



SIOFA | APSOI

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

Development of a SIOFA Scientific Observer Data Collection Manual (Project Code: OBS-2025-01)

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Disclaimer

Artificial Intelligence (AI) tools were used during the preparation of the *SIOFA Scientific Observer Manual* to support language editing, including correction of English grammar, improvement of structure, readability and consistency, and refinement of drafting. AI tools were also used to assist with the preparation of tables, summaries, and illustrative material based exclusively on information provided by the author or extracted from publicly available SIOFA Conservation and Management Measures (CMMs), official SIOFA guidance documents, and other cited scientific and technical references. The use of AI was limited to editorial, formatting, and drafting assistance only.

All technical content, scientific interpretations, analyses, recommendations, protocols, and substantive material presented in this manual were conceived, developed, reviewed, and validated by the author. All references, regulatory requirements, and technical guidance were independently verified against the original source documents. AI tools did not contribute independent scientific judgement, develop original technical content, determine the interpretation of SIOFA Conservation and Management Measures, or influence the conclusions or recommendations contained in this manual.

The author accepts full responsibility for the accuracy, completeness, and integrity of the content presented in the *SIOFA Scientific Observer Manual*.

1 Introduction

1.1 Background

The Scientific Observer Programme of the Southern Indian Ocean Fisheries Agreement (SIOFA) has been progressively developed as part of broader efforts to support the systematic collection of fishery-dependent data from vessels operating in the Convention Area. The programme aims to provide reliable biological, operational, and ecosystem information to the SIOFA Scientific Committee, in order to underpin robust scientific advice for fisheries management.

Following the adoption of the SIOFA Agreement in 2006 and its entry into force in 2012, Members have recognised the need for standardised at-sea data collection, including observer coverage. Between 2013 and 2017, the Scientific Committee highlighted important gaps in fishery-dependent biological and operational data and encouraged Members to strengthen national observer programmes operating within the Convention Area. Subsequent discussions recommended harmonisation of national protocols and the development of guidance for observer activities.

Since 2018, SIOFA has advanced the development of observer resources, including standardised observer form templates, species identification guides, and data collection instructions. Workshops in 2024 (e.g. WS2024-OBS and WS2024-OBS2) reviewed trial observer forms and refined the scope and content of observer data collection fields ([SIOFA WS2024-OBS2](#)). These efforts highlighted the need for a comprehensive, regionally standardised manual to guide observers in collecting operational, biological, and ecosystem information.

To address this need, SIOFA established a **Contract for the Provision of Scientific Services for the development of a SIOFA Scientific Observer Data Collection Manual ([OBS-2025-01](#))**.

This report documents the process undertaken to develop the **SIOFA Scientific Observer Data Collection Manual**. It describes the methodology adopted, the work carried out during the project, and the resulting Manual. The report also presents the key outcomes, lessons learned, conclusions and recommendations arising from the development process, with the aim of supporting the implementation, future maintenance and continuous improvement of the Manual.

The development of the Manual was guided by five main aims:

- **C1 – Scientific rigour and harmonised data collection:** Combine scientific rigour with a modular, user-centred structure to support harmonised and practical data collection procedures across the SIOFA Convention Area.
- **C2 – Web-oriented and adaptable format:** Develop a flexible, web-oriented framework that can be readily updated, maintained and integrated into digital platforms.
- **C3 – Field usability:** Enhance the usability of the Manual in the field by improving clarity, reducing ambiguity and supporting the consistent application of scientific observer protocols.
- **C4 – Standardisation and comparability:** Apply standardised terminology and harmonised methodologies to strengthen data consistency and improve comparability across SIOFA Contracting Parties, Cooperating non-Contracting Parties and participating fishing entities (CCPs), as well as with other RFMOs.
- **C5 – Digitisation and operational efficiency:** Strengthen the standardisation, digitisation and operational efficiency of SIOFA scientific observer programme tools.

Together, these aims provided the framework for developing a scientifically robust, practical and adaptable Manual that supports consistent scientific observer data collection while providing a

foundation for its continued evolution in response to SIOFA's future scientific and operational requirements.

1.2 Objectives

The objectives of this consultancy was to develop a comprehensive Scientific Observer Data Collection Manual for the SIOFA, providing standardised, practical, and scientifically robust guidance for application by scientific observers operating within SIOFA fisheries.

The consultancy also aimed to support the development of a digital-ready **Observer** Manual and associated resources, designed for electronic access and at-sea usability, including offline functionality and multimedia integration to enhance operational reference.

More broadly, the **Observer** Manual is intended to strengthen the consistency, quality, and comparability of observer-derived datasets, thereby supporting scientific assessments, compliance monitoring, and ecosystem-based fisheries management within the SIOFA Agreement Area.

1.3 Scope of Work

The scope of work comprised the development of the Observer Manual structure, content framework, and associated guidance materials required to support standardised observer operations across SIOFA fisheries. This included the consolidation and harmonisation of technical methodologies and procedures across all key thematic areas of observer work, including navigation, meteorology and oceanography, biological sciences, fishing operations, and compliance-related reporting.

The scope further included the design and preparation of a digital-compatible reference materials intended for dissemination through a website or Learning Management System (LMS) platform. This included modular text content and a suite of supporting multimedia and visual tools, such as icons, infographics and step-by-step infographic tables, species biology and sex/maturity identification plates, operational information plates, graphs, technical drawings, photographic materials, and video resources.

These outputs were developed to ensure that the Manual is operationally practical, scientifically robust, and suitable for both at-sea deployment and long-term harmonisation of observer data collection systems within the SIOFA framework.

The scope of work does did not include the actual uploading, hosting, or implementation of materials on any digital platform.

2 Methods

2.1 Data Sources

The Observer Manual was developed to meet the requirements of SIOFA, primarily drawing on SIOFA Conservation and Management Measures (CMMs), observer data collection requirements, and other official SIOFA documents.

To ensure consistency with international best practice, the development process was informed by a broad range of complementary sources. These included observer programme manuals and technical guidance developed by other Regional Fisheries Management Organisations (RFMOs), including the South Pacific Regional Fisheries Management Organisation (SPRFMO), the Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), the Indian Ocean Tuna Commission (IOTC), the Northwest Atlantic Fisheries Organisation (NAFO), the Western and Central Pacific Fisheries Commission (WCPFC), the General Fisheries Commission for the Mediterranean (GFCM), and the South East Atlantic Fisheries Organisation (SEAFO). Additional resources were obtained from

intergovernmental organisations and regional bodies, including the Intergovernmental Oceanographic Commission of UNESCO (IOC-UNESCO), the Indian Ocean Commission (IOC), the Secretariat of the Pacific Community (SPC), the Southeast Asian Fisheries Development Center (SEAFDEC), together with observer programme materials produced by SIOFA Contracting Parties and Cooperating Non-Contracting Parties (CPCs), including France and Spain.

