part of the One Ocean Hub Capacity Development Cruise

Line	Date	Time	CTD	Depth (m)	Lat (DD)	Lon (DD)
Ncera	17/02/2023	09:24	CTD01	77	-33.164333	27.990983
Kwelera	22/02/2023	08:47	CTD02	95	-32.9838	28.1505
Kwelera	22/02/2023	09:22	CTD03	238	-33.080800	28.241967
Kwelera	22/02/2023	11:08	CTD04	90	-33.0377	28.2035
Kwelera	22/02/2023	11:36	CTD 05	52	-32.927900	28.099317
Kwelera	22/02/2023	11:50	CTD06	24	-32.915750	28.099683
Buffalo	23/02/2023	11:48	CTD07	82	-33.120967	27.958633
Buffalo	23/02/2023	06:10	CTD08	102	-33.222033	28.016417
Buffalo	23/02/2023	06:30	CTD09	210	-33.230517	28.048167
Buffalo	23/02/2023	09:51	CTD10	67	-33.058667	27.923983
Buffalo	23/02/2023	10:02	CTD11	26	-33.0461111	27.925850
Gxulu	24/02/2023	10:18	CTD12	64	-33.298150	27.866767
Gxulu	24/02/2023	10:55	CTD13	213	-33.298267	27.869367
Gxulu	24/02/2023	11:47	CTD14	100	-33.265750	27.840300
Gxulu	24/02/2023	12:12	CTD15	80	-33.222767	27.798017
Gxulu	24/02/2023	12:34	CTD16	55	-33.164850	27.757383
Gxulu	24/02/2023	12:50	CTD17	26	-33.131783	27.754817
Buffalo	26/02/2023	05:54	CTD18	77	-33.164	27.99143

Table 4a. Invertebrate collections for biodiscovery for Rosie Dorrington. Samples were collected using the ROV manipulator arm.

Sample Collection ID	Station	Date	Latitude (DD)	Longitude (DD)	Depth (m)	Common name
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TIC2023-001	OOH017	14/02/2023	-33,159583	27,994817	78	Lava sponge
TIC2023-002	OOH018	14/02/2023	-33,159500	27,994767	79	Chicken bone sponge
TIC2023-003	OOH018	14/02/2023	-33,159500	27,994767	79	Beige foam sponge
TIC2023-004	OOH019	14/02/2023	-33,159550	27,994733	80	Milk bottle sponge

Table 4b. Invertebrate collections for eDNA metabarcoding for Jody Oliver’s PhD thesis. Samples were collected using the ROV manipulator arm.

Sample Collection ID	Station	Date	Depth (m)	Common name
OOH017_SP1	OOH017	14/02/2023	78	Lava sponge
OOH018_SP2	OOH018	14/02/2023	79	Chicken bone sponge
OOH018_SP3	OOH018	14/02/2023	79	Beige foam sponge
OOH018_SP4	OOH018	14/02/2023	79	Milk bottle sponge
OOH019_SP5	OOH019	14/02/2023	80	NA
OOH029_SP6	OOH029	24/02/2023	230	NA

Table 5a. Invertebrate collections for SeaMap DNA barcoding. Samples were collected using benthic sled on 2023/02/23 at 83 m OOH-D-001.

ID	Common name	Scientific Name	No. of individuals	Institution destination
1	NA	<i>Errina capensis</i>	1	SANBI
2	NA	<i>Vimnella sp</i> (white)	1	SANBI
3	NA	<i>Homophyton verrucosum</i>	2	SANBI/SAIAB
4	Purple soft coral	NA		SANBI
5	Unidentified Soft Coral A	NA		SANBI
6	Melithid (Yellow)	NA		SANBI
7	Leptogorgia (Sunset)	NA		SANBI
8	NA	<i>Vimnella sp</i> (red)		SANBI
9	NA	<i>Lithochela conica</i>		SANBI
10	Magenta octocoral on L. conica	NA		SANBI
11	NA	<i>Isodictya multiformis</i> (on <i>Leptogorgia</i>)		SAIAB
12	NA	<i>Echinoclathria dichotoma</i>	1	SAIAB
13	NA	<i>Styella sp</i>	2	SAIAB
14	NA	<i>Atriohium sp</i>	5	SAIAB
15	NA	<i>Aplidiopsis tubiferus</i>	1	SAIAB
16	Yellow finger sponge cf. sp	NA	2	SAIAB
17	NA	<i>Aspidostoma</i> (Dark)	1	SAIAB
18	Magenta bryozoan	NA		SAIAB
19	NA	<i>Ceratopsian microxephora</i>	4	SAIAB
20	NA	<i>Bubaris amatholensis</i>	1	SAIAB
21	Dusky pink crumpled sponge	NA	1	SAIAB
22	NA	<i>Isodictya sp.</i>	2	SAIAB
23	NA	<i>Adeonella sp.</i>		SAIAB
24	NA	<i>Securiflustra sp.</i>		SAIAB

