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

10th Meeting of the SIOFA Compliance Committee (CC10) and 13th Meeting of the Meeting of the Parties (MoP)

Savoy Seychelles Resort & Spa, Beau Vallon, Seychelles, 6–10 July 2026

MoP-13-INFO-09

An overview of the SIOFA Precautionary Approach Framework

The SIOFA Scientific Committee Chair

Meeting	Compliance Committee ☐ Meeting of the Parties ✔
Document type	Administrative Paper ☐ Proposal or Working Paper ☐ Information Paper ✔
Distribution	Public ✔ Restricted [1] ☐ Closed session document [2] ☐

Abstract

This paper introduces the SIOFA Precautionary Approach Framework (PAF), developed by the Scientific Committee in response to Recommendation 10 of the 2023 SIOFA Performance Review.

The PAF provides a consistent, science-based system for managing fisheries across SIOFA's diverse portfolio, built around three components: information classification, three-zone stock status, and tiered management procedures. SC11 endorsed the Framework and made a number of recommendations to the MoP, including its formal adoption and an indicative workplan for implementation.

The paper provides a summary of the SC advice to the MoP to adopt the PAF, endorse the workplan, and provide guidance on species scope, resourcing, and capacity-building priorities.

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1. Introduction

SIOFA manages a diverse portfolio of fisheries across the Southern Indian Ocean, ranging from commercially significant deepwater species such as orange roughy and toothfish, through to poorly understood bycatch species for which basic biological data are sparse. This diversity creates a management challenge: how to apply consistent, science-based precaution and management across stocks with a diverse range of information levels.

Article 4(c) of the SIOFA Agreement requires the Parties to apply the precautionary approach in accordance with the 1995 UN Fish Stocks Agreement and the FAO Code of Conduct for Responsible Fisheries. These state that the absence of adequate scientific information cannot be used as a reason for postponing or failing to take conservation and management measures.

SIOFA's first Performance Review (2023) identified the need for a systematic precautionary management framework as a priority area for improvement. Recommendation 10 of that review called for the development of a framework for the provision of scientific advice consistent with the precautionary approach, and encouraged the current interim arrangements be replaced with permanent measures.

In response, the Scientific Committee commissioned three linked projects, collectively the SIOFA Precautionary Approach and Management (PAM) programme, funded by the European Union:

- PAM-2024-01 — Development of the Precautionary Approach Framework (the subject of this paper), led by Kerrie Robertson and Dr Glen Holmes.
- PAM-2024-02 — Development of Biological Reference Points, led by Dr Simon Hoyle and Dr Sophie Mormede.
- PAM-2024-03 — Development of Harvest Control Rules, led by Dr Mormede and Dr Hoyle.

These three projects were developed in coordination with one another, and an expert review panel (Project PAM-2024-04) to assist the Scientific Committee by providing an independent review of the projects.

The work included three virtual SC workshops in 2025 (WS2025-PAM in February, WS2025-PAM2 in August, and WS2025-PAM3 in October), each of which provided input and advice to the draft reports presented at SC11.

Draft reports were available at SC11, and the final reports for these projects have been submitted to SIOFA in May 2026. The final reports will be considered in detail at SC12.

An infographic describing the PAF and provided by the authors of PAM-2024-01, is attached as Annex A.

2. The Precautionary Approach Framework

The PAF was designed to provide a consistent, transparent, and science-based system for managing fisheries across the full range of SIOFA's portfolio, regardless of how much, or how little, information is available about any given stock. A key design principle is that reduced data availability does not mean reduced precaution — instead, the method of delivering precaution adapts to the amount of scientific information available.

The Framework is built around three interconnected components: the information classification system, the three-zone stock status system, and management procedures.

2.1 Component 1: Information Classification System

Every SIOFA stock can be assigned to one of four information categories — High, Medium, Low, or Zero — based on the quality, quantity, and breadth of available data. Classification drives the entire

downstream framework: it determines which assessment methods may be appropriate, which type of management procedure should be applied, and how wide the precautionary buffers around reference points may need to be.