The development process was further informed by scientific literature on fisheries monitoring, observer programmes and biological sampling, including publications produced by the Food and Agriculture Organisation of the United Nations (FAO), the International Council for the Exploration of the Sea (ICES), the International Whaling Commission (IWC), the International Union for Conservation of Nature (IUCN), and peer-reviewed scientific literature. Additional guidance relevant to scientific observer programmes and fisheries management was incorporated from governmental agencies, research institutes, international organisations and non-governmental organisations, and fishers associations, including the Australian Fisheries Management Authority (AFMA), the New Zealand Department of Conservation (DOC), the United States National Oceanic and Atmospheric Administration (NOAA), the Agreement on the Conservation of Albatrosses and Petrels (ACAP), the International Maritime Organisation (IMO), the International Monitoring, Control and Surveillance Network (IMCS Network), the International Seafood Sustainability Foundation (ISSF), the Russian Federal Research Institute of Fisheries and Oceanography (VNIRO), the French National Research Institute for Sustainable Development (IRD), the French Research Institute for Exploitation of the Sea (IFREMER), the Muséum national d'Histoire naturelle (MNHN), the Instituto Español de Oceanografía (IEO), and the SIOFA Deepwater Fishers Association (SIODFA)

While the Manual has been developed specifically to address SIOFA requirements, publications, technical guidance, figures, diagrams, photographs and other materials produced by external organisations were reviewed during its preparation and, where appropriate, adapted to develop SIOFA-specific, illustrations, infographics and supporting materials. All adapted or reproduced visual materials were appropriately acknowledged.

The full names of the organisations and complete bibliographic details of all source materials consulted are provided in the References section.

2.2 Analytical Approach

A comparative review approach was used to identify best practices and harmonise methodologies across a wide range of available materials. This involved systematically reviewing and cross-referencing SIOFA Contracting Parties, Cooperating non-Contracting Parties and Participating Fishing Entities (CCPs) and external observer manuals, sampling protocols, and data collection frameworks from multiple sources. Particular attention was given to identifying commonalities, divergences, and areas of innovation across Regional Fisheries Management Organisations, regional bodies, and national programmes.

Given the breadth of existing materials, a selective process was applied to determine which methodologies and guidances should be retained, adapted, or excluded. Selection criteria included scientific robustness, operational feasibility for observers at sea, clarity of application, and consistency with current international practices (e.g., the choice to use five-stage maturity scales for bony fish and four-stage maturity scales for rays). This process supported the refinement of methodologies and ensured that the **Observer Manual** addresses key data needs while avoiding duplication or ambiguity.

Overall, the analytical approach aimed to standardise methodologies in line with recognised international standards and guidelines, particularly those of SIOFA, CCAMLR, and the FAO, thereby promoting consistency, comparability, and scientific reliability of data collected across programmes.

2.3 Framework Development

The development of the Observer Manual framework was guided by the project Terms of Reference ([Annex 1](#)), as well as discussions with the project Advisory Panel (composed of members of the SIOFA Scientific Committee and the SIOFA Secretariat). These discussions, held during the kick-off meeting and subsequent meetings, informed the overall project setup and development. The framework also builds on the data sources and analytical approach described above, with the objective of producing a structured, user-friendly, and standardised resource for scientific observers. Drawing on the comparative review, the framework integrates selected best practices and harmonised methodologies into a coherent and accessible format suitable for digital dissemination via a website or Learning Management System (LMS).

A modular structure was adopted to minimise duplication, facilitate navigation, usability, and future updates. Content was organised into thematic sections reflecting the key components of the project objectives, with each chapter including a contextual paragraph explaining why the information is collected.

In terms of format, the Observer Manual is structured so that its content can be delivered through a website or learning management system (e.g., Moodle), while integrating documents (e.g., guidelines, protocols, identification manuals, etc.) that can be downloaded for offline use at-sea. The Manual incorporates text, icons, illustrations, photographs, animations, infographics, practical illustrated guides, videos, and both internal and external hyperlinks to guides and guidelines of interest to observers, all prepared for future online integration by SIOFA.

The selection and organisation of content were guided by the need to balance scientific rigour with operational practicality. Procedures were standardised in line with recognised international guidelines, while ensuring that instructions remain clear and applicable in at-sea conditions. Where multiple methodological options existed, priority was given to those combining scientific robustness, operational feasibility, clarity of application, and offering the greatest potential for data comparability across programmes.

2.4 Assumptions and Limitations

The development of the Observer Manual framework was based on several underlying assumptions. It was assumed that the materials reviewed, including RFMOs observer manuals, national programmes, and scientific literature, were sufficiently representative of current international practices in fisheries monitoring and observer-based data collection. It was also assumed that the selected sources reflect generally accepted methodologies and that differences between them largely represent variations in implementation rather than fundamental methodological incompatibilities.

A further assumption was that harmonising methodologies across observer programmes and between RFMOs is both feasible and beneficial, particularly where alignment with internationally recognised standards and guidance, such as those of the FAO, SIOFA, CCAMLR and the IOTC, can improve consistency, comparability and scientific robustness of data.

It was also assumed that the Manual's end-users (i.e., scientific observers) have varying levels of experience. Accordingly, the content is designed to be sufficiently standardised, well-structured and explanatory to support both observer training and practical application in the field.

Several limitations should also be acknowledged. The review was informed by the very large volume of available materials across regional, national, and organisational observer programmes, as well as scientific publications. But this abundance of information required a selective approach, which

necessarily involved prioritising certain sources over others and may have resulted in the exclusion of relevant but less accessible or less widely documented methodologies.

In addition, observer programmes across organisations and regions are not fully standardised, and differences in terminology, sampling design, and operational procedures can limit the direct comparability of certain methods. While efforts were made to identify and prioritise harmonised and widely adopted practices, some degree of subjectivity was necessarily involved in selecting between alternative approaches.

Furthermore, the framework reflects current scientific and operational knowledge at the time of development. As fisheries science, monitoring technologies, and international standards continue to evolve, certain procedures or recommendations may become outdated and will require periodic review and updating.

Finally, while the manual is designed to support at-sea application and offline use, its effectiveness depends on appropriate implementation, training, and access to supporting digital infrastructure (e.g., web-pages, LMS platforms, device availability, and connectivity where relevant).

3 Results

The development process resulted in a structured Observer Manual framework that consolidates a wide range of existing materials into a single resource. The comparative review enabled the identification of core methodological elements that are applied across Regional Fisheries Management Organisations, national observer programmes, and relevant scientific literature. These elements were integrated and standardised to ensure alignment with recognised international standards, particularly those of SIOFA and the FAO.

The resulting framework is organised into a modular structure covering all key aspects of observer work at sea, including observer roles and responsibilities, safety procedures, navigation, meteorology, biological sampling methodologies, species identification, data collection and reporting requirements. This structure ensures that users can access information in a logical and task-oriented manner, while maintaining methodological consistency across topics.

A key result of the process was the harmonisation of previously divergent methodologies. Where multiple approaches existed, a single standardised method was selected based on scientific robustness, operational feasibility, and comparability of data outputs.

