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FINAL TECHNICAL REPORT:

Technical Support to Enhance Data and Information Management for Decision Support to the Eastern Caribbean Flyingfish Fishery



CRFM Secretariat 2019

FINAL TECHNICAL REPORT: Technical Support to Support Data and Information Management for Decision Support to the Eastern Caribbean Flyingfish Fishery

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CRFM TECHNICAL & ADVISORY DOCUMENT – Number 2019 / 08

FINAL TECHNICAL REPORT: TECHNICAL SUPPORT TO ENHANCE DATA AND INFORMATION MANAGEMENT FOR DECISION SUPPORT TO THE EASTERN CARIBBEAN FLYINGFISH FISHERY

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This report is an output of the **Technical Support to Enhance Data and Information Management for Decisions Support Consultancy**, which was implemented by the Nexus Coastal Resources Management Ltd. while under contract to the Caribbean Regional Fisheries Mechanism (CRFM).

Disclaimer

This publication has been produced for the CRFM. However, the views expressed herein are those of the authors, and can therefore in no way be taken to reflect the official opinions of the CRFM.

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ABBREVIATIONS AND ACRONYMS

CARICOM	Caribbean Community and Common Market
CBO	Community-Based Organization
CCAD	Central American Commission for Environment and Development
CEP	Caribbean Environment Programme (UNEP)
CERMES	Centre for Resource Management and Environmental Studies
CFMC	Caribbean Fisheries Management Council
CITES	Convention on the International Trade of Endangered Species
CKAN	Comprehensive Knowledge Archive Network
CLME	Caribbean Large Marine Ecosystem
CLME+	Caribbean and North Brazil Shelf Large Marine Ecosystem (CLME Project)
CRFM	Caribbean Regional Fisheries Mechanism
DSS	Decision Support System
EAF	Ecosystem Approach to Fisheries
EBM	Ecosystem-based Management
EcoQO	Ecosystem Quality Objective (CLME SAP)
FAO-WECAFC	Food and Agriculture Organization of the United Nations – Western Central
	Atlantic Fisheries Commission
GDP	Gross Domestic Product
GEF	Global Environment Facility
GPA	Global Programme of Action for the Protection of the Marine Environment from
	Land Based Activities
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICM	Integrated Coastal Management
IGO	Inter-Governmental Organization
ILO	International Labour Organization
IMO	International Maritime Organization
IOC	Intergovernmental Oceanographic Commission of UNESCO
IUU	Illegal, Unreported and Unregulated fishing
IWECO	Integrating Water, Land and Ecosystem Management in Caribbean Small Island
	Developing States (GEF)
LBS	Protocol concerning Pollution from Land-based Sources and Activities
	(Cartagena Convention)
LME	Large Marine Ecosystem
LMR	Living Marine Resources (CLME Project)
MARPOL	International Convention for the Prevention of Pollution from Ships
MCS	Monitoring, Control and Surveillance
NAP	National Action Plan
NBSLME	North Brazil Shelf Large Marine Ecosystem
NEXUS	Nexus Coastal Resource Management Ltd.
NGO	Non-Governmental Organization
NPOA	National Plans Of Action
OECS	Organization of Eastern Caribbean States
OSP	Oil Spills Protocol (Cartagena Convention)
OSPESCA	Central American Fisheries and Aquaculture Organization
REMP	Regional Environmental/Ecosystem Monitoring Programme (CLME Project)
RFMO	Regional Fisheries Management Organization
RGF	Regional Governance Framework (CLME Project)
SAP	Strategic Action Programme (CLME Project)
SBO	Societal Benefits Objective (CLME SAP)

Strategic Direction (CLME SAP)
Small Grants Programme (GEF)
Small Island Developing States
Shared Living Marine Resources (CLME Project)
Specially Protected Areas and Wildlife Protocol (Cartagena Convention)
Transboundary Diagnostic Analysis (CLME Project)
United Nations
United Nations Development Programme
United Nations Environment Programme
United Nations Educational, Scientific and Cultural Organization

EXECUTIVE SUMMARY

This Consultancy takes place under CLME+ Strategic Action Programme Sub-Project #3 and aims to contribute to the delivery of Output 5. Long-term enhancement of livelihoods / human well-being facilitated (O5.1, O5.2, O5.3) under COMPONENT 3 of the main CLME+ Project Document: "*Transition to an ecosystem approach for the Eastern Caribbean flyingfish fisheries demonstrated*". It has been developed in response to the corresponding calls for action under (a) the CLME+ Strategic Action Programme (SAP), politically endorsed at the regional level in 2013 and (b) the approved Regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean.

This Consultancy was conducted in several stages as defined by the Terms of Reference including preparation of an inception report and work plan, desktop research and field visits necessary to produce the Consultancy deliverables. It was noted that several challenges had to be addressed during the Consultancy implementation including communications, insufficient data, scheduling / timeline difficulties, duplication with other projects and soliciting full Member State participation. NEXUS Coastal Resource Management Ltd. (NEXUS) undertook desktop research and data collection that focused on current data collection, storage, and management systems within selected Member States.

There was the expectation that all consultancy participants would provide data and information necessary for the completion of consultancy deliverables. This was unfortunately not the case and extra effort was needed to identify sources of information and to compile this information directly by the Consultancy. Based on this information the Consultancy built analysis on the available country-specific and region-specific data as well as data compiled from in-country surveys / interviews. These interviews and surveys were conducted in Grenada, Barbados and Trinidad and Tobago in October 2017, with Member State representatives during the CRFM Fisheries Forum in Montserrat in April 2018, during in-country visits in Barbados and Grenada in July and August 2018 and finally during the Regional Fisheries Technical Meeting in October 2018. All surveys and interviews were conducted by Consultancy staff in accordance with interview guides provided to Member States.

Based on the analysis of the findings the following recommendations are offered:

- Member States should enhance collection of data and information through legislation and
- regulations that require vessel registration, logsheets / books, and dockside monitoring. Accordingly, greater effort should be applied across governments to collect and compile diverse and relevant data and information regarding the social and economic aspects of the fishery;
- Member States should support the continued development of fishers' organizations and ensure their full participation in data collection to support the enhancement of livelihoods; and,
- Promote private sector industry collaboration across and between Member States.



Barbados Beach (Credit: Maria Delesalle, NEXUS)

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INTRODUCTION

This Report is submitted by NEXUS Coastal Resource Management Ltd. (the consultants) of Canada, a marine resource consultancy firm established in 1993 and is the Final Report for the consultancy "Technical Support to Enhance Data and Information Management for Decision Support to the Eastern Caribbean Flyingfish Fishery".

This consultancy takes place under CLME+ Strategic Action Programme Sub-Project #3 and aims to contribute to the delivery of Output 5. Long-term livelihoods/human enhancement of well-being facilitated (05.1, 05.2, 05.3) under COMPONENT 3 of the main CLME+ Project Document: "Transition to an ecosystem approach for the Eastern Caribbean flyingfish fisheries demonstrated". It has been developed in response to the corresponding calls for action under (a) the CLME+ Strategic Action Programme (SAP), politically endorsed at the regional level in 2013 and (b) the approved Regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean. Specifically, the purpose of this contract was to advance the respective processes towards long-term enhancement of livelihoods and human well-being by enhancing data and information management for decision support to the fishery.



Primary Landing Site, Grenada (Credit: Maria Delesalle, NEXUS)

The anticipated results of this consultancy were to provide:

- Improved stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish and improved availability of data and information to the global community; and,
- Strengthen EAF information and knowledge base.

APPROACH TO ASSIGNMENT

The consultancy was conducted in several stages as defined by the Terms of Reference. The first stage consisted of the preparation of an Inception Report and work plan that advanced information related to available data and methodology to be used for the implementation of the consultancy. During this phase it was determined that the consultancy would focus on Barbados, Grenada and Trinidad and Tobago (specifically Tobago). This would enable evaluation of the national data management and associated decision support systems.

The second stage consisted of desktop research and field visits to compile information for the deliverables in each of the three Work Packages. Data mining consisted of online searches of government reports, academic literature (research studies), international organization reports, grey literature and industry reports. The final stage consisted of roundtable analysis and report / database preparation.



Flyingfish Processing, Barbados (Credit: Maria Delesalle, NEXUS)

The consultants' approach to this consultancy was to ensure that the overall consultancy objectives aligned with the five other consultancies that focused on flyingfish and to

contribute to the actual realization of change in the region (understanding fiscal and human constraints).

The consultants employed an honest broker approach to ensure CRFM and Member States received recommendations that addressed the human and fiscal constraints facing their day to day operations while offering tangible recommendations on how best to enhance the collection, compilation, and management of data to support sustainable livelihoods within the flyingfish fishery. These recommendations are based both on expertise and experience in fisheries management as well as international best practices.

COMMENTS ON TERMS OF REFERENCE

Implementing the Terms of Reference (refer to Annex 1 for more information) resulted in significant technical and practical challenges throughout the lifespan of the consultancy.

From a practical perspective, these challenges included:

Communication

In the implementation of any consultancy, timely communication is essential in providing consultancy deliverables on time and within budget. However, external communication with Fisheries Divisions can often create unanticipated burdens. Finding the right balance between consultants' schedules and Fisheries Divisions staff work schedules is not always easy. This was the case experienced in the implementation of this consultancy. As a result, communications were often inhibited by Fisheries Division staff schedules resulting in delays in accessing available information.

Travel and Logistics

The initial consultancy design provided budget and time for travel to collect information for specific consultancy deliverables. However, due to the lack of readily data and information from the participating Fisheries Division necessitated direct face-to-face meetings and as a result, additional travel was required. This included reallocating consultancy funds for additional field work and to attend unplanned meetings.

Schedule and Timeline

The consultancy schedule and timeline were defined in anticipation that datasets and sufficient information would be readily available to the consultants by Member States. Regrettably, this was not the case and as a result, the consultants' schedules had to be revisited and adjusted accordingly.

Member State Participation

At the consultancy onset it was determined that the three countries involved in the consultancy would be Barbados, Grenada and Trinidad and Tobago. However, due to the current state of the fishery and Member State interaction, Tobago was reluctant to provide data and information needed to meet consultancy needs. As a result, the deliverables focus largely on Barbados and Grenada, with some reference to Tobago.

Duplication / Similarity with other Consultancies

This consultancy was one of six ongoing consultancies related to the Eastern Caribbean Flyingfish Fishery. Much of the work was similar to other consultancies. Thus, this had a direct impact in the implementation of this consultancy as much of the information provided did not adequately meet the consultancy requirements. Additionally, the six consultancies were being conducted by multiple consultancies and due to the similarity between the consultancies Member State Fisheries Divisions staff were often confused by the purpose/objective of the various consultancies. Similarly, multiple requests for information by the various consultancies (CLME+ as well as others) resulted in further misunderstanding and consultation fatigue within Fisheries Divisions and amongst stakeholders.

From a technical perspective, these challenges included:

1) Data and Limitations of Available Information

It was assumed at the consultancy onset that the necessary information and data/datasets needed to conduct thorough analysis related to data management systems would be available to the consultants. However, it quickly became apparent that this was not the case. The limitations of accessing usable and up-to-date data and information significantly impact the consultant's ability to conduct rigorous analysis related to consultancy deliverables. Based on this, the consultants revised their approach, which resulted in more effort than the budget allowed in order to provide CRFM with the best possible final products.

2) Change in Scope

During early project activities it became apparent that the types of information and data available from Member States and the capacities for data storage and management at the sub-regional level were limited, thus it was determined that the searchable bibliographic database and the data repository be combined into one platform. This ensured a more cost-effective strategy for continued development of the platform within the sub-regional organization.

ORGANIZATION AND METHODOLOGY

The following activities were carried out to in order to prepare the final deliverables associated with this consultancy.

1. Research and Data Collection

The consultants conducted thorough online desktop research for this consultancy, drawing on the latest publications and standards that focused on:

- Data collection, storage and management systems
- Data sharing protocols and procedures
- Data necessary for decision-making
- Monitoring and evaluation performance criteria
- Model catch documentation schemes
- Decision support systems

Furthermore, this research was augmented by two separate in-country trips to collect data and implement field surveys. The data that was collected during this in-country travel was further augmented with additional online research.



In-country Field Surveys (Credit: NEXUS)

2. Development of Database

The consultants undertook the preparation of a rationale, structured, and review of the intent for the online searchable bibliographic database and data repository for the eastern Caribbean Flyingfish fishery. This analysis provided insight for the design and development of the bibliographic database and information repository so that it would meet Member States' basic requirements. Furthermore, it was determined that the database platform be deployed as an operational service by the CRFM Secretariat.

The database was constructed on the Comprehensive Knowledge Archive Network (CKAN) platform since it is cost-effective for present and future users who seek to advance more effective management of the Flyingfish fisheries in the Caribbean area and to be in agreement with the FAO system for disseminating information, Fisheries Global Information System (FIGIS). The structure of the database was set to facilitate stakeholder access to relevant data and information about and improve the availability of data and information to the global community. The database can be accessed through a CRFM-managed web portal that provides a single resource for data discovery that may be used by not only national, regional, and local fisheries managers, but also by universities, researchers and fishermen or any associations related to fisheries management.

3. Analysis

Based on the information collected during desktop research and data collection from in-country travel the consultants facilitated round table analysis and brainstorming sessions within the consultant Team. These roundtable discussions were an effective approach for analyzing data and information as they create a space for differing opinions on a topic to emerge and to be discussed in greater detail. Roundtable discussions can be time consuming, however, the benefits of this approach are:

- Space for critical thinking;
- Innovative ideas / approaches emerge;
- Enables broad range of perspectives and input;

- Facilitates collaboration amongst subject matter experts; and,
- Avoids duplication of effort.

4. Report Writing

Based on the data and information collected and analyzed, the consultants prepared the following reports to meet the deliverables stated in the Terms of Reference:

- Inception Report
- Data Management Systems Report
- Multi-Objective Assessment Report
- Gender-sensitive Valuation Report
- EAF Management and Policy Cycle Implementation Report
- Monitoring Evaluation of Management Measures Report
- Recommendations for Enhance Data Collection Systems Report
- National Vessel Census Report
- Collection and Storage of Traditional Knowledge Report
- Revised FMP Summary Report
- Management Performance Report
- Data and Information Requirements Report
- Model Catch Documentation Scheme Report
- Draft Model Catch Documentation Scheme Barbados Report
- Stock Assessment Report
- Impact Assessment Tool
- Decision Support System Proposal

DELIVERY OF TERMS OF REFERENCE

The following table sets out the required consultancy deliverables, as per the Terms of Reference, and the outputs delivered by the consultants.

Deliverable as per ToR	Consultancy Output
Prepare an Inception Report and Work Plan	An inception meeting took place via teleconference with CRFM Secretariat staff and the consultants, where a work plan was agreed upon and countries were selected for participation. Based on these discussions the consultants prepared a final Inception Report for review and approval by CRFM.
Establish a CRFM data and information repository for EAF management of Eastern Caribbean flyingfish, which would include identification and electronic consolidation of all published data and information	The consultants designed and implemented a CRFM- based online searchable bibliographic database and information repository. The consultants also prepared a Data Management Systems Report which provides greater detail into the structure and purpose of the repository and bibliographic database.

Deliverable as per ToR	Consultancy Output
An online, keyword searchable, bibliographic database with facility for download of published documents	As noted above, the consultants designed and implemented a CRFM-based online searchable bibliographic database and information repository. To maintain cost-effective data management services by the CRFM the information repository and bibliographic database were combined into a single platform.
The up-to-date, broadened, multi-objective assessment of the eastern Caribbean flyingfish fisheries	The consultants conducted a review of national fisheries management systems and plans to evaluate consistencies and completeness of national fisheries management objectives. The Multi-Objective Assessment Report examines conflicts and consistencies between national and regional management objectives.
The results of / report on the comprehensive and gender-sensitive valuation (social and economic) of the current and potential future contribution of flyingfish and associated pelagic fisheries	The consultants conducted an evaluation of gender equity within the fishery sector of participating Member States. This was used to inform the valuation (social and economic) of the fishery which provide recommendation of development potential of flyingfish fishery in each Member State and the region as a whole.
New information for EAF management and policy cycle implementation support, including options for value chain problem solving	The consultants conducted a review of the state of data availability and quality related to the various components, sectors, and attributes of the flyingfish fishery. This information was analyzed to determine new approaches and requirements for EAF management and policy cycle implementation.
Refined operational objectives, indicators and reference points for monitoring and evaluation of management measures	The consultants completed a review and analysis of the objectives for the national and regional FMPs and existing monitoring and evaluation measures to determine where additional effort is needed to strengthen management capacity.
National level recommendations made consistent with the sub-regional FMP, including provisions for further development of data collection and management systems	The consultants prepared a report to provide recommendations to CRFM Member States to advance and enhance fishery data collection regarding the understanding and management of the Eastern Caribbean flyingfish fishery. Recommendations focused on the improvement of general systems through which data is collected and the content of the data collected.
National vessel census for quantifying existing fishing effort and fishing capacity	The consultants completed a Vessel Census Report in collaboration with Blue Earth Consulting (ERG) for the "Flyingfish Fishery Vessel Census Report" from ERG's project "CLME / SP3-FF / EOI-IMS / 01 / 17: Technical Support on Implementation of Management / Stress Reduction Measures in the Eastern Caribbean Flyingfish Fishery.

Deliverable as per ToR	Consultancy Output
A system for collection and storage of traditional and/or unpublished knowledge about the ecosystem and fishery through interviews with local fisherfolk and other stakeholders	The consultants prepared a report providing feedback and recommendations developing a system for CRFM to collect and store traditional and/or unpublished knowledge.
Revised Sub-Regional Fisheries Management Plan (FMP) for Eastern Caribbean Flyingfish	As a result of multiple consultancies involving modification and recommendations to the FMP it was concluded that it would be advantageous for all inputs to be consolidated into a single report. Thus, the consultants prepared a summary report of the information presented in the "Revised Sub-Regional Fisheries Management Plan for Flyingfish in the Eastern Caribbean" (prepared in collaboration with Blue Earth Consulting/ERG).
Management Performance Report	The consultants prepared an overview of the identified factors that influence and contribute to the performance of national and regional flyingfish fisheries management. This report expands on the considerations presented in NEXUS' "Management, Monitoring and Evaluation Report", which deals with the specific indicators/metrics used to monitor/evaluate performance of the objectives.
Data and Information Requirements Report	The consultants prepared a report that summarized the results of the findings from multiple reports prepared for this consultancy that identify and discuss data and information requirements for the management of flyingfish fishery.
Model Catch Documentation Scheme	The consultants conducted a review of Catch Documentation Schemes (CDS) and examined how a CDS could be implemented for the flyingfish fishery, identifying some of the inherent constraints/difficulties. In addition, the consultants prepared a draft (example) CDS for Barbados.
The updated FIRMS resource and fisheries inventories for the eastern Caribbean stock of four- wing flyingfish	The consultants prepared an updated "Resource and Fisheries Assessment for the Eastern Caribbean Stock of Four-Wing Flyingfish 2018" report. This report represents an update of previous stock assessment work, in particular the Fisheries and Resource Monitoring System (FIRMS) Report on Status of Stocks and Resources 2008 for four-wing flyingfish.
Impact assessment tool on the impact of the online data and information repository for CRFM use to assess improvements in stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish. An impact assessment tool on systems and procedures supporting generation of updated EAF management advice, for follow up evaluation by the CRFM	The consultants prepared one Impact Assessment Tool Report, which included 4 assessment tools to meet the deliverables in both this project and the "Technical Support to Enhance Data and Information Management for Decision Support System".

Deliverable as per ToR	Consultancy Output
A proposal for decision support system for Eastern Caribbean flyingfish	The consultants prepared a report which provides an overview of Decision Support Systems and outlines proposal requirements for contracting professional consulting services for CRFM to consider.
Appropriate number of bi-monthly technical activity progress reports	Progress reports were prepared and submitted to CRFM to note project progress, issues, constraints and mitigations measures. However, not all reports were bimonthly due to the extended timetable, and lack of significant progress during some periods.
Final Technical Report	This current report represents this deliverable.

OVERVIEW OF ACTIVITIES CONDUCTED

The activities involved in this consultancy consisted of desktop research, field visits, roundtable analysis sessions and report writing. The following table highlights the activities conducted with each associated deliverable, as described in the Terms of Reference.

Activities for Deliverables as per ToR	Consultancy Actions
Preparation of an Inception Report and Work Plan	The consultants participated in a teleconference with CRFM staff to discuss consultancy deliverables and work plan. A final Inception Report was prepared based on this discussion and submitted to CRFM for review and approval.
Establish a CRFM data and information repository for EAF management of Eastern Caribbean flyingfish, which would include identification and electronic consolidation of all published data and information	The consultants reviewed various open source data management systems to ensure most appropriate (simple and cost-effective) platform would be selected for the development of a specific Eastern Caribbean Flyingfish Fishery data and information repository. CKAN was selected as the appropriate structure for the platform considering the applicability of CKAN it was determined that it could be used for both the data and information repository as well as the searchable, bibliographic database. Combining the two components simplifies searches by interested parties and reduces cost for data management. The consultants developed a pilot platform and uploaded this to CRFM for ongoing management. The consultants provided online instruction and support to CRFM's data manager.
An online, keyword searchable, bibliographic database with facility for download of published documents	See above information on data and information repository.