ID	Common name	Scientific Name	No. of individuals	Institution destination
25	NA	<i>Mursia sp.</i>		SAIAB
26	Concentric sponge	NA		SAIAB
27	Toilet sponge	NA		SAIAB
28	Unidentified crab A	NA		SAIAB/SANBI
29	NA	<i>Clathrina sp.</i>		SAIAB
30	NA	<i>Guitarra flamenca</i>		SAIAB

Table 5b. Invertebrate collections for DNA barcoding. Samples were collected using benthic sled on 2023/02/23 at 86 m OOH-D-002.

ID	Common name	Scientific Name	No. of individuals	Institution destination
1	Red hydrocoral	<i>Errina capensis</i>	2	SAIAB
2	NA	<i>Tethya sp.</i>	NA	SAIAB
3	NA	<i>Turitella sp</i>	NA	SAIAB
4	Hedgehog sponge	NA	NA	SAIAB
5	Sticky <i>Tethya</i>	<i>Tethya</i>	NA	SAIAB
6	Squat lobster	<i>Munida sp</i>	NA	SAIAB
7	Ribbed Lamp shell	<i>Megerlina capensis</i>	NA	SAIAB
2	White sea whip	<i>Vimnella sp (white)</i>	1	SANBI

Table 6. Sediment collections for grain size analysis for Sinothando's research and for Actinobacteria metabarcoding for SeaMap. Samples were collected using cone dredge. *Sediment samples opportunistically collected from the legs of the Stereo-BRUV lander.

Sample #	Station	Date	Depth (m)	Lat (DD)	Lon (DD)
1*	OOH-029 OOH-CAP_01*	24/02/23	319	-33,297967	27,536183
2	OOH-025	19/02/23	79	-32,895	28,166017
3	R64	15/02/23	85,7	-33,29713	27,67282
4	OOH-27	22/02/23	75	-32,98365	28,150683
5	OOH-21 (DFR-083-R63)	15/02/23	75	-33,2642	27,70145
6	R97	19/02/23	88	-32,86528	28,29083
7	OOH-024	19/02/23	90	-32,93115	28,2632
8	DFR-044	15/02/23	62,9	-33,2828	27,58837
9	OOH-D-002	23/02/23	83	-33,129067	27,950083