From a delivery perspective, the manual was structured to be fully compatible with digital platforms, enabling the integration of text, images, diagrams, videos, and interactive elements. Content was designed for minimal redundancy, improving clarity and ease of navigation, while also allowing for future updates and expansion.

3.1 Observer Manual Core Chapters

The Observer Manual includes the following core chapters and components:

1 Chapter 1: Introduction

- 1.1 Fundamental Concepts in Fisheries Management
- 1.2 The South Indian Ocean Fisheries Agreement (SIOFA)
 - 1.2.1 Area of Competence and Objectives
 - 1.2.2 Origins and Development
 - 1.2.3 Governance
 - 1.2.4 Cooperative Framework

- 1.2.4.1 Agreement on Conservation of Albatrosses and Petrels
 - 1.2.4.2 Commission for the Conservation of Antarctic Marine Living Resources
 - 1.2.4.3 FAO Fisheries and Resources Monitoring System
 - 1.2.4.4 FAO's Common Oceans Deep-sea Fisheries Project
 - 1.2.4.5 Southwest Indian Ocean Fisheries Commission
 - 1.2.4.6 Indian Ocean Tuna Commission
- 2 Chapter 2: SIOFA Scientific Observer Programme Framework
 - 2.1 Purpose of the Scientific Observer Scheme
 - 2.2 Definition of key terms
 - 2.2.1 UNCLOS Concepts
 - 2.2.2 FAO Fisheries Concepts
 - 2.2.3 SIOFA Fisheries Concepts
 - 2.3 SIOFA Conservation and Management Measures (CMMs)
 - 2.3.1 CMMs Relevant to Observers
 - 2.3.2 Data confidentiality requirements
 - 2.4 Scientific Observer Role, Duties and Conduct
 - 2.4.1 Roles and Responsibilities
 - 2.4.2 Code of Conduct
 - 2.4.3 Reporting Obligations
 - 2.4.3.1 Daily Journal
 - 2.4.3.2 Trip Reports
 - 2.5 Observer At-sea Safety Awareness
 - 2.5.1 Health & First Aid
 - 2.5.2 Safety on Fishing Vessels
 - 2.5.3 Safety Protocols
 - 2.5.3.1 Vessel "Pre-Sea" Safety Check (VSC)
 - 2.5.3.2 Emergency Action Plan (EAP)
 - 2.5.3.3 Transfers at Sea Protocol
- 3 Chapter 3: Navigation and Positioning at Sea
 - 3.1 Fundamentals of Position Recording
 - 3.2 Latitude and Longitude Systems
 - 3.2.1 Coordinate System Key Concepts
 - 3.2.2 Latitude
 - 3.2.3 Longitude
 - 3.3 Chart Reading and Interpretation
 - 3.4 Time, Time Zones and Twilight
 - 3.5 Bridge and Electronic Navigation Systems
 - 3.6 Basics of Radio and Satellite Communications
 - 3.6.1 Global Maritime Distress and Safety System
 - 3.6.2 GMDSS Communication Equipment and Use
- 4 Meteorology and Oceanography
 - 4.1 Atmospheric Pressure and Coriolis Effect

- 4.1.1 Atmospheric Pressure
 - 4.1.2 High- & Low-Pressure Systems
 - 4.1.3 Coriolis Effect
 - 4.2 Wind Speed and Direction
 - 4.2.1 Wind
 - 4.2.2 Wind Speed
 - 4.2.3 Wind Direction
 - 4.3 Sea state and Swell
 - 4.3.1 Wave formation
 - 4.3.2 Sea Direction
 - 4.3.3 Sea Height
 - 4.4 Current
 - 4.4.1 Ocean Current
 - 4.4.2 Surface Currents
 - 4.4.3 Upwelling
 - 4.4.4 Current Direction
 - 4.4.5 Current Speed
 - 4.5 Monsoons and Seasonal Currents
 - 4.6 Sea surface Temperature and Colour
 - 4.6.1 Sea Surface Temperature (SST)
 - 4.6.2 Sea Surface Colour
 - 4.7 Thermoclines and ocean stratification
 - 4.7.1 Ocean Stratification
 - 4.7.2 Thermocline
 - 4.8 Indian Ocean Dipole (IOD)
- 5 Chapter 5 – Species identification
- 5.1 Basic Taxonomy and Nomenclature
 - 5.2 Diagnostic Features for Identification
 - 5.2.1 Crustaceans
 - 5.2.2 Echinoderms
 - 5.2.3 5.2.4 Chordates
 - 5.2.3.1 Fishes
 - 5.2.3.1.1 Cartilaginous Fish (Chondrichthyes)
 - 5.2.3.1.2 Bony Fish (Osteichthyes)
 - 5.2.3.2 Air Breathing Marine Vertebrates
 - 5.2.3.2.1 Marine Turtles (Reptilia)
 - 5.2.3.2.2 Marine Mammals (Mammalia)
 - 5.2.3.2.2.1 Cetaceans
 - 5.2.3.2.2.2 Pinnipeds
 - 5.2.3.3 Aves (seabirds)
 - 5.2.4 Vulnerable marine ecosystems (VME)
 - 5.3 Species Identification Guides
- 6 Chapter 6: Biological Sampling Methods
- 6.1 Measuring Tools
 - 6.2 Weighing Tools

- 6.3 Biological Data Collection
 - 6.3.1 Required Biological Observations
 - 6.3.2 Species-specific Procedures
- 6.4 Conversion Factors
 - 6.4.1 Conducting Conversion Factor Tests
 - 6.4.2 Identifying Main Processing Methods
 - 6.4.3 Applying Species-specific Conversion Factors
- 7 Biological Sample Collection and Preservation
 - 7.1 Age Sample Collection
 - 7.2 Genetic Sample Collection
 - 7.3 Stomach Sample Collection
 - 7.4 Gonad Sample Collection
 - 7.5 Voucher Specimen Collection
 - 7.6 General Sample Handling Principles, Sampling Equipment and Maintenance
- 8 Chapter 8: Tagging and Tag Recovery Procedures
 - 8.1 General Tagging and Tag Recovery Principles
 - 8.2 Data Recording Requirements
 - 8.3 SIOFA Bottom Longline Tagging Programme
 - 8.3.1 Toothfish, Skates and Deepwater Sharks
 - 8.4 Other Observer Tagging Protocols
 - 8.4.1 Lobsters
 - 8.4.2 Marine Turtles
 - 8.4.3 Seabirds
- 9 Chapter 9: Photo-identification Techniques
 - 9.1 Species Identification Photography
 - 9.1.1 General Principles
 - 9.1.2 Principles per Taxonomic Group
 - 9.2 Cetacean Species and Individual Photo-Identification
 - 9.2.1 General Principles
 - 9.2.2 Whales
 - 9.2.3 Dolphins
 - 9.3 Equipment and Camera Settings
 - 9.3.1 Species Identification Photography
 - 9.3.2 Cetacean Photo-Identification
 - 9.4 Image Quality and Metadata
 - 9.4.1 Image Quality
 - 9.4.2 Metadata
 - 9.4.3 Image management
- 10 Chapter 10: Fishing Vessels and Gears
 - 10.1 Hooks and lines
 - 10.1.1 LINES
 - 10.1.1.1 Vessel Types