Activities for Deliverables as per ToR	Consultancy Actions	
The up-to-date, broadened, multi-objective assessment of the eastern Caribbean flyingfish fisheries	The consultants reviewed national and sub-regional fisheries management plans to determine fishery management policy objectives, industry objectives and priorities for sustainable fisheries management. The consultants conducted an internal roundtable review of the identified objectives and compared them for consistency, conflict, and adherence to sub-regional FMP objectives. Based on the roundtable review the consultants prepared the Multi-Objective Assessment Report that included a matrix analysis.	
The results of / report on the comprehensive and gender-sensitive valuation (social and economic) of the current and potential future contribution of flyingfish and associated pelagic fisheries	The consultants conducted a survey to collect gender specific information related to the fishery. Upon completion of the survey the consultants conducted a value chain analysis to determine the social and economic value of the current and potential future contribution of the fishery to local livelihoods and economies. The consultants prepared a report based on the findings from the above.	
New information for EAF management and policy cycle implementation support, including options for value chain problem solving	The consultants conducted a gap analysis of the social and economic data required for EAF management and policy cycle implementation, including value chain, fleet management, gender and social data. The consultants reviewed the current state of catch effort data and modes of data collection including fishery independent studies and local and traditional knowledge. This compiled data was analyzed in relation to the FMP objectives and a final report was prepared.	
Refined operational objectives, indicators and reference points for monitoring and evaluation of management measures	The consultants conducted a series of meetings, interviews and discussions with industry personnel and Fisheries Division staff to discuss the current monitoring and evaluation that is conducted by Member States regarding management performance (performance to objective) for the flyingfish fishery. The consultants examined the status of fisheries management plans, identified areas where management planning can be improved, identified new opportunities for management and determined where additional financial assistance support is required. Based on the results of this analysis the consultants prepared a final Monitoring and Evaluation of Management Measures Report.	
National level recommendations made consistent with the sub-regional FMP, including provisions for further development of data collection and management systems	The consultants conducted a detailed review (desktop and site visit) of existing data collection systems and associated policies within selected Member States. Based on this review the consultants, in collaboration with other consultancies (Blue Earth), prepared an updated sub-regional FMP including recommendations for enhanced data collection systems (capacity building, technologies, data content, and format).	

Activities for Deliverables as per ToR	Consultancy Actions
National vessel census for quantifying existing fishing effort and fishing capacity	The consultants reviewed the current condition and structure of vessel specific data compiled within the selected national Fisheries Divisions. The consultants prepared a design for national vessel census including approach, forms, and registry. Based on the above the consultants prepared a summary report (this work was undertaken in association with another consultancy in collaboration with Blue Earth).
A system for collection and storage of traditional and/or unpublished knowledge about the ecosystem and fishery through interviews with local fisherfolk and other stakeholders	The consultants conducted a literature review and prepared an inventory of existing relevant research on the use of traditional knowledge in fisheries decision-making in the Eastern Caribbean. The consultants examined the current state of international norms for ownership of traditional knowledge including approaches to documentation, intellectual property rights, copyrights and prepared a report which provides advice on documentation format, enhancing roles of knowledge holders, and academic institutions. The final report, prepared by the consultants, included recommendations for protocols on the collection, storage, access and use of traditional knowledge in fisheries.
Revised Sub-Regional Fisheries Management Plan for Eastern Caribbean Flyingfish	In collaboration with other consultancies (Blue Earth), the consultants prepared one updated sub-regional FMP including recommendations for enhanced data collection systems (capacity building, technologies, data content, and format).
Management Performance Report	The consultants conducted a desktop and interviews on constraints in the implementation of management activities including political will, financial support, data availability, human resource capacity, environmental condition, ocean literacy, and general management approach. The consultants conducted a desktop and interviews on the strengths of current management regimes including regional collaboration, professional qualification, fisheries scale, and integrated operations. The consultants prepared a final report with recommendations to enhance strengths and mitigate constraints.
Data and Information Requirements Report	Based on other consultancy activities the consultants prepared a report that summarized existing data management systems, relationship to other policy considerations, data collection progress tracking and recommendations to enhance data collection systems.

Activities for Deliverables as per ToR	Consultancy Actions
Model Catch Documentation Scheme	The consultants conducted a review of existing data gaps within Member States as well as reviewed the framework for catch documentation schemes. The consultants provided recommendations on measures to address data gaps as well as the administrative structure for a catch documentation scheme. In addition, the consultants prepared a sample model catch documentation scheme for Barbados.
The updated FIRMS resource and fisheries inventories for the eastern Caribbean stock of four-wing flyingfish	The consultants compiled the most up to date flyingfish fishery data from national Fisheries Divisions, sub-regional organizations and UN FAO. This data was analyzed to assess the current state of the stock (using the Beverton-Holt model) and results were used to update the FIRMS report.
Impact assessment tool on the impact of the online data and information repository for CRFM use to assess improvements in stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish	The consultants facilitated a roundtable discussion to identify indicators and questions to support CRFM in conducting future impact assessment as they relate to consultancy objectives. The indicators and questions selected were designed in a manner whereby CRFM staff should have easy access to the information needed to conduct the impact assessment. The consultants prepared an Impact Assessment Tool Report, which included four assessment tools to meet the deliverables in both this consultancy and the "Technical Support to Facilitate Long-term Enhancement of Livelihoods and Human Well-being for Eastern Caribbean Flyingfish Fisheries".
A proposal for decision support system for Eastern Caribbean flyingfish	The consultants conducted a review of current decision-making procedures within selected Member States. The consultants reviewed various decision support system (DSS) models and made recommendations for appropriate DSS to be employed within Member States.
An impact assessment tool on systems and procedures supporting generation of updated EAF management advice, for follow up evaluation by the CRFM	See actions for impact assessment tool above.
Appropriate number of bi-monthly technical activity progress reports	Interim progress reports were prepared and submitted to CRFM to note project progress, issues, constraints and mitigation measures.
Preparation of Final Technical Report	This current report represents this deliverable.

CONSULTANCY INFORMATION, MOBILIZATION ACTIVITIES AND APPROACHES

The consultancy activities were defined by the template within the Terms of Reference and consultancy agreement. There was the expectation that all consultancy participants would provide data and information necessary for the completion of consultancy deliverables. This was unfortunately not the case and extra effort was needed to identify sources of information and to compile this information directly by the consultancy. Based on this information, the consultants built analysis on the available country-specific and region-specific data as well as data compiled from in-country surveys/interviews.

Mobilization of Data

Early in the consultancy, the consultants requested information and data related to catch and landings data, data management systems, data collection, data storage, data access, gender disaggregated data, income, the value chain, etc. from the Member States. Subsequently, survey questionnaires were sent to Member States for their review and approval. It was intended that these surveys would later be implemented by Fisheries Divisions staff. In addition to these surveys, the consultants planned field surveys / interviews to augment the data that was provided by Fisheries Divisions.

Approaches

Once the information and data were compiled the consultancy facilitated in-house roundtable discussions within the technical team. These roundtable sessions involved the following:

- Preparation of interview guides and in-country survey instruments
- Data and information requirements and management systems
- Multi-Objective Assessment
- Gender Valuation
- Monitoring and Evaluation Measures
- Collection and Storage of Traditional Knowledge Protocols and Procedures
- Management Performance
- Model Catch Documentation Schemes
- Stock Assessment
- Impact Assessment Tools
- Decision Support Systems

Unforeseen and Unanticipated Issues

Despite advanced planning and internal discussions between the client and the consultancy several unforeseen and unanticipated issues surfaced during the implementation that resulted in delays in consultancy output delivery which required additional effort and modification of consultants' schedules, activities and outputs. These include the following specific elements which are discussed below:

Insufficient Data

Based on information from past reports the consultants had assumed that there had been sufficient structure and effort to collect, compile and analyze data across landing sites. Regrettably, this was not the case and gaps in data sets as well as deteriorating availability of data resulted in the need for the consultants to reexamine the approach to data acquisition for the analysis. This involved diversifying the number and nature of the contact points within each Member State to collect useful and anecdotal information to inform data management recommendations.

Limited Capacity

An important component of the consultancy was the implementation of in-country surveys / interviews and provision of existing compiled data. As stated above, the original intent was for Fisheries Divisions staff to provide the data and directly conduct these surveys. However, due to staff shortages and increased workloads it became apparent that Fisheries Divisions were not going to take on this responsibility. As a result, the consultants had to redirect consultancy resources to cover travel costs and time for consultant personnel to gather existing datasets and to conduct interviews/surveys with key stakeholders.

Coordination

It was assumed at the consultancy inception that Member States were collaborating and coordinating in the overall flyingfish fishery, including sharing data and collaborating on post-harvest utilization of the resource. Regrettably, political differences and economic competition at the harvester level result in less than optimal collaboration. As a result, not all Member States were willing to provide the data and information for the fishery necessary for a comprehensive review and assessment of the resource. This created additional work for the consultants related to communications and efforts to identify alternative sources of information necessary to complete the assignment.

Consultancy Reports

The following technical reports were provided in accordance with the Terms of Reference:

- Inception Report (see Annex 2)
- Data Management Systems Report (see Annex 3)
- Multi Objective Assessment Report (see Annex 7)
- Gender Sensitive Valuation Report (see Annex 7)
- EAF Management and Policy Cycle Implementation Report (see Annex 7)
- Monitoring Evaluation of Management Measures Report (see Annex 7)
- Recommendations for Enhanced Data Collection Systems Report (see Annex 3)
- National Vessel Census Summary Report (see Annex 7)
- Collection and Storage of Traditional Knowledge Report (see Annex 4)
- Revised FMP Summary Report (see Annex 3)
- Management Performance Report (see Annex 7)
- Data and Information Requirements Report (see Annex 5)
- Model Catch Documentation Scheme Report & Draft CDS for Barbados Report (see Annex 7)
- Stock Assessment Report (see Annex 7)
- Impact Assessment Tools Report (see Annex 6)
- Decision Support System Proposal Report (see Annex 7)

Due to the consultancy planning and implementation difficulties (outlined above), it was not possible to provide these reports in accordance with the timetable in the Terms of Reference and Inception Report, and most reports were provided later in the schedule.

IN-COUNTRY MEETINGS AND ACTIVITIES OVERVIEW

The consultants participated in four in-country field visits to facilitate stakeholder meetings, field surveys and meet with Fisheries Division staff to gather data and information related to data management systems, catch monitoring, value chain and review of fishery management performance. It is important to note that the resources used for this travel was pooled from resources from the consultants' other CRFM Consultancy

"Technical Support to Facilitate Long-term Enhancement of Livelihoods and Human Well-being for Eastern Caribbean Flyingfish Fisheries".

The Consultancy Field Visits consisted of the following:

Barbados, Grenada and Trinidad and Tobago – Stakeholder Meetings and Data Collection

Trip Purpose: To meet with representatives of National Fisheries Departments, fishing industry (including harvesters, processors, vendors, etc.) and other relevant stakeholders involved in the fishery to collect information on flyingfish value chain, data collection and management systems, socio-economic data (i.e. employment, earnings, etc.), fishing practices, livelihoods, landings data and more.

Trip Duration: 10 October to 26 October 2017

Montserrat – CRFM Fisheries Forum

Trip Purpose: To participate as an observer to CRFM's annual Fisheries Forum and to meet with representatives of National Fisheries Departments to discuss consultancy deliverables,



NEXUS Engagement with Local Fishers, Grenada (Credit: Maria Delesalle, NEXUS)

consultancy surveys, timelines and accessing relevant National data and information.

Trip Duration: 15 April to 20 April 2018

Barbados and Grenada – Stakeholder Meetings, Survey Implementation and Data Collection

Trip Purpose: To meet with representatives of National Fisheries Departments, fishing industry (including harvesters, processors, vendors, etc.) and other relevant stakeholders involved in the fishery to collect information on data collection and management systems, gender issues, socio-economic data (i.e. employment, earnings, etc.), fishing practices, livelihoods and more. Additionally, the consultancy team conducted several surveys that focused on livelihoods and gender roles.

Trip Duration: 28 July to 11 August 2018.

Barbados – Regional Fisheries Technical Meeting

Trip Purpose: Participation in the Regional Fisheries Technical Meeting to provide consultancy overview and update as well as to contribute to technical discussions.

Trip Duration: 1 – 5 October 2018

Based on the above, the consultants prepared interview guides to help guide the conversations to gather information on data collection processes, data management, the flyingfish fishery, fishing activities, local and international markets, gender roles and responsibilities, fisher traditional knowledge, importing, exporting, and socio-economic components.

The following provides a summary of the survey questions asked for the Gender Valuation Report.

Gender Survey:

- 1. In which country do you work?
 - (a) Barbados
 - (b) Grenada
 - (c) Trinidad and Tobago
- 2. What is your gender?
 - (a) Male
 - (b) Female
 - (c) Other
- 3. What area of the fishery are you involved
 - in?
 - (a) Harvesting
 - (b) Selling
 - (c) Processing
 - (d) Brokering
 - (e) Marketing
 - (f) Managing
 - (g) Consumer
 - (h) Other
- 4. What are the traditional male roles in the fishery?
 - (a) Manage
 - (b) Catch fish
 - (c) Transport fish
 - (d) Sell
 - (e) Process
 - (f) Market
 - (g) Supply fishing gear / ice
 - (h) Boat building / maintenance
 - (i) Purchase to cook
 - (j) Other
- 5. What are the traditional female roles in the fishery?
 - (a) Manage
 - (b) Catch fish
 - (c) Transport fish
 - (d) Sell
 - (e) Process
 - (f) Market
 - (g) Supply fishing gear / ice
 - (h) Boat building / maintenance
 - (i) Purchase to cook
 - (j) Other

- 6. How are male youth involved in the fishery?
 - (a) Help family prepare fishing gear / supplies
 - (b) Help catch fish
 - (c) Help sell fish
 - (d) Help process fish
 - (e) Help market fish
 - (f) Help buy fish to eat
 - (g) Other
- 7. How are female youth involved in the fishery?
 - (a) Help family prepare fishing gear / supplies
 - (b) Help catch fish
 - (c) Help sell fish
 - (d) Help process fish
 - (e) Help market fish
 - (f) Help buy fish to eat
 - (g) Other
- 8. What do men own related to the fishery?
 - (a) Fishing gear
 - (b) Boats
 - (c) Processing space/equipment
 - (d) Trucks or other transport equipment
 - (e) Market / storage space
 - (f) Retail facilities
 - (g) Restaurant / food stands
 - (h) Other
- 9. What do women own related to the fishery?
 - (a) Fishing gear
 - (b) Boats
 - (c) Processing space / equipment
 - (d) Trucks or other transport equipment
 - (e) Market / storage space
 - (f) Retail facilities
 - (g) Restaurant / food stands
 - (h) Other

- 10. Who makes the decisions in each other following categories? Men? Women? Or Both?
 - (a) Regulatory management
 - (b) Business management
 - (c) Where and when to fish
 - (d) Selling the fish
 - (e) Processing the fish
 - (f) Marketing the fish
- 11. How are most of the decisions made in each of these categories? Individually? As a family? As a group / committee? As a business? By the government?
 - (a) Regulatory management
 - (b) Business management
 - (c) Where and when to fish
 - (d) Selling the fish
 - (e) Processing the fish
 - (f) Marketing the fish
- 12. Who are the primary beneficiaries of these decisions? Men? Women? Or Both?
 - (a) Regulatory management
 - (b) Business management
 - (c) Where and when to fish
 - (d) Selling the fish
 - (e) Processing the fish

- (f) Marketing the fish
- 13. In your opinion, are current fishery policies / regulations:
 - (a) Gender blind
 - (b) Gender aware
 - (c) Gender neutral
 - (d) Unsure
 - (e) Other
- 14. Do you think gender roles in the fishery are:
 - (a) Changing
 - (b) Remaining constant but need to change
 - (c) Remaining constant without need to change
 - (d) Other
- 15. What barriers do you think there are preventing gender diversity in the fishery?
- 16. What opportunities are there to increase gender equity in the fishery?
- 17. What should we do to make sure everyone is able to benefit from the fishery?

CONCLUSIONS AND RECOMMENDATIONS

This consultancy provided an assessment of the current state of flyingfish fishery management and data collection related to the management of the fishery. The following provides a brief statement regarding the recommendations provided in the reports that were produced under this consultancy. Detailed recommendations, which are thematically grouped below, are included in each of the reports found in Annex 3.

Recommendations

1. Fisheries Management Plan(s)

All Member States should prepare updated FMPs that build upon the goals and objectives of the sub-regional FMP 2020 - 2024.

The sub-regional FMP should be reorganized to make it consistent with other standard management plans in other jurisdictions.

Monitoring and enforcement should be given a high degree of attention in the development of the national and sub-regional FMPs because the information that is collected will form the basis for how the fishery is managed.

The total annual catch trigger point of 5,000 mt proposed in the 2014 Fisheries Management Plan should be revisited in the context of recent low catches and new information from this stock assessment. A renewed effort to collect more data is increasingly important given the challenges of managing a fishery that may be under more pressure than previously thought.

2. Management Approach

The precautionary approach should be a foundational principle upon which goals and objectives within national FMPs are drafted.

To advance integrated fisheries management Member States should promote the use of fishing strategies that harvest equally at each trophic level to minimize trophic level ecosystem changes.

The focus for fishery management should be the provision of benefits to sustainable livelihoods rather than focusing on profit maximization, which often promotes overfishing.

Member States should examine and implement strategies to integrate fishery operations (full value chain) with other marine resource sectors (tourism, transportation, energy, aquaculture, etc.). This may involve, as a preliminary step, cross sectoral committees/working groups to share information and management objectives / approaches.

Fisheries Managers should be encouraged to identify, document and analyse barriers related to support for fisheries management, including political barriers to implementing fisheries regulations. This should include social, economic, administrative and policy barriers.

3. Data Collection

As a foundational system for record keeping, it is recommended that Member States enact legislation requiring all fishers to keep detailed logsheets/books of their catch and landings, as well as other relevant

information. Member States should consider exempting fishers from landing fees when completed logsheets / books are presented at the landing site, or exempt fishers from registration fees when they have completed logbooks for the preceding year.

Member States should adopt common legislation that requires mandatory vessel licensing and registration, fisher licensing and registration, landing slips, and fisher logbook completion, which will support the collection of data that is needed to assess the condition of the fishery and fishing industry.

Data collection should be conducted on a regular basis and compiled data should be integrated into a common reliable, accessible and easily usable database. Data need not be collected directly by Fisheries Divisions but can be collected through other organisations (i.e. fisheries organisations) or from other activities (i.e. export marketing information, value chain, local consumption, registries, etc.).

Up-to-date socio-economic should be compiled and included in the shared sub-regional database. This data should be aggregated to protect the privacy of individual fishers and fishing enterprises.

Buyers should be responsible for providing fishers with purchase slips that clearly indicate the date, time and quantity of fish purchased. Copies of these purchase slips should be submitted to the Member State Fisheries Division for use in cross referencing.

New technologies should be integrated into data collection procedures allowing fisher organizations and Fisheries Divisions to have access to accurate and reliable information for the basis of their decisions.

Environmental data that relates to fisheries production, such as presences of sargassum, should be collected and compiled into the sub-regional database.

The greatest advancement for stock assessments will come from reliable collection of fishing data. Vessel and gear type, catch volume, and time spent fishing for flyingfish should be gathered from each fishing trip, whether it is for bait or consumption. In order to collect information in a manner that everyone participates, yet a minimum of administrative resources is needed, a system with mandatory reporting is strongly recommended.

It is recommended that fishers be the fundamental unit for data collection, and as such, efforts should be made to train fishers in record keeping and use of appropriate technologies. It is further recommended that efforts be made to facilitate participation of fishers' organizations in collecting and compiling fisheries data and in training fishers in record keeping and use of appropriate technologies.

4. Data Management

A review of each Member State Fisheries Division should be completed to examine sufficiency of the technical and human capacity to undertake data collection on a regular basis and manage data in an organized system. Each Fisheries Division should include a dedicated Data Manager who has proficiency in statistical analysis, as well as support staff with the prerequisite knowledge and experience to assume responsibilities, thus ensuring a transitional plan for consistent data management. This review and evaluation should be through a constructive, impartial and non-critical process.

To reduce monitoring and evaluation costs Member States should leverage partnerships, collaborations, or sponsorships of the following nature:

- Academic institutions with shared interest, both local and international;
- Internship programs for post -secondary and graduate students looking to gain experience;
- International organizations that provide funding;

- Tech companies and start-ups looking to promote their products; and
- Citizen science

To facilitate collaborative management of shared flyingfish resources between Member States data should be collected in a common format and shared through the use of a common database. This database should be maintained and updated regularly so that the most current catch and effort data is accessible throughout the sub-region.

5. Co-Management

Member States should promote meaningful co-management by increasing the roles and responsibilities of fishers and fishers' organizations in fisheries data collection, and in fisheries management planning. This may require additional training and support for organizational development; however, this can greatly impact the availability of timely data and promote compliance amongst fishes, thus leading to costs savings in fisheries management.

Fisher's organizations should be encouraged, and their role should include the collection of data and enforcement of regulations. Steps should be taken to ensure that there is effective communication between fishers and fish processors so as to allow for their collaboration in the management of the fishery.

Traditional knowledge should be considered of equal value to science-based knowledge in decision making processes. Traditional Knowledge Collection and Storage Protocols should be adopted by Member States. These protocols should include consideration of the following criteria: Legal, Ethics, Privacy and Security, Responsible Authority, Consent, Transparency and Collaboration, Protection, Ownership, Control, and Access, Aggregation, Equal Recognition, Integrity, Intellectual Property, and Use.