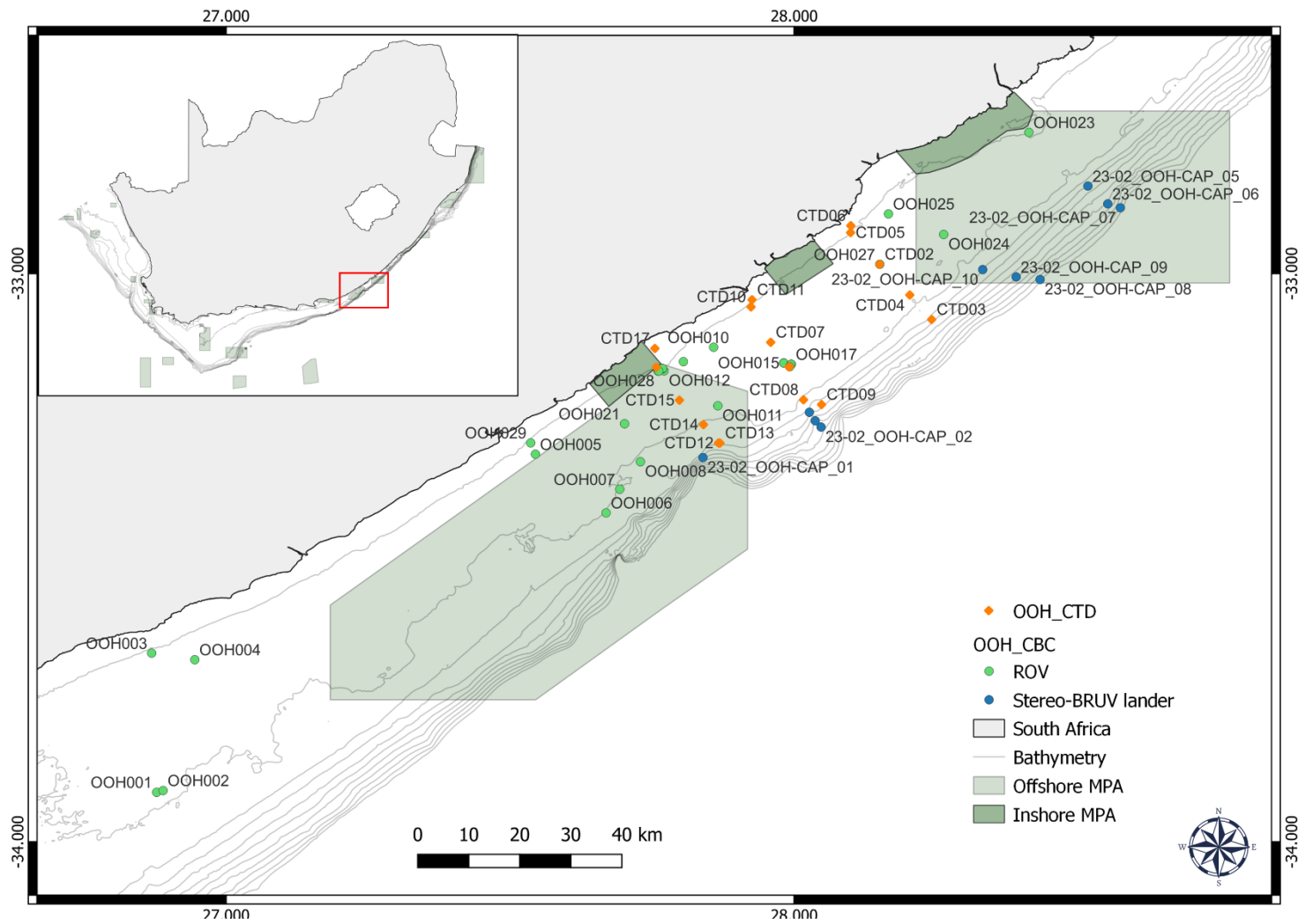


Figure 1. Overview of locations sampled on the East London shelf and slope of South Africa during the One Ocean Hub capacity development research cruise February 2023. Map by Luther Adams

Progress against cruise objectives

1. Capacity building

The first objective of this research cruise was to develop the capacity of Southern African emerging researchers and build new multi-disciplinary research teams in the longer term. The research cruise was divided into two legs to complete a number of objectives under this aim. This gave all 10 young professionals equal opportunity to gain experience using the various offshore sampling gear and to facilitate knowledge sharing, engage in discourse around common interests, and broaden understanding of other fields in marine science. Luther Adams acquired experience as a chief scientist and all participants were involved in cruise planning with the sampling design for most components led by emerging researchers. As such, all participants gained experience in cruise planning and logistics. Additionally, a multi-disciplinary research relationship was conceptualized by Jody and Sinothando through a peer-to-peer training opportunity. This idea was later supported by Prof. Kerry Sink with financial support from the One Ocean Hub. As a result, Sinothando received training from Jody in molecular research techniques at SAIAB. DNA barcoding results generated from the training will contribute towards the SeaMap project.



Plate 1: Emerging researchers learning the ropes of various offshore sampling techniques. [From top left] Juan-Jacques Forgas deploying a benthic sled with guidance from Ryan Palmer and Ferdy Jacobs. Jody Oliver and Ndamonda Mateus decanting eDNA water samples collected from Niskin bottles attached to the ROV. Matsobane and Thembelihle learning how to operate the acoustic release and satellite tracking beacon on the Stero-BRUV landers from Dr Anthony Bernard. Sinothando Shibe collecting sediment samples using a cone dredge. Juan-Jacques Forgas collecting a *Lophelia* fragment using the ROV manipulator arm with guidance from Prof Kerry Sink and Ryan palmer. Safiyya Sedick and Luther Adams cataloguing and preserving reef invertebrates collected by benthic sled for DNA barcoding. Matsobane configuring the cameras and lights on the Stereo-BRUV landers with guidance from Dr Anthony Bernard.