- 10.1.1.2 Line Types
 - 10.1.1.2.1 Handlines (LHP)
 - 10.1.1.2.2 Mechanised Lines (LHM)
- 10.1.2 Vertical lines (LVT)
- 10.1.3 LONGLINES
 - 10.1.3.1 Vessel Types
 - 10.1.3.2 Longline Types
 - 10.1.3.2.1 Set longlines (LLS)
 - 10.1.3.2.2 Drifting Longlines (LLD)
- 10.2 TRAPS
 - 10.2.1.1 Vessel Types
 - 10.2.1.2 Trap Types
 - 10.2.1.2.1 Pots (FPO)
- 10.3 TRAWLS
 - 10.3.1.1 Vessel Types
 - 10.3.1.2 Trawl Types
 - 10.3.1.2.1 Bottom Trawls (TB)
 - 10.3.1.2.2 Mid-water Trawls (TM)
 - 10.3.1.2.3 Semi-pelagic Trawls (TSP)

11 Chapter 11. Fisheries Impacts and Mitigation

- 11.1 Basic Biology and Conservation of Endangered, Threatened and Protected (ETP) Species
 - 11.1.1 Basic Biology and Conservation
 - 11.1.1.1 Marine Mammals
 - 11.1.1.2 Seabirds
 - 11.1.1.3 Marine Turtles
 - 11.1.1.4 Sharks and Rays
 - 11.1.2 Assessing Abundance at Sea
- 11.2 Fisheries Interactions with Endangered, Threatened and Protected (ETP) Species
 - 11.2.1 Hook and line fisheries
 - 11.2.2 Jigging Fisheries
 - 11.2.3 Trawl Fisheries
 - 11.2.4 Pots Fisheries
- 11.3 Depredation
 - 11.3.1 Definition
 - 11.3.2 How Depredation Occurs
 - 11.3.3 Consequences
 - 11.3.4 Quantifying depredation
- 11.4 Marine Debris
 - 11.4.1 Sources
 - 11.4.2 Ecological impacts
- 11.5 Vulnerable Marine Ecosystems
 - 11.5.1 Definition
 - 11.5.2 Key characteristics
 - 11.5.3 Indicator taxa
 - 11.5.4 Fisheries Impacts
 - 11.5.5 Ecological Consequences

- 11.6 Mitigation Measures
 - 11.6.1 Hook and Line Mitigation
 - 11.6.1.1 Tori Lines
 - 11.6.1.2 Line Weighting
 - 11.6.1.3 Night Setting
 - 11.6.2 Trawl Mitigation
 - 11.6.2.1 Warp Bafflers
 - 11.6.2.2 Water Sprayers
 - 11.6.2.3 Warp Scarers
 - 11.6.2.4 Bycatch Reduction Devices
 - 11.6.2.4.1 Seal Exclusion Device (SEDs)
 - 11.6.3 Pot Mitigation
 - 11.6.4 Depredation Mitigation Strategies
 - 11.6.5 VMEs Mitigation
 - 11.6.6 Marine Debris Mitigation
- 11.7 Resources Available
 - 11.7.1 Fisheries impacts, interactions with ETPs
 - 11.7.2 Depredation
 - 11.7.3 Vulnerable Marine Ecosystems
 - 11.7.4 Marine Debris

12 Chapter 12. Data Collection and Reporting

- 12.1 Mandatory and Recommended Requirements
 - 12.1.1 Vessel Requirements
 - 12.1.2 Observer Data Collection Requirements
- 12.2 Data Collection 3
 - 12.2.1 Data Collection Priorities
 - 12.2.2 Species Prioritisation
 - 12.2.3 Practical Application
- 12.3 Data Quality Assurance and Validation
- 12.4 Data Confidentiality, Submission and Reporting

3.2 Digital and Multimedia Resources

A comprehensive suite of digital and multimedia resources was developed for integration on the *SIOFA Scientific Observer Manual*, to improve usability, facilitate navigation, and support both observer training and practical application at sea. These resources comprise icons, infographics, illustrated guidelines, photographs and instructional videos, each developed to fulfil a specific function within the Manual.

Icons

A set of icons was developed for use throughout the *SIOFA Scientific Observer Manual* to support intuitive navigation and improve the accessibility of information. The icons provide visual cues that enable observers to quickly identify key functions, topics, procedures, warnings and information categories across chapters, tables, infographics, illustrated guidelines and other supporting materials.

Infographics

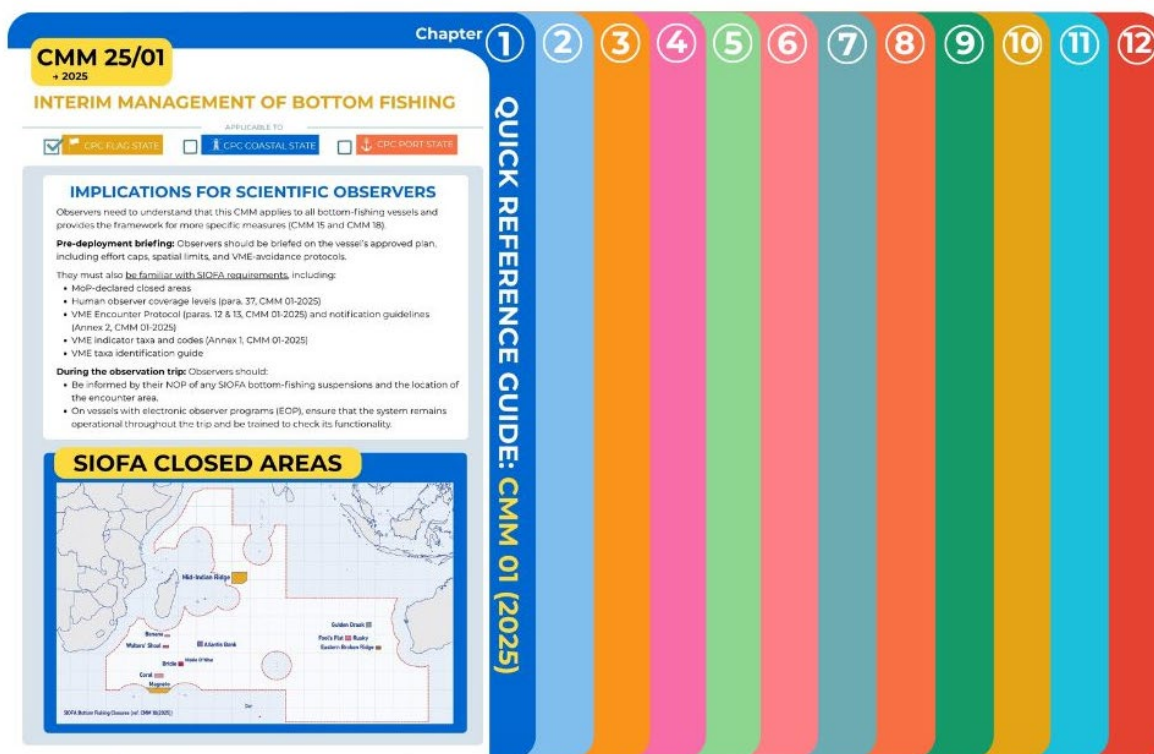
A comprehensive set of infographics was developed to complement the main text of the Manual and to serve as stand-alone visual resources within the illustrated guidelines. Their purpose is to present complex concepts, procedures and operational workflows in a clear, concise and visually engaging format. By combining illustrations, symbols and structured text, the infographics simplify technical information, highlight key messages, and facilitate rapid understanding and retention.

