SIOFA | APSOI
Southern Indian Ocean Fisheries Agreement
Accord relatif aux Pêches dans le Sud de l'Océan Indien

9th Meeting of the Scientific Committee (SC9)

Bangkok, Thailand, 18–27 March 2024

SC-09-INFO-21

Identification and Trends in Deepwater Sharks (Project DWS-2023-02)

Paul J. Clerkin and Jan R. McDowell

Document type	working paper ☐ information paper ✔
Distribution	Public ✔ Restricted [1] ☐ Closed session document [2] ☐

Abstract

This note reports the progress of the project, Identification and Trends in Deepwater Sharks (DWS-2023-02). The project aims to investigate 2012 and 2014 shark species and capture rates to current ones, collect samples and data for future studies, and develop a fast and intuitive shark identification guide. The overall goal of the project is to provide information and tools that contribute to the conservation and management of deep-water living resources in the Southern Indian Ocean. The project is on schedule and the field studies are expected to take place on the F/V Will Watch during the vessel's August-November 2024 trip.

[1] Restricted documents may contain confidential information. Please do not distribute restricted documents in any form without the explicit permission of the SIOFA Secretariat and the data owner(s)/provider(s).
[2] Documents available only to members invited to closed sessions.

Identification and Trends in Deepwater Sharks (Project DWS-2023-02)

1. Introduction

Deep-sea sharks of the Southern Indian Ocean have low fecundity and may be vulnerable to fishing through both targeted and accidental catch. Conservation and management of these deepwater living resources requires an understanding of the life history and natural history of the species in question. However, taxonomic resolution and correct species identification is a prerequisite for properly compiling life history information but is currently an impediment to accurate data collection at sea for these species.

This project has three main objectives while accompanying the F/V *Will Watch* of Sealord/United Fame Investments, during routine fishing activities:

i. Compare the catch of shark species and capture rates used in the 2012 and 2014 assessments to the catch and capture rates in 2024 to assess changes in shark abundance and biodiversity over the last ten years.
ii. Collect spine and vertebrae samples of Portuguese dogfish to support Project DWS-2023-01 (Improving the scientific advice for data- limited deep-water sharks caught longline fisheries in the SIOFA Area).
iii. Develop, test, and optimise identification guides being developed with SIOFA and FAO's DSF Project.

2. Current progress status

A contract between SIOFA and the Virginia Institute of Marine Science's (VIMS) Office of Sponsored Programs (OSP) was signed in November 2023. A Letter of Agreement drafted between FAO and VIMS was signed in February 2024.

Living and working accommodations have kindly been volunteered by F/V *Will Watch*, Sealord/United Fame Investments, together with deploying specialized equipment as allowed by fishing activity. The project activities will take place during the F/V *Will Watch*'s August—November 2024 routine fishing trip.

The digital identification key is currently being developed in cooperation with FAO and is scheduled to be prepared for the August—November 2024 trip. The digital key is being developed to identify broader taxonomic groups before departure and will be field tested and refined to enable resolution of higher taxonomic (genus and/or species) resolution at-sea. Photos of key characters will be taken from fresh specimens at sea. The end product will be a functional, photo-illustrated more intuitive digital key.

Sampling protocols, digital information management systems, and specialized equipment are being developed for sample and data collection for tentative future projects, in addition to this main project.

3. Potential future projects

Future projects that the SIOFA Scientific Committee might wish to consider for inclusion in its Workplan going forward:

- *Deepwater chondrichthyan species catalogue and molecular barcode database*. A record of shark species encountered during the 2024 survey will be produced as a deliverable for FAO

under the current funding agreement. **Potential future work**: Continued work could include a molecularly verified and vouchered catalogue of chondrichthyan species of the Southern Indian Ocean (encountered during the 2024 survey) and associated life history information (geographical distribution, sex ratio, length at maturity, fecundity, etc.).

- *Age and growth of deepwater sharks*. Understanding the age and growth rate of deepwater sharks is crucial to inform fishery management and establish sustainable catch limits, especially for slow-growing species. However, many deep-sea chondrichthyan species have yet to be successfully aged. This is largely due to the lack of samples available and issues inherent in aging deep-sea species. Vertebrae and spines will be collected from *Centroscymnus coelolepis, C. owstonii,* and *Centrophorus granulosus* and frozen during the 2024 trip. **Potential future work**: Spines could be sectioned and aged, while vertebrae could be double stained using cobalt nitrate and ammonium sulfide. A von Bertalanffy growth curve and and/or Lester growth model could then be estimated on a species-by-species basis depending on the number of samples collected for each species. The resulting estimates could contribute to the information needed to set total allowable catch for the deepwater shark species studied.
- *Observer digital information system*. A digital, intuitive key to aid in shark species identification will be developed as a deliverable to the FAO. **Potential future work**: This proposed study plans to further develop and field test tools for shark species identification, data collection, and sample collection developed during the 2024 trip, and make these tools available to observers and factory-deck workers to see if they are useful to non-experts. Tools would include training videos, digital keys (if agreed upon by FAO), Bluetooth electronic measuring equipment, and a digital information system. Species identification would be verified, and identification success rates could be calculated. Data and samples collected could be used to understand data collected at sea, estimate identification accuracy, and contribute to life history information of Southern Indian Ocean chondrichthyans.
- *Alfonsino population genetics*. Splendid alfonsino (*Beryx splendens*) is a commercially valuable fish, but due to its slow growth and early sexual maturity, the species may be vulnerable to overfishing. There is little information about the species' population structure. An understanding of the genetic diversity and population structure is needed to maintain a sustainable fishery and understand of how the SIO alfonsino stock should be managed. Alfonsino tissue samples could be taken during the 2024 survey. **Potential future work**: This study would examine the genetic stock structure of alfonsino within the SIOFA fishing area. This information could then be used in recommendations for managing the fishery.
- *Deepwater shark trophic ecology.* This study would investigate the feeding ecology of three abundant but poorly known deep-sea shark species in the Southwestern Indian Ocean, *Etmopterus granulosus* (Southern Lanternshark), *Centroselachus crepidater* (Longnose Velvet Dogfish), and *Dalatias licha* (Kitefin Shark). These species are frequently caught as bycatch, yet little is known about their diet composition, resource partitioning, and how these factors differ between sexes. Stomach samples from these sharks will be collected during the 2024 field trip. **Potential future work**: Stomach samples can be analysed later using traditional taxonomic methods and/or batch DNA metabarcoding to identify prey items and stable isotope analysis could be used in analysis of food webs. Diets of the three species could be compared to determine if they compete for the same resources and how diet composition differs between males and females. The resulting information will improve our understanding of the role of these sharks in the deep-sea food web and their vulnerability to human impacts.