Importantly, classification does not need to be permanent; stocks should move up as data improve, or down if data collection lapses. The system was designed to create clear incentives for better information to allow better scientific advice to be used for management.

2.2 Component 2: Three-Zone Stock Status System

Each stock can be assigned to one of three stock status zones — Healthy, Under Watch, or Critical — based on its biological condition relative to scientifically established reference points.

The zone a stock occupies determines the importance and nature of the management response. Stocks in the Healthy Zone can sustain current fishing levels; stocks in the Under Watch Zone require enhanced monitoring and potentially catch reductions; stocks in the Critical Zone require immediate intervention, including a rebuilding plan if the stock has fallen below its limit reference point.

2.3 Component 3: Management Procedures

Management Procedures are pre-agreed, science-based decision rules that determine fishing opportunities based on stock status and information level. They reflect current best practice for managing fish stocks and are proposed as the primary tool for providing scientific advice on SIOFA stocks.

The Framework provides for three tiers of Management Procedure, matched to data availability: Tier 1 (full quantitative, model-based), Tier 2 (simplified empirical), and Tier 3 (qualitative, knowledge-based). The Tier 3 approach for data-limited stocks is a novel contribution, as few existing international frameworks provide guidance for this case. All tiers require simulation testing and evaluation before implementation, at a level that is proportionate to the available data.

The three components of the Framework were designed to work together as a system. Information classification shapes which management tools are feasible; stock status assessment places the stock in the appropriate zone; and the Management Procedure provides the pre-agreed rules that automatically adjust fishing opportunities based on an indicator of status. The result should be a predictable, transparent management system that can be applied consistently across all of SIOFA's fisheries.

3. Introduction to the Precautionary Approach Framework Document

The PAF document presented at SC11 (SC11-31) consists of a covering report by the consultants and two Attachments.

The covering report sets out the background and requirements for the project, summarises the approach taken, provides an overview of both attached documents, and identifies three specific matters for SC consideration:

1. implementation scope and progressive application
2. the operational checklists for information classification, whose threshold values require SC review before being applied to any specific stock, and
3. the treatment of low- and zero-information stocks through Tier 3 Management Procedures and alternative management approaches.

Taken together, the two attachments constitute a system for translating the precautionary approach into operational fisheries management across SIOFA's diverse fish stocks, based on the best available scientific advice.

Conceptual Framework

The Conceptual Framework (Attachment A in SC-11-31) is the policy architecture document. It sets out the legal basis for the PAF, its relationship to the SIOFA Agreement and Conservation and Management Measures, the principles that should guide management decisions, and the three-component architecture summarised above.

It also addresses the roles and responsibilities of CCPs, the Scientific Committee, the Compliance Committee, the MoP, and the Secretariat, and provides the governance arrangements for review and amendment of the Framework over time. Species coverage is addressed here, including the proposed phased approach and the lists of primary and secondary species.

The Conceptual Framework is the document that the MoP would formally adopt, most likely as a non-binding framework instrument.

Technical Guidelines

The Technical Guidelines (Attachment B in SC-11-31) provide an operational approach to implementing the Framework. They provide the practical workflows, operational checklists, decision protocols, and technical specifications that the Scientific Committee and Secretariat would use when implementing the Framework. This includes: the operational checklist for stock information classification (with indicators across fishery data, stock-specific knowledge, biological sampling, and ecosystem context domains); detailed guidance on assessment method selection for each information tier; reference point frameworks and default proxy values; guidance on developing Harvest Control Rules across all three management procedure tiers; the Green/Amber/Red flag system for performance monitoring and exceptional circumstances; and guidance on rebuilding plans for stocks in the Critical Zone. The Technical Guidelines are intended to evolve over time as SIOFA gains experience with the implementation of the PAF.