Illustrated Guidelines

A comprehensive set of illustrated guidelines was developed as a practical companion to the *SIOFA Scientific Observer Manual*. These stand-alone reference materials combine text, tables, illustrations, photographs and infographics to provide clear, step-by-step guidance on key observer tasks and operational procedures. They were designed for rapid consultation and present essential information in a concise, highly visual format that supports both observer training and practical implementation at sea.

The illustrated guidelines developed for the Manual include:

- **Step-by-step visual guides:** Practical procedures such as the calibration, use and maintenance of measuring and sampling equipment, tagging and tag recovery protocols, conversion factor tests, and other operational procedures routinely undertaken by scientific observers.
- **Biology and sampling plates:** Illustrated reference sheets covering key biological characteristics, diagnostic features and anatomical structures of species, including sex and maturity determination, taxon-specific biological data collection, and sample collection and preservation.
- **Information plates:** Thematic reference sheets summarising operational topics such as fish product forms, fishing gears, mitigation measures, photographic guides, sampling methods and other field procedures.



Each illustrated guideline has been designed to remain fully integrated with the corresponding chapter of the Manual while also functioning as an independent reference document. Every page displays the relevant chapter number together with the chapter or sub-chapter title, allowing users to immediately identify the associated section of the Manual. In addition, each chapter has been assigned a distinctive colour and a set of subject-specific icons, creating a visual navigation system that enables observers to rapidly locate topics, move efficiently between the Manual and the illustrated guidelines, and identify relevant information in both electronic and printed formats.

The illustrated guidelines have been designed to be downloaded individually or compiled into a practical field guide that observers can store electronically or print for use during fishing trips.

Photographs

Photographs were used sparingly throughout the *SIOFA Scientific Observer Manual* and only where they were considered essential to illustrate features that could not be represented adequately through illustrations, diagrams or infographics. Their principal application is to depict biological characteristics requiring a high level of visual realism, such as gonad maturity stages, where photographic representation provides the most accurate means of interpretation and identification.

Videos

A list of instructional videos was compiled for each chapter of the *SIOFA Scientific Observer Manual* to complement the written guidance. By presenting real-world operations in motion, videos convey a level of detail, context and practical understanding that cannot be achieved through text, photographs or illustrations alone. They therefore represent a valuable training resource, enabling observers to visualise equipment, sampling methods, fishing practices and species-handling techniques before applying them in the field. The proposed videos are listed in the **References** section of this report.

3.3 IT Publishing

To facilitate efficient online publication, the *Observer-Manual* was developed using a modular, web-oriented structure rather than a single linear document. The content was organised into “web-ready” sections, with information divided into smaller, self-contained components. This should allow each topic to be published as a stand-alone web page, improving usability, navigation, and ease of maintenance.

Text content was prepared in Microsoft Word using a consistent hierarchical structure to ensure seamless integration into content management systems and to support automated formatting during publication. The following style hierarchy was applied:

- **Heading 1:** Section
- **Heading 2:** Page title
- **Heading 3:** Subsections
- **Heading 4:** Detailed sub-elements (where applicable)

Example structure:

- Heading 1: Chapter 1- Introduction
 - Heading 2: Fundamental Concepts in Fisheries Management
 - Heading 2: The South Indian Ocean Fisheries Agreement (SIOFA)
 - Heading 3: Geography
 - Heading 3: Origins and Development
 - Heading 3: Governance (SIOFA, 2023)

- **Heading 3: Cooperative Framework**

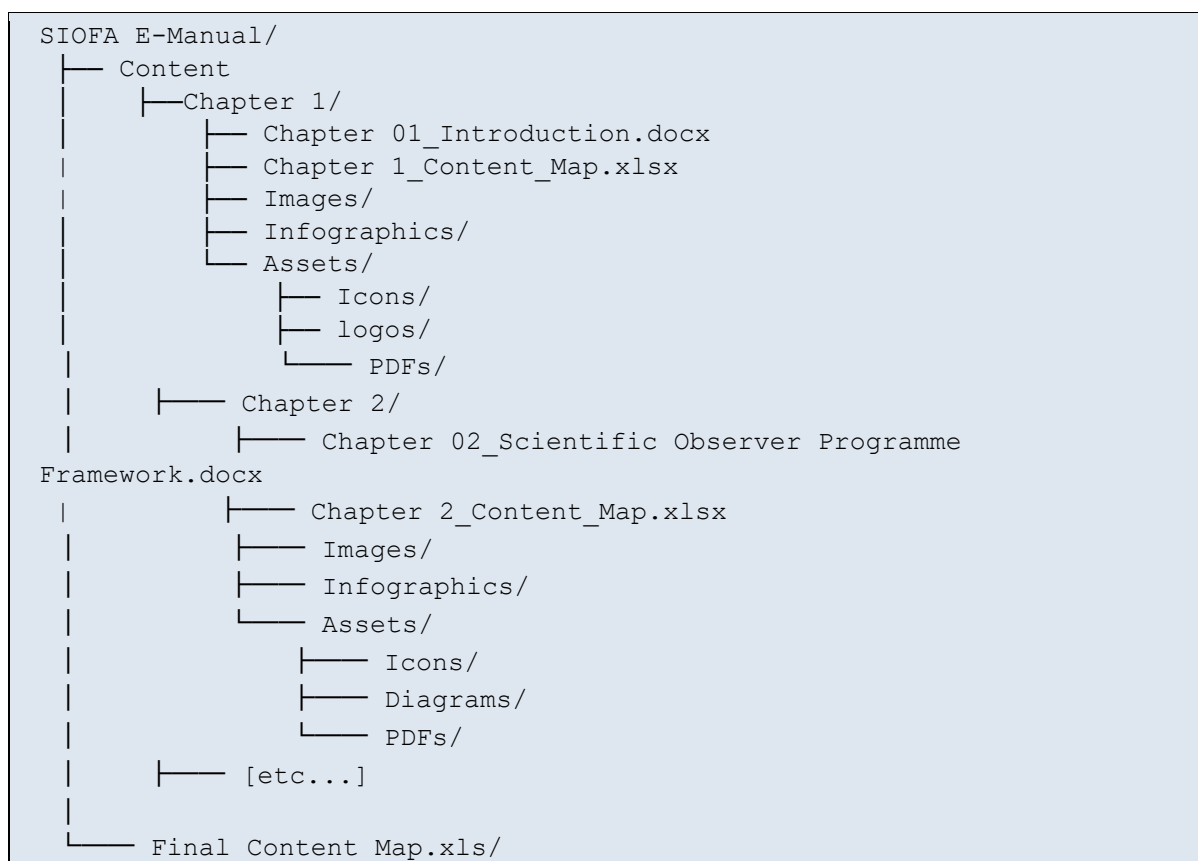
All visual and multimedia assets were managed separately from the text and referenced within the relevant Word chapters using placeholders (e.g. *[Insert: IC01.000_Fisheries Management.jpg]*). Assets were named using a standardised convention and stored in dedicated chapter-specific folders (e.g. *Images, Videos and Assets*).