2. Post graduate support

This second objective of this research cruise was to support post graduate research projects of four students. Targeted water and sponge samples for eDNA work were collected to support Jody's PhD research. Only 1/3 of the priority areas we planned to collect samples were successful. Strong currents



(3 knots on average, peaking at 7 knots) were endured throughout the research cruise and prevented collections in the Gxulu Canyon, and off the Kei River mouth. An additional site inshore of the Gxulu Canyon was attempted thrice but flooding of rivers upstream of the current caused poor visibility so sampling was impossible. Caroline Sejeng's PhD thesis was supported by the strategic collection of CTD data along active monitoring lines, around the Gxulu Canyon and where data gaps were present. A portion of these CTD casts also supported Mari-Lise Franken's PhD research on Vulnerable Marine Ecosystems. Sinothando Shibe's MSc thesis was supported by the collection of all nine sediment samples at sites where she had analysed the ROV imagery and defined soft sediment benthic communities in the region.

Plate 2: Sinothando Shibe collecting sediment samples to ascertain sediment grain size to support her MSc thesis.

3. Specimen collections for barcoding

The third objective was to collect hard ground specimen to support barcoding efforts for the NRF funded SeaMap project. A total of 45 invertebrate specimens were collected and preserved using ROV [n=6] and benthic [n=39] sled to support SANBI's contributions to the SeaMap project's barcoding efforts (Tables 5a-b). Nine sediment samples were opportunistically collected for Actinobacteria metabarcoding to further support the SeaMap Project.



Plate 3: Reef invertebrates collected by benthic sled from 80 m deep on a low relief reef on the East London shelf.

4. Support ecosystem and species research for the national biodiversity assessment

The fourth objective was to conduct visual surveys of fish and invertebrates to support ecosystem classification. Remotely Operated Vehicle (ROV) was the primary tool used. In total 29 ROV deployments were conducted between 43-230 m depth. Four sites were surveyed offshore of Port Alfred. They yielded an undocumented mud habitat, potentially orthogenic, and reef habitats which compliments and grows the coverage of visual surveys in the region. We also surveyed Gxulu Dunes for the third time, first was in 2017 (IMD063) during the Imida Frontiers Project, the second was in 2019 (DFR083) in the Deep Forest project. Other noteworthy discoveries include dense aggregations of sea pens inside the Amathole MPA; dense cerianthid aggregations offshore of the Shwele-Shwele estuary; a 10m high current swept dune feature which has inspired further research by marine geologists familiar with this region; we ground-truthed paleo shorelines from multibeam bathymetry data; observed large aggregations of large *Polysteganus undulosus* in the Restricted Zone of the Amathole Offshore MPA off the Kei River mouth and encrusting coralline algae on reefs down to 90 m. Part of this objective was to pilot deep-sea lander deployments in the swift current conditions. This was pioneered by Anthony Bernard and his team from SAIAB. A total of 10 Stereo-BRUV lander between 250-1053 m.



Plate 4: [From top] Discovery of dense aggregations of *Pteroides* seapens inside the Gxulu section of the Amathole Offshore MPA. Paleo-shoreline reef structure offshore of the Buffalo River mouth with large threatened seabream species such as the *Petrus rupestris* and *Polysteganus undulosus*.



Plate 5: Photographs of Stereo-BRUV landers inside the Gxulu Canyon in the Amathole Offshore MPA. [From Jacopever, wreckfish, *Squalus* sharks, rat tails, *Lithodes* stone crabs, hagfish, deep water rock lobster (cf. *Projasus* or *Palinurus gilchristi*) *Chaceon chuni* crabs.

5. Specimen collections to support biodiscovery

The fifth objective was to collect sponges and conduct surveys for *Cephalodiscus gilchristi* for biodiscovery research. Targeted collections by ROV yielded four sponges of potential biodiscovery importance (Table 4b). High resolution in-situ photos of each sponge were taken before collection, photographed according to the BOLD protocol, a subsample was fixed in RNAlater and the rest of the specimen was placed in a ziplock bag and frozen at -20°C (Plate). Twenty-nine sites were surveyed and did not yield the agar animal. Any effort to survey potential *Cephalodiscus gilchristi* sites earmarked during the planning phase we halted by strong currents and/or poor visibility.



Plate 6: Side by side photographs of in situ sponge specimens for biodiscovery research and eDNA metabarcoding. [From top left] Lava sponge, beige foam sponge, chicken bone sponge and milk bottle sponge.