4. Advice from SC11

Project PAM-2024-01 was presented to SC11 in Fremantle in March 2026 as document SC-11-31. It was accompanied by draft project reports for PAM-2024-02 (SC-11-32) and PAM-2024-03 (SC-11-33). Final versions of these reports (Company for Open Ocean Observations and Logging (COOOL) 2026, Hoyle & Mormede 2026, Mormede & Hoyle 2026, Robertson & Holmes 2026, Walker 2026) are available on the SIOFA website (https://siofa.org/science/sc-works).

The SC noted the high quality and comprehensiveness of the work. Discussion focused on several issues of practical importance including (i) the development of a plan to operationalise the PAF; (ii) the treatment of early-stage fisheries when setting Tier 3 catch limits (noting that catch levels tend to be relatively high in early years, before declining); (iii) the challenges of monitoring stock recovery if a fishery must be closed under a rebuilding plan; and (iv) the provision of flexibility in the Framework for situations it may not have anticipated.

SC11 adopted the following recommendations to the MoP (paragraphs 163 and 165; see the SC11 report for the full record of the SC discussion):

163. The SC recommended that the MoP note that work provided in the PAM-2024-01, PAM-2024-02, and PAM-2024-03 projects provided a strong scientific basis for advancing a precautionary approach to fisheries management within SIOFA.

165. The SC recommended that the MoP adopt the SIOFA PAF.

5. Future Proposed Actions and Considerations for the MoP

The SC11 also recommended (paragraphs 167-170):

167. The SC recommended that the MoP endorse the indicative workplan for the adoption of management procedures (Annex F); develop a detailed workplan with clear tasks, timelines, and responsibilities; and regularly update the workplan, including with input from the SC.

168. The SC requested that the MoP provide advice on the level of resourcing that is envisioned for the development and adoption of management procedures, while noting that if SIOFA shifts to a management procedure-based MSE approach, some of the resources that would previously have been allocated to stock assessment work could be reallocated to management procedure-related work.

169. The SC recommended that the MoP endorse the holding of a two-day workshop on SIOFA PAM-related work in late 2026 or early 2027, which will consider the recommendations from the SIOFA-PAM projects and consolidate advice to SC12 on next steps, workplans, and an implementation plan for PAM, taking into account any decisions from MoP12. The SC further recommended that the MoP endorse the holding of a one-day MoP-SC joint workshop in late April or early May 2027 to consider the outcomes of the SC's work and provide preliminary advice to the MoP and CCPs, thereby facilitating further discussions on ways forward at MoP14.

170. The SC recommended that the MoP note that the SC intends to delay the implementation of management procedure-related work for 12 months and that the SC will identify key parts of any consultancy starting in 2027–2028, if required.

6. References

Company for Open Ocean Observations and Logging (COOOL) (2026). Expert Review for the Development of the SIOFA Precautionary Approach and Management Projects (PAM-2024-04_01). Scientific Committee of the South Indian Ocean Fisheries Agreement, 25 p.

Hoyle, S.; Mormede, S. (2026). Determination of Biological Reference Points (BRPs) for key SIOFA fish stocks (SIOFA PAM-2024-02) Final Project Report. Scientific Committee of the South Indian Ocean Fisheries Agreement, 72 p.

Mormede, S.; Hoyle, S. (2026). Development of harvest strategies for key SIOFA fish stocks (SIOFA PAM-2024-03) Final Report. Scientific Committee of the South Indian Ocean Fisheries Agreement, 72 p.

Robertson, K.; Holmes, G. (2026). Development of the SIOFA Precautionary Approach Framework (PAF) (SIOFA PAM-2024-01) Final Project Report. Scientific Committee of the South Indian Ocean Fisheries Agreement, 186 p.

Walker, N.A. (2026). Expert Review for the Development of the SIOFA Precautionary Approach and Management Projects (PAM-2024-04_02). Scientific Committee of the South Indian Ocean Fisheries Agreement, 21 p.

Annex A

PROJECT PAM-2024-01 · MOP12 INFORMATION BRIEF

SIOFA Precautionary Approach Framework

A structured system for applying the precautionary approach across SIOFA's full portfolio of fisheries

DELIVERED BY	REVIEWED AT	LEGAL BASIS	FUNDING
Project PAM-2024-01	SC11 · Fremantle, March 2026	SIOFA Agreement, Article 4(c)	European Union

LEGAL OBLIGATION

Article 4(c) requires SIOFA to apply the precautionary approach consistent with the 1995 UN Fish Stocks Agreement and FAO Code of Conduct. SIOFA currently has no formal framework to meet this obligation.

PERFORMANCE REVIEW

The 2023 SIOFA Performance Review directly recommended the development of a precautionary approach framework and harvest strategies. This project delivers both.

SCALE OF THE CHALLENGE

Up to 100+ species may fall within scope. Most are data-limited. No existing international framework addresses this context — the PAM Framework is designed to address this challenge and future-proof SIOFA's management.

WHAT THE PROJECT DELIVERED

A Two-Document Framework

DOCUMENT 1
Conceptual Framework

DOCUMENT PARTS

- **PART I** **Foundation** — Legal basis, SIOFA Agreement, principles, and scope
- **PART II** **Framework Architecture** — The three-component system and how it functions together
- **PART III** **Information Classification System** — Four categories and the classification process
- **PART IV** **Three-Zone Stock Status System** — Reference points, zone definitions, and management triggers
- **PART V** **Management** — Zone-specific responses, Management Procedures (three tiers), alternative management approaches, roles and review

KEY FEATURES

- Aligned with UNFSA Article 6 requirements
- Explicitly addresses SIOFA Performance Review recommendations
- MoP sets risk tolerance — SC implements
- Sets out roles and responsibilities for the MoP, SC, CCPs, and Secretariat
- Designed with the special requirements of developing States in mind
- Progressive opt-in implementation by species group
- Framework-level review every 5 years
- Transboundary stocks and ecosystem considerations included

DOCUMENT 2
Technical Guidelines

Information Classification
Detailed application guidance and a novel operational checklist translating criteria into assessable indicators. Addresses how 'adequate data' differs by life history.

Reference Points & Zone Boundaries
Methods for establishing reference points across information tiers, matched to information availability. Interim default values (PAM-2024-02) for stocks where stock-specific values cannot yet be determined.

Tier 1 & 2 Management Procedures
Guidance on full quantitative and simplified empirical MPs — development process, performance indicators, and review requirements. Integrates PAM-2024-03 HCR frameworks.

NOVEL

Tier 3 Management Procedures
No international precedent found. A qualitative adaptation of the key elements of an MP for low- and zero-information stocks, using expert knowledge, catch history, and precautionary defaults. Warrants SC scrutiny.

Alternative Management Approaches
For stocks where a full MP is not currently feasible — applicable under three documented circumstances only: interim management pending MP development; truly minimal fisheries (sporadic bycatch, negligible catch); or technical infeasibility where even Tier 3 is unachievable.

7 MANDATORY MINIMUM REQUIREMENTS

1. Document reasons for alternative approach
2. Catch limits or triggers (best available science)
3. Stock assessment (best available method)
4. Limit Reference Point (required for all stocks)
5. Monitoring strategy (data collection and reporting)
6. Performance indicators (Green/Amber/Red flag system)
7. Transition plan with triggers for MP development

Orange Roughy Worked Example
Pilot case study working through the framework step by step — illustrating how classification, zone assignment, and management procedure selection operate in practice.

THREE INTEGRATED COMPONENTS

I

Information Classification

Categorises stocks by the quantity, quality, and breadth of available data.

- **High** · data-rich stocks
- **Medium** · limited data
- **Low** · sparse data
- **Zero** · no usable data

II

Stock Status Zones

Stock condition assessed relative to agreed reference points.

Healthy — at or above target; supports sustainable exploitation (not overfished; no overfishing)

Under Watch — below target but above limit; enhanced monitoring required (overfishing or overfished relative to target)

Critical — immediate rebuilding required; both overfished and overfishing occurring

III

Management Procedures

Pre-agreed decision rules, scaled to information level, maintaining equivalent conservation risk across all stocks.

- **Tier 1** · full quantitative MSE
- **Tier 2** · simplified / empirical
- **Tier 3** · qualitative / knowledge-based

PAM-2024-02
Biological Reference Points
Tiered reference point approaches proposed for SIOFA species, consistent with international practice including CCAMLR.

PAM-2024-03
Harvest Strategies
Initial harvest control rule testing via management strategy evaluation, using orange roughy and alfonsino as test cases.

PAM-2024-04
Expert Review Panel
Independent scientific review of all three projects, confirming high quality and identifying areas for refinement.

COMPANION PROJECTS INFORMING THE FRAMEWORK

CONCEPTUAL FRAMEWORK · TABLE 3

Management Procedure Elements Matrix

Every Management Procedure — regardless of tier — must be built from the same essential elements. What differs across tiers is *how* each element is applied, not *whether* it applies. This architecture ensures risk equivalency across all SIOFA stocks, from the best-assessed to the most data-limited.

ELEMENT	TIER 1 Full Quantitative MP (High information)	TIER 2 Simplified Empirical MP (Medium information)	TIER 3 Qualitative MP (Low / zero information)	NOTES (Applies across tiers)
ESSENTIAL ELEMENTS — REQUIRED ACROSS ALL TIERS				
Fishery Definition	✓ Required	✓ Required	✓ Required	Basic requirement for all MPs
Management Objectives	✓ Required	✓ Required	✓ Required	Primary: detailed; Secondary: basic sustainability
Reference Points (LRP)	✓ Default unless otherwise determined	✓ Default unless otherwise determined	✓ Default unless otherwise determined	Can use default LRP for secondary stocks
Stock Assessment	✓ Regular schedule	✓ Regular schedule	✓ Regular schedule	Use best method available based on data availability; frequency based on scientific advice; forms part of MP monitoring
Harvest Control Rules	✓ Required	✓ Required	✓ Can be qualitative (low data / secondary species)	HCRs appropriate to the fishery
Performance Monitoring	✓ Comprehensive	✓ Based on best available data	✓ Essential indicators	Focus on key indicators for secondary stocks; cost-effective approach
Exceptional Circumstances Protocol	✓ Required	✓ Required	✓ Required	
MP Review	✓ Every two MP cycles	✓ Every two MP cycles	✓ Every two MP cycles	
Reference Points (TRP)	✓ Required	✓ Required	✓ Required	May be expressed across a range of values
ADDITIONAL ELEMENT				
Simulation Testing (MSE)	✓ Model-based MSE	✓ Model-based MSE	✓ Expert judgement MSE	
ENHANCED ELEMENTS — ENCOURAGED WHERE RELEVANT AND FEASIBLE				
Economic Analysis	○ Optional	○ Optional	— Not required	Primarily for high-value primary stocks
Ecosystem Indicators	○ Encouraged	○ Encouraged	○ Encouraged	Where relevant and feasible
Climate Considerations	○ Encouraged	○ Encouraged	○ Encouraged	Where relevant and feasible

LEGEND
- ✓ Required
- ○ Optional / encouraged
- — Not required

CONCEPTUAL FRAMEWORK · TABLE 2 — MANAGEMENT PROCEDURE TYPE SELECTION

	INFORMATION CLASSIFICATION			
	High	**Medium**	**Low**	**Zero**
Primary stocks	Quantitative, model-based MP	Quantitative, model-based MP (preferred where possible)	Full MP (preferred where possible)	Full MP (preferred where possible)
Secondary stocks Decision based on cost vs value	Full MP (preferred where possible)	Full MP (preferred where possible)	Full MP (preferred where possible)	**No commercial fishing**

★ **A framework designed for SIOFA's reality.** The framework treats data-limited stocks as the operational norm — not the exception. No existing international framework fully addresses SIOFA's context. Guidance draws on ICES, NAFO, Australia, Canada, and New Zealand where applicable, while developing novel approaches for the zero- and low-information stock situations that characterise most of SIOFA's fisheries portfolio.