A standardised asset naming system was implemented to ensure consistency, traceability and efficient management of all Observer Manual resources. Each asset name incorporates a structured code identifying the asset type, followed by the chapter number and a unique identifier. Standardised prefixes include PH (photograph), IM (image), IL (illustration), IN (infographic), IC (icon), GIF (animated GIF), TB (table), VD (video), EL (external link), INL (internal link) and LG (logo), enabling immediate identification of the asset category.

To facilitate content management and publication, a dedicated Microsoft Excel file entitled "Chapter XX Content Map" was developed for each chapter of the Manual. Each chapter-specific Content Map provides a complete inventory of all materials developed for that chapter, including components, tables, figures, illustrations, infographics, icons, photographs, videos, hyperlinks and other digital assets.

All project documents were organised and stored in Google Drive using a structured folder hierarchy to facilitate collaborative development, version control and long-term document management.

All project documents were stored in Google Drive following a structured folder hierarchy.



4 Discussion

The primary objective for the development of the SIOFA Scientific Observer Data Collection Manual was to produce a standardised, operationally practical, and digitally adaptable manual that would strengthen data consistency, improve reporting quality, and support regional scientific assessments.

A central consideration in the development process was the need to balance scientific robustness with field usability. Scientific observers operate in challenging offshore environments, often under time constraints and operational pressures. As a result, the manual was designed to be highly structured, modular, and task-oriented, ensuring that observers can quickly locate and download relevant guidance without navigating lengthy narrative text. This approach also supported alignment with digital deployment platforms, enabling the manual to function effectively as an e-reference tool.

The integration of standardised SIOFA and FAO definitions and procedures was a critical element of the Observer Manual's development. Particular attention was given to harmonising biological sampling protocols, maturity scales, species identification standards, and gear classification systems. This standardisation is essential for ensuring comparability of datasets across fleets, vessels, and CCPs, thereby enhancing the reliability of regional stock assessments and scientific advice.

In parallel, a structured IT publishing approach was adopted, allowing content to be broken down into discrete, web-ready modules. This should facilitate integration into content management systems and future deployment through platforms such as learning management systems, the SIOFA website or other portals. The adoption of hierarchical content structuring and standardised metadata further ensured long-term maintainability and scalability.

Multimedia resources were extensively used in the development of the [Observer Manual](#). These included illustrated guidelines species identification plates, sex and maturity guides, operational infographics, photographic libraries, and video demonstrations. These tools were introduced to improve user-friendliness. By combining visual and textual guidance, the manual aims to strengthen accuracy and reduce observer uncertainty. A standardised naming convention and centralised content tracking system were introduced to ensure traceability of all digital assets.

5 Conclusions

The Observer Manual developed for the SIOFA strives to combine scientific rigour with a modular, user-centred design, ensuring that data collection procedures are both harmonised across the Convention Area and practical for implementation at sea.

The adoption of a web-oriented, structured content architecture intends to equip the SIOFA with interactive digitally adaptable [Observer Manual](#), that can be easily uploaded, maintained and improved and that can further supports field usability by improving scientific fisheries observers comprehension, reducing ambiguity, and reinforcing correct application of procedures.

In parallel, the integration of standardised terminology, and harmonised protocols is expected to strengthen data consistency and to enhance comparability across Contracting Parties and RFMOs.

The [Observer Manual](#) is expected to provide a robust foundation for improving the quality and reliability of scientific observer data, and to support broader institutional objectives related to digital transformation, capacity building, and evidence-based fisheries management.

6 Recommendations

To maximise the effectiveness and long-term value of the [Observer Manual](#), the following recommendations are proposed:

- **Platform deployment:** Upload the manual to a suitable digital platform, such as a learning management system (e.g. Moodle), the SIOFA website, or other relevant portals to ensure broad accessibility and ease of use.
- **Regular updates and version control:** Establish a formal review cycle to ensure that protocols, species references, and operational procedures remain aligned with evolving requirements of the SIOFA and current scientific best practices.
- **CCPs feedback mechanism:** Introduce a structured feedback system to capture field experience from Contracting Parties (CCPs) Scientific Observer Programs and identify areas for clarification, improvement, or simplification of content.
- **Continuous improvement of multimedia resources:** Strengthen collaboration with CCPs to further enrich the Observer Manual resources using scientific, training, and multimedia materials developed or collected through national observer programmes (e.g. observer photographs, videos, and species-specific maturity scales). Visual materials (e.g. species plates, videos, and infographics) should be periodically updated to reflect new species, fishing practices, and user feedback.
- **Regional harmonisation:** Continue collaboration with CCPs to develop standardise observer data collection protocols and ensure consistent implementation across the entire SIOFA Convention Area.
- **Capacity building and training:** Further develop the [Observer Manual](#) as a training resource and integrate it with digital platforms (e.g. learning management systems) to support the systematic training of observers, debriefers, national coordinators, and database managers. This will enhance consistent interpretation and application of procedures and ensure seamless use in both training and operational contexts.

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9 Annexes

9.1 Annex 1 – Terms of Reference for the project



Scientific Committee

Terms of Reference (ToR) for the provision of scientific services to SIOFA Scientific Committee

Project title: Development of a SIOFA scientific observer data collection manual

Project Code: OBS-2025-01

INTRODUCTION

The SIOFA Scientific Committee (SC) is tasked to provide fisheries management advice to the SIOFA Meeting of the Parties (MoP). In recent years, SIOFA implemented a series of projects and workshops which contributed to the harmonization of the observer framework. Project SEC2022-OBS1 (2024) constituted the backbone of these efforts, producing observer logbook forms and recommendations which were picked up in workshop WS2024-OBS (2024) and workshop WS2024-OBS2 (2024). These efforts culminated in a dense observer-related agenda item at the 10th annual meeting of the SIOFA SC (2025). SC10 identified as a next step in this process the development of detailed biological sampling requirements for primary and secondary species in all SIOFA fisheries. A list of primary, secondary and bycatch species in SIOFA is available in the annually-updated Appendix A of the Overview of SIOFA Fisheries (https://siofa.org/sites/default/files/files/SIOFA-Fisheries-Overview-2024_redacted.pdf).