6. Science communication

The sixth objective of the research cruise was to generate media around this project. Four press releases were issued and online coverage from news publishers on the research cruise totalled to more than 2 million unique online engagements (Annexure 1 and 2). This excludes social media posts by Kerry Sink, Mzantseba, Luther Adams on Twitter, Instagram and Linked-in. The media campaign was initiated with press releases that introduced the expedition intentions of research cruise to the public and profiled the chief scientist, Luther Adams (Annexure 1). This garnered much attention and led to a radio interview on Voice of the Cape 91.3 with 190 000 local listeners (Annexure 1). Overall, the media campaign was successful and would have amounted to R 510 544.88 or £ 226 469.73.

7. Culturally Significant Area (CSA) and species research

The final objective was to build on the research on Culturally Significant Areas (CSA) and the use of marine species in medicine and ritual. The first part was to explore and recognize the deeper connections of many South Africans to the Coastal and Ocean environment and the team led by Loyiso Dunga visited a site named Gompo Rock, also known as Cove Rock. This site was an example of many sites of intangible cultural connections to the Sea and a site of historic and cultural significance with a history conveyed through orature. Gompo's Rock is a powerful site that tells a story of a great Xhosa prophet, visionary and leader for the Xhosa, Khoi Khoi and San people.



Plate 7: Loyiso Dunga eloquently tells the story of the Great prophet Makhanda and explains the cultural significance of Gompo rock.

The second part of this objective was to understand the use of marine organisms in traditional medicine and rituals. We visited three outlets of imithi (traditional medicine) in the East London CBD to find marine species being sold for traditional medicine. Two of the three markets had mostly plant products, many with exotic origins. One shop had some mollusc shells in a display case but products were not labelled or packaged like all the other products in the store. The store owners and

shopkeepers were open to our questions regarding traditional use of marine organisms and shared their stories of use, names and applications. Key taxa that were being used in the area included limpets, cowries, seaweeds particularly articulated coralline algae (used during engagement with ancestors). The use of east coast rock lobster *Palinurus* to improve fertility and productivity of chickens and cattle was reported.



Plate 8: [From left] Traditional healer describing the use of limpet epiphytes in ritual. Loyiso, Luther, Sinothando and Juan-Jacques in a traditional medicine market purchasing shells and beads.

Sample collection summary

A total of 29 ROV dives were dedicated to collections for taxonomic, genetic and biodiscovery research. A total of 45 specimens were collected, six sponges were collected by ROV for barcoding, biodiscovery and eDNA analyses, and 39 specimens from benthic sled for barcoding work. This survey successfully collected sponges along a paleo shoreline and a *cf. Enallopsamnia* cold water coral from 240m depth.

Overall, this ambitious expedition was successful in extending the reach, depth range and diversity of applications for ROV work and piloted stereo-BRUV lander down to 1000m depth in South Africa, building multi-disciplinary research capacity, developing skills to survey in high current and canyon environments and to pioneer new approaches in integrated taxonomy, e-DNA and the application of marine biodiversity research in spatial planning.

Perspectives from the Early Career Researchers

This was the first dedicated multidisciplinary deep sea research cruise in South Africa that was planned, coordinated, executed and reported by early career researchers with the aim of strengthening their at-sea capacity and to support their postgraduate research projects. Equally, this research cruise leveraged local knowledge, infrastructure and locally developed deep sea landers to mark the deepest camera survey in South Africa in more than 40 years. Below are perspectives and reflections from some of the early career researchers.

“I had led this research cruise with only three equivalent research cruises on my resume. Not only did I help strengthen the capacity of my peers, I also had my capacity as a chief scientist strengthened.”

“I enjoyed the cruise and being close to renowned scientists like Kerry. It's not often that someone as early in their career as I am gets the advantage of networking in a space that welcoming, and gets to learn so much from experts and peers while getting advice on the trajectory of their career. The skills and guidance that came out of the cruise are unmatched and quite pivotal to the advancement of my career. When I got home and thought about my cruise experiences since it ended, the biggest question that came up for me was (still is), "How can I apply and better these skills from where I am in my career life?" I haven't come up with an answer for that but I hope a question like this can contribute to enhancing the meaning of capacitation in this field, shifting towards more continuous, thus sustainable means of engagement with early career scientists.”

"The OOH (cruise) was an amazing opportunity for me to get back into marine science work with a diverse team of scientists at various stages of their careers. It was a chance to expose myself to marine sampling techniques that I haven't previously been able to witness in-situ before (ROVS, BRUVS, etc.). Additionally, the trip allowed me to learn a great deal about the nature of the relationships various cultures have with the sea and reaffirmed my belief that regardless of the race or culture that you originate from, if you're willing to put yourself out there, marine science is for you."

