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Post-Processing of Benthic Samples and Imagery collected during the EAF-Nansen Programme – Common Oceans Deep-Sea Fisheries Project

Delegation of France Overseas Territories

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| Abstract | |
| <p>This proposal to the Scientific Committee consists in a request for financial support from the SIOFA to complete the post-processing of benthic macro-invertebrate samples and underwater imagery collected during survey leg 3.3 (Deep-sea fisheries resources in the SIOFA Convention Area) conducted aboard the R/V Dr Fridtjof Nansen under the FAO EAF-Nansen Programme and the Common Oceans Deep-sea Fisheries Project. The mission generated an integrated dataset combining trawl bycatch sampling, van Veen grab sediment sampling, and deep-sea video observations across key seamount systems (Walter's Shoal, Station X, Banana). These data are directly relevant to the identification and mapping of Vulnerable Marine Ecosystems (VMEs) as defined by FAO guidelines and implemented under SIOFA conservation measures. They also contribute to the scientific foundations required for implementation of the BBNJ Agreement, including area-based management tools, environmental baselines, and marine genetic resources documentation. However, the material currently remains at the morphospecies level and the imagery unannotated. Dedicated funding is required to:</p> | |

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² Documents available only to members invited to closed sessions.

Conduct expert taxonomic identification of preserved specimens (via an international workshop at the Iziko South African Museum or coordinated specimen circulation);
Perform DNA extraction and barcoding to validate identifications and support genetic traceability;
Recruit technical support for systematic annotation of photos and video;
Integrate specimen-based and imagery-based datasets to produce quantitative VME maps and benthic community analyses.

This post-processing phase is essential to transform field collections into robust, policy-relevant outputs supporting VME protection, trawling impact assessment, and the establishment of a baseline (“state zero”) for long-term monitoring in the SIOFA Convention Area.

Recommendations

- **SIOFA SC considers** the issues presented in this document regarding post-processing of benthic samples and imagery collected during the EAF-Nansen Programme – Common Oceans Deep-Sea Fisheries Project
- **SIOFA SC requests** the Secretariat to provide funding to the organization of an international taxonomic identification workshop at the Iziko South African Museum, bringing together recognized experts to conduct detailed species-level identification of preserved specimens.
- **SIOFA SC requests** the Secretariat to provide funding, alternatively, to coordinated shipment of specimens to international specialists, ensuring standardized identification protocols and centralized data integration.
- **SIOFA SC requests** the Secretariat to provide funding to systematic DNA extraction and barcoding of representative specimens, in line with FAO and BBNJ objectives concerning marine genetic resources and traceability of biodiversity records.
- **SIOFA SC requests** the Secretariat to provide funding to recruitment of dedicated technical personnel for video and image annotation, to implement a standardized protocol identifying all organisms and events recorded.

Post-Processing of Benthic Samples and Imagery collected during the EAF-Nansen Programme – Common Oceans Deep-Sea Fisheries Project

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Executive Summary

This proposal to the Scientific Committee consists in a request for financial support from the SIOFA to complete the post-processing of benthic macro-invertebrate samples and underwater imagery collected during survey leg 3.3 (Deep-sea fisheries resources in the SIOFA Convention Area) conducted aboard the R/V Dr Fridtjof Nansen under the FAO EAF-Nansen Programme and the Common Oceans Deep-sea Fisheries Project. The mission generated an integrated dataset combining trawl bycatch sampling, van Veen grab sediment sampling, and deep-sea video observations across key seamount systems (Walter's Shoal, Station X, Banana). These data are directly relevant to the identification and mapping of Vulnerable Marine Ecosystems (VMEs) as defined by FAO guidelines and implemented under SIOFA conservation measures. They also contribute to the scientific foundations required for implementation of the BBNJ Agreement, including area-based management tools, environmental baselines, and marine genetic resources documentation. However, the material currently remains at the morphospecies level and the imagery unannotated. Dedicated funding is required to:

- *Conduct expert taxonomic identification of preserved specimens (via an international workshop at the Iziko South African Museum or coordinated specimen circulation);*
- *Perform DNA extraction and barcoding to validate identifications and support genetic traceability;*
- *Recruit technical support for systematic annotation of photos and video;*
- *Integrate specimen-based and imagery-based datasets to produce quantitative VME maps and benthic community analyses.*

This post-processing phase is essential to transform field collections into robust, policy-relevant outputs supporting VME protection, trawling impact assessment, and the establishment of a baseline (“state zero”) for long-term monitoring in the SIOFA Convention Area.

1. Institutional and Programmatic Framework

The scientific material underpinning the present proposal was collected during survey leg 3.3 entitled “*Deep-sea fisheries resources in the SIOFA Convention Area*”, conducted aboard the R/V *Dr Fridtjof Nansen* from 20 November to 10 December 2025.

This survey was implemented within the framework of:

- The **EAF-Nansen Programme** (Ecosystem Approach to Fisheries Nansen Programme) (FAO, 2026 b),
- The **Common Oceans Deep-sea Fisheries Project** (FAO, 2026, a),
- Under the coordination of the **Food and Agriculture Organization of the United Nations (FAO)**,
- In agreement with the **Southern Indian Ocean Fisheries Agreement (SIOFA)**, which defined the survey objectives.

The survey formed part of a coordinated effort to improve scientific knowledge of deep-sea fisheries resources and benthic ecosystems within the SIOFA Convention Area. All data collection followed the Nansen Programme Data Policy and international standards for ecosystem-based fisheries assessment. Details and full description of scientific objectives and protocols can be found in the survey report.

The present recommendation for funding request concerns the essential post-processing phase required to transform the collected material into management-relevant scientific outputs aligned with FAO technical guidelines (FAO, 2009), SIOFA conservation measures (SIOFA, 2018), and emerging international biodiversity governance frameworks (SIOFA, 2021; SIOFA, 2024; UN, 2023).

2. Policy Context: VME Protection and International Obligations

2.1 Vulnerable Marine Ecosystems (VME) Framework

The concept of Vulnerable Marine Ecosystems (VMEs) was defined by the FAO International Guidelines for the Management of Deep-sea Fisheries in the High Seas (2009). According to FAO, VMEs are characterized by:

- Uniqueness or rarity
- Functional significance of the habitat
- Fragility
- Life-history traits making recovery difficult
- Structural complexity

SIOFA has incorporated this framework into its conservation and management measures, requiring identification, mapping, and protection of VME indicator taxa (e.g., reef-forming corals, large sponges, habitat-forming organisms).

The datasets collected during survey leg 3.3 directly target these objectives by documenting macro-epibenthic communities, substrate characteristics, and fishing impacts across seamount systems including Walter’s Shoal, Station X and Banana.

However, VME identification under FAO (FAO, 2009) and SIOFA criteria requires species-level or, at minimum, high-resolution taxonomic identification, quantitative density estimates, and validated habitat characterization. These cannot be achieved without post-processing phase.

2.2 Relevance to the BBNJ Agreement

The recently adopted Agreement under the United Nations Convention on the Law of the Sea on the Conservation and Sustainable Use of Marine Biological Diversity of Areas Beyond National Jurisdiction (BBNJ Agreement, UN 2023) reinforces international obligations regarding:

- Area-based management tools (including marine protected areas)
- Environmental impact assessments
- Capacity building and scientific cooperation
- Marine genetic resources

The proposed post-processing work contributes directly to these pillars by:

- Generating robust biodiversity baselines in areas beyond national jurisdiction
- Supporting area-based management decisions grounded in quantitative evidence
- Producing genetic barcoding data relevant to marine genetic resources
- Strengthening international scientific collaboration

Failure to complete the post-processing phase would undermine the ability of SIOFA Contracting Parties to align regional fisheries management with emerging global biodiversity governance standards under BBNJ.

3. Scientific Overview of Collected Material

3.1 Trawl Bycatch Protocol

The protocol consisted of systematic spreading and sorting of benthic macro-invertebrate bycatch. A total of 89,42 kg of benthos has been caught over 10 trawling stations. Organisms were grouped by morphospecies following rapid visual assessment, photographed with scale reference, weighed to estimate biomass removed by fishing activity, and subsampled for preservation (Figure 1).

Specimens were frozen to allow tissue extraction, stable isotope analyses and DNA sampling. Collection results in 13 lots of specimens over the 10 trawling stations, constituted by subsampling for two stations presenting high biomass (14,27 and 45,08 kg) and full preservation for eight stations presenting lower biomass (from 1,42 to 5,53 kg).

All preserved material is currently curated at the Iziko South African Museum (Cape Town). Associated metadata—including station coordinates, depth, gear type, trawling effort and benthic biomass—are stored in the Nansen Programme database.

No detailed taxonomic identification has yet been performed.



Figure 1: Trawl Benthos Bycatch sampling

3.2 Van Veen Grab Sampling

Sediment samples and associated macrofauna were collected using a 0.1 m² van Veen grab at predetermined stations. Samples were sieved (5 mm and 1 mm), photographed (Figure 2), labelled (Figure 3) and frozen at -20 °C.



Figure 2: Macro-benthos Van Veen Grab Sampling



Figure 3: Sediment Van Veen Grab Sampling

Collection results in 25 lots of specimens over 24 grabbing stations.

All preserved material is currently curated at the Iziko South African Museum (Cape Town). Associated metadata—including station coordinates, depth, gear type, trawling effort and benthic biomass—are stored in the Nansen Programme database.

Final sediment granulometry and taxonomic determination remain pending expert analysis.

3.3 Autonomous Underwater Video Systems

Autonomous Bendicam (Figure 4) units were deployed between 33 and 3005 m depth. These systems documented:

- Macro-epibenthic community structure along transects
- Density of VME indicator organisms
- Interactions between trawling gear and benthic fauna (Figure 5)
- Substrate composition (Figure 6)
- Occurrence of teleosts and benthic sharks

Bendicam units have been deployed during 68,5 hours over 22 sampling stations or transects. Videos are archived in a structured database and require systematic annotation to convert imagery into quantitative datasets.



Figure 4: Bendicam Unit 2 sledge deployment

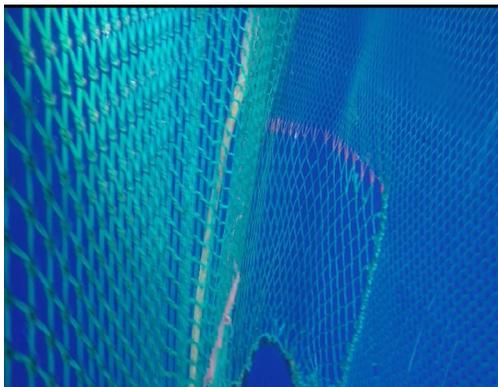


Figure 5: Bendicam Unit 1 trawl deployment

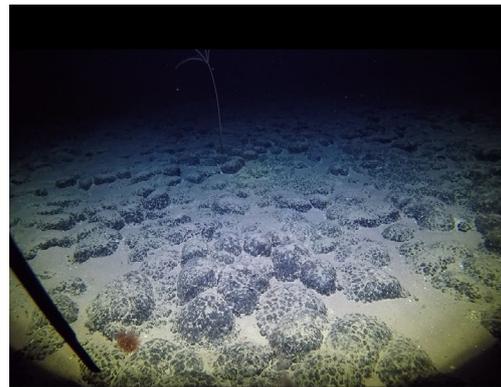


Figure 6: Bendicam Unit 2 deep habitat observation

4. Scientific Necessity of the Post-Processing Phase

The material collected represents a rare, integrated dataset covering multiple seamount systems in the SIOFA Convention Area.

However, current identifications are limited to morphospecies groupings. For VME assessment under FAO and SIOFA criteria, higher taxonomic resolution and quantitative validation are mandatory.

Moreover, the integration of specimen-based and image-based datasets is essential to:

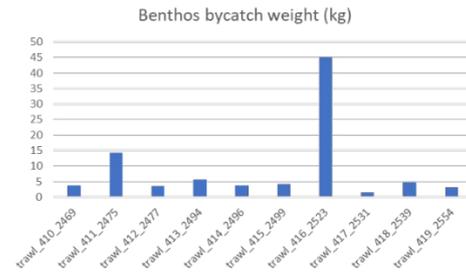
- Confirm VME indicator taxa presence and density (Figure 7)
- Assess bottom trawling impacts (Figure 8)
- Characterize habitat structure (Figure 9)
- Establish baseline ecological conditions in regulated areas (Figure 10)
- Support long-term monitoring frameworks

This transformation from raw material to policy-relevant science requires dedicated financial resources.



Figure 7: Bendicam Unit 2 VME indicator taxa detection

Trawl 410



Trawl 417



Figure 8: bottom trawling impact assessment based on cross-analysis of bycatch data, VME organism detection and video analysis

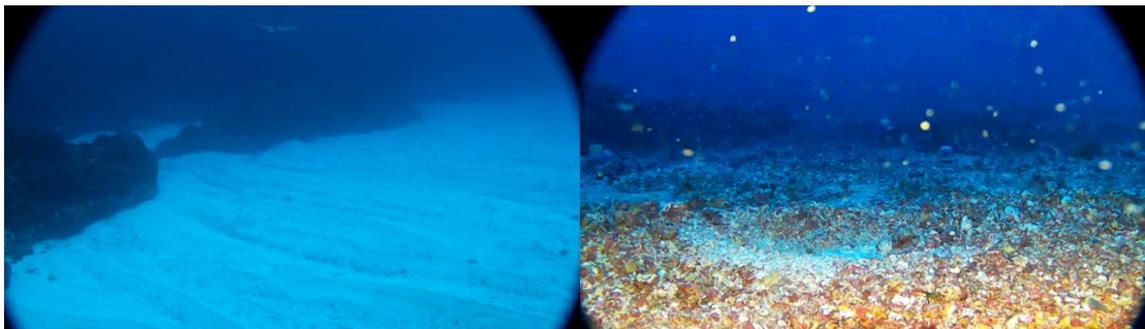


Figure 9: Bendicam Unit 2 habitat structure analysis

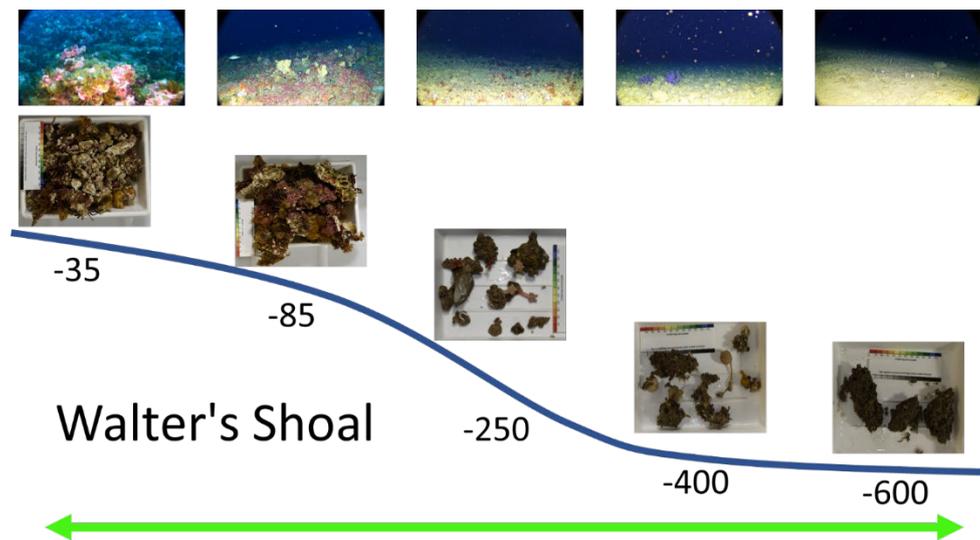


Figure 10: Benthic profile based on cross-analysis of specimen data, video data and environmental data

5. Recommendations to the SIOFA Scientific Committee

We recommend that the SIOFA allocate targeted funding to support the following actions:

- **Organization of an international taxonomic identification workshop at the Iziko South African Museum**, bringing together recognized experts to conduct detailed species-level identification of preserved specimens.
- **Alternatively, coordinated shipment of specimens to international specialists**, ensuring standardized identification protocols and centralized data integration.
- **Systematic DNA extraction and barcoding of representative specimens**, in line with FAO and BBNJ objectives concerning marine genetic resources and traceability of biodiversity records.
- **Recruitment of dedicated technical personnel for video and image annotation**, to implement a standardized protocol identifying all organisms and events recorded.

Such support which may allow the next steps of the study:

- Expert validation of annotated imagery, particularly for VME indicator taxa.
- Integrated cross-analysis of specimen-based and imagery-based datasets, enabling robust ecological interpretation and quantitative VME mapping.
- Production of georeferenced VME distribution maps and benthic habitat characterizations, directly supporting SIOFA conservation measures.
- Establishment of a defensible ecological baseline (“state zero”) in surveyed areas, particularly those subject to fishing restrictions, to enable multi-annual monitoring and impact assessment consistent with FAO guidelines and BBNJ principles.

6. Strategic Conclusion

Survey leg 3.3 of the EAF-Nansen Programme, implemented under the FAO Common Oceans Deep-sea Fisheries Project in agreement with SIOFA, has generated a scientifically robust but not yet fully exploitable dataset.

The requested post-processing phase is not ancillary—it is the essential final step that converts sampling effort into operational knowledge.

By supporting this funding request, the SIOFA Scientific Committee will:

- Reinforce FAO-compliant VME identification and protection,
- Strengthen regional implementation of ecosystem-based fisheries management,
- Align SIOFA actions with the objectives of the BBNJ Agreement,
- Ensure that a substantial international scientific investment delivers its full conservation and management value.

We therefore respectfully submit this recommendation for consideration and approval to the Scientific Committee.

Acknowledgments

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References

- Food and Agriculture Organization of the United Nations. (2009). *International guidelines for the management of deep-sea fisheries in the high seas*. FAO. <https://openknowledge.fao.org/handle/20.500.14283/i0816t>
- Food and Agriculture Organization of the United Nations. (accessed 2026) (a). *Common Oceans deep-sea fisheries project*. FAO. <https://www.fao.org/in-action/commonoceans/what-we-do/deep-sea-fisheries/en>
- Food and Agriculture Organization of the United Nations. (accessed 2026) (b). *EAF-Nansen Programme*. FAO. <https://www.fao.org/in-action/eaf-nansen/en>
- Southern Indian Ocean Fisheries Agreement. (2018). *Conservation and management measure 2018/01: Interim management of bottom fishing in the SIOFA area*. SIOFA. <https://siofa.org>
- Southern Indian Ocean Fisheries Agreement. (2021). *SIOFA bioregionalisation and vulnerable marine ecosystem mapping project: Full report*. SIOFA. <https://siofa.org>
- SIOFA Scientific Committee. (2024). *Implementing area protection in SIOFA (SC-09-INFO-27)*. Southern Indian Ocean Fisheries Agreement. <https://siofa.org>
- United Nations. (2023). *Agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction*. United Nations. <https://www.un.org/bbnjagreement>