The content of this manual must cover sampling of “fish” (Chondrichthyes and bony fishes), crustaceans and molluscs, as well as VME indicator taxa. A paragraph explaining the context, why observers are asked to collect this information and how it is used shall be included in every chapter.

In terms of format, this could be made available on a MOODLE or similar platform hosted by the Secretariat, chapters would be written through the use of the tool “book” in which, text, photos and animated images can be inserted. Videos and screencast shall be used to better illustrate the manual. Chapters would be structured to have as little as duplicate text as possible, for example a chapter on how to identify a fish with a key would be followed by the different ID guides clearly labelled by area. Consultant would have an account with a “teacher” status to upload material on the Moodle platform. The content should also be able to be downloaded so that observers can use it offline.

TERMS OF REFERENCE

Project Objectives

Development of an Observer Manual that describes the detailed methods and processes that can be used by all scientific observers in SIOFA fisheries, including the following contents:

- a. Introduction: history of SIOFA, members, species caught (how and where), links with other RFMOs

b. SIOFA Scientific Observer roles and responsibilities

- i. Definition of terms
- ii. SIOFA regulations (CMMs, e.g. CMM 02(2023))
- iii. Overview of roles and responsibilities

c. Navigation: basic information on calculating distance, what is latitude and longitude, bearing, how distance and degrees of longitude are related, location determination, how to read a map, how speed in KT works, distances in miles etc.

d. Meteorology and oceanography, current, depression, Coriolis

e. Biology: basic information (fish, crustaceans, molluscs) on anatomy, biology, reproduction etc.

f. Data confidentiality (based on CMM 03(2016)), archiving data, backups...

g. General operational procedures

- i. Units and formats (length, weight and explaining motion compensated scale, distance, speed in KT, bearing in degrees, time in hours).
- ii. Standard measurements (LS, LT, LA, LF, mantal length, carapace width and length)
- iii. Weights.
- iv. Sexing and maturity stages (identification plates).
- v. General chapter on different types of sampling: dry, in alcohol, frozen, how to do it and label them properly, including the importance of contamination for genetic sampling.
- vi. Otolith collection and storage
 - 1. How to remove otoliths.
 - 2. Otolith storage.
- vii. Tissue sampling (flesh, rays, genetic punches) in alcohol or RNALater solution for genetic studies using sterile sampling techniques.
- viii. Stomach and stomach content sampling.
- ix. Tagging and tag recaptures (toothfish and skates, crustaceans): different methods and gear, hygiene, structure of the fish bones and cartilage to explain anchoring of the tags, pictures of the recaptures along with otoliths and a colour template, renaming of the photos through the naming convention presented. See SC-10-70.
- x. Bird bands: observation and collection (if bird is dead). Some context on the different bird bands methods used and what information are provided in term of population study.
- xi. Photo-identification (comprehensive chapter provided by France OT).
- xii. Conversion factor tests (background on studies, library of products with pictures, implementation).

h. Target catch and bycatch species:

- i. Primary species definitions and species identification.
- ii. Secondary species definitions and species identification.

- iii. Primary and secondary species sampling requirements.
 - i. Observations of marine mammals and seabirds, identification guides, method to assess abundance, basic knowledge on their biology and conservation, self-training tool to learn species (same as on CCAMLR website).
 - j. Fishing gear (not restricted to gear legally used within SIOFA but an overview of all possible gear, that would include pictures, figures and when available: videos).
 - k. Interactions with fishing gear and vessel and mitigation methods associated: birds and vessel, birds and fishing gear (baffles, tori line, Brickle curtain etc), mammals and fishing gear (exclusion devices...). This would include the use of tori line simulator (SC-10-71).
 - l. Depredation: how it works, species involved, evidences of interaction, what are interaction rates and depredation rates, background on species implicated, solutions tried etc.
 - m. Vulnerable marine ecosystems (a bit of historical context and link with CCAMLR's work, why some taxa were chosen, some biological basic information on the different phylum), identification guide for VME indicator taxa.
 - n. ETP species list
 - o. Marine debris. How it works, impact of entanglement, background on beach surveys, educational material and poster.
 - p. Vessel requirements
 - q. Observer data collection and data submission requirements
 - r. Appendices
 - i. Appendix 1 – Identification guides.
 - ii. Appendix 2 – Maps of the SIOFA Areas, Sub-areas, and relevant seamounts/seamount complexes.
 - iii. Appendix 3 – Functions and tasks of Scientific Observers.
 - iv. Appendix 4 – SIOFA Scientific Observer resources.
 - v. Appendix 5 – Recommended lists of Scientific Observer safety gear.
 - vi. Appendix 6 – Recommended lists of Scientific Observer sampling gear and their maintenance.

The order for the different chapters and the structure can be discussed with the consultant.

Relevant SIOFA information

1. SIOFA data (provided by the SIOFA Secretariat upon request)
2. SIOFA spatial data layers. Available on https://github.com/SIOFASecretariat/SIOFA_SC_Spatial_layers
3. SIOFA reporting templates. Available on https://github.com/SIOFASecretariat/SIOFA_Reporting_templates
4. SIOFA reports:
 - a) SIOFA SC, SC Working Group, and National Reports. Scientific Committee Meeting | SIOFA (<https://siofa.org/>)
 - b) SIOFA MoP reports. Meeting of the Parties | SIOFA (<https://siofa.org/>)

- c) SIOFA technical and scientific reports (public reports and abstracts of restricted reports are available from <https://siofa.org/>, and full restricted reports will be made available by the SIOFA Secretariat to the project consultant upon request and after the approval of concerned CCPs.

Expected progress

1. Follow the project timeline as detailed in this agreement, including the submission of deliverables.
2. Collect any necessary data as early as possible, e.g. by submitting a data request to the SIOFA Secretariat.
3. Attend a kick-off meeting with the project Advisory Panel (composed by members of the SIOFA Scientific Committee and the SIOFA Secretariat) to discuss the project setup and development. Further engage, as requested, with the Advisory Panel that will assist the consultant access and interpret reports, data, and to provide advice on relevant analyses or data interpretation for the project.
4. Provide regular (i.e. every 2-3 months), proactive updates to the Project Coordinator and the Advisory Panel throughout the project, in particular informing promptly of any unforeseen delay or variation to the project.
5. Submit deliverables on time and appropriately formatted, as required. Each deliverable will be going through a SIOFA review to ensure that it meets the quality targets and the project objectives as set out in the Terms of Reference.
6. Appropriately acknowledge the project funding source (e.g. EU or SIOFA), with appropriate corresponding logos in prominent positions, within each deliverable.
7. Take into reasonable account the outcomes of the SIOFA review or any comments made by meeting attendees, when revising the deliverables.

