TERMS OF REFERENCE
AND TECHNICAL SPECIFICATIONS

I. General information

Assignment name	Technical overhaul of the fisheries data quality control procedures and fisheries data processing workflows used by the Indian Ocean Tuna Commission (IOTC)
Beneficiary	Indian Ocean Tuna Commission (IOTC)
Country	Seychelles
Duration	The contract is concluded for a firm period of twenty-four (24) months. It may be renewed for up to two (2) additional periods of six (6) months each.

II. Context and justification of the need

Expertise France (EF) is the French public agency for international technical cooperation. EF operates in the Western Indian Ocean region to support sustainable development, regional integration, ocean governance and environmental sustainability. Through partnerships with regional organisations and national institutions, the agency contributes to strengthening technical capacities, improving access to scientific information and promoting evidence-based decision-making.

The Sustainable Western Indian Ocean Programme (SWIOP) is a regional programme funded by the European Union and structured around complementary components supporting ocean governance, sustainable blue-economy development and ecosystem resilience.

Under SWIOP, Expertise France supports regional fisheries organisations in strengthening data systems, scientific information and decision-support mechanisms contributing to sustainable fisheries governance. The present assignment supports activities aimed at optimising data-processing workflows and updating data quality-control procedures within the IOTC information system.

Rationale for the consultancy

IOTC fisheries data originate from multiple reporting systems and include nominal catches, geo-referenced catches and effort, size-frequency data, observer data, vessel information and other specialised datasets. These data pass through validation, consolidation and processing stages before they can be used for scientific analyses, stock assessment, compliance-related work and dissemination.

Several operational rules and scientific assumptions have developed progressively over time and are implemented through a combination of databases, scripts, reference tables, automated tools, manual checks and expert review. Although these procedures support essential Secretariat functions, parts of the overall system remain only partially documented, and some logic is embedded in legacy code or supporting tables. This creates challenges for transparency, testing, traceability, maintenance and integration with the redesigned information system.

Data validation and data processing are interdependent. Validation controls determine whether submitted or processed data meet defined requirements, while processing workflows transform accepted information into

standardised scientific datasets. Common rule definitions, metadata, versioning, test strategies and documentation are therefore required across both areas. Combining these activities in a single assignment will support coherent technical architecture, consistent quality assurance and integrated implementation planning.

The assignment will provide specialised technical capacity to document and modernise existing procedures, implement reproducible R-based tools, define data and metadata structures, test results against historical outputs, prepare institutional procedures and transfer the resulting knowledge to the IOTC Secretariat.

III. Objectives and desired results

The overall objective is to strengthen the transparency, reproducibility, quality assurance and long-term maintainability of the Indian Ocean Tuna Commission (IOTC) fisheries information system through the harmonization and modernization of data validation procedures, core data processing workflows, metadata structures, technical documentation and implementation arrangements.

The assignment combines two closely related technical components.

- The first concerns the **review, harmonization and automation of quality-control and data-validation procedures applied to fisheries datasets submitted to the IOTC Secretariat**.
- The second concerns the **documentation, refactoring and modernization of core data-processing procedures used to transform submitted data into standardized scientific datasets**. The components shall be implemented within a common technical and quality-assurance framework so that validation rules, processing logic, metadata, versioning, testing and documentation remain coherent across the information system.

The service provider shall preserve validated scientific methodologies and operational requirements unless a proposed improvement is explicitly documented, justified and approved through the applicable review process. The resulting tools and workflows shall be modular, tested, reproducible, documented and suitable for integration into the redesigned IOTC information system.

IV. Description of the assignment

1) Activities

The assignment comprises two main technical components and a cross-cutting component for technical oversight, coordination, documentation, and knowledge transfer. Applicants may refine the sequencing and implementation methods in their technical proposal, provided that all required outputs are covered and the integrity of existing data and scientific processes is protected.

1. Component 1 - Review, harmonization and automation of data quality-control procedures

This component will establish a coherent validation framework across IOTC datasets and reporting systems, including nominal catches, geo-referenced catches and effort, size-frequency data, Regional Observer Scheme data and data concerning the use of drifting Fish Aggregating Devices, as applicable during implementation.

Task 1 - Review and harmonization of data quality-control procedures

Existing quality-control procedures have developed progressively through automated routines, manual checks and expert review. They require consolidated documentation, consistent rule definitions and systematic coverage across datasets.

The service provider shall:

- Review existing quality-control procedures applied to datasets managed by the IOTC Secretariat;
- Document end-to-end validation workflows, including automated and manual controls from data submission through consolidation, processing and publication;
- Identify inconsistencies, duplicated rules, gaps and dependencies across datasets, reporting templates, databases and information systems;
- Review consistency between validation rules, the IOTC Reference Data Catalogue, reporting templates and associated metadata standards;
- Develop a harmonised validation-rule model that includes unique rule identifiers, detailed definitions, severity levels, affected datasets, required reference data and expected outputs;
- Develop and maintain an IOTC Data Validation Rule Registry suitable for implementation, versioning and long-term maintenance;
- Recommend priorities and an implementation sequence for harmonising and extending the quality-control framework.

Task 2 - Development of automated data-validation procedures

The assignment shall consolidate existing R-based approaches and extend automated validation to support consistent implementation, maintainability and traceability.

The service provider shall:

- Review existing automated validation tools, R packages, Shiny applications, database procedures and supporting scripts;
- Refactor, complement and harmonise validation routines using an appropriate modular R-based framework, including the rule package where technically suitable;
- Develop additional automated rules to detect within-dataset inconsistencies and implement cross-dataset checks across statistical, observer, vessel and other relevant databases;
- Implement mechanisms that retrieve and use current approved reference code lists and metadata;
- Improve validation reports through consistent classification and presentation of errors, warnings and informational messages;
- Develop mechanisms for recording validation results, corrections, resubmissions and successive dataset versions;
- Test updated procedures using appropriate historical and test datasets, compare outcomes with existing tools and document all material differences;
- Prepare reusable modules, test cases and deployment or integration guidance for the redesigned information system.

2. Component 2 - Review and modernisation of core data-processing workflows

This component will reproduce three priority legacy processing workflows as transparent, modular and documented R-based pipelines while preserving existing scientific methodologies and expected outputs.

Task 3 - Catch disaggregation for taxonomic and gear aggregates

Nominal catches reported under aggregated taxonomic or gear categories are disaggregated to species and gear-level estimates using reference tables, observed compositions, historical information and documented expert assumptions.

The service provider shall:

- Review and document the existing disaggregation workflow and its relationship with Level 0, Level 1 and Level 2 nominal-catch datasets;
- Identify all source datasets, taxonomic and gear mapping tables, historical compositions, reference fisheries, proxy fisheries, allocation rules and assumptions;

- Produce a complete process map describing calculations, decision points, fall-back rules and quality controls;
- Assess the current methodology and identify opportunities to improve transparency, reproducibility and maintainability without altering approved scientific logic;
- Develop a modular R-based implementation that reproduces the current outputs;
- Develop a structured and versioned framework for allocation rules, proxy fisheries, assumptions and reference datasets;
- Validate the implementation against historical outputs and document differences, limitations and recommendations.

Task 4 - Conversion of geo-referenced catches between numbers and weight

Geo-referenced catch data may be reported in numbers or weight. Current procedures estimate equivalent values using annual average weights, size-frequency information, nominal catches, product-form conversion factors and other reference information.

The service provider shall:

- Review and document the existing methodology for converting geo-referenced catches between numbers and weight;
- Identify all contributing datasets, conversion factors, biological reference values, historical parameters and assumptions;
- Document rules used when direct average-weight estimates are unavailable, incomplete or implausible;
- Assess estimated average weights against appropriate biological ranges and identify cases requiring alternative methods;
- Develop a decision framework defining the hierarchy of estimation methods, application conditions and quality indicators;
- Develop a modular R-based implementation reproducing the current methodology;
- Specify a database structure for storing annual average weights, conversion factors, methods, quality indicators, version information and processing metadata;
- Validate the implementation against historical outputs and document differences or proposed improvements.

Task 5 - Spatial extrapolation of geo-referenced catches and fishing effort

Geo-referenced catch and effort data are reconciled with corresponding annual nominal catches. Existing procedures include catch-raising factors and substitution methods using predefined spatial areas or proxy fisheries when spatial information is incomplete or unavailable.

The service provider shall:

- Review and document the existing methodology for reconciling geo-referenced catches with annual nominal catches;
- Identify source datasets, reference tables, spatial definitions, proxy fleets, processing rules and assumptions;
- Produce a detailed process map covering calculations, decisions and quality controls;
- Document estimation and treatment of annual catch-raising factors, including cases where geo-referenced catches exceed or fall below nominal catches;
- Develop a decision framework for selecting predefined CWP statistical areas, proxy fleets and other approved substitution methods;
- Develop and document a method for extrapolating geo-referenced fishing effort for selected longline and surface fisheries, using spatial allocation principles consistent with catch extrapolation;
- Develop a modular R-based implementation reproducing the current workflow and outputs;

- Specify a versioned database framework for raising factors, effort parameters, proxy fleets, spatial rules, reference areas, assumptions and processing metadata;
- Validate the implementation against historical outputs and document differences, limitations and recommendations.

Component 3 – Technical coordination, integration and operationalisation

This cross-cutting component shall ensure that the data quality-control and data-processing workstreams are developed as parts of a single, coherent, maintainable and operational system rather than as separate technical products. The service provider shall ensure the technical integration and operational consistency of the different workstreams, including their interfaces, business rules, data structures, reference data, metadata, processing logic, testing procedures and resulting outputs. Particular attention shall be given to traceability, reproducibility, interoperability and compatibility with the redesigned IOTC information system.

Task 6 – Operationalisation, integration and technical oversight

The service provider shall:

A. Technical integration and workflow consistency

- Define and document the interfaces between the data quality-control and data-processing workflows, including inputs, outputs, dependencies, and processing sequences;
- Ensure that validation outcomes can be incorporated consistently into subsequent processing and estimation workflows;
- Ensure consistent use of reference data, code lists, parameters, metadata and processing rules across all technical components;
- Define common conventions for identifiers, naming, versioning, repository structure, configuration management and release documentation;
- Ensure compatibility with the redesigned IOTC information system, database architecture and associated services.

B. Integration testing and operational deployment

- Develop and maintain an integrated testing framework covering the complete workflow from data submission through validation, correction, processing and generation of outputs;
- Define acceptance criteria and testing procedures for the integrated workflows;
- Support testing using representative current and historical IOTC datasets;
- Compare outputs, where relevant, against existing operational systems and data-management tools, including ROS and other Secretariat workflows;
- Support user acceptance testing and phased implementation planning with the IOTC Secretariat;
- Identify implementation risks and recommend mitigation measures

C. Documentation, operationalisation and knowledge transfer

- Prepare consolidated technical and operational documentation covering workflow operation, maintenance and future evolution;
- Consolidate code, configuration files, metadata templates, test datasets, and implementation guidance in agreed repositories and editable formats;
- Deliver practical demonstrations and knowledge-transfer sessions for Secretariat staff and relevant technical partners;
- Prepare recommendations concerning governance, ownership, maintenance, and future development of the integrated workflows.

2) Anticipated deliverables

The consultancy will be structured around the six-deliverable packages presented below, corresponding to the six tasks described in the scope of the assignment, together with the implementation period from the signing of the contract. The level of effort and detailed schedule shall be established in the technical offer submitted by the service provider.

Deliverables may be submitted in agreed iterations to allow technical review and testing. All final deliverables shall be submitted in English and in editable, reusable formats. Code shall be documented and version-controlled. Each package shall include the documentation and test materials needed to understand, reproduce and maintain the corresponding workflow. Deliverables will be technically reviewed by the IOTC Secretariat, with Expertise France ensuring contractual follow-up and formal acceptance in accordance with the contract.

Tasks	Description	Deliverables	Indicative timing
D1. Data quality-control framework	Framework document (pdf) describing validation architecture, business rules, validation categories, reporting outputs and implementation specifications	One (1) report	Months 1-8
D2. Validation workflows and software components	Development and implementation of validation routines (R scripts), quality-control outputs, rule management, issue-tracking mechanisms and reporting tools	One (1) package	Months 6-24
D3. Catch-disaggregation workflow package	Methodology documentation (pdf) including process map, source and assumption inventory, modular R workflow (R scripts), and validation component.	One (1) package	Months 1-3
D4. Numbers-weight conversion workflow package	Methodology documentation (pdf) including decision framework, source and parameter inventory, modular R workflow (R scripts), and validation component	One (1) package	Months 3-6
D5. Spatial catch and effort extrapolation workflow package	Methodology documentation (pdf) including catch-raising and substitution framework, prototype effort-extrapolation method, modular R workflow (R scripts), and validation component	One (1) package	Months 6-9
D6. Workflow integration and operationalisation	Integration and technical oversight of validation and processing workflows, including common standards, testing, implementation support and operational guidance. One final report summarizing the delivery of the activities, as well as recommendations to further strengthen IOTC data workflows in the coming years.	One (1) package	Months 1-24

3) Coordination

The service provider shall designate a single contact person for project implementation purposes.

Mr. Théo GIRARD, Technical Coordinator for SWIOP 1.2 will be the service provider's sole contact person for Expertise France

Tel: +33 6 49 609 854
E-mail: theo.girard@expertisefrance.fr

To avoid ambiguity of roles, the service provider shall not:

- Represent Expertise France or IOTC vis-a-vis the European Union, States, partner institutions or stakeholders, unless expressly authorised for a specific technical purpose;
- Assume project-management, staff-management, procurement, contractual, budgetary or administrative responsibilities;
- Exercise decision-making, formal validation or arbitration authority on behalf of Expertise France or IOTC;
- Approve changes to scientific methodologies, official datasets, reporting requirements, reference code lists or data-access policies;
- Directly modify production data or deploy changes to production systems without the applicable authorisation, controls and acceptance procedures;
- Substitute for the SWIOP Project Coordinator, IOTC Secretariat staff, designated data owners or system owners.