6. Other Considerations

Advance the regional and sub-regional organizations involved in fisheries management by providing enough financial support to enable development of sufficient and full-time expertise in fisheries policy and planning, data compilation (including fishery independent surveys), fisheries economics and marketing, and training.

Member States should provide the CRFM Secretariat with a sufficient core budget to cover data management costs (equipment and communications) and full-time professional staff.

Promote ocean literacy to support wider public understanding of the importance of the ocean as a source of economic, social, and cultural well-being (Blue Economy) and the means and measures needed to maintain a sustainable ocean economy.

Management of the flyingfish fishery should be considered as a part of an overall marine resource management strategy, often referred to as "Blue Economy". Accordingly, flyingfish fishery management activities should be integrated with management of other marine sectors so that the ecosystem approach to management will be supported by new efforts to promote the Blue Economy.

The Fisheries Division should be a part of the regulation of offshore oil and gas exploration and development. Furthermore, environmental assessments for resource development projects should be done on a regional level since fishery resources do not adhere to national boundaries.

The Fisheries Division play an active role in climate change research and development of adaptation strategies.

ANNEX 1: TERMS OF REFERENCE

CLME+ Sub-Project #3: EAF for the Eastern Caribbean Flyingfish Terms of Reference Consultant Services: Technical Support to Enhance Data and Information Management for Decisions Support

1.0 INTRODUCTION

In view of the significance of the Eastern Caribbean four-wing flyingfish commercial fisheries, the CRFM, in collaboration with WECAFC and with support provided during the corresponding case study under CLME Project (GEF ID 1032), developed and finalized a Sub-regional Management plan (Sub-regional FMP) for Flyingfish in the Eastern Caribbean. The plan takes into account the relevant provisions of two key CRFM instruments, the Agreement on the Establishment of the Caribbean Community Common Fisheries Policy (CCCFP), and the 2010 Castries (St. Lucia) Declaration on Illegal, Unreported and Unregulated (IUU) Fishing. The Sub-regional FMP was endorsed by the 15th Sessions of WECAFC, by the Caribbean Fisheries Forum in April 2014, and by the CRFM Ministerial Council in May 2014, following extensive consultation with stakeholders at both the national and regional levels, and is now cleared for voluntary, regional FMP are: (a) sustained flyingfish resources (biological objective), (b) optimal use of flyingfish resource for long-term benefits (socio-economic objective) and (c) sustained ecosystem health (ecological objective).

A specific sub-strategy relating to flyingfish fishers was included under Strategy 5 of the CLME+ Strategic Action Programme (SAP). Sub-Strategy 5A of the SAP aims to enhance the governance arrangements for implementing an ecosystem approach to flyingfish fisheries in the CLME+ region. Under this sub-strategy, a number of short-term (0-5 years) and medium-term (6-10 years) actions were agreed upon.

5A.1 [Short]	Strengthen the FAO-WECAFC and CRFM sub-regional arrangements for the assessment and management of the flyingfish fisheries including the establishment of a decision-making capacity for management.
5A.2 [Short]	Establish and operationalize a formal agreement between the CRFM and France on the management of the flyingfish fisheries;
5A.3 [Short, Medium]	Operationalise and strengthen an integrated, sub-regional Decision Support System (DSS) for the flyingfish fisheries (in coordination with the large pelagics arrangements);
5A.4 [Short, Medium]	Strengthen the FAO-WECAFC and CRFM capacity to develop, adopt and implement management and conservation measures for the flyingfish fisheries (full policy cycle implementation);
5A.5 [Short, Medium]	Implement the CRFM/FAO-WECAFC Sub-Regional Management Plan for Flyingfish Fisheries in the Eastern Caribbean;
5A.6 [Short, Medium]	Develop and implement education and awareness building initiatives to improve understanding and enhanced stakeholder commitment and participation in decision-making in the flyingfish fisheries.

The Sub-Project of which this consultancy is a part, aims to contribute to the delivery of Output 5. Longterm enhancement of livelihoods/human well-being facilitated (O5.1, O5.2, O5.3) under COMPONENT 3 of the main CLME+ Project Document: *"Transition to an ecosystem approach for the Eastern Caribbean flyingfish fisheries demonstrated"*. It has been developed in response to the corresponding calls for action under (a) the CLME+ Strategic Action Programme (SAP), politically endorsed at the regional level in 2013 and (b) the approved Regional Fisheries Management Plan (FMP) for Flyingfish in the Eastern Caribbean.

This Consultancy seeks contribute to fostering long-term human well-being of the (direct and indirect) stakeholders of the Eastern Caribbean flyingfish fishery by providing technical support to facilitate long-term enhancement of livelihoods and well-being for flyingfish fisheries.

The UNOPS will provide general oversight for the action. The CRFM is responsible for providing technical supervision, leadership and coordination to execute the activities related to this action.

THE CONSULTANT: NEXUS Coastal Resource Management Ltd.

2.0 **OBJECTIVE**

To enhance data and information management for decision support.

3.0 SCOPE OF WORK

The Consultant will work under the general direction of Peter A. Murray, Programme Manager, Fisheries Management and Development, CRFM Secretariat or the CRFM staff assigned to supervise the assignment, to improve stakeholder access to data and information of relevance to application of the Ecosystem Approach to Fisheries (EAF) assessment and management of eastern Caribbean flyingfish and improved availability of data and information to the global community; and, strengthen the EAF information and knowledge base.

The scope of work covers all activities necessary to accomplish the Expected Results stated. The main tasks / activities are as follows:

- 1. Inception activities
- (a) Attend an initial virtual briefing meeting with the CRFM Technical Team to discuss the objectives, activities, approach, expected outputs and any other issues related to the execution of the assignment that require clarification;
- (b) Within five (5) days of the briefing meeting, THE CONSULTANT will prepare a report of the briefing (inception report) and work plan identifying an outline and timelines for the execution of the actions.
- 2. Technical Work Package 1 –
- (a) Establish a CRFM data and information repository for EAF management of Eastern Caribbean flyingfish, which would include identification and electronic consolidation of all published data and information;
- (b) Develop an online, keywork searchable, bibliographic database with facility for download of published documents;
- (c) Address any copyright issues which may impact on the sharing of data and information;

- (d) Support update of FIRMS resource and fisheries inventories for the eastern Caribbean stock of four-wing flyingfish through a FIRMS data query and automated report to be created along with the database;
- (e) Prepare an impact assessment tool for CRFM use in follow up work;
- (f) Prepare bi-monthly technical activity progress reports.
- 3. Technical Work Package 2 –
- (a) Update, as well as broaden, multi-objective assessment of the eastern Caribbean flyingfish fisheries to:
 - (i) Determine the bio-economic and ecological status of the stock;
 - (ii) Quantify baseline estimates of indicators and derive estimates for management reference points;
 - (iii) Provide updated recommendations in support of adaptive EAF management;
 - (iv) Provide information on benefits and costs of EAF from social, economic, ecological and management perspectives and other economic factors related to the fishery.
- (b) Carry out a comprehensive and gender-sensitive valuation (social and economic) of the current and potential future contribution of flyingfish and associated pelagic fisheries to food security (socio-economic), income (costs and earnings) and employment (socio-economic) and ecosystem goods and services (ecological), with recommendations for enhancement of the livelihoods and improvements of the conditions of work for fishers and processors study to focus on 4 countries participating in the fishery;
- (c) Facilitate availability of new information for EAF management and policy cycle implementation support, including:
 - (i) Options for value chain problem-solving.
 - (ii) Refined operational objectives, indicators and reference points for monitoring and evaluation of management measures, with socio-economic objectives
 - incorporating goals for achieving gender equality and youth development.
 - (iii) National level recommendations made consistent with the sub-regional FMP, including provisions for further development of data collection and management systems.
 - (iv) National vessel census for quantifying existing fishing effort and fishing capacity, taking into account present and emerging management needs, including the need to establish a list of authorized fishing vessels, to reduce and eliminate IUU fishing practices, to reduce possible impacts of present fishing strategies on long-term flyingfish recruitment, and to guarantee resilience to climate change and climate variability impacts.
 - (v) Establish a system for collection and storage of traditional (unpublished) knowledge about the ecosystem and fishery through interviews with local fisherfolk and other stakeholders.
 - (vi) Revised Sub-Regional Fisheries Management Plan for Eastern Caribbean Flyingfish, taking into account present and emerging needs and any new management advice generated.
- (d) Monitor and evaluate management performance at the national and regional levels.
- (e) Identify key data and information requirements, associated sources of data and information and the mechanisms for data and information sharing at the regional, national, sectoral and local levels to inform development of a DSS.
- (f) Develop a model catch documentation scheme for the flyingfish fishery based on the FAO CDS guidelines, that is, using the guideline template as the starting point for developing the model;
- (g) Formulate a proposal to inform development of a decision support system;
- (h) Prepare an impact assessment tool for CRFM use in follow up work;
- (i) Prepare bi-monthly technical activity progress reports.

- 4. Final Technical Report
- (a) Develop, draft, revised and final versions of a final technical report which would comprise at least the following sections: Acknowledgements; Abbreviations and Acronyms; Executive Summary; Introduction; Approach to the Assignment; Comments on Terms of Reference; Organization and Methodology; Delivery of Terms of Reference; Description of Activities Carried Out; Project Mobilization; National Missions; Reporting; Comments and Conclusions; Recommendations (including lessons learned); Annex 1 Terms of Reference; Annex 2: Inception Report; Annex 3 Mission Reports; Annex 4 Consultancy Products defined in the above work packages, project final financial report; other agreed Reports
- (b) Draft of each product are to be reviewed by the CRFM, prior to finalization

4.0 EXPECTED RESULTS

- (a) Improved stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish and improved availability of data and information to the global community.
- (b) Strengthened EAF information and knowledge base.

5.0 **DELIVERABLES**

- 1. Inception repot and work plan
- (a) An inception report and work plan clearly identifying an outline and timelines for the execution of the actions.
- 2. Technical Work Package 1
- (a) A CRFM data and information repository for EAF management of eastern Caribbean flyingfish.
- (b) An online, keyword searchable, bibliographic database with facility for download of published documents
- (c) Updated FIRMS resource and fisheries inventories for the eastern Caribbean stock of four-wing flyingfish
- (d) An impact assessment tool for CRFM use in follow up work to assess improvements in stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish.
- 3. Technical Work Package 2
- (a) An up-to-date broadened, multi-objective assessment of the Eastern Caribbean flyingfish fisheries
- (b) A comprehensive and gender-sensitive valuation (social and economic) of the current and potential future contribution of flyingfish and associated pelagic fisheries to food security (socio-economic), income (costs and earnings) and employment (socio-economic) and ecosystem goods and services (ecological), with recommendations for enhancement of the livelihoods and improvements of the conditions of work for fishers and processors.
- (c) New information for EAF management and policy cycle implementation support. This will include:
 - (i) A report on options for value chain problem solving;

- (ii) Refined operational objectives, indicators and reference points for monitoring and evaluation of management measures to be incorporated into the management performance report, below;
- (iii) National level recommendations made consistent with the sub-regional FMP, including provisions for further development of data collection and management systems, to be incorporated into the revised FMP;
- (iv) National vessel census for quantifying existing fishing effort and fishing capacity in at least three of the targeted countries;
- (v) A system for collection and storage of traditional and/or unpublished knowledge about the ecosystem and fishery through interviews with local fisherfolk and other stakeholders;
- (vi) Revised Sub-Regional Fisheries Management Plan for Eastern Caribbean Flyingfish Fishery
- (d) Report on flyingfish management performance at the national and regional levels
- (e) Report on key data and information requirements, associated sources of data and information and the mechanisms for data and information sharing at the regional, national, sectoral and local levels to inform development of a DSS
- (f) A model catch documentation scheme for the flyingfish fishery based on the FAO CDS guidelines, that is using the guideline template as the starting point for developing the model;
- (g) Proposal for decision support system for Eastern Caribbean flyingfish
- (h) An impact assessment tool for CRFM use in follow up work to evaluate expected improvements in systems and procedures supporting generation of updated EAF management advice.
- 4. Final Technical Report
- (a) Draft, revised and final versions of a final technical report which would comprise at least the sections referred to in the scope of work above.

6.0 ROLES AND RESPONSIBILITIES

The CONSULTANT is responsible for execution of the main ACTIONS and accomplishing the Expected Results and Deliverables as outlined above.

In the conduct of the assignment the KEs will be supported by the CRFM Secretariat, which will provide overall guidance on implementation of the contract. The CRFM Secretariat will assign two (2) staff (fisheries experts) who will work closely with the team at all times. The CRFM Secretariat will also assist in the circulation of documents for regional-level review, and facilitate the finalization of all documents produced.

The CONTRACTING PARTY, through the CRFM Secretariat in Belize and St. Vincent and the Grenadines, will provide the following assistance to the CONSULTANT in a timely manner: [agreed-upon assistance to be provided by CRFM Secretariat]

7.0 **REPORTING**

The CONSULTANT will prepare an inception report, progress reports and final reports. The progress reports will be submitted bi-monthly over the contractual period. The final technical report should include methodologies used to deliver the various outputs, with lessons learned and recommendations for follow up action, and include final technical deliverables in publisher-ready format. The report should be produced in Microsoft Word for Windows format and submitted electronically to the CRFM Secretariat.

8.0 LOGISTICS

All logistical arrangements pertaining to travel by the CONSULTANT and workshop participants are the responsibility of the CONSULTANT.

9.0 **DURATION**

The assignment will require 29 months, for the period 1 December 2016 to 30 April 2019.

ANNEX 2: INCEPTION REPORT

Introduction

This Inception Report is provided to the CRFM in accordance with the Terms of Contract dated November 30th. 2016. This Report builds upon the initial Proposal submitted by NEXUS, the terms of reference included in the Contract, and the deliberations of the Inception Meeting between representatives from NEXUS and the CRFM Secretariat which was held by teleconference on 21 December 2016.

This Report is intended to provide an overview of the activities, outputs and schedules for the Project. It is, however, understood that changes to the project may be deemed appropriate due to unforeseen demands on the CRFM Secretariat or Fisheries Divisions participating in the Project. Any such changes will be documented and appended to this Report.

Project Management

Overview

The following three project deliverables (illustrated in the graphic below) will be completed to meet the outlined objectives of providing technical support to enhance data and information management for decision support to the Eastern Caribbean flyingfish fishery.

Establish CRFM data and information repository Develop database Update FIRMS inventories Impact Assessment Tool Bi-Monthly Progress Reports	Work Package 2		
	Update Multi-objective Assessment of flyingfish fishery Gender Sensitive Valuation EAF Management & Policy Cycle Monitor Management Performance Identify Data and Information Paguiraments (Propage	Final Technical Report	
		for CRFM review CRFM review Prepare final technical report	
	National vessel census		

Figure 1: Project Deliverables Overview

Approach: NEXUS intends to take a development assistance approach to the implementation of this project. While the overall goal is to provide detailed reports for each Work Package, the team will ensure open and transparent communication with national fisheries division staff to ensure the individual divisions can acquire knowledge and insight of the processes involved in conducting the work. This can enhance understanding and use of the project outputs within each national jurisdiction and enhance the capacity of the fisheries division to support the effective management of their fisheries data.

NEXUS will, wherever possible, augment inputs to the project through collaborative efforts with other project activities that support the "CLME. Sub-Project #3: EAF for the Eastern Caribbean Flyingfish"

(Technical Support to Enhance Data and Information Management for Decision Support). In addition, NEXUS will seek additional financial support for the overall project, including financial support for student participation in this initiative. These activities will be undertaken only with full communication, advice and approval from Caribbean Regional Fisheries Mechanism (CRFM). It is understood that any effort to seek additional support will not diminish NEXUS' efforts in accordance with the contract obligations.

Management and Communications

Project Management

NEXUS's project management system is designed to ensure our goal to "deliver quality services on schedule and within budget" is achieved. NEXUS's fully integrated project management system is centered on sound business principles. Our system integrates all project management functions including project control. The initial step, following contract award, is to establish a detailed breakdown of the project tasks and subtasks; identifying cost, manpower and schedule parameters. Once the initial project requirements have been identified, the system is capable of comparing work progress with the initial project plan, identifying any problems before they arise and providing project management with up-to-date data for organizing and managing the project on time and within budget. Responsibility for project control is accepted by the Project Manager, or may be partially or wholly delegated to project or task coordinators in larger projects. In addition, project control capabilities shared by the project team also includes:

- Suggesting alternatives, evaluating them, and assisting with decisions so as to best meet the project needs in terms of time, quality, and scope;
- Where appropriate, identifying the effects (scope, time, quality, cost) of proposed changes, so that well informed decisions can be made, and whether or not to proceed with the changes;
- Arranging and coordinating the procurement, expediting, and quality control of all required products and services; and
- Managing implementation for conformity with approved program design, including detailed scheduling and coordination, and record documentation.

Effective and efficient performance of the work under the Service Agreement will rely heavily on the ability of the Project Managers to guide the work through a logical, step-wise series of tasks and subtasks. These include, for the most part, gathering information (data), interpreting the data (what CRFMs it mean?), and preparing reports with practical recommendations for CRFM action. Our project management philosophy is best summarized by the following statement "Right People doing the Right Things at the Right Time". This is NEXUS's commitment to CRFM that properly trained people will implement scientifically sound technical programs under a system of tight project management controls.

The roles and responsibilities for each of the Team members are clearly identified, as explained below.

Project Manager: The Project Manager will be a single point of contact for the CRFM at all times. The Project Manager will set in place the overall QA / QC plan for the Service Agreement and will ensure that it is being followed at all times by all Team members. The Project Manager will also have responsibility for resolving any problems that cannot be solved by the appropriate Project Leads and will act as a "sounding board" for CRFM regarding overall Team performance.

Project Leads: Project Leads will retain day-to-day operational responsibility for all individual projects, including expert support and technical support, schedule, and quality. Internally, the Project Leads report to the Project Manager.

Project Experts: Will be responsible for completing individual assigned tasks within predefined targets of schedule, budget, and quality. The Project Experts will report to the Project Leads.

Technical Support personnel – The Technical Support personnel will be responsible for gathering the required information and performing assigned tasks under the supervision of the Project Manager or assigned Project Experts. The Tech Support personnel also report to the Project Managers.

Communications

NEXUS will communicate with CRFM through a single contact in NEXUS – Mr. Chris Milley (Project Manager). Mr. Milley will be available to CRFM by phone (902-441-6104), or email (<u>cmilley@nexuscoastal.com</u>) or Skype (nexuscoastal). Mr. Milley is well versed in the challenges associated with managing interdisciplinary teams and is intimately familiar with the various resources that NEXUS can call upon. All project communication between NEXUS and CRFM will be through the project manager and the CRFM project manager, however, individual team members may be in direct communication with CRFM staff on a project specific matter from time to time.

Additionally, many of the project tasks will involve direct communication with fisheries staff from participating nation states. Due to budgetary limitations, the majority of these discussions will be conducted via telephone, or through virtual meetings (using platforms such as Skype). However, where opportunity may be presented through other regional activities or project that bring key persons together (regional workshops, meetings or conferences), the NEXUS Team will endeavor to arrange face-to-face workshops or roundtable meetings. The following table provides an overview of the types of communication that will occur throughout the duration of the project.

Communication Type	Objective of Communication	Medium	Frequency	Audience	Owner
Kick-off Meeting	Introduce the project and discuss project objectives and management approach	Conference Call	Once	 Project Manager Project Administrator CRFM 	Project Manager
Project Team Meeting	Review status of the project with the team	Conference Call	As needed	• Project Team	Project Manager
Meetings with CRFM	Review status of project and discuss mitigation measures for project issues	Conference Call; Email	As needed	 Project Manager Project Administrator CRFM 	Project Manager
Monthly Project Status Meetings	Report on the status of the project to management	Conference Call; Email	Monthly	• Project Team	Project Manager
Project Status Reports	Report the status of the project including activities, progress, and issues	Email	Bi-Monthly	• CRFM	Project Administrator and Project Manager

Table 1: Communication Strategy

Outputs and Deliverables

The NEXUS Team will provide the following deliverables within the budgetary scope of the project. The following diagram provides an overview of the key reports (deliverables) and their associated tasks.



Figure 2: Overview of Project Deliverables and Associated Tasks
Work Package 1:

- 1. Work Package 1 Report
 - (a) Review of the state of and effectiveness of flyingfish data management systems, guidance on the update of the FIRMS resource and fisheries inventories and an impact assessment tool for use by CRFM and national fisheries divisions; and,
 - (b) Copyright Protocol.
- 2. Develop a pilotable framework for an online, keyword searchable, bibliographic database; and,
- 3. A stand-alone impact assessment tool (WP1) for use by national fisheries staff.

Work Package 2:

- 1. Work Package 2 Report
 - (a) Multi-Objective Assessment on the bio-economic and ecological status of the resource, baseline indicators, which can be used to monitor management effectiveness and fishery impacts;
 - (b) Socio-economic Valuation which will include evaluation of gender, food security, income employment and ecosystem goods and services with special reference to livelihood effects;
 - (c) FMP Performance Report which will include: (i) model catch documentation scheme, (ii) data and information requirements, and (iii) Decision Support System proposal;
 - (d) EAF Report which will provide an overview of recommendations to enhance fisheries policy and information requirements for national and regional fisheries management planning. This report will include recommendations regarding:
 - (i) A national vessel census for quantifying existing fishing effort and fishing capacity; and,
 - (ii) The design of a system for collection and storage of traditional (unpublished) knowledge about the ecosystem and fishery through interviews with local fishers and other stakeholders;
 - (e) Monitor and evaluate management performance at the national and regional levels;
 - (f) Recommendations for the development of a Decision Support System, which will include identifying key data and information requirements, associated sources of data and information and mechanisms for data and information sharing at the regional, national, sectoral and local levels;
 - (g) Model Catch Documentation Scheme; and,
 - (h) Formulate a proposal to inform development of a decision support system.
- 2. A stand-alone impact assessment tool (WP2) for use by national fisheries staff.