Expected deliverables

1. A (virtual) presentation of preliminary methods and results to the next SIOFA SC annual meeting (end-March 2026), to be confirmed depending on contract duration.
2. A Draft Report that addresses the project objectives and tasks as laid out in this contract, which will be reviewed by SIOFA. The report should follow the guidelines and format available at https://github.com/SIOFASecretariat/SIOFA_Reporting_templates. In particular, the report should include a concise (max 300 words) summary, and should detail the methods, the outcomes, conclusions, and concise recommendations.
3. A Final Report revised by considering any comments and advice from the SIOFA review or comments received during meetings, to be further reviewed by SIOFA. The Consultant is to submit this Final Report to the SIOFA Secretariat following the guidelines and format available at https://github.com/SIOFASecretariat/SIOFA_Reporting_templates.
4. Provide all the information collected to the SIOFA Secretariat (including that sourced from the Secretariat) before the final payment of the contract. Such information includes electronic data files, analysis codes, biological samples, and other relevant data if applicable.

Presentations of reports to the Scientific Committee may be given virtually and travel to the meetings is not obligatory.

Acceptance of Draft and Final Reports

1. Draft and Final Reports must be submitted to the SIOFA Secretariat (Project Coordinator).
2. Draft and Final Reports will be reviewed by SIOFA using the procedures outlined in paper MOP-09-12 (Annex B), see also https://github.com/SIOFASecretariat/SIOFA_Reporting_templates/tree/main/SC%20reports/Review%20template%20for%20consultant%20reports.
3. Payment of contracts milestones will be subject to acceptance of the submitted reports by SIOFA.

Intellectual Property clause and confidentiality

The Consultant shall submit all the information collected to the SIOFA Secretariat (including that sourced from the Secretariat) before the final payment of the contract is made to the consultant. Such information includes electronic data files, analysis codes, biological samples, and other relevant data if applicable. Any arrangements for ownership, storage, or disposal of physical samples shall be agreed by SIOFA as a part of the contract. All Intellectual Property generated as a part of this contract shall become the property of SIOFA unless otherwise excluded in the proposal and agreed by SIOFA in the contract. The Consultant shall not release confidential data provided for conducting this study to any persons nor any organisations, other than SIOFA Secretariat. The Consultant shall delete all the confidential data upon the completion of the contract.

WORK TIMELINE AND PAYMENT SCHEDULE

The funds for this project allow for a maximum total budget of 15 000 Euros (including all costs and any travel related expenses).

The consultant shall follow the timeline described in Table 1 below.

Table 1: Timeline for payments, milestones, and report submission

Milestone	Date	Activities
Initiation of contract	30 September 2025	First instalment payment (30% of the total contract sum)
Presentation of preliminary results	23 March -1 April 2026	Presentation of preliminary methods and results to the SC11 meeting (virtual)
Delivery of draft report	15 April 2026	Second instalment payment (30% of the total contract sum) upon satisfactorily submission of draft report, in a format suitable for submission to SC, to the project coordinator.
Delivery of final report	1 June 2026	Submission of final report in a format suitable for submission to SC and submission of project information to the project coordinator. Final instalment payment (40% of the total contract sum) on acceptance of the final report by the advisory panel and the final submission of project information

SUBMISSION OF APPLICATIONS

- 2 A current CV that summarises the applicant(s) relevant educational background and professional experience.
- 3 A brief proposal (indicatively 1-3 pages) outlining the proposed methods and analyses, including a description of how the objectives of the ToR will be achieved.

- 4 Any proposed exclusions to the intellectual property clause or variations to the work timeline and payment schedule.
- 5 The proposed consultancy price (including all consultant expenses and project related costs), noting that the available budget for this work indicated in Section 3.
- 6 Identification of any project risks and associated mitigation and management required to successfully complete the project.
- 7 A statement that identifies any perceived, potential, or actual conflicts of interest of the applicant(s), including those described in paragraph 4 of the SIOFA recruitment procedure (see Section 6), and
- 8 Any additional relevant information the applicant(s) wish to submit.

The applicants must have appropriate experience and knowledge of fish population dynamics, particularly of deep water species, and knowledge of climate change models and the effects of climate change on marine fish abundance and distribution.

Applications must be submitted to the SIOFA Science Officer (Marco Milardi, marco.milardi@siofa.org, CC secretariat@siofa.org). Only those applications received **before 12:00 PM (9:00 AM UTC) on the 15th of September 2025**, Reunion Island time, will be considered.

EVALUATION CRITERIA FOR THE SELECTION OF CANDIDATES

An evaluation panel, the SIOFA Secretariat, and the Chair and Vice-Chairs of the SIOFA Scientific Committee will select one successful applicant for this contract. The selection criteria will include the following:

1. Adequate submission of information to allow the panel to evaluate the candidate
2. Evaluation of the proposal from the candidate, including the proposed contract price
3. Ability to undertake and complete the analyses or work required in this ToR
4. The candidate's agreement with confidentiality provisions required for the project
5. Acceptable conflict of interest statement
6. Agreement with the data submission and intellectual property terms required in this ToR, and
7. Financial and resourcing considerations.

CONFLICTS OF INTEREST. PARAGRAPH 4 OF SIOFA'S RECRUITMENT PROCEDURE

To ensure that situations relating to potential and actual conflict of interests are avoided, persons falling into the following categories may not normally be considered for SIOFA consultancy: (i). any person designated as a designated representative or alternate representative of a CCP to the Meeting of Parties (MOP) as per Rule 3.1 of the Rules of Procedure, and to the SC and any other subsidiary bodies of the MOP, as per Rule 21.3 of the Rules of Procedure; (ii). Any person fulfilling the function of Chair or Vice-Chair of the MOP or Chair or Vice-Chair of a SIOFA subsidiary body or working group; (iii). Any person acting as a member of a delegation involved in the SIOFA decision-making process resulting in recommendations and/or approval for the SIOFA work requiring the engagement of a consultant; and (iv). Individuals who were SIOFA Secretariat staff members at the time when the recommendations and/or approval for the SIOFA works were adopted or who are members of immediate family (e.g., spouse or partner, father, mother, son, daughter, brother, or sister) of any Secretariat staff member or of the persons identified in 4 (i), (ii), and (iii).

CONTACTS

Project Coordinator – SIOFA Science Officer (Marco Milardi, marco.milardi@siofa.org)

Administrator – SIOFA Executive Secretary (Thierry Clot, thierry.clot@siofa.org)

REFERENCES

SEC2022-OBS1 Establish a framework for scientific observation of SIOFA fisheries (2024)

<https://siofa.org/science/sc-works/SEC2022-OBS1>

WS2024-OBS Scientific Committee Workshop on the Harmonisation of Scientific Observers (2024)

<https://siofa.org/meetings/WS2024-OBS>

WS2024-OBS2 Scientific Committee Workshop on Scientific Observer Forms (2024)

<https://siofa.org/meetings/WS2024-OBS2>

SIOFA Scientific Committee (2025) Report of the 10th annual meeting of the SIOFA SC

<https://siofa.org/sites/default/files/2025-04/SIOFA-SC10-Report.pdf>