“As an early career marine scientist, I was honoured to be part of the multidisciplinary deep-sea cruise. I got to meet with renowned scientists who are doing amazing work, everyone was friendly, welcoming, and willing to share skills and knowledge. This capacitated my research and communication skills as an introverted individual, I was forced to come out of my cocoon and interact with everyone for bettering science. My highlight was witnessing the deployment and retrieval of stereo-BRUVs landers for the first time. I was also fascinated by marine life on the seafloor which was investigated using the ROV along the Agulhas Bank.”

“From the 21st-27th of February I was presented an opportunity to participate on the ACEP Capacity Development cruise onboard the R/V Observer as an emerging researcher. What excites me about transdisciplinary work is the how the distinct disciplines connect and complement each other, the numerous opportunities available for emerging researchers, the platforms provided to meet and engage with likeminded individuals and most importantly the potential for growth. In addition, I also appreciate the platform it provides for new discoveries and innovation. One of my highlights was observing how to deploy a CTD (Conductivity Temperature Depth) and being provided an opportunity to do so on my own”

Daily log

Friday 10 February 2023

The Transit Team (Luther, Kerry, Ryan, Koos and Ferdi) assembled at Gqeberha Port and Departed at 05:11 am. Arrived at Deep off Padrone at 10:50 am, sea was turbulent with no wind and the current was hauling <3 knots. We headed inshore to avoid current but it was still swift at 11:11 am. Arrived at first station at 11:46 am. ROV surveyed **OOH001** Kenton Whips, **OOH002** Kenton Fans, **OOH003** Port Alfred Mud Clumps- Kerry thinks it could be orthogenic origin (noted to cone dredge for sediment and benthic sled site for mud clump worms at the end of cruise) and **OOH004** Port Alfred Beige (sediment sample collected. Anchored in the off the Shwele-Shwele Estuary for the night.

Saturday 11 February 2023

The sea was still turbulent the next morning and the current was better to work in than the day before. Six sites were surveyed on this day. The first site **OOH005** Shwele-Shwele cerianthids was surveyed by photoquadrat method at 07:38 am and a sediment sample was taken. This coarse sandy had a high density of cerianthids. **OOH006-OOH008** (Gxulu TFR, Cups and Panga, named respectively) were all surveyed along the 100m depth contour derived from reef marks Koos had shared. Any attempts to survey deeper were futile because the current was too strong offshore. The flooding the Great Kei and other large rivers upstream clouded the water and littered the sea with large debris ranging from branches, bushes and even small trees. **OOH009** was a repeat of IMD031 “Sable Cops” trying to find caves. No caves were found. The vessel tracks were needed to determine the high relief sections on the multibeam. **OOH010** (Winterstrand Dune) we investigated a 10m high feature Koos saw on the echosounder between 70m-80m deep. This feature was a large current scoured dune with few organisms.

Sunday 12 February

Anchored overnight off Winterstrand. Proceeded to DFR039 at to collected a sediment sample for Sinothando. We proceeded to a gap in our sample area and surveyed **OOH011** (Kidds’ Gap) which resembled KeiRoo. Hermits, tube worms, baby gurnards, *Marthasterius* and *Calliaster baccatus* we present. We then proceeded to an area with multibeam (MBES_11) to check for the presence of seapen offshore of IMD074 at **OOH012** (Gxulu Seapens) in the controlled zone of the MPA. This site appeared to have the densest seapens ever observed in the area. Brittle stars *cf Ophiothrix fragilis* were stock to the ROV’s thruster and was subsequently collected for identification. A sediment sample was subsequently collected at the same site. **OOH013** (Gxulu Gloom) was based off of multibeam and potential reference site of similar reef to Superbowl of the restricted zone of the MPA. This reef site was inundated with sand with many *Homophyton verrucosum*. **OOH014** (Gxulu Turbid) was attempted but conditions were surgy and visibility was nil. IMD037, IMD072 and IMD028 were subsequently cone dredged and ROV operated were halted for the day at around midday. We proceeded to the Port of East London and docked at 13:30.

Monday 13 February

Stayed on land to replenish supplies and settle into accommodation and collect Sinothando and Juan-Jacques from the East London Airport.