Final Technical Report

1. Final Technical Report will provide summaries of the key considerations in Work Package 1 and 2 as well as additional recommendations regarding enhance data and information management and fisheries management planning for the flyingfish fishery in Eastern Caribbean.

Please refer to Appendix A for a detailed timetable with key dates and deliverables.

Risks to Project Deliverables

NEXUS understands that during the project, unforeseen circumstances might occur that may impact the project schedule. NEXUS will maintain effective communication with CRFM to identify and mitigate any potential issues throughout the project to ensure the project objectives continue to be met. NEXUS has identified the follow as potential risks:

- Weather events impacting travel, availability of personnel and/or general business operations;
- Potential barriers to timely communications with Fisheries staff (staff travel, vacations, competing workloads);
- Inaccessibility to information on a timely basis / lack of updated information; and
- Changes in key contacts (staffing changes)

The NEXUS Project Team will take an adaptive approach for this project to ensure schedules and outputs can benefit from opportunities that may arise from time to time. These opportunities may include other ongoing initiatives in the region such as other projects in member countries, regional meetings / workshops, or conferences. NEXUS will discuss with the CRFM project lead any prospects identified to see if the project to benefit from collaboration with other ongoing activities.

Target States

The following four target States (illustrated in the map below) have been selected to be the focus of the project to provide technical support to enhance data and information management for decision support of the Eastern Caribbean flyingfish fishery:

- 1. Barbados
- 2. Trinidad and Tobago
- 3. Grenada
- 4. Martinique



Figure 3: Selected Member States (Source: http://vott.tk/map-eastern-caribbean/)

Scope of Work

Project Management and Client Liaison

Client liaison will be extensive and ongoing throughout the project. The Project Manager (Chris Milley) will ensure that effective and clear communication is maintained. Bi-monthly status reports will be provided to CRFM representatives commencing at the end of every second month after the contract start-date. The purpose of the status reports will be to summarize project progress including:

- Status of project;
- Services provided;
- Remaining deliverables; and
- Identify any issues or concerns that may affect specific deliverables and suggest mitigative measures.

Work Package 1

The elements of Work Package 1 (WP-1) provide a large part of the infrastructure for the Decision Support System (Decision Support System) referenced in Work Package 2 (WP-2), populated with the information to date. Maintaining the up-to-date status of the Decision Support System information will require revitalizing or establishing, and maintaining, national fisheries monitoring systems including fisheries statistics, economic indicators and social indicators.

The requirements of WP-1 include two different approaches to information management systems for computerized (web-based) access. Although the terms of the call refer to keyword searchable this approach is quite dated now. The repository of reports and published documents should include full-text search in addition to keyword search capability. For this purpose, a 'NoSQL' platform provides more flexible approaches to provide full-text features expected today. Relational databases are more suited to the quantitative and qualitative data produced from monitoring, surveys and other conventional data collection activities.

Task 1: Establish a CRFM Data and Information Repository

Identification and compilation of published information and data (including unpublished reports and other grey literature), and imaging / scanning published data and information will require a significant bibliographic effort. Bibliographic databases (ASFA etc.) and digital libraries will be searched and reference lists will be prepared. Wherever possible, full-text copies will be obtained from online source, libraries or existing collections held by established researchers (scanning as required). These collections will be identified and arranged for electronic storage. Data sets from surveys, studies, fisheries monitoring etc. will also be identified and metadata and/or full access storage will be included in the repository.

Having one of the region's leading flyingfish experts on the team provides the NEXUS Team with a significant advantage in the identification of bibliographic sources. Regional government offices will have reports and other grey literature available and fisheries departments, government archives and libraries are the likely repositories.

Task 2: Develop Pilot Framework for Database

Existing bibliographic systems will be employed in creating the bibliographic database/ digital library. The first approach is common when both relational data types and full-text requirements can be reasonably well specified in advance. There are numerous relational platforms that support full-text options natively or

through third-party systems, some of which are Open Source (e.g. MySQL or PostgreSQL) and some of which are proprietary (MS SQL Server, Oracle). The second alternative of NoSQL databases can support the bibliographic and full-text requirements fully but will still require parallel relational databases for managing the structured quantitative and qualitative data.

The process of developing the database is an iterative process, since each member state will have different needs and different capacities. The NEXUS Team will, to the extent possible, pilot the database with a minimum amount of data from one site to demonstrate functionality. Activities will be undertaken to determine:

- **Functionality** Determine functionality (what will the database need to do) based on specific national needs interview staff
- **Content** Work with national staff to identify content
- **Structure** Determine the most appropriate architecture for the database
- **Technology** Make recommendations of appropriate technologies and systems to meet needs and realistic expectations

The specific steps involved in this task of Work Package 1 are as follows:

Step 1: Research and evaluate system requirements and options, in consultation with country representatives. This will involve interviews with fishery division staff to determine their departments' needs for a database, specifically to identify their specific needs and capabilities to determine database functionality.

Step 2: Facilitate discussions with country representatives to identify, classify and collect data to ensure the structure of the database aligns with the type of content that exists for the flyingfish fishery.

Step 3: Based on the research, types of information that were identified in Step 1 and 2 and feedback received from country representatives the NEXUS Team will conduct a comparison of various options and alternatives so that appropriate database structures can be recommended to CRFM and participating countries.

Step 4: Evaluate and provide recommendations for hosting solutions. This will include considerations of cost-effectiveness and thus, likely give greater consideration to Open Source solutions.

Step 5: Develop a pilot framework database and, to the extent possible, populate it with a minimum amount of data from one participating country to demonstrate functionality. The pilot framework database will act as a roadmap for future development to enhance the management of the Eastern Caribbean flyingfish fishery.

Task 3: Copyright Protocol

Copyright issues are a matter of law, and as a result must be addressed with special attention in the Project. Information published by government or intergovernmental organizations is generally available for redistribution without copyright infringement. This is not the case for academic publications, such as that which is published in "primary" commercial and academic journals. Bibliographic access is wide-spread but full-text access is controlled by licenses and subscription models. The copyright considerations will be addressed throughout the project.

NEXUS will prepare a Copyright Protocol that will involve the following:

• Identification of barriers facing copyright issues with a focus on CARICOM copyright laws;

- Review copyright arrangements for other re-publishing platforms; and
- Prepare advice / recommendations for copyright management for a data and information repository.

It is important to note that the copyright protocol will need to consider openness and accessibility of the information in the database, which will require the feedback from participating countries. Furthermore, this <u>may</u> require interaction with legal experts to determine copyright protection instruments necessary to protect the database host and users.

Task 4: Prepare a FIRMS Data Query for an Automated Report

The WECAFC / FIRMS regional database and information sharing project is already in operation. The requirements for querying and reporting are part of the ongoing development process. The need to specify reports and query elements specific to flyingfish will be evaluated and defined in the course of the assessments and fisheries management reviews, updates and revisions in the context of Work Package 2.

NEXUS will coordinate this task with CRFM, specifically related to the following activities:

- Review indicators and data required for ongoing management and decision making;
- Identify required data types, reports and other data products to support the process;
- Develop, in consultation with national officials, specific reports to be routinely generated;
- Develop, in consultation with national officials, the requirements for analysis-ready data; and
- Specify requirements for consideration by the FIRMS IT working group.

Task 5: Prepare an Impact Assessment Tool

Development of an Impact Assessment Tool will be undertaken in association the automated reporting activities in Task 4 above. As the assessment indicators are defined and the suite of appropriate management actions are specified, changes in to specific indicators will need to be tracked to determine the effectiveness of the management actions. The Impact Assessment Tool will provide regional officials and fisheries staff with a resource to assist them in determining the means and approaches to measure impacts and the appropriate structure, format and schedule for monitoring reports, which will be incorporated into the Decision Support System.

NEXUS will undertake the following in the preparation of an Impact Assessment Tool:

Step 1: Identify and review impact indicators for ongoing management decision making.

Step 2: Determine and review overall management process and activities, starting with overarching management objectives of each participating country.

Step 3: Specify required reports to track indicators for the FIRMS IT working group to consider.

Step 4: Assist in determining the "State of Management" – define baselines, level of effort, harvest levels, economic importance etc.

Step 5: Prepare the Impact Assessment Tool in a survey document format. The survey document will guide users through the review process: structured tool to compile information, review and analyse the state of national fisheries management and impact of decision. Survey document will facilitate a structure review in a format that can be compared and communicated to other countries, if desired.

Task 6: Prepare Bi-monthly Technical Activity Progress Reports

NEXUS will provide bi-monthly update reports in a format agreed upon by CRFM and NEXUS.

Work Package 1 Outputs and Deliverables:

- 1. The NEXUS team will compile the results of each task undertaken for Work Package 1 into a final report, which will include a review of the state of and effectiveness of flyingfish data management systems, guidance on the update of the FIRMS resource and fisheries inventories and a copyright protocol;
- 2. The NEXUS Team will provide a pilotable framework for an online, keyword searchable, bibliographic database.
- 3. The NEXUS Team will provide a stand-alone impact assessment survey tool for use by CRFM and national fisheries staff.

Work Package 2

As described in Section 1.2 there will be ongoing communication between NEXUS, CRFM representatives and participating national fisheries divisions. Access to fishery staff is key to the effective delivering of this work package.

Task 1: Update Multi-Objective Assessment of the Eastern Caribbean Flyingfish Fisheries

NEXUS will update current models and methods employed in the management of flyingfish in the eastern Caribbean. The Team will ensure recent advancements in fisheries assessment, and ensure data and information provided through the updated systems are employed for multi-objective management. This will require use of the data products from both work packages (WP-1 and WP-2). The following provides an overview of the key steps when completing a comprehensive multi-objective assessment of the Eastern Caribbean flyingfish fisheries.

Step 1: Complete an inventory of the individual Nation State objectives for management of flyingfish fishery.

Step 2: Categorize the objectives within social, economic and ecosystem (biophysical) perspective.

Step 3: Compare objective priorities between countries to determine differences in emphasis on the social, economic or biophysical components.

Step 4: Facilitate interviews with National fishery staff to determine if there are any undocumented objectives for the flyingfish fishery established for operational purposes.

Step 5: Complete a matrix analysis to determine areas where policy objectives may conflict in implementation thus undermine the overall management objectives. In addition, identify conflicts and look at similarities of conflicts between management objectives experienced in other jurisdictions.

Step 6: Prepare Multi-Objective Assessment Report.

Task 2: Complete Gender-Sensitive Valuation of Flyingfish Fishery

NEXUS will complete an assessment of gender-sensitive valuation of the flyingfish fishery to eastern Caribbean food security, income and employment, as well as ecosystem goods and services. This valuation process will be supported by the NEXUS database and data management experts, who will assistance with survey design, and analysis. In addition to being a specific task in this project gender analysis will be applied across the project tasks to ensure the issues of gender fairness are considered in every aspect of the fishery management process.

Gender-sensitive evaluation is an approach to evaluation that pays specific and sustained attention to gender needs, interests, and culturally specific dynamics and recognizes the disparities in opportunities, resources, and power that are organized by gender and that are pervasive. Further, an evaluation that is gender-sensitive is responsive to the fact that not only are gender and gender disparities shaped and reinforced by cultural values and norms, but also by structures, institutions, polices, organizational practices and programs¹. The gender sensitive valuation and analysis will advance the current thinking with respects to gender equity by acknowledging potential barriers to achieving full gender equality. This will require more than a numeric evaluation of gender issues, understand that targets can create barriers and examine the social realities of transition through fairness that advances full indiscriminate gender participation. In undertaking this analysis, we will build on the existing gender policies at CRFM and CARICOM and provide feedback that these institutions may wish to consider to enhance these policies. The NEXUS team will collaborate with the CARICOM Gender in Fisheries Team (GIFT) in undertaking this task.

The following provides an overview of the step necessary to complete a thorough gender-sensitive valuation.

Step 1: Identify and establish a set of gender sensitive indicators (quantitative and qualitative indicators²) to be organized into a standardized list. The criteria for the selection of indicators is as follows:

- Developed in a participatory fashion, including all stakeholders wherever possible;
- Relevant to the needs of the user, and at a level that the user can understand;
- Should be sex-disaggregated;
- Both qualitative and quantitative indicators should be used;
- Should measure trends over time; and
- Must be clearly defined.

Step 2: Use various sources and methods for the collection of data and information. Ensure that the information is collected from women and men, girls and boys and the voices and opinions of the target population are represented. Prioritize gender issues through the management process.

Step 3: Complete qualitative analysis³ to identify where future questions and problems might lie.

¹ USAID (2014). Gender-Sensitive Evaluation: Best and Promising Practices in Engendering Evaluation. Source: http://pdf.usaid.gov/pdf_docs/PA00K43P.pdf

 $^{^{2}}$ Quantitative Indicator can be defined as measures of quantity, such as the number of people who own sewing machines in a village. Qualitative indicators can be defined as people's judgements and perceptions about a subject, such as the confidence those people have in sewing machines as instruments of financial independence.

³ Qualitative analysis is used to understand social processes, why and how a particular situation that indicators measure came into being, and how this situation can be changed in the future.

Step 4: Identify a monitoring and evaluation framework to assess the gender sensitivity of its various components and the extent to which the outcomes and impacts achieved the goals of gender equity, equality and fairness.

Step 5: Reporting and Utilization- identifying actionable items, considerations and recommendations.

Task 3: EAF Management and Policy Cycle Implementation

The information systems into which the data products will reside will require effort to develop the full range of information types and data access requirements. Some aspects of this process, (inclusion of new referential databases) can start early in the task and will likely require less effort than other aspects which will involve input and decision by governments and regional agencies / organizations. This will require consultation during the first year of the Project and build upon the development of the information repository development in WP-1.

The NEXUS team will organize and facilitate in-country frame surveys. The bulk of field work data collection / compilation will be undertaken by national staff. This will ensure full involvement of national fisheries departments, which will be necessary to promote full understanding of the data availability and requirements for enhanced EAF management. In addition, NEXUS Team members will arrange in-person site visits and draft questionnaires to further support the collection of necessary information and data to undertake the Project tasks.

NEXUS will undertake the following activities for this Task:

- (i) Undertake a review of Value-chain components to identify and assess options to address shortcomings and provide solutions for identified problems. This will be necessary to prepare robust policy which will address handling/processing/market issues, value optimization, reduce post-harvest loss, etc.
 - Identify the value chain components of the flyingfish fishery;
 - Interview national fishery staff to fully understand the value-chain components within each participating country;
 - Assess the inbound logistics, operations, outbound logistics, marketing and sales, and service; and,
 - Prepare final review.
- (ii) Facilitate in-country stakeholder consultation activities to refine the objectives, indicators, and reference points. This work will contribute to defining measurable and relevant indicators and monitoring procedures built upon the right data, data products and reports.
- (iii) Facilitate the review of governmental processes to determine measures to align national data management and information systems so that they are consistent with regional and sub-regional Fishery Management Plans. This review will include examination of data collection, management and reporting procedures to determine consistencies between jurisdictions.
- (iv) Preparation of a national vessel census and data-collection system to provide up-to-date information on fishing effort and fleet capacity. This activity will include identification of information gaps which can inhibit compliance monitoring, and determine issues of misreporting, and misalignment of effort and abundance. Nexus will, in collaboration with National Fisheries Division, conduct a vessel census. The census and information gathering system will focus on needs related to:

- Quantifying existing fishing effort and fishing capacity;
- Present and emerging management needs, including the need to establish a list of authorized fishing vessels;
- Work directly with each participating country to get available up-to-date information regarding vessel landing sited;
- Reducing and eliminating IUU fishing practices, reducing possible impacts of present fishing strategies on long-term flyingfish recruitment; and
- Improving fleet resilience to climate change and climate variability impacts.
- (v) Identify sources of traditional knowledge (TK) that can be used to fill information gaps and shortcomings of current data gathering systems. The Team will identify elements for a TK data collection protocol necessary to enhance processes to update, store and manage information from traditional knowledge sources.

Special consideration will be given to local traditional knowledge systems including customary means to compile information and transmit information between generations, customary means to determine the validity of locally generated information, customary measures to protect individual and collective intellectual property and customary means to share information.

(vi) Revising the sub-regional Fisheries Management Plan for Flyingfish based on the additional and updated information compiled in this Project. This will be a multi-lateral effort involving stakeholders, government officers, stock assessment experts, economists as well as other parties top ensure the FMP addresses the collective interests and objectives of the various players. Documenting and disseminating the FMP and detailed provisions contained within the FMP will be part of Decision Support System.

NEXUS will provide detailed recommendations to be including in the Work Package 2 Report.

Task 4: Monitor & Evaluate Management Performance

The NEXUS Team will provide a report on performance review of the national and regional flyingfish fisheries management based on the team's review of the systems and procedures employed to monitor and evaluate management performance (completeness and effectiveness review). This activity will be undertaken as part of the development of the Decision Support System. It is likely that there are national sensitivities regarding information sharing so a tiered Decision Support System may be required to limit access to national indicators while providing global access to the regionally agreed data and indicators. In addition, NEXUS will examine how the management objectives are reviewed and assessed in the participating countries. This is important to determine effectiveness of the specific controls that have been implemented within the participating countries and if they are meeting their objectives.

Task 5: Inform Development of a Decision Support System

A critical step in the development of the Decision Support System involves scoping the specific and necessary data and information to define the Decision Support System. As noted in Task 4, above, there may be national sensitivities about what information gets shared so a tiered Decision Support System will be required to limit access to national indicators while providing global access to the regionally agreed data and indicators. This work will require direct, bilateral discussion between the Project Team and the national fisheries managers.

Task 6: Develop a Model of a Catch Documentation Scheme

It is understood that participating countries have not currently adopted a quota-based or effort-based management system for their flyingfish fishery. Thus, greater effort is needed to establish a robust data capture system and enhance the amount of data available. As a result there is a significant gap that must be addressed. The first step will be to define a system that can track harvest levels, harvest methods and end markets.

This work will involve direct structured interviews and discussions with Member State Fishery Division staff. Thus, the NEXUS Project Team will consult with national fisheries departments to identify needs and determine steps which can be taken to enhance technical and capacity for catch monitoring and documentation, as specified in the existing FAO Catch Documentation Scheme guidelines.

The NEXUS Team will complete the following steps:

Step 1: Develop a structure interview guide,

Step 2: Collect information from member state fishery divisions through structured interviews,

Step 3: Analyse results and provide recommendations to fishery staff on steps to be taken to enhance data collection, and documentation.

The focus of this system will be based on long-term objectives for traceability of catch and potential certification (using existing international certification systems as options for consideration by participating countries).

Task 7: Formulate a Proposal to Inform Development of a Decision Support System

Based on the tasks undertaken in both WP-1 and WP-2 the Team will collaborate with the CRFM to advance a proposal for the development of the Decision Support System. The long-term objective of a robust Decision Support System will require considerably greater effort than can be undertaken in this initiative. Accordingly, the NEXUS Team will work with CRFM to advance a proposal for regional collaboration in the development of a Decision Support System. In undertaking this activity, the NEXUS Team will advise on the specific components required, including main databases, reporting tools, access modes and web interfaces, early in the proposal preparation process. This will build upon the various elements embedded in overall tasks undertaken in the Project. This work will be addressed throughout the overall Project.

Task 8: Prepare an Impact Assessment Tool

The NEXUS Team will scope and prepare an overview of indicators and reference points, which can be used to assess the impacts of the Decision Support System on flyingfish management. These indicators will form the basis of a tool which can be employed by the CRFM in future review and evaluation of the flyingfish FMP, and can be used to inform the development of Decision Support Systems for other regional fisheries. In addition to ecological and economic aspects of the flyingfish fishery, attention will be given to social indicators, such as gender equity/fairness, income distribution, barriers to participation, intergenerational transition etc.

NEXUS will undertake the following in the preparation of an Impact Assessment Tool:

Step 1: Identify and review impact indicators for ongoing management decision making.

Step 2: Determine and review overall management process and activities, starting with overarching management objectives of each participating country.

Step 3: Specify required reports to track indicators (ecological, economic, and social) for CRFM to consider.

Step 4: Assist in determining the "State of Management" – define baselines, level of effort, harvest levels, economic importance etc.

Step 5: Prepare the Impact Assessment Tool in a survey document format. The survey document will guide users through the review process: structured tool to compile information, review and analyse the state of national fisheries management and impact of decision. Survey document will facilitate a structure review in a format that can be compared and communicated to other countries, if desired.

Task 9: Prepare Bi-Monthly Technical Activity Progress Reports

NEXUS will provide bi-monthly update reports in a format agreed upon by CRFM and NEXUS.

Work Package 2: Outputs and Deliverables

- 1. The NEXUS Team will compile the results of each task undertaken for Work Package 2 into a separate report on the bio-economic and ecological status of the resource, baseline indicators, which can be used to monitor management effectiveness and fishery impacts;
- 2. The NEXUS Team will provide a Socio-economic Report, which will include evaluation of gender, food security, income employment and ecosystem goods and services with special reference to livelihood effects;
- 3. The NEXUS Team will provide an EAF Report, which will provide an overview of recommendations to enhance fisheries policy and information requirements for national and regional fisheries management planning. This report will include a national vessel census for quantifying existing fishing effort and fishing capacity and information regarding the design of a system for collection and storage of traditional (unpublished) knowledge about the ecosystem and fishery through interviews with local fishers and other stakeholders.
- 4. Outputs from WP2 will be incorporated into the impact assessment tool (WP1)

Final Technical Report

During the ongoing implementation of the Project, NEXUS will provide draft copies of products from each of the above Tasks (WP-1 and WP-2) to the CRFM for review and comment. Final versions of each product will be submitted with the necessary revisions.