All proposed methodological or technical changes shall be documented and remain subject to review and formal validation by the competent organisations. Technical review undertaken by the service provider does not replace institutional acceptance or approval.

V. Place, duration and terms of performance

1) Implementation period: December 2026 – December 2028

2) Location: Remote with field missions to Seychelles to be organized by the service provider

The main beneficiary of this activity
The service provider may deliver the technical assistance remotely. However, the technical offer should include several field missions to engage directly with the IOTC Secretariat at the most critical stages of the work. The service provider should specify the number of field missions it will organize, at which stage(s) of the work they will take place, and should budget them into the proposal accordingly. Expertise France will not cover any travel expenses under this contract; travel expenses shall be borne by the service provider's organization.

VI. Required expertise and profile

Applications may be submitted by an individual expert, by a service provider or by a team of experts applying in consortium. Given the breadth and level of effort of the assignment, applicants shall demonstrate how all required competencies will be covered throughout implementation. Where a team is proposed, the application shall identify a lead expert responsible for technical coherence and overall quality oversight, and shall describe the allocation of responsibilities and deliverables for each expert involved in the assignment.

Academic qualifications

The proposed expert or team shall collectively include advanced university qualifications at Master's degree level or above, in the relevant fields below:

Fisheries science, marine science or fisheries statistics;
Statistics, data science, environmental sciences or quantitative ecology;
Additional qualifications or specialised training in software quality assurance, data governance, metadata, fisheries information systems, database architecture or scientific workflow management will be considered assets.

Professional experience

The proposed expert or team shall demonstrate substantial professional experience in fisheries data systems, scientific data processing, data validation, software development or closely related fields. In the case of a team, the proposed lead expert should have at least eight (8) years of relevant professional experience, including responsibility for the design, technical coordination and oversight of complex fisheries data or information-system assignments. Other proposed experts should have experience proportionate to their responsibilities under the assignment.

Collectively, the proposed expertise shall demonstrate solid working experience in the following areas:

- Development, maintenance or modernisation of fisheries or environmental data-processing workflows;
- Design and implementation of fisheries data validation-rule or quality-control systems;
- Development of reproducible scientific software and modular R-based data pipelines;
- Data modelling, relational databases, SQL and integration of multiple scientific data sources;
- Documentation and refactoring of legacy systems while preserving validated operational or scientific requirements;
- Software testing, regression testing, technical review, code review;
- Metadata management, versioning, traceability, reference-data management and data lineage;
- Preparation of database specifications, technical architecture documentation, SOPs and user guidance;
- Technical coordination of multidisciplinary work streams and integration with wider information-system programmes;
- Knowledge transfer and capacity development for institutional users and technical teams.

Given the highly technical nature of fisheries data-related work, the following field experience is also required for this assignment:

- Experience with Regional Fisheries Management Organisations (RFMOs);
- Experience with nominal catches, geo-referenced catch and effort, size-frequency, observer, vessel or Fish Aggregating Device (FADs) datasets;
- Experience with fisheries reporting requirements, scientific data standards, reference code lists or metadata catalogues;
- Experience in the design, implementation or migration of fisheries information systems.

Technical competencies

The proposed expert or team shall demonstrate an appropriate combination of the following competencies:

- Advanced R programming, including package-based or modular development of reproducible pipelines and validation tools;
- R Shiny or other web-based interfaces for validation, reporting or data-management functions;
- Relational database systems and SQL, preferably including PostgreSQL and, where relevant, PostGIS;
- Version control and collaborative software-development practices using Git-based platforms;
- Automated testing, test-data management, continuous integration or comparable software-quality practices;
- Data validation frameworks, rule libraries and structured quality-assurance approaches;
- Metadata, reference data, data lineage, audit trails and version-management mechanisms;
- Technical documentation, process modelling and production of maintainable code and database specifications.

Applicants are not required to use every technology listed above. The technical proposal shall justify the selected architecture, tools and methods in relation to reproducibility, maintainability, interoperability, security, institutional ownership and integration with existing or redesigned systems.

Languages

- Fluency in English, both spoken and written, is mandatory;
- Working knowledge of French will be considered an asset.

Professional competencies

- Strong analytical and problem-solving ability;
- Excellent attention to detail and commitment to data quality, testing and reproducibility;
- Ability to organise and integrate multiple interdependent technical workstreams;
- Ability to work independently while maintaining effective communication with institutional and technical counterparts;
- Excellent technical writing and ability to translate complex procedures into clear, testable and maintainable specifications;
- Constructive review skills and the ability to resolve technical issues transparently;
- Commitment to practical knowledge transfer and long-term institutional sustainability.