Tuesday 14 February

Koos forecasted bad weather the day prior so we arrived early at the vessel at 04:45 and planned to sample within 10nm of the harbour. We planned and attempted to resurvey Mari-Lise's seapen sites but the water was still dirty from the flooding of the Kei River. We proceeded to multibeam MBES_12 with a mark **OOH015** (Buffalo Crystal) near DFR051 that Luther had determined in an attempt to locate caves to sample for Jody. This was a blunder. The site was divable and the topography was flat with no caves. We then proceeded to the seaward portion of the multibeam which had some low relief feature to survey two sites. A ridge feature was identified on the multibeam and landward side was surveyed because the current was too strong on the seaward side 120m away.

We explored the first mark on the paleoshoreline feature at 07:26. This mark, **OOH016** (Buffalo Breams), yielded a long complex of small caves <1m of the paleoshoreline feature with lots of large fish. After an hour of exploring, we decided to come up to attach the manipulator arm, Niskin bottle and the collection funnel to the ROV. **OOH017**, **OOH018** and **OOH019** was spent collecting water and sponge samples to complete the replicates for the Buffalo site of Jody's thesis. The Psychedelic sponge *cf. Topsentia* was collected on **OOH017**. The second dive at the same site **OOH018** yielded three sponges, the Dog bone sponge, the Gelatinous foam sponge and potentially a baby Arnold sponge. One the last dive of the day **OOH019** we collected the Milk Bottle sponge. ROV operations were suspended at 12:00 as the current speed increased to 4 knots and conditions deteriorated. We retreated into port.

Wednesday 15 February

We left port at 05:04 and headed to the Gxulu Canyon to deploy three landers at 300m, 600m and 900m. The sea was choppy and the current was nearing 4 knots. The multibeam in the area was off by up to 200m. Koos surveyed the area and Ant prepared the lander at 07:06. The lander was then deployed at 500m at 07:44. Only one lander was deployed as a risk mitigation measure. At 08:25 we steamed towards Gxulu Superbowl DFR101 to collect samples for Jody. We arrived at 09:09 and aborted the site at 09:22 due to <1m visibility. We then proceeded to DFR083/IMD063 to collect sediment and resurvey for Mari-Lise. This was here "low" site. At 10:27 we surveyed the aforementioned site. This was the third time surveying this site. No seapens were observed

A pod of >7 bottlenose dolphins were sighted at S33 12.711 E33 44.031 at 81m near Gxulu Canyon at ~09:40.

Sediment samples were collected at 10:00, at 11:50 DFR044 sediment was collected and 12:13 IMD064 sediment was collected.

The lander was collected at 13:12 and DFR058 was survey at 14:24 and aborted at 14:41 due to zero visibility.

Thursday 16 February

Stayed on shore due to weather

Friday 17 February

Three landers were deployed in the Ncera Canyon at **LC1D** at 950 m, **LC1M** at 689 m, **LC1S** at 260 m.

Saturday 18 February

Left the port at 05:00. Arrived at the first lander site (300 m) at 08:06. Arrived at the second lander site (600 m).

Sunday 19 February

This day was dedicated to the exploring the Cintsa area inside the Amathole MPA. We left port the usual time at 05:00 am. We arrived at the first lander site at 07:23 am. The current speed was going averaging five knots. All three landers were deployed safely without any challenges. Once lander deployments were completed, we travelled inshore because the current four knots.

We attempted a site on multibeam close to the wreck site surveyed in the Deep Forest Project. We decided to deploy the ROV on drift at 09:37 because the current was slacker than it was offshore with the surface temperature 21.7. Only the first few meters of the surface water was “pea soup”. **OOH024** affectionately called Cintsa Blow had coralline algae on the low relief reef but current was too swift to land the ROV. A sediment sample was collected using the cone dredge. At 10:30 we retreated inshore, where the surface temperature was 18.92, to escape the heart of the Agulhas current. We resurveyed R97 from the Imida Frontiers Project **OOH025** and collected a sediment sample. We collected the landers and headed back into port.

Monday 20 February

On shore due to weather

Tuesday 21 February

On shore due to weather. Leg one and leg two participant changeover.

Wednesday 22 February

He headed to Sable Cops and arrived at 06:05 am to assess the sea conditions. The current was the slackest it was been, with the surface temperature at 22.8 the entire expedition so we decided to try a deeper site further offshore. We then headed to head of the Ncera Canyon at 200 m deep to assess the current speed. We arrived at the head of the canyon at 06:25 am and were met wit 6m swell and a 4 knot current. We proceeded back to Sable Cops area on the Buffalo multibeam bathymetry and deployed the ROV at 06:54 at a GPS location given by marine geologist Andrew Green. Two ROV surveys **OOH026** and **OOH027** were conducted here.

Due to deteriorating sea conditions as the day progressed which halted ROV operated, a CTD line was conducted off Kwelera. A total of five CTD casts (**CTD02-06**) were deployed down to 95 m, 238 m, 90 m, 52 m and 24 m, respectively. **CTD06** was a repeat of a Russo et al. station. A cone dredge was conducted at 10:50.

Thursday 23 February

This day was dedicated to CTDs and dredging in the Buffalo area due to bad weather forecasted for midday onwards. Five CTD (**CTD07-11**) casts were deployed down to 82 m, 102 m, 210 m, 67 m and 26 m, respectively to establish possible monitoring transect across the East London shelf to complement historical CTD transects in the area. Two 20-minute dredges, were completed shortly after 08:00 am to collect invertebrates from a known flat reef. The dredge samples **OOH-D-001** and **OOH-D-002** were collected between 83-86 m and 80-83 m and, respectively. The samples were kept

in separate sorting trays, sorted, individuals identified, photographed according to BOLD specifications, preserved and catalogued for DNA barcoding and/or biodiscovery research.

Friday 24 February

Left port at 05:00. Arrived at Goosen’s superbowl @ 06:04. We proceeded to “Edge” mark to take advantage of the steep drop in bathymetry. The current was the slackest it’s been on the expedition. We used the DFR083 (Goosen’s Overhangs) mark and deployed the ROV at 06:56 for **OOH028**. The visibility was poor and the dive was aborted four minutes later. We then proceeded to Gxulu Canyon margin @ 150 m depth from the multibeam mark for **OOH029**. This dive was 1.5 hours long between 188 m to 230 m depth range. A dead *Lophelia* fragment was collected along with a sponge and a *cf. Enallopsammia* fragment.

A cross-shelf line of five CTD casts were completed from inside the Gxulu Canyon landward, crossing Goosen’s superbowl. **CTD 12** was deployed inside the canyon. A complementary water sample was collected for eDNA work. **CTD 13** was collected down to 150 m. **CTD 14** was collected down to 100 m. **CTD 15** was collected down to 80 m. **CTD 16** was collected down to 60 m. **CTD 17** was collected down to 25m depth.

Saturday 25 February

Stayed on shore due to weather

Sunday 26 February

Left port at 05:00. Arrived at Sable Cops at 05:41 to assess sea conditions. The swell was 3m+ and the current was still pumping. We decided to deploy **CTD 18** at 05:54. Thereafter, we discovered that the back right thruster on the ROV was not working. After some troubleshooting, we decided to end operations for the day because it would take too long to troubleshoot and fix the thruster on board the vessel and conditions did not allow further CTD casts at desired locations 15 nautical miles away.

Key areas for future sampling consideration

	Notes
Gumboot (100m, 25°C)	Koos mark, wreckfish & coppers suggesting complex habitat.
North of Cintsa wall	Establish the northern extent of the Amathole lace coral gardens and level of protection in MPA
Gxulu superbowl	Sponge, bruv, eDNA comparison with sparid primers
Unknown shipwreck	Further surveys to support shipwreck identification and the biodiversity associated with the wreck should be considered.
Gxulu Dune	Map 10m high dune feature
Gxulu seapens	Resurvey dense seapen sites in Gxulu section of Amathole Offshore MPA and adjacent sites to examine temporal changes

Acknowledgements

Logistical arrangements were supported by Ryan Palmer and SAIAB support staff, who are gratefully acknowledged for arranging the accommodation, flights, rental vehicles and other logistics. SAIAB support in terms of, chemical supplies, equipment and Ryan's expert piloting of the ROV are also deeply appreciated. We thank the crew of the RV Observer, Koos Smith and Ferdy Jacobs for providing reef locations and deploying equipment safely. Theses and publications from these data must acknowledge the One Ocean Hub (UKRI GCRF Grant NE/S008950/1). We thank Andrew Green for providing and interpreting multibeam bathymetry data that enabled targeted reef and canyon surveys. We thank our institutions and funders particularly the UKRI funded One Ocean Hub, including the NRF Marine and Coastal Research Grant No. 116038, the European Union's Horizon 2020 research and innovation program under Grant Agreement No. 862428 (Mission Atlantic) and the SeaMap project funded through the NRF Grant number 138572 that supported molecular analysis.

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