Upon completion of the project, NEXUS will prepare an overall Project Report. This report will compile all the project results and provide an overall summary of the Project. Specific proposal-oriented products will be compiled in the final report as a standalone guidance document (i.e. separate annex) which can facilitate CRFM's efforts to secure ongoing support for additional data management and reporting initiatives. Subject of further discussion with the CRFM Secretariat, this document will include the following Table of Contents:

- I. Acknowledgements
- II. Abbreviations and Acronyms
- III. Executive Summary
- IV. Introduction
- V. Approach to the Assignment
- VI. Comments on Terms of Reference
- VII. Organization and Methodology
- VIII. Delivery of Terms of Reference;
- IX. Overview of Activities conducted
- X. Project information mobilization activities and approaches
- XI. In-country meetings and activities overview
- XII. Comments and Conclusions and Recommendations
- XIII. Annex 1 Terms of Reference
- XIV. Annex 2 -Inception Report
- XV. Annex 3 Mission Reports
- XVI. Annex 4 Project Outputs and Products (by work package)

A project final financial report and other agreed upon reports will be provided as stand-alone reports.

<u>Work Plan</u>

NEXUS understands the importance of developing and adhering to a detailed work plan. The work plan allows the client to see exactly what is happening at each stage of the project, it allows the Project Team members to know where and when they are involved, and it keeps the project on schedule, which in turn efficiently utilizes resources.

The following table provides a breakdown of the project work plan and schedule. The work plan ensures all project objectives are completed within the designated timeline as stipulated in the RFP.

For additional information on the Project Work Plan please refer to Appendix C.

Table 2: Project Work Plan

	Project Task	Resource	Approximate Timeline				
1.	Project Management and Client Liaison	Milley, Delesalle	Ongoing				
	Work Pac	ekage 1					
2.	Establish a CRFM data and information repository for EAF management of Eastern Caribbean Flyingfish	Delaney, Fournier, Delesalle	Month 2 – 6				
3.	Develop an online, keyword searchable, bibliographic database with facility for download of published documents	Mahon, Fanning, Delaney, McConney, Fournier	Month 3 – 11				
4.	Address any copyright issues which may impact on the sharing of data and information	Fanning, Delaney, Fournier	Month 7 – 10				

	Project Task	Resource	Approximate Timeline				
5.	Support update of FIRMS resource and fisheries inventories for the eastern Caribbean stock of four-wing flyingfish through a FIRMS data query and automated report be created along with the database	Mahon, Fanning, Delaney, Fournier	Month 19 – 21				
6.	Prepare an impact assessment tool for CRFM use in follow up work	Milley, Fanning, Delaney, Fournier	Month 20 - 21				
7.	Prepare bi-monthly technical activity progress reports	Milley, Delesalle	Ongoing				
	Work Pa	ckage 2					
8.	Update multi-objective assessment of the eastern Caribbean Flyingfish fisheries to:	Milley, Mahon, Fanning, Medley, Oxenford	Month 11 – 13				
	a. Determine the bio-economic and ecological status of the stock	Lead: Oxenford	Month 11				
	b. Quantify baseline estimates of indicators and derive estimates for management reference points	Lead: Oxenford	Month 11				
	c. Provide updated recommendations in support of adaptive EAF management	Lead: Fanning	Month 12				
	d. Provide information on benefits and costs of EAF from social, economic, ecological and management perspectives and other economic factors related to the fishery	Lead: Oxenford	Month 13				
9.	Complete comprehensive and gender-sensitive valuation of the current and potential future contribution of flyingfish and associated pelagic fisheries to food security, income and employment, and ecosystem goods and services	Milley, Mahon, McConney, Delesalle	Month 11 – 16				
10.	Facilitate availability of new information for EAF management and policy cycle implementation support	Milley, Mahon, Fanning, Delaney, Oxenford, McConney, Fournier, Delesalle	Month 11 – 22				
	a. Options for value chain problem solving	Lead: Milley	Month 11 – 13				
	b. Refined operational objectives, indicators and reference points for monitoring and evaluation of management measures, with socio-economic objectives incorporating goals for achieving gender equality and youth development	Lead: McConney	Month 11 – 14				

Project Task	Resource	Approximate Timeline
c. National level recommendations made consistent with the sub-regional FMP, including provisions for further development of data collection and management systems	Lead: Fanning	Month 13 – 16
d. National vessel census for quantifying existing fishing effort and fishing capacity, considering present and emerging management needs, including the need to establish a list of authorized fishing vessels, to reduce and eliminate IUU fishing practices, to reduce possible impacts of present fishing strategies on long-term flyingfish recruitment, and to guarantee resilience to climate change and climate variability impacts	Lead: Fanning	Month 13 – 16
e. Establish a system for collection and storage of traditional (unpublished) knowledge about the ecosystem and fishery through interviews and local fisherfolk and other stakeholders	Lead: Milley	Month 16 – 22
f. Revised sub-regional fisheries management plan for Eastern Caribbean flyingfish, taking into account present and emerging needs and any new management advice generated	Lead: Oxenford	Month 16 – 22
11. Monitor and evaluate management performance at the national and regional levels	Milley, Mahon, Fanning, McConney	Month 23 – 24
12. Identify key data and information requirements, associated sources of data and information and mechanisms for data information sharing at the regional, national, sectoral and local elves to inform development of a DSS	Milley, Mahon, Fanning, Oxenford, McConney	Month 24 – 25
13. Develop a model catch documentation scheme for the flyingfish fishery based on the FAO CDS guidelines, that is using the guideline template as the starting point for developing the model	Milley, Mahon, Fanning	Month 25 – 26
14. Formulate a proposal to inform development of a decision support system	Milley, Mahon, Fanning, Fournier	Month 26 – 27
15. Prepare an impact assessment tool for CRFM use in follow up work	Milley, Mahon, Fanning, Oxenford, McConney	Month 27 – 29
16. Prepare bi-monthly technical activity progress reports	Milley, Delesalle	Ongoing

Project Task	Resource	Approximate Timeline					
Final Technic	cal Report						
17. Prepare draft technical report for CRFM Review	Milley, Mahon, Fanning, Delaney, Medley, Oxenford, McConney, Fournier, Delesalle	Month 29					
18. CRFM Review of Technical Report	CRFM Staff	2 weeks					
19. Revise and prepare final Technical Report	Milley, Mahon, Fanning, Delesalle	Month 30					

Work Breakdown Structure

Please refer to Appendix B for detailed Work Breakdown Structure. This document will be updated regularly and will be included in NEXUS' bi-monthly reports.

Detailed Work Plan

Please refer to Appendix C for detailed work plan.

Appendix A: Timeline Year 1, 2 and 3



Deliverable	Tentative End Date				
Project Start and CRFM Conference Call	21 December 2016				
Inception Report	13 January 2017				
Data Repository	31 July 2017				
Copyright Protocol	30 November 2017				
Bibliographic Database	15 December 2017				
Multi-Objective Assessment	31 January 2018				
Gender Sensitive Valuation	30 May 2018				
Update FIRMS	15 September 2018				
WP 1 Impact Assessment Tool	20 October 2018				
EAF Management and Policy Cycle	21 November 2018				
Evaluate Management Performance	31 January 2019				
Mechanisms for Data Sharing	28 February 2019				
Model Catch Documentation Scheme	31 March 2019				
Formulate Proposal	30 April 2019				
WP 2 Impact Assessment Tool	30 May 2019				
Final Technical Report	30 June 2019				

Appendix B: Detailed Work Breakdown Structure

STATUS	COLOR	LEGEND	&	TOGGLE

	Not	t Started	In Progress	Delayed	Complete	Revision Necessary	Custom 1	Custom 2	Custom 3	Custom 4				
		ON	ON	ON	ON	ON	OFF	OFF	OFF	OFF				
	T.	ASK			✓ STATUS	- OWNER	ASSIGNED TO	 Project Team 	- START DATE -	END DATE -	START DATE	END DATE	AVAILABLE 👻	ACTUAL
	P	roject Manage	ement and Client Liais	on	In Progress	Milley	Milley	Milley	2016-11-23	3 2019-06-30	2016-11-2	3	18	
N	Ingt Ir	nception Repo	rt		In Progress	Milley	Milley	Delesalle	2016-12-21	. 2017-01-13	2017-01-0	3	n/a	
	В	i-Monthly Rep	orts		Not Started	Milley	Delesalle	M.D.	2017-02-01	. 2019-06-30			14	
	С	ireate data ar	nd information reposite	ory	Not Started	Fournier	Fournier	D.F.D.	2017-02-01	2017-07-31			33	
	D	evelop Bibliog	graphic Database		Not Started	Fournier	Fournier	D.F.F.	2017-03-01	2017-11-30			19	
v	/P1 C	opyright Prote	ocol		Not Started	Fournier	Fournier	D.F.F.	2017-07-01	2017-11-30			2	
	" 1 U	Ipdate FIRMS			Not Started	Fanning	Fanning	M.F.D.F.	2018-07-01	2018-09-30			10	
	W	/P1 Impact As	ssessment Tool		Not Started	Milley	Milley	M.M.F.F.	2018-08-01	2018-10-31			7.5	
	W	VP1 Final Repo	ort		Not Started	Milley	Delesalle	Delesalle	2018-09-01	2018-11-30			n/a	
	M	Iulti-Objective	Assessment		Not Started	Milley	Milley	M.F.O.	2017-11-01	2018-02-28			11	
	a	. Bio-economi	ic and ecological stat	us of stock	Not Started	Milley	Milley	O.M.	2017-11-01	2018-12-31			n/a	
	b	. Quantify bas	seline estimates of inc	licators	Not Started	Oxenford	Oxenford	O.M.	2017-11-01	2018-12-31			n/a	
	C.	. Update reco	ommendations EAF ma	nagement	Not Started	Milley	Milley	F.M.	2017-12-01	2018-01-31			n/a	
	d	. Info on ben	efits and costs of EAF	from multi-perspective	Not Started	Milley	Milley	O.M.	2018-01-01	2018-02-28			n/a	
	G	iender Sensitiv	ve Valuation		Not Started	Milley	McConney	M.M.D.	2017-11-01	2018-05-31			12	
	E	AF Manageme	ent and Policy Cycle Ir	nplementation Support	Not Started	Milley	Fanning	M.F.D.O.M.F.D	2017-12-01	2018-10-31			28	
	a	. Value Chain	Problem Solving		Not Started	Milley	Milley	M.F.D.	2017-12-01	2018-02-28			n/a	
	b	. Refine oprat	ional objectives, indica	ators and reference points	Not Started	McConney	McConney	M.M.O.D	2018-01-01	2018-04-30			n/a	
v	VP2 c.	. National leve	el recommendations		Not Started	Fanning	Fanning	F.M.M.O.D.F	2018-02-01	2018-06-30			n/a	
	d	. National ves	ssel census		Not Started	Fanning	Fanning	F.D.F.M	2018-03-01	2018-08-31			n/a	
	e.	. System for a	collection/ storage of	traditional knowledge	Not Started	Milley	Delesalle	M.D.F.D	2018-05-01	2018-10-31			n/a	
	f.	Revised sub-	regional fisheries man	agement plan	Not Started	Milley	Milley	O.M.F.M.D	2018-05-01	2018-10-31			n/a	
	E	valuate Manag	gement Performance		Not Started	Fanning	Fanning	M.F.M.	2018-11-01	2019-01-31			6	
	Μ	lechnisms for	Data Information Sha	ring	Not Started	Fanning	Fanning	M.F.O.M.	2018-12-01	2019-02-28			6	
	Μ	Iodel Catch D	ocumentation Scheme		Not Started	Fanning	Fanning	F.M.	2019-01-01	2019-03-31			6	
	F	ormulate Prop	oosal		Not Started	Milley	Delesalle	M.M.F.F.	01-Feb-19	01-Apr-19			9.5	
	W	VP2 Impact As	ssessment Tool		Not Started	Milley	Delesalle	M.F.O.M.	01-Mar-19	9 31-May-19			7	
	W	/P2 Final Repo	ort		Not Started	Milley	Delesalle	Delesalle	01-Apr-19	9 31-May-19			n/a	
	Fi	inal Technical	l Report		Not Started	Milley	Delesalle	F.M.M.O.D.F	01-Feb-19) 30-Jun-19			17	
	FΡ	repare Draft 1	Technical Report		Not Started	Delesalle	Delesalle	Delesalle	01-Feb-19	9 30-Apr-19			n/a	
	Fi	inalize Techno	cial Report		Not Started	Milley	Delesalle	Delesalle	01-Jun-19) 30-Jun-19			n/a	

Appendix C: Detailed Work Plan

NEXUS: CRFM Data	and Information Manag	gem	ent	for D	ecisi	ion	Sup	port	t to	the	Eas	tern	ı Cari	ibb	ean Flyi	ngfi	sh F	ist	nery									
Task	Bespensible	Year 1					Year 2											Yea	fear 3									
Task	Responsible	1	2	3 4	1 5	5 6	5 7	8	9	10	11	12	1	2	3 4 5	5 6	5 7	/	8 9	10	11	12	1	2	3	4	5	6
Project Management & Client Liaison	Milley, Delesalle																											
Work Package 1																												
1. Create a data and information reportant	Delaney, Fournier,																Т	Т										_
	Delesalle																											
2. Develop bibliographic database	Delaney, Fournier,																											
	Fanning															_		╇	_						\rightarrow			
3. Address any copyright issues and create copyright	Fanning, Delaney,																											
protocol	Fournier																								\rightarrow			
Update of FIRMS resource and fisheries	Milley, Fanning,																											
inventories	Delaney, Fournier															_		42										
5. Prepare an impact assessment tool	Milley, Mahon,																											
	Fanning, Fournier																_											
6. Bi-monthly progress reports	Milley, Delesalle																											
Work Plackage 2																												
1 Undate multi-objective assessment of the Eastern	Milley Fanning						1									1		T			1							_
Caribbean flyingfish fisheries	Oxenford																											
a. Determine the bio-economic and ecological status	exemend																+	+									+	
of the stock	Oxenford, Milley																											
b. Quantify baseline estimates of indicators & derive																	-	+							-			
estimates for management reference points	Oxenford, Milley																											
					-					-						-	+	+							-+	-	+	
c. Provide updated recommendatiosn in support of	Fanning, Milley																											
adaptive EAF management					_											_	_	+							\rightarrow		_	
d. Provide information on benefits and costs of EAF	Oxenford Milley																											
(social, economic, ecological and mngt perspectives)	exerie a, mic,																											
2 Comprehensive and gender-sensitive valuation	Milley, Mahon,																											
2. Comprehensive and gender-sensitive valuation	McConney, Delesalle																											
EAF management and policy cycle	Milley, Fanning,																											
implementation support	Delaney, Oxenford,				_	_											4	4							_		_	
a. Options for value chain problem solving	Milley, Fanning,																											
h Monitoring and evaluation of management	Delesalle McCopport Millor															-		+										
b. Monitoring and evaluation of management	Overford Delesalle																											
	Fanning, Milley.																<u> </u>	+									+	
c. National level recommendations made consistent	McConney, Oxenford,																											
with the sub-regional FMP	Delaney, Fournier																											
d. National vessel census for quantifying existing	Fanning, Delaney,																											
fishing effort and fishing capacity	Fournier, Milley																											
e. System for collection and storage of traditional	Milley, Delesalle,																											
knowledge about the ecosystem and fishery	Fournier, Delaney																											
f Revised sub-regional fisheries management plan	Oxenford, Milley,																											
for Fastern Caribbean flyingfish	Fanning, McConney,																											
	Delesalle				-	_								_			4	4							\rightarrow		+	
4. Monitor and evaluate management performance	Milley, Fanning,																											
at the national and regional levels	McConney																											
Identifying key data and information	Milley, Fanning,																											
requirements and mechnisms for data info sharing	Oxenford, McConney																											
6. Develop a model catch documentation scheme	Milley Fanning																											
based on FAO CDS guidelines																	_	\perp										
7. Formulate a proposal to inform development of a	Milley, Mahon, Fanning																											
decision support system	Fournier																											
8. Prepare an impact assessment tool for CRFM use	Milley, Fanning,																											
in follow up work	Oxenford, McConney	l																\perp										
9. Bi-monthly progress reports	Milley, Delesalle																											
Final Technical Report						_						_				_		Ę.		-	_							
1. Prepare drat technical report for CRFM review	All																											
2. Revise and prepare final technical report for	Milley, Fanning,				-		-									-	+-	+		1	1							
CRFM	Delesalle																											

ANNEX 3: DATA SYSTEMS REPORT- COMBINED BIBLIOGRAPHIC AND DATA MANAGEMENT SYSTEM

Introduction

This Report provides an overview of the document and database management system developed for the CLME / SP3: EAF for the Eastern Caribbean Flyingfish: Technical Support to Enhance Data and Information Management for Decision Support. The database has been \ designed to facilitate access to documents (Word, PDF, etc.) and datasets (MS Access, dBase, Excel, and other Spreadsheets etc.) relevant to the management of flyingfish within the eastern Caribbean. In this, the data management system serves as both as a data repository and bibliographic database accessible to fisheries managers and researchers within the eastern Caribbean. The data management system utilizes the CKAN platform and only supports data storage and search. It is not a reporting system but provides a limited capacity for data visualization.

Scope of the Document

This Report provides a brief overview of the rationale, structure and intent of the online searchable bibliographic database and data repository for the eastern Caribbean Flyingfish fishery. It describes the basic requirements, the general concept of the system recommended, and the strategy for deploying an operational service.

This document will highlight the benefits that the Comprehensive Knowledge Archive Network (CKAN) platform will bring to present and future users, helping to create a more effective management of the Flyingfish fisheries in the Caribbean area and to be in agreement with the FAO system for disseminating information, Fisheries Global Information System (FIGIS). The scope of the document is in line with the two main objectives described in the EOI: 1) Improve stakeholder access to data and information of relevance and 2) improve the availability of data and information to the global community.

References

Reference Documents

Table 3: Reference Documents

Document	Title	Date				
1.	Inception Report	January 2017				
2.	Inception Report Revised Version	February 2017				
3.	FIRMS Information Management Policy	2015				
	FIRMS FSC9 / 2015 / 5					
	http://www.fao.org/3/a-ax530e.pdf					
4.	Inventory: method and Guidelines	2013				
	ftp://ftp.fao.org/FI/DOCUMENT/FIGIS FIRMS/Method Guidelines/Mar					
	ineResourcesInventoryGuidelines.pdf					
5.	FIRMS website - <u>http://firms.fao.org/firms/en</u>	N/A				
6.	FAO Glossary – <u>http://www.fao.org/fishery/glossary/en</u>	N/A				
7.	FIGIS - http://www.fao.org/fishery/rtms/60000/en	N/A				
8.	Report of the WECAFC-FIRMS Data Workshop	2016				
	http://www.fao.org/3/a-i5789e.pdf					
9.	http://www.fao.org/fiishery/rbf/wecafc/en	N/A				
10.	Guidelines for the Routine Collection of Capture Fishery Data. Prepared	18 – 30 May 1998				
	at the FAO / DANIDA Expert Consultation, Bangkok, Thailand. Chapter					
	7 Data Management – <u>http://www.fao.org/3/a-x2465e/x2465e0a.htm</u>					
11.	Software Requirements Specifications template	2008				
	http://itest.sourceforge.net/documentation/developer/Software Requireme					
	nts Specification-iTest.pdf					
12.	FAO, Review of current fisheries management performance and	2015				
	conservation measures in the WECAFC area.					
	http://crfm.net/images/Review_of_the_current_Fisheries_Management_pe					
	rformance_and_conservation_measures_in_the_WECAFC_area.pdf					
13.	http://www.i-marine.eu/Pages/Home.aspx	N/A				
14.	WECAFC-FIRMS Data Workshop - Database requirements	2016				
	ftp://ftp.fao.org/FI/DOCUMENT/wecafc/Wecaf_Firms16/19e.pdf					

Acronyms and Abbreviations

Table 2: Acronyms and Abbreviations Summary

Acronym	Description
CKAN	Comprehensive Knowledge Archive Network
CRFM	Caribbean Regional Fisheries Mechanism
FAO	Food and Agriculture Organization
FIRMS	Fisheries and Resources Monitoring System
FIGIS	FAO Fisheries Global Information System
GIS	Geographic Information System
IT	Information Technology
QA	Quality Assessment

Structure of the Document

The document contains the following material:

- Introduction on the data and information management requirements
- Targeted benefits
- System overview
- Future development

CRFM Data and Information Requirements

Information and Data Management Needs - The International Framework

A number of international and national regulations apply to the subject of protecting species and marine activities such as fishing and vessel fishing safety and fishermen. They aim at protecting economic activities and impeding illegal ones, and they are aiming at providing the legal framework to address possible threats (to the species, to the population, to the fishermen). The FAO technical report published in 2015, *Review of current fisheries management performance and conservation measures in the WECAFC area and* offer a detailed review of the local regulations affecting fisheries.

We listed the most important, from the international legal framework, below.

Table 3:	Summary	of International	Framework
		./	

Name	Date
UNCLOS	1982
Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks	Adopted in 1995
Agreement to Promote Compliance with International Conservation and Management Measures by Fishing Vessels on the High Seas	Adopted in 1993
FAO Code of Conduct for Responsible Fisheries	Adopted in 1995
United Nations Conference on Environment and Sustainable Development Agenda 21	Adopted in 1992
Rome Declaration on Illegal, Unreported and Unregulated (IUU) Fishing	2005
Agreement on Port State Measures to Prevent, Deter and Eliminate IUU Fishing	Adopted in 2009

The FAO is responsible for disseminating a web-based information management tool that integrates fisheries information and interconnects groups of institutional partnerships to build up a network of subsystems. After the workshop held in 2016 in Barbados, some common points were highlighted:

- 1. A need for harmonization in data collection and data sharing.
- 2. A need for standardization of data collection, including standards and references.

Based on the FIRMS Information Management Policy document, Data and Information Management supporting fishing activities should be characterized by the following major parameters:

The system proposed shall follow the requirements and the specifications expected in FIRMS FIGIS: FAO system for disseminating information provided by many different partners:

- Data will be loaded and maintained by many different organisations. In our case: Grenada, Martinique, Barbados and Trinidad and Tobago.
- In this distributed system, information remains under the full responsibility and control of data owners.

- Shall ensure that source citations of responsible party together with information on the nature, origins and quality of the information are visible.
- Ensure data and information conform to standard classifications
- Ensure validity of the data and information
- Ensure integrity and internal consistency
- Secure and maintain primary data
- Allow easy access to primary data
- Allow different data sets to be integrated, thereby increasing their overall utility.

General Database Architecture

The following architecture of the system is based on the FAO requirements expected to be completed by the info management system and the CRFM's EOI. The system shall:

- Collect and / or collate data from different national and possibly regional sources;
- Harmonize this information for aggregation and comparison for fisheries monitoring and policymaking support; and,
- Publish this data in a way that improves data discoverability and dissemination.



Figure 1: Illustration of Database Architecture

Benefits for Agencies, Researchers, Fishermen and Citizens

The web portal will provide a single resource for data discovery that may be used by not only national, regional, and local agencies, but also by universities, researchers and fishermen or any associations related to fisheries management. Through the portal, users will be able to download information for use in the decision-making process. The vision behind this project is that making the data readily and easily accessible will increase the knowledge and insight of the fisheries and fisheries management in the region. It may also encourage research and development.

Overview of the System Proposed

The approach to the technical specification has been driven by the basic requirement to build a consistent service able to deliver an information repository that will provide to the regional/local users and knowledge discovery infrastructure to augment their fisheries management plan. We chose the option of adapting an existing system instead of developing a system from scratch. By using an existing system has the following benefits:

- Using an existing system is cheaper than developing a new one, especially if an Open Source solution is used.
- Interaction with the portal will be well tested and familiar to experienced users.
- Compatibility and interoperability with similar portals will be simpler.
- There already exists online support and experienced developers and administrators.

The team reviewed three options, that are the most commonly used in terms of information management. The table below summarizes the different options assessed.

Tuble 4. Summary of Dulubuse Systems	Table 4:	Summary	of Database	Systems
---	----------	---------	-------------	---------

Name	URL	Pricing	Live Demo
CKAN	https://ckan.org/	Free – there are associated costs if there is a desire to increase the range of services (hosting, cloud, etc.)	http://demo.ckan.org/
DSpace	http://www.dspace.org/getting- started http://dspacedirect.org/benefits#fa st	High Price – but includes a large range of services	https://www.youtube.com/user /dspacedirectvideos
Dataverse	http://dataverse.org/	Free	https://dataverse.harvard.edu/d ataverse/bc

After analysis and several evaluations of the demonstration products, reading evaluation on trial versions, and creating a test platform, the system recommended is CKAN.

CKAN is used by several supranational, national, and regional agencies. It is a powerful data management system that uses metadata standards for data discovery. The data can be of multiple formats, for example pdfs, or csv data files and can be publicly or privately published. The users can query the metadata catalogue to find data of interest, which they preview or download. Data can be easily added to the repository through a series of simple to navigate forms. CKAN is an open source program that has become the de-facto standard for publishing Open Data around the world. Here are some example sites:

- Irish government data sharing portal: <u>https://data.gov.ie/data</u>
- European Union data portal: <u>https://www.europeandataportal.eu/</u>
- Canadian Open Data portal: <u>http://open.canada.ca/data/en/dataset</u>

CKAN Features

CKAN is a tool for making websites for publishing data. It helps manage and publish data. Once the data is published users can use its faceted search features to browse and find the data they need, and preview it using maps, graphs, and tables.

Publish and Manage Data

Entering and Editing Data

There are three ways of entering data:

- Using the web interface. Data can be entered via a series of forms.
- Using the JSON API. Data can be entered via a web service.
- Via custom spreadsheet importers. Data import tools are available.

Harvesting

If the organizations already has a well-defined structure for their data (webserver, geoserver...etc.) they can be pulled into the CKAN portal directly from the existing repositories.

- Geospatial Catalogue Service for Web (CSW) servers, ArcGIS, and Geoportal Servers.
- Existing web catalogues.
- Simple HTML index pages or Web Accessible Folders
- Interlibrary catalogue searchers (Z39.50 standard)
- Other CKAN instances

FileStore and Data Store Addin

When enabled, the FileStore allows users to upload data onto the CKAN instance that has been deployed. The FileStore mechanism treats each unit of data uploaded as a single entity, publishing the data on the CKAN catalogue via a single URI.

A download from the catalogue will be as a single complete data file.

In order to avail of the advanced data querying and data previews the Data Store extension needs to be installed. The Data Store is a free plugin to the CKAN system.

Publisher Tools

There are different ways of publishing datasets, either within an organization, or by filling a form containing the mandatory fields. Datasets can be published and be visible by any user of the portal, or they can remain private and be used only within an organization and only if the users are logged in. The roles of the users can also be defined depending on the rights the administrator wants them to have (read only, editor, admin etc.).

Search and Discovery

Search on all dataset attributes and/ or Fulltext search

The website will allow users to browse data in different ways: by theme, by department etc. But the data can also be searched thanks to a search bar clearly visible at the top of the page.

For example, if the user enters "fish" as a keyword then click enter, all the data sets available will be listed in a new page (see figure below). On the left side, the categories will help the user to filter the data either by collection, licence, format of data, theme, publishers, etc.

Once the data set is chosen, the downloadable format appears, if available, as well as the metadata link, and general information on the document.



fish Search Tips	Q	1,308 results Sort by:	Relevance -
Conduct Map Based Search		Fish Typology Prediction Sites (unpublished)	Environment
PUBLISHED STATUS		Environment Agency	
Published datasets (1299)		Environment & Business - Land and Water. Fish Typology Prediction Sites are points	
Unpublished datasets (9)		dataset.	
COLLECTION		Freshwater Fish Failures (unpublished)	Environment
National Information Infrastructure (1)		Environment Agency	
		Environment & Business - Land and Water. Freshwater Fish Failures dataset	
API		Directive (2006/44/EC). This	
Hide datasets with APIs (1308)			
		Obstacles to Fish Passage	Environment
LICENCE		Scottish Government Spatial Data Infrastructure	
Open Government Licence (1090)		Natural and artificial obstacles to the migration of fish, mainly salmonids, in	
Non-Open Government Licence (209)		SAVIDIN.	
Unpublished dataset (9)		Fish Smoking Area	Towns & Cities
771 UTA 477		Scottish Government Spatial Data Infrastructure	Atom Feed HTML
THEME		Fish Smoking Area in Arbroath for the production of the Arbroath Smokie	
Environment (1244)			
Mapping (17)		Commercial Fish Catch data (unpublished)	Environment
Colors & Lucelos (14)		Environment Agency	
Crime & Justice (7)		contains stock exploitation Monitoring data. It is used to inform fishery	
Society (b)		management decisions both	
v more v			
		Freshwater Fish River - Polyline (unpublished)	Environment
RESOURCE FORMAT		Environment Agency Environment Agency	
WMS (150)		England and Wales showing stretches of river designated under the EC Freshwater	
HTML (107)		Fish Directive	

Home / Datasets / The United Kingdom fishing Vessel List		
The United Kingdom fishing Vessel List		
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Marine & Fisheries Agency Statistics releases of lists of current registered UK commercial fishing vessels		
DATA RESOURCES (1)		
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Image: Subscreent and the su		
ADDITIONAL INFORMATION		
Added to data.gov.uk	09/02/2010	
Theme	Environment	
Geographic coverage	United Kingdom (England, Scotland, Wales, Northern Ireland)	
Precision	Individual vessel information	
Update frequency	monthly	
Temporal granularity	month	
Mandate	No value	
Temporal coverage	No value	
Schema/Vocabulary	No value	
Code list	No value	
Service Level	No value	

Metadata

CKAN allows for each data set accompanied by a rich set of metadata. The metadata is core to the data search capabilities of CKAN, some of the metadata fields available are listed here:

- Title: The title of the dataset.
- Unique Identifier: A unique URL to the dataset.
- Groups: Datasets can be assigned to particular thematic groups.
- Description: Description of the data to assist users query.
- Licence: The availability of the data according to its licence.
- Multiple formats: Other formats that the data are available in.

Geospatial

CKAN has advanced geospatial features covering data preview, search, and discovery. This feature is of particular relevance to this project as data being collected is coming from different geographical locations in the Caribbean. Some of the features are as follows:

- Preview on a Map: When location data is included in the metadata of a data set and the Data Store extension is used CKAN can plot the data on a map.
- Discovery: CKAN can make data it publishes queriable via accepted geo data query standards. It also can import geo data published in standard geo data formats.

Community

CKAN provides a suite of community tools that are used to improve collaboration and project planning. Users of CKAN can communicate and exchange about the datasets available.

Visualise

The portal allows the users to get a preview of the data stored before downloading or using the dataset chosen. Please note that the Data Store extension is needed for this functionality.

Themeable

The portal can be customized. Examples of internationally existing platforms are: Irish government data sharing portal: <u>https://data.gov.ie/data</u>. European Union data portal: <u>https://www.europeandataportal.eu/</u> Canadian Open Data portal: <u>http://open.canada.ca/data/en/dataset</u> DataNorge.no: <u>https://ckan.org/files/2011/10/Screen-Shot-2011-09-23-at-17.07.30.png</u> Manchester: <u>https://ckan.org/files/2011/10/Screen-Shot-2011-09-23-at-17.02.45.png</u>

History

Versioning is available: the portal will keep a complete history of all edits and versions of dataset metadata.

Extend

When customizing the page of the portal, it is possible to pick and choose which features you want to use for your data portal, e.g. <u>ckanext-googleanalytics</u> which integrates Google Analytics data into CKAN and gives download stats on dataset pages, lists the most popular datasets, etc.

Specifics

This section summarizes the tools and functions provided in the CRFM data management system.

Functional Requirements

The functional requirements are the activities that the system must perform. The table below summarize the requirements extracted from the CRFM's EOI compared to the functions offered by CKAN.

Work Package 1 Tasks	CKAN Features
Establish CRFM data	CKAN has a data store feature. This is used to store upload files in a secure
and information	repository
repository for EAF	
management of Eastern	
Caribbean flyingfish	

Table 5: Overview of CKAN Features

Work Package 1 Tasks	CKAN Features
Develop an online, keyword searchable, bibliographic database with facility for download of published documents	Each file in the CKAN datastore must have metadata associated with it. This metadata is keyword searchable. The search facility is focused on improving data discovery. Once data is found it can be downloaded. Data can be documents or data sets in various formats
Address any copyright	Copyright information must be included in a file metadata. This information can be
issues which may impact	used to restrict access to files. It is possible to provide CKAN users a number of levels of data access through the user account system
and information	levers of data access through the user account system
	FIRMS will be able query the CKAN datastore and harvest information found. Interoperability can work both ways. FIRMS compliant data descriptors are provided in a guide linked to the Database Management System. Users are encouraged to use these descriptors at a minimum when uploading datasets and documents to the system. The CKAN datastore is not capable of converting datasets to meet the specifications of end users, however, interoperability of national databases and FIRMS data systems can be enhanced through use of common data architecture. It is recommended that national data be structured in keeping with the Draft Data Collection Framework (DCRF) prepared by WECAFC FIRMS (http://www.fao.org/fi/static- media/MeetingDocuments/WECAFC/SAG2018/Inf.14.pdf). In addition to facilitating use of national datasets by CRFM, and WECAF, common data structures will facilitate collaboration in data analysis between individual Member States.

The following describes the functions offered by CKAN and that meet the CRFM's requirements.

Access Roles

Two access roles shall be created: one public, the second with restricted access.

Data catalogue capabilities

- Entering
- Listing
- Searching data sets including complex search by tag, departments, themes...
- Automated harvesting of metadata and material from third sources within and outside government and national agencies

Languages

• Multilingual metadata shall be managed within the system, allowing filtering and multilingual descriptions.

Copyrights

• The system shall address any copyright issues which may impact on the sharing of data and information.

Automated reports

A number of automated reports can be constructed by the CRFM System Administrator. The reports will be run against the CKAN web portal database and data store. It will be possible to trigger the reports on demand, it will also possible to make reports available based on the access rights of users to the new portal. For example: https://data.gov.uk/data/report

Harmonized layout

Much of the CKAN graphical user interface should be familiar to many of the stakeholders, in order to benefit from this the deployment of this CKAN instance will use recommended standard forms. In addition, the project will use the following practices:

- Information shall be entered using mandatory fields
- Mandatory fields and keywords shall follow a common and controlled vocabulary
- Grid for Quality Assurance shall be developed and followed by the partners
- Might be available in three languages (English, French, Spanish)

Metadata

Metadata is crucial to data quality control, it also an essential part of data discovery and dissemination. Metadata will be mandatory for each data resource added to the CKAN repository. The metadata standards used in this project will:

- Follow best practises for data archiving and data discovery
- Follow UNFAO recommendations for fisheries data
- Use mandatory fields that will be visible to users
- Use the RDF (Resource Description Framework)
- Grid for Quality Assurance shall be developed and followed by the partners
- Might be available in three languages (English, French, Spanish)

Standards

The standards that are important to this project are those that promote interoperability and data discoverability among the greater fisheries community. To that end the project has followed the lead from the UNFAO (see Appendix 2) and uses:

- Existing standards metadata standards for data description and discovery
- FIRMS developed standards for citation, geo-reference, and marine resources naming standards.
- FIRMS marine resource data dictionary (which should be followed by users as standard).

Performance Requirements

The Cloud-based portal is robust and fast enough to serve the stakeholder community. CKAN is designed to meet these requirements and can serve large community using modest resource.

Interface with Users

In this section we are describing the human-computer interface (HCI).

Access

- The system uses a CRFM-based domain to which access can be restricted.
- The system facilitates access to frequently used functions: search for and find data
- The system has easy menus / tabs with commands
- The system has readily accessible "Help" keys or a command-button to access online help messages
- Tutorials / documentation can be provided by CRFM

Import dataset

- Key features are creating dataset, edit dataset, delete dataset
- Only the users with appropriate permissions can create, edit, update, and delete datasets.
- Publishing shall be done by a click, although it may, and should, require a high level of authorization within the organization.

Export dataset

• Datasets can be downloaded when they are published. Before being published the datasets are only visible within the same organization.

Finding data

- Any combination of keywords can be typed in the search box
- The first page displays the total number of results
- The search is restricted by the use of tags, data format, license types, themes, publishers etc.
- The filters and the search box can be emptied in order to repeat the search

Exploring datasets

- The datasets are selectable
- After selecting the dataset, the page displays the name of the dataset, the links, a description, and the metadata about the dataset

Operational Requirements

Hosting

The system is hosted on a Cloud server, specifically AWS (Amazon Web Services). The Tier 1 service is currently being used, however consideration should be given to increasing the level of service used.

Requirements for Data Quality Control

- Partners are responsible for the information submitted and the Quality Assessment (QA) associated with that information
- Minimum requirements: mandatory fields, agreement on standards use, harmonised layout, development of quality assurance indicators (both qualitative and quantitative, such as "risk indicators") and indicators of reliability and timeliness in metadata
- The system relies on metadata and controlled vocabulary (thesauri) standards (see Appendix 2)

Maintainability

Data Owners' Responsibility

- Data will be loaded and maintained by many different organisations (Grenada, Martinique, Barbados and Trinidad and Tobago)
- CKAN can host multiple organisations on a single web portal.
- In this distributed system, information remains under the full responsibility and control of data owners
- Need for a long-term commitment to support the data/information management application
- Responsible authorities must commit adequate financial and personnel resources for maintenance
- Archives and backups
- Responsible authorities must make regular archives to protect the data, and periodically re-evaluate the design to be sure the system is meeting its objectives.
- The system should always be prepared for major hardware or software failures and data loss. Procedures should be made as simple as possible to ensure that backups are regularly made.

Controls

- Access should be controlled to ensure database integrity and confidentiality but interfere as little as possible with legitimate access.
- Periodic evaluations of the system should be undertaken (make sure the system still meet the needs of the client).

Workflow- How the Platform Should Typically be Used

The figure below is a representation of a workflow showing how CKAN is used as the central resource for data management, both for regional and national scale projects, and for the visitors to the portal. A general description of the process is included in Appendix 1 attached. The case study has been extracted from the workshop held in 2016 in Barbados (p. 21, Part 4 on the identification of datasets to be shared at regional level). Guides for Organization editors (System Administrators and Users) are provided in Appendices 3 and 4, attached.



Figure2: Overview of CKAN Workflow

Appendix 1 to Annex 3: Introductory Statement for CRFM Fisheries Data and Information Access Point

The overall purpose of this database is to enable access to documents (Word, PDF, etc.) and datasets (MS Access, dBase, Excel, and other Spreadsheets etc.), serving both as a data repository and bibliographic database. This database is managed by the CKAN platform and only supports data storage and search (CKAN is not a reporting system); notwithstanding that, it has a small module for data visualization.

In this database, an "Organization" is a group of users (e.g., national fisheries departments and organizations, which upload data and information), with different permissions to interact with the platform; while "Group" refers to a collection of datasets that are related (such as species-specific data, national overview data, bibliographic documents on a particular topic / species).

The Data repository attributes of the Database allows users to upload datasets and documents. This means that the different systems used by the member States (i.e. Excel spreadsheet, or Access databases) can be found through queries and examined and relevant data can be downloaded, including subsets of the datasets. This system also allows older data formats (FoxPro, lotus, dBase etc.) to be uploaded and used as well.

People can inspect and examine the datasets, make standard analyses (according to the tools and attributes software associated with the dataset) from within the database. Alternatively, the datasets can be downloaded, and more extensive analyses can be made by combining or integrating the downloaded datasets.

Datasets within the database, and documents stored in the database can also be accessed through online searches (google, yahoo, etc.) depending if the document or database is made "public" by the owner.

Appendix 2 to Annex 3: Guide for Use of Reference Terms for Document and Data Upload

For the purpose of clarity and ease of user search of the database, the CRFM encourages users to apply standard descriptors adopted for the FAO Fishery Resource Monitoring System. This will facilitate additions and updates of the database in a manner that will facilitate broad use and compatibility with other fishery databases.

The following FIRMS Reference terms have been extracted from the Reference Table Management System (RTMS). Information on the FIRMS definitions is provided below.

General descriptors:

- Climatic Zone
 - Polar
 - Temperate
 - Tropical
- Bottom Type
 - Seagrass
 - Coral reef
 - Soft bottom
 - Hard bottom
 - Unspecified
 - Mangrove
- Depth Zone
 - Coastal
 - Shelf
 - Slope
 - Abyssal
 - Unspecified
- Horizontal Distribution
 - Littoral
 - Estuarine
 - Neritic
 - Oceanic
 - Unspecified
 - Inland waters
- Vertical Distribution
 - Demersal / Benthic
 - Pelagic
 - Unspecified
- Spatial scale
 - Global
 - Regional
 - Sub-Regional

- National
- Local
- Unspecified
- Jurisdictional distribution
 - National
 - Shared between nations
 - Straddling between High Seas and EEZ
 - Highly migratory
 - High Seas Purely
 - Unspecified

Assessment descriptors:

- Assessment Model
 - Age-Structured
 - Size-Structured
 - Biomass-Aggregated
 - Others
- Assessment Data
 - Fishery Catch and Effort
 - Vessel Surveys
 - Tagging
 - Remote Sensing
 - Environmental Data
 - Others
- Assessment Indicator
 - Biomass
 - Abundance
 - Exploitation rate
 - SSB
 - Recruitment
 - Fishing mortality
 - Average weight
 - Average length
 - Others
- Reference Point
 - MSY
 - Others

Stock status descriptors:

- Exploitation Rate
 - No or low fishing mortality
 - Moderate fishing mortality
 - High fishing mortality
 - Uncertain / Not assessed
- Not provided
- Abundance level
 - Pre-exploitation biomass or high abundance
 - Intermediate abundance
 - Low abundance
 - Depleted
 - Uncertain / Not assessed
 - Not provided
- Exploitation State
 - Recovering
 - Depleted
 - Fully exploited
 - Moderately exploited
 - No-specific assessment
 - Overexploited
 - Uncertain
 - Underexploited
 - Unexploited
 - Not provided

FIRMS concepts' definitions

Definitions based on the FAO Fisheries Glossary have been proposed for the core concepts considered in the Partnership Arrangement for reporting in FIRMS.

Aquatic Resource: Biotic element of the aquatic ecosystem, including genetic resources, organisms or parts thereof, populations, etc. with actual or potential use or value (sensu lato) for humanity. Fishery resources are those aquatic resources of value to fisheries. FAO Fisheries Glossary.

Fishery Resource: In general, refers to elements of a natural aquatic resource (e.g. strains, species, populations, stocks, assemblages) which can be legally caught by fishing. It may sometimes be taken as including also the habitat of such resources.

Stock: A group of individuals in a species occupying a well-defined spatial range independent of other stocks of the same species. It can be affected by random dispersal movements and directed migrations due to seasonal or reproductive activity.

Fishery: A Fishery is an activity leading to the harvesting of fish, within the boundaries of a defined area. The fishery concept fundamentally gathers indication of human fishing activity, including from economic, management, biological / environmental and technological viewpoints.

Management unit: Is a Fishery unit considered by an Authority for a purpose of management, usually within a jurisdiction and / or with established legal rights. Jurisdiction is interpreted here as the limits or territory within which some authority may be exercised.

Management: The art of taking measures affecting a resource and its exploitation with a view to achieving certain objectives, such as the maximization of the production of that resource. Management includes, for example, fishery regulations such as catch quotas or closed seasons. Managers are those who practice management.

Management authority: The legal entity which has been assigned by a State or States with a mandate to perform certain specified management functions in relation to a fishery, or an area (e.g. a coastal zone). Generally used to refer to a state authority, the term may also refer to an international management organization. Examples of a Management authority are a regional body, a state, provincial government, or local fishing community.

Management System: Functional system governed by an authority having a mandate to perform specified management functions focusing on a territory, a production system, or a fishery. This functional system is usually formalized through a legal framework. Examples of production systems as understood here are: Marine Capture fisheries, Inland Capture fisheries, Coastal fisheries, Culture based fisheries, Aquaculture. The degree of formalization of a Management system may vary from thoroughly established systems driven by a Regional Fishery Commission, to a recognized traditional rights-based system at fishermen community level.

Modelling of concepts in the FIRMS application

FIRMS will fundamentally manage objects from 3 information domains:

Fishery represents the exploitation and usage dimension. It covers the previously defined term Fishery and therefore that of Management Unit.

Aquatic Resource represents the biological dimension. It covers the previously defined terms aquatic resource, fishery resource and stock.

Management System describes the institutional framework and the set of rules used to reach management objectives.

The concept of Management Unit in FIRMS

According to the terms previously defined, a Management Unit is a Fishery, and a Fishery may be defined from a biological perspective by reference to an exploited Aquatic Resource. In order to avoid the duplication of objects, which could be a source of confusion for the user and would dissociate information that a partner would prefer to be displayed together, the FIRMS Aquatic Resource concept may also represent a Management Unit. Having this qualifier, an Aquatic Resource can be the subject of detailed reporting on management. But detailed information related to exploitation is restricted to objects of the Fishery domain. From a software system view point, what fundamentally differentiate these domains are the attributes used to identify each instance object (key attributes), a set of attributes used to classify the objects in categories and a set of topics subject of reporting.

Marine Resource

Key attributes

- Species or group of species,
- Area of distribution

Reporting topics

• Habitat and Biology

- Geographical distribution
- Water Area Overview
- Structure (see below section on relationships)
- Exploitation (Fishery overview)
- Assessment (available data, method, results, and scientific advice)
- Management Overview*
- Biological state and trend (including a status of exploitation typology)
- Statistics
- Historical data, Bibliographic References and Source of information

Fishery

Key attributes

- Fishing Area
- Other key descriptor of the fishing activity: Fishing Gear(s), Vessel type(s), Fishing techniques(s), Fishing community(ies), Flag State(s), Fishing port(s), Exploitation Form, Handling mode, Target species

Reporting Topics

- Description of
 - Fishing Season
 - Target, Bycatch, Discard, and Incidental Species
 - Fishing Area
 - Fishing Gear
 - Vessel type
 - Fishing technique
 - Fishing community
 - Exploitation Form
 - Handling mode description
 - Overview of the Management System
- Exploitation (including available data, indicators, and biological assessment overview)
- Management Overview *
- Status and trends (including a status of exploitation typology)
- Production System (including available data, socio-economic indicators)
- Post-harvest information
- Issues
 - Historical data, Bibliographic References and Source of information * If the Aquatic Resource or the Fishery is a Management Unit, the management topic might be detailed using the following sub-topics:
 - Objectives
 - Strategies
 - Methods
 - Advices
 - Resolutions
 - Problems

Management System

Key attributes

- The mandated authorities: country or institution
- Focus of management: a jurisdiction area, a sector (e.g. Inland fishery, marine Fishery, etc..) or a fishery

Reporting Topics

- The legal framework reflecting the formal status of the management system
- Jurisdiction Overview
- The participating institutions and their mandates
- Structure of the Management System, including references to other related management systems
- References to the Management Units focus of the application of selected policies, management methods and measures
- Management Objectives
- Management Strategies
- Management Methods, including Method performance
- Management Resolutions
- Management Problems
- Historical data, Bibliographic References and Source of information

Appendix 3 to Annex 3: Systems Administrator Guide

This guide covers the administration features of CKAN 2.0, such as managing users and datasets. These features are available via the web user interface to a user with sysadmin rights. The guide assumes familiarity with the User guide.

Certain administration tasks are not available through the web UI but need access to the server where CKAN is installed. These include the range of configuration options using the site's "config" file, documented in Configuration Options, and those available via Command Line Interface.

A sysadmin user can access and edit any organizations, view, and change user details, and permanently delete datasets. You should carefully consider who has access to a sysadmin account on your CKAN system.

Creating a Sysadmin Account

Normally, a sysadmin account is created as part of the process of setting up CKAN. If one does not already exist, you will need to create a sysadmin user, or give sysadmin rights to an existing user. To do this requires access to the server; see "Creating a Sysadmin User" for details. If another organization is hosting CKAN, you will need to ask them to create a sysadmin user.

Adding more sysadmin accounts is done in the same way. It cannot be done via the web UI.

Customizing Look and Feel

Some simple customizations to customize the 'look and feel' of your CKAN site are available via the UI, at <u>http://<my-ckan-url>/ckan-admin/config/</u>.

About

Text that appears on the "about" page, <u>http://<my-ckan-url>/about</u>. You can use Markdown here. If it is left empty, a standard text describing CKAN will appear.

Intro Text

This text appears prominently on the home page of your site.

Custom CSS

For simple style changes, you can add CSS code here which will be added to the <head> of every page.

Managing Organizations and Datasets

A sysadmin user has full access to user accounts, organizations⁴, and datasets. For example, you have access to every organization as if you were a member of that organization. Thus, most management operations are done in the same way as in the normal web interface.

For example, to add or delete users to an organization, change a user's role in the organization, delete the organization or edit its description, etc. visit the organization's home page. You will see the "Admin" button on

⁴ For the purpose of the CRFM Fisheries Data Access Point, an "Organization" can consist of the CRFM, Member State Fisheries Division, or Partner Organization.

as if you were a member of the organization. You can use this to perform all organization admin functions. For details, see the User Guide.

Similarly, to edit, update or delete a dataset, go to the dataset page, and us the "Edit" button. As an admin user you can see all datasets including those that are private to an organization. They will show up when doing a dataset search.

Moving a Dataset between Organizations

To move a dataset between organizations, visit the dataset's Edit Page. Choose the appropriate entry from the "organization" drop-down list, and press "Save".

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🗡 ckan		Datasets Organizations Oroups About	Search C
O CKAN config options	 Syssemms 	& Config	
this CKAN instance It appears in various places throughout CKAN.	Site Title:	CKAN Demo	1
Style: Choose from a list of simple variations of the main	Style:	Default 3	
colour scheme to get a very guick custom theme working.	Site Tag Line:	Demo]
Site Tag Logo: This is the logo that appears in the header of all the CKAN instance	Site Tag Logo:	base Imagesickan-logo prg	1
About: This text will appear on this CKW instances about page.	About:	Adveut page text	
appear on this CKAN instances home page as a velocime to		You can use Markdown lowering here	-
Vectors. Custoes CSB: This is a block of CSS that appears in «head»: tap of every page. If you wish to customize the temptates more fully we recommend reading the	intro Text:	Try out standard CKAN functionality in a sandbox en directly toon the homeopae of by navgating to the ID distances exercised page where you can face to tago, own datasets _ust [sign ud](http://beta.ckan.org/org/n/ publishing [organization](http://beta.ckan.org/organiz voice are tainidiant lowering leve	vronment. Search für datasets utasets()(http://dwmo.ckan.org proups and format. To add your ser/register) and create your ration()
doctuoistration?			

Here you can edit the following:

Site Title

• This is used in the HTML <title> of pages served by CKAN (which may be displayed on your browser's title bar). For example, if your site title is "CKAN Demo", the home page is called "Welcome – CKAN Demo". The site title is also used in a few other places, e.g. in the alt-text of the main site logo.

Style

• Choose one of five colour schemes for the default theme.

Site Tag Line

• This is not used in CKAN's current default themes but may be used in the future.

Site Tag Logo

• A URL for the site logo, used at the head of every page of CKAN.

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Edit Resources	Title:	: UP Library catalogue
Catalogue - XML		URL: demo.ckan.org/dataset/up-library-catalogue Edit
+ Add New Resource	Description:	List of books held in Upper Papwel Village Library
		managery (
		national-statistics office
	2	organization-example
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Permanently Deleting Datasets

A dataset which has been deleted is not permanently removed from CKAN; it is simply marked as "deleted" and will no longer show up in search, etc. The dataset's URL cannot be re-used for a new dataset. To permanently delete ("purge") a dataset:

- Navigate to the dataset's "Edit" page and delete it. Visit <u>http://<my-ckan-url>/ckan-admin/trash/</u>.
- This page shows all deleted datasets and allows you to delete them permanently.
- This operation **cannot** be reversed.

At present, it is not possible to purge organizations or groups using the web UI. This can only be done with access to the server, by directly deleting them from CKAN's database.

Managing Users

To find a user's profile, go to <u>http://<my-ckan-url>/user/</u>. You can search for users in the search box provided.

You can search by any part of the user profile, including their e-mail address. This is useful if, for example, a user has forgotten their user ID. For non-sysadmin users, the search on this page will only match public parts of the profile, so they cannot search by e-mail address. On their user profile, you

will see a "Manage" button. CKAN displays the user settings page. You can delete the user or change any of its settings, including their username, name, and password.

A (Unam (Cal U D))		
W / Users / Col H Dedsh	iott / Manage	
Account Info		
Your profile lets other CKAN users know about who you are and what you do.	Change detail	ils
	*Usemane:	dedshat 🗊
	Full name:	Col H Dedshott
	" Email:	dedshott@cataputs.org
	About:	A-life information about yourself
		Yes on see Ministeen forwarding here
		Subscribe to notification emails Or and frame watching with the SMM or public year for mean achieve in our
	Change pass	sword
	Password:	

New in version 2.2: Previous versions of CKAN did not allow you to delete users through the web interface

Appendix 4 to Annex 3: User Guide

This user guide covers how to use CKAN's web interface to organize, publish and find data. CKAN also has a powerful API (machine interface), which makes it easy to develop extensions and links with other information systems. The API is documented in API guide.

Some web UI features to site administration are available only to users with sysadmin status and are documented in Sysadmin Guide.

What is CKAN?

CKAN is a tool for making open data websites. (Think of a content management system like WordPress – but for data, instead of pages and blog posts.) It helps you manage and publish collections of data. It is used by national and local governments, research institutions, and other organizations who collect a lot of data.

Once your data is published, users can use its faceted search features to browse and find the data they need, and preview it using maps, graphs, and tables – whether they are developers, journalists, researchers, NGOs, citizens or even your own staff.

Datasets and Resources

For CKAN purposes, data is published in units called "datasets". A dataset is a parcel of data – for example, it could be the crime statistics for a region, the spending figures for a government department, or temperature readings from various weather stations. When users search for data, the search results they see will be individual datasets.

A dataset contains two things:

- Information or "metadata" about the data. For example, the title and publisher, data, what formats it is available in, what license it is released under, etc.
- A number of "resources", which hold the data itself. CKAN does not mind what format the data is in. A resource can be CSV or Excel spreadsheet, XML file, PDF document, image file, linked data in RDF format, etc. CKAN can store the resource internally, or store it simply as a link, the resource itself being elsewhere on the web. A dataset can contain any number of resources. For example, different resources might contain the data for different years, or they might contain the same data in different formats.

On early CKAN versions, datasets were called "packages" and this name has stuck in some places, especially internally and on API calls. Package has exactly the same meaning as "dataset".

Users, Organizations, and Authorization

CKAN users can register user accounts and log in. Normally (depending on the site setup), login is not needed to search for and find data but is needed for all publishing functions: datasets can be created, edited, etc. by users with the appropriate permissions.

Normally, each dataset is owned by an "organization". A CKAN instance can have any number of organizations. For example, if CKAN is being used as a data portal by a national government, the organizations might be different government departments, each of which publishes data. Each organization can have its own workflow and authorizations, allowing it to manageits own publishing process.

An organization's administrators can add individual users to it, with different roles depending on the level of authorization needed. A user in an organization can create a dataset owned by that organization. In the default setup, this dataset is initially private, and visible only to other users in the same organization. When it is ready for publication, it can be published at the press of a button. This may require a higher authorization level within the organization.

Datasets cannot normally be created except within organizations. It is possible, however, to set up CKAN to allow datasets not owned by any organization. Such datasets can be edited by any logged-in user, creating the possibility of a wiki-like datahub.

The user guide covers all the main features of the web user interface (UI). In practice, depending on how the site is configured, some of these functions may be slightly different or unavailable. For example, in an official CKAN instance in a production setting, the site administrator will probably have made it impossible for users to create new organizations via the UI. You can try out all the features described at <u>http://demo.ckan.org.</u>

Using the CKAN-based CRFM Fisheries Data Access Point

<u>Registering and logging in</u>

Registration is needed for most publishing features and for personalization features, such as "following" datasets. It is not needed to search for and download data.

To create a user ID, use the "Register" link at the top of any page. CKAN-based CRFM Fisheries Data Access Point will ask for the following:

Username – choose a username using only letters, numbers, - and _ characters. For example, "jbloggs" or "joe_bloggs93".

Full name – to be display edition your user profile

E-mail address – this will not be visible to other users

Password – enter the same password in both boxes

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If there are problems with any of the fields, CRFM Fisheries Data Access Point will tell you the problem and enable you to correct it. When the fields are filled in correctly, CRFM Fisheries Data Access Point will create your user account and automatically log you in.

It is perfectly possible to have more than one user account attached to the same e-mail address. For this reason, choose a username you will remember, as you will need it when logging in.

Features for Publishers

Adding a new dataset

You may need to be a member of an organization to add and edit datasets. See the section Creating an Organization below. On <u>http://demo.ckan.org</u>, you can add a dataset without being in an organization, but dataset features relating to authorization and organizations will not be available.

Step 1. You can access CRFM Fisheries Data Access Point's "Create dataset" screen in two ways.

- a) Select the "Datasets" link at the top of any page. From this, above the search box, select the "Add Dataset" button.
- b) Alternatively, select the "organizations" link at the top of a page. Now select the page for the organization that should own your new dataset. Provided that you are a member of this organization, you can now select the "Add Dataset" button above the search box.

Step 2. The CRFM Fisheries Data access Point will ask for the following information about your data. (The actual data will be added in step 4).

• *Title* - This title will be unique across the CRFM Fisheries Data Access Point, so make it brief but specific. E.g. "UK population density by region" is better than "Population figures".

- *Description* You can add a longer description of the dataset here, including information such as where the data is from and any information that people will need to know when using the data.
- *Tags* here you may add tags that will help people find the data and link it with other related data. Examples could be "population", "crime", "East Anglia". Hit the <return> key between tags. If you enter a tag wrongly, you can use its delete button to remove it before saving the dataset.
- *License* it is important to include license information so that people know how they can use the data. This field should be a drop-down box. If you need to use a license not on the list, contact your site administrator.
- Organization If you are a member of any organizations, this drop-down will enable you to choose which one should own the dataset. Ensure the default chosen is the correct one before you proceed. (Most users will be in only one organization. If this is you, the CRFM Fisheries Data Access Point will have chosen your organization by default and you need not do anything.)

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By default, the only required filed on this page is the title. However, it is good practice to include, at the minimum, a short description and, if possible, the license information. You should ensure that you choose the correct organization for the dataset, since at present, this cannot be changed later. You can edit or add to the other fields later.

Step 3. When you have filled in the information on this page, select the "Next: Add Data" button. (Alternatively select "Cancel" to discard the information filled in.)

Step 4. The CRFM Fisheries Data Access Point will display the "Add Data" screen.

This is where you will add one or more "resources" which contain the data for this dataset. Choose a file or link for your data resource and select the appropriate choice at the top of the screen:

- If you are giving the CRFM Fisheries Data Access Point a link to the data, like <u>http://example.com/mydata.csv</u>, then select "Link to a file" or "Link to an API".(If you don't know what an API is, you don't need to worry about this option select "Link to a file".)
- If the data to be added to the CRFM Fisheries Data Access Point is in a file on your computer, select "Upload a file". The CRFM Fisheries Data Access Point will give you a file browser to select.

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Step 5. Add the other information on the page. The CRFM Fisheries Data Access Point does not require this information, but it is good practice to add it:

- *Name* a name for this resource, e.g. "Population density 2011, CSV". Different resources in the dataset should have different names.
- *Description* a short description of the resource.
- *Format* the file format of the resource, e.g. CSV (comma-separated values), XLS, JSON, PDF, etc.

Step 6. If you have more resources (files or links) to add to the dataset, select the "Save & add another" button. When you have finished adding resources, select "Next: Additional Info".

Step 7. The CRFM Fisheries Data Access Point display the "Additional data" screen.

- Visibility A Public dataset is public and can be seen by any user of the site. A Private dataset can only be seen by members of the organization owning the dataset and will not show up in the searches by other users.
- *Author* The name of the person or organization responsible for producing the data.
- *Author e-mail an e-mail address for the author, to which queries about the data should be sent*
- *Maintainer / maintainer e-*mail If necessary, details for second person responsible for the data.
- *Custom fields* If you want the dataset to have another filed, you can add the field name and value here. E.g. "Year of publication". Note that if there is an extra field that is needed for a large number of datasets, you should talk to your site administrator about changing the default schema and dataset forms. Everything on this screen is optional, but you should ensure the "Visibility" is set correctly. It is also good practice to ensure an Author is named.
- *Changed in version 2.2:* Previous versions of the CRFM Fisheries Data Access Point used to allow adding the dataset to existing groups in this step. This was changed. To add a dataset to an existing group now, go to the "Group" tab in the Dataset's page.

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Step 8. Select the 'Finish' button. The CRFM Fisheries Data Access Point creates the dataset and shows you the result. You have finished!

You should be able to find your dataset by typing the title, or some relevant words from the description, into the search box on any page in your CKAN instance. For more information about finding data, see the section Finding data.

Editing a Dataset

You can edit the dataset you have created, or any dataset owned by an organization that you are a member of. (If a dataset is not owned by any organization, then any registered user can edit it.)

- Go to the dataset's page. You can find it be entering the title in the search box on any page.
- Select the 'Edit' button, which you should see above the dataset title.
- The CRFM Fisheries Data Access Point displays the "Edit dataset" screen. You can edit any of the fields (Title, Description, Dataset, etc.), change the visibility (Private / Public), and add or delete tags or custom fields. For details of these fields, see Adding a new dataset.
- When you have finished, select the "Update dataset" button to save your changes.
- Go to the dataset's "Edit dataset" page (steps 1-2 above). In the left sidebar, there are options for editing resources. You can select an existing resource (to edit or delete it) or select "Add new resource".
- You can edit the information about the resource or change the linked or uploaded file. For details, see steps 4-5 of "Adding a new resource", above.
- When you have finished editing, select the button marked "Update resource" (or "Add", for a new resource) to save your changes. Alternatively, to delete the resource, select the "Delete resource" button.

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	Author Email:	dedshots@catapuits.org				

Adding, Deleting, and Editing Resources

Deleting a Dataset

- Go to the dataset's "Edit dataset" page (see "Editing a dataset", above).
- Select the "Delete" button.
- The CRFM Fisheries Data Access Point displays a confirmation dialog box. To complete deletion of the dataset, select "Confirm".
- The "Deleted" dataset is not completely deleted. It is hidden, so it does not show up in any searches, etc. However, by visiting the URL for the dataset's page, it can still be seen (by users with appropriate authorization), and "undeleted" if necessary. If it is important to completely delete the dataset, contact your site administrator.

Creating an Organization

In general, each dataset is owned by one organization, such as a national fisheries division or CFRM partner agency. Each organization includes certain users, who can modify its datasets and create new ones. Different levels of access privileges within an organization can be given to users, e.g. some users might be able to edit datasets but not create new ones, or to create datasets but not publish them. Each organization has a home page, where users can find some information about the organization and search within its datasets. This allows different data publishing departments, bodies, etc. to control their own publishing policies.

To create an organization:

- Select the "Organizations" link at the top of any page.
- Select the "Add Organization" button below the search box.
- The CRFM Fisheries Data Access Point displays the "Create an Organization" page.
- Enter a name for the organization, and, optionally, a description and image URL for the organization's home page.
- Select the "Create Organization" button. The CRFM Fisheries Data Access Point creates your organization and displays its homepage. Initially, of course, the organization has no datasets.

/ Organizations / Crea	te an Organizati	ion
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Organizations act like publishing departments for datasets (for example, the Department of Health). This	Create	an Organization
published by and belong to a	Title:	Pagwell Borough Council
department instead of an individual user.		URL: demo.ckan.org/organization/pagwell-borough-council
Within organizations, admins can assign roles and authorisation its members, giving individual users the right to publish datasets from that particular completion (c. o.	Description:	Open data from Great Pagwell, Little Pagwell, Pagwell Magna, Pagwell Parva, Pagwell-on-Sea and Upper and Lower Pagwells.
Office of National Statistics).		You can use Manudown formatting here
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You can now change the access privileges to the organization for other users - see Managing an organization below. You can also create datasets owned by the organization; see Adding a new dataset above.

Depending on how the CRFM Fisheries Data Access Point is set up, you may not be authorized to create new organizations. In this case, if you need a new organization, you will need to contact your site administrator.

Managing an Organization

When the designated user⁵ creates an organization, the CRFM Fisheries Data Access Point automatically makes you its "Admin". From the organization's page you should see an "Admin" button above the search box. When you select this, The CRFM Fisheries Data Access Point displays the organization admin page. This page has two tabs:

Info – Here you can edit the information supplied when the organization was created (title, description, and image).

Members – Here you can add, remove, and change access roles for different users in the organization. Note: you will need to know their username on the CRFM Fisheries Data Access Point.

⁵ A designated user is the representative from the CRFM, National Fisheries Division, or CRFM partner agency authorized to access and upload data and documents to the CRFM Fisheries Data Access Point.

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By default, The CRFM Fisheries Data Access Point allows members of organizations with three roles:

- *Member* can see the organization's private datasets
- *Editor* can edit and publish datasets
- *Admin* can add, remove, and change roles for organization members

Finding Data

Searching the Site

To find datasets in the CRFM Fisheries Data Access Point, type any combination of search words (e.g. "health", "transport", etc.) in the search box on any page. The CRFM Fisheries Data Access Point displays the first page of results for your search. You can:

- View more pages of results
- Repeat the search, altering some terms
- Restrict the search to datasets with particular tags, data formats, etc. using the filters in the left- hand column

If there are a large number of results, the filters can be very helpful, since you can combine filters, selectively adding and removing them, and modify and repeat the search with existing filters still in place.

If datasets are tagged by geographical area, it is also possible to run the CRFM Fisheries Data Access Point with an extension which allows searching and filtering of datasets by selecting an area on a map.



Searching within an Organization

If you want to look for data owned by a particular organization, you can search within that organization from its home page in the CRFM Fisheries Data Access Point.

- 1. Select the "Organizations" link at the top of any page.
- 2. Select the organization you are interested in. The CRFM Fisheries Data Access Point will display your organization's home page.
- 3. Type your search query in the main search box on the page.

The CRFM Fisheries Data Access Point will return search results as normal but restricted to datasets from the organization.

If the organization is of interest, you can opt to be notified of changes to it (such as new datasets and modifications to datasets) by using the "Follow" button on the organization page. See the section "Managing" your news feed below. You must have a user account and be logged in to use this feature.

Exploring Datasets

When you have found a dataset, you are interested and selected it, the CRFM Fisheries Data Access Point will display the dataset page. This includes:

- The name, description, and other information about the dataset
- Links to and brief descriptions of each of the resources

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The resource descriptions link to a dedicated page for each resource. This resource page includes information about the resource and enables it to be downloaded. Many types of resource can also be previewed directly on the resource page. .CSV and .XLS spreadsheets are previewed in a grid view, with map and graph views also available if the data is suitable. The resource page will also preview resources if they are common image types, PDF, or HTML.

The dataset page also has two other tabs:

- *Activity stream* see the history of recent changes to the dataset
- *Groups* see any group associated with this dataset.

If the dataset is of interest, you can opt to be notified of changes to it by using the "Follow" button on the dataset page. See the section Managing your news feed below. You must have a user account and be logged in to use this feature.

Personalization

The CRFM Fisheries Data Access Point provides features to personalize the experience of both searching for and publishing data. You must be logged in to use these features.

Managing your news feed

At the top of any page, select the dashboard symbol (next to your name). The CRFM Fisheries Data Access Point displays your News feed. This shows changes to datasets that you follow, and any changed or new datasets in organizations that you follow. The number by the dashboard symbol shows the number of new notifications in your News feed since you last looked at it. As well as datasets and organizations, it is possible to follow individual users (to be notified of changes that they make to datasets).

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If you want to stop following a dataset (or organization or user), go to the dataset's page (e.g. by selecting a link to it in your News feed) and select the "Unfollow" button.

Managing your user profile

You can change the information that the CRFM Fisheries Data Access Point holds about you, including what other users see about you by editing your user profile. (Users are most likely to see your profile when you edit a dataset or upload data to an organization that they are following.) To do this, select the gearwheel symbol at the top of any page.

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	Username:	branestawm		
	Full name:	Prof P Braneslawm		
	Email:	branestawm@pagwell.ac.uk		
	About:	Inventor		
		You can use Markdown formatting here		
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The CRFM Fisheries Data Access Point displays the user settings page. Here you can change:

- Your username
- Your full name
- Your e-mail address (note: this is not displayed to other users)
- Your profile text an optional short paragraph about yourself
- Your password

Make the changes you require and then select the "Update Profile" button.

If you change your username, the CRFM Fisheries Data Access Point will log you out. You will need to log back in using your new username.

ANNEX 4: TRADITIONAL KNOWLEDGE COLLECTION, STORAGE AND USE PROTOCOLS

INTRODUCTION

Traditional knowledge (TK) embodies different meanings around the world. For the purposes of this report TK is considered to be the locally accumulated body of knowledge that is intertwined with people's cultural and social identity.

Traditional knowledge can be used to fill information gaps and shortcomings of current data gathered for fisheries management. It is recognized that there is a wealth of valuable information that fishers hold about the resource, local environment and changing climate that is useful to further advance the effectiveness of fisheries management plans. However, throughout the Eastern Caribbean TK has not been integrated into current management systems. Accordingly, there is the need to adopt formal processes to integrate TK into governance systems including collection, storage and use protocols to ensure proper, culturally appropriate methods are implemented.

There are a variety of benefits from the proper documentation and use of TK. This includes, but is not limited to, the following⁶:

- Ensure effective integration of TK in fisheries decision-making,
- Impede further loss of TK,
- Maintain TK over time,
- Support benefit sharing between holders of TK and those who use it,
- Facilitate meaningful participation of fishers in management planning
- Protect TK from unwanted use.

LITERATURE REVIEW

In developing a TK collection and storage protocol it is important to be aware that there may be nongovernmental sources of information regarding traditional knowledge that may have compiled and stored TK in other locations, such as academic journals and databases within International agency. The Project Team conducted a literature review of readily available peer-reviewed academic literature on fisheries management from the region.

The following table provides an inventory summary of available research that has been conducted on fisheries traditional knowledge in the region. It is important to note that this inventory is by no means exhaustive and there may be additional sources of traditional knowledge that are not included in the table below.

Author(s)	Title	Year	Description
Grant, S. Berkes, F.	Fisher knowledge as expert system: A case from the longline fishery of Grenada, the Eastern Caribbean	2007	Study on how fishermen generate knowledge. Researchers found that fishers rely on their observations, experiences, and experimentations to learn and adapt to situations, making them experts.
Grant, S.	<i>"One hand can't clap":</i> Combining scientific	2004	This paper discusses the different levels of management in the long line fishery of

Table 1: Inventory Summary of Readily Available Traditional Knowledge Research in the Caribbean

⁶ World Intellectual Property Organisation (WIPO) (2017). Documenting Traditional Knowledge – A Toolkit. WIPO. Geneva.

Author(s)	Title	Year	Description
Berkes, F.	and local knowledge for improved Caribbean fisheries management		Grenada, and how scientific and local fisheries knowledge can be integrated to better inform international regulations within the Caribbean.
Chakalall, B. Smith, A. H.	Community-based management of fishery resources in the Caribbean	1991	This paper discusses the potential benefits of community-based fisheries management as an alternative to modern fisheries practices that have failed to solve the issues faced in the Caribbean. The use of traditional knowledge is considered in the evaluation.
Mahon, R. Almerigi, S. McConney, P. Parker, C. Brewster, L.	Participatory methodology used for sea urchin co- management in Barbados	2003	The sea urchin fishery was used as a case study in the development of a co- management system. Fishermen were involved in the development of best practices for managing the fishery, with the incorporation of traditional knowledge and practices.
García-Quijano, C. G.	Fishers' knowledge of marine species assemblages: Bridging between scientific and local ecological knowledge in southeastern Puerto Rico	2007	This study focuses on how local traditional fisheries knowledge can be recorded and presented so that it can be of use in fisheries resource management.
Berkes, F.	Indigenous ways of knowing and the study of environmental change	2009	This paper discusses traditional knowledge as a process that should be considered alongside science, referencing fisher knowledge as an expert system (using case study of longline fishery of Grenada)

INFORMATION OWNERSHIP

There is international discourse regarding the documentation of traditional knowledge (TK) and concerns of its potential effects on the rights, cultures and livelihoods of indigenous peoples and local communities. Currently, the World Intellectual Property Organization (WIPO) has noted a growing concern regarding the unauthorized, misuse or misappropriation of local and Indigenous Traditional Knowledge. This is of particular interest with the development of new technologies that make it both easier to document TK and easier for unauthorized users to get access (i.e. accessing or hacking databases) to TK. This brings to light the question of ownership and access of TK and how best to protect the interests of the people the TK originates.

TK is rolled up within society. It starts with the individual who then typically shares their knowledge with their immediate and extended family. This knowledge then is often to the larger community scale, which is finally rolled into the knowledge system of society. At each phase of this knowledge transfer the question of ownership and intellectual property rights changes. The following sections provides information to be considered when documenting TK.

WIPO – Documenting Traditional Knowledge⁷

Stages of Documentation

TK documentation is broadly categorized into three distinct phases. Consideration should be given to each of these steps for the purpose of integrating TK with scientific data and information in fisheries management. These steps are:

Pre-Documentation - This phase should include careful planning, assessing options and setting objectives for the use of TK, as well as consultation with knowledge holders (fishers, local community members or indigenous peoples).

Documentation - In this phase, TK is collected, compiled and organized in a coherent manner following a set plan of actions and activities that are in accordance with local customs and traditions.

Post-Documentation - This phase involves a series of post-collection and organization activities related to the management of the information (through a database, documentation system or registry). It includes managing access to and use of the documented TK.

The objective of TK documentation needs to be well understood and defined before the process begins. There are a variety of purposes for collecting TK, which may or may not trigger intellectual property issues. These purposes may include:

- Making TK available in a more systematic manner for integration into fisheries management decision making processes;
- Creating new intellectual property rights through the scientific validation of TK;
- Collaborative research and development;
- Preserving, safeguarding or promoting TK and transmitting it to future generations; or,
- Using TK for specific community-oriented objectives.

Intellectual Property Rights and Traditional Knowledge

The relationship between TK and intellectual property rights is an important topic that exceeds the scope of this report. It is widely accepted that Intellectual property for traditional knowledge rests with the group or community which has generated the knowledge, often over long periods of time. It is also understood that individuals or groups outside the community could benefit from access and use of this knowledge, often for the benefit of wider society. As a result, there are a number of rights issues to consider when accessing and documenting TK for future use by third parties. The intellectual property rights of the individual needs to be considered in the development of TK collection and storage protocols. The following types of protection measures should be considered in the development and adoption of TK protocols:

- Positive Protection provides TK holders with intellectual property rights and empowers them to use those rights for their own purposes. For example, Positive Protection measure enables communities to promote the use of traditional knowledge while allowing knowledge holders to control the use of their TK by other people outside of the community.
- Defensive Protection allows TK holders to prevent or stop people from outside their community from illegally acquiring intellectual property rights over their TK. It also refers to a set of strategies

⁷ http://www.wipo.int/edocs/pubdocs/en/wipo_pub_1049.pdf

to ensure that third parties do not gain illegitimate or unfounded intellectual property rights over traditional knowledge⁸.

Copyright

As a result, the topic of copyright is of particular relevancy when considering the documentation of TK. In this context, copyright does not protect ideas or knowledge within TK, but rather the form in which they are expressed. It can be argued that TK falls under the rules that protect public domain; and, as a result may be considered within national copyright laws and rules. Bearing in mind the following:

- Whoever writes down TK related information may be entitled to copyright in the way the TK has been put into words.
- Whoever translates the TK related information express in words may have his or her own rights in the translation.
- Whoever films someone explaining how to use TK may be entitled to rights in the recording.
- Whoever scans a manuscript and includes that information in a database may be entitled to rights in the selection and arrangements of its contents.

Thus, under copyright laws, the TK itself will not be protected but the medium in which it is collected, be it in text, translation, recording or database, and does qualify for protection.

Clear indication of the proposed uses and associated permissions to use collected TK related information should be formally sought at the onset of data collection procedures. This permission should include knowledge holder authorization for how information can be used and a statement of limitations for use after data / information has been collected.

INTEGRATION METHODS

Documentation Format

The format in which traditional knowledge is collected is a matter of consideration. The means by which TK is collected and compiled may affect the ease of integration with other information sources, such as scientific studies. Thus, it is suggested that Fisher Organizations and Member States consider the following elements when developing a standardized format for the collection of fisher traditional knowledge.

A format may include the following elements:

- Date / time;
- Area and location where traditional knowledge is being undertaken;
- Information about the environment;
- Organization or local communities involved;
- Individuals involved;
- Conditions or limitations imposed on the use of the collected traditional knowledge;
- Specific site and place where traditional knowledge is being recorded;
- Targeted species of consideration;
- Forms of application or techniques;
- History of use; or,
- Forms of verification.

⁸ http://www.wipo.int/tk/en/tk/

Additionally, there are a number of key activities that should be considered during the 3 phases (before documentation, during documentation and after documentation) of collecting and storing traditional knowledge. For a complete list of these steps please refer to the checklists provided in Annex A.

ROLE OF STAKEHOLDER GROUPS

In general, there are four distinct stakeholder groups (i.e. community, academic institutions, civil society organisations and government) that may have an interest in a TK documentation project. Regardless of who leads the documentation process a clear set of roles needs to be predetermined and agreed upon.

The following provides an overview of suggested key roles of family/community, organisations, academic institutions and government pertaining to the collection and storage of TK.

Family / Community

Families and local communities within the stakeholder group are the foundation for the creation, and intergenerational transmission of traditional knowledge. Accordingly, they play an essential role in the process to document TK, including the following:

- Validate TK to avoid over-emphasis or embellishment;
- Ensure TK has been shared beyond the individual and strengthen community knowledge through knowledge sharing;
- Strengthen relationship between family/ community and organisations; and,
- Actively participate in verification to ensure accuracy and representation.

Stakeholder Organisation

The stakeholder organisation, in this case Fishers' Organisations, can have a key role in the collection and storage of TK. It is proposed that Fisheries Organisations take the lead role in the collection and storage of TK. This ensures continual community involvement throughout the documentation and storage process.

Academic Institutions

Academic institutions have been actively involved in TK research for several decades and can continue to offer support in the collection and storage of TK. It is likely that the institutions would have an interest in the TK being collected, thus, they can offer technical and research support and personnel capacity in the implementation of TK collection and storage.

Government / Fisheries Division

Government can significantly influence the collection and use of TK in fisheries management. To this end, it is essential that Fisheries staff foster and maintain collaborative working relationships with the organisations that are responsible for collecting and storing TK.

Ownership

Ownership rights rest with the individual or group that has generated the knowledge in its most recent form. The following graph illustrates that 3 stages associated with the knowledge transfer process from raw knowledge to aggregated knowledge. During each of these stages the ownership of the knowledge is transferred to the individual or group that has transformed the information to a new form of knowledge.



APPROACHES IN COLLECTING TRADITIONAL KNOWLEDGE

Traditional knowledge comes in many different forms that include oral histories, written documents, videos, images or audio recordings. There are a variety of approaches for collecting TK that can be utilized by Fisheries Division Staff or Fisheries Associations / Co-ops. The following provides a brief overview of these approaches, including the advantages and disadvantages of each.

Group Workshops

Facilitated workshops to gather fisheries traditional knowledge are effective as they enable discussions with key knowledge holders within the community. This process brings small groups of key knowledge holders from a variety of sectors (harvesters, processors, sellers, etc.) together for open discourse that enables TK to be shared, verified, and documented. This provides researchers / Fisheries Division Staff an opportunity to observe and collect information from participants.

Advantages:

- Group dynamics provide an opportunity to dampen embellishment of information;
- Groups can provide multiple perspectives on past community experience;
- Members of the group can trigger old memories;
- Group sessions are more cost and time effective means to conduct surveys.

Disadvantages:

- Some participants may not be as forthcoming with information in a group setting;
- Possibility of some participants 'hijacking' the workshop not allowing other participants to share their knowledge.

Individual Meetings

Individuals meetings are another useful approach in collecting fisheries traditional knowledge. Individual meetings can be formal or informal depending on the nature of the information that is being collected.

Advantages:

• Participants can go into more in-depth discussions on topics of information they have an interest in.

Disadvantages:

- It is difficult to directly verify the accuracy of the information that is being shared.
- Time intensive.

Web-Based Information Sharing

There are a number of emerging web-based approaches for collecting TK internationally. These approaches include developing online platforms to digitally capture and disseminate TK⁹. Online platforms are highly customizable and allow for a variety of type of data to be shared, including photographs, documents, videos, etc.

Advantages:

- Time and cost effective.
- Participants are able to participate when it is convenient for them.
- Digital technologies offer avenues for preserving TK and making it accessible to future generations.

Disadvantages:

- It is difficult to directly verify the accuracy of the information that is being shared.
- Initial startup costs to develop online platform.
- Greater consideration must be given to protecting Intellectual Property.

Checklists for Documentation of Traditional Knowledge

Before documenting fisheries traditional knowledge, Member States Fisheries Division should:

- Consult as widely as possible among fishers and local communities and other key stakeholders;
- Consider the legal issues that may arise in the context of existing policies, legal frameworks and regulations, in particular intellectual property related issues;
- Identify existing rules and principles which regulate the conditions under which traditional knowledge is collected and obtained;
- Set out documentation objectives and develop an intellectual property strategy, if needed;
- Consider the widest possible range of options to meet these objectives;
- Clarify the role of the different stakeholders;
- Consider whether and how to apply the principles of free, prior and informed consent;

⁹ Nakata, M., et al. (2014). Using Modern Technologies to Capture and Share Indigenous Astronomical Knowledge. Australian Academic & Research Libraries.

- Evaluate the best options and instruments which may be utilized to formalize agreement related to traditional knowledge documentation;
- Distinguish between confidential and non-confidential traditional knowledge, which may require additional securities and conditions;
- Define the criteria and methods to be used to collect and identify the traditional knowledge being documented;
- Define access control policies or guidelines which establish categories of users and thereby access conditions / restrictions; and,
- Develop a monitoring and verification plan so that it is possible later to ensure that documented traditional knowledge is used as agreed.

During collection fisheries traditional knowledge, Fisheries Divisions should:

- Document traditional knowledge in a precise and standardized manner, including through local management systems;
- Create a database to properly and adequately store collected traditional knowledge;
- Follow agreed guidelines or codes of conduct, obligations and legislation and regulations;
- Respect customary laws and practices;
- Be alert to the need to adapt the documentation process;
- Allow fishers and local communities to verify at all times how their traditional knowledge is being documented in order to ensure that it is properly recorded and attributed, and that access and use terms are being complied with;
- Develop protocols to establish clear rules on the use and access to traditional knowledge; and,
- Put in place model contracts or other legal arrangements setting conditions for the use of and access to traditional knowledge.

After documenting and prior to sharing/using fisheries traditional knowledge, Fisheries Divisions should:

- Examine documented traditional knowledge to identify any elements which should be deleted, restricted or otherwise given special protection;
- Ensure management of the database is controlled by fisher organisations;
- Put in place technological measures to establish ownership over the documentation, by protecting the documentation against unauthorized access by third parties, securing the content, protecting the database servers and securing the website; and,
- Carry out periodic reviews of compliance with requirements for storage, maintenance and control, such as electronic safeguards and restrictions in web-based databases.

TRADITIONAL KNOWLEDGE COLLECTION, STORAGE, ACCESS AND USE PROTOCOLS

The following Traditional Knowledge Collection & Storage Protocols were drafted for the consideration of the CRFM and Member States. The purpose of the Protocols is to provide guidelines that can assist CRFM and Member States Fisheries Divisions in the collection and storage of TK.

1. Legal

National laws should clearly recognize local and Indigenous peoples' rights over their TK, special consideration should be given to the potential benefits and drawbacks of documenting TK.

2. Ethics, Privacy & Security

The collection, storage and sharing of TK should comply with established international processes regarding intellectual property rights of TK, as documented by WIPO. Data holders (Fisheries Associations) should respect the rights of individuals to access their personal information. Fisheries Associations should have the authority to determine how compiled/ aggregated TK is accessed and used.

3. Responsible Authority

Legally recognized and incorporated Fisheries Associations should be recognized as the responsible authority for the collection and storage of TK from fishers and local community members.

4. Consent

Clear protocols should be established to ensure consent by knowledge holders on how TK will be used and will be provided to Fisheries Associations. Fisheries Associations have the authority to deny or limit access by outside parties to any documented TK they possess.

5. Transparency and Collaboration

Member States should implement a collaborative approach in the collection and storage of TK. The best interests of the fishers, community and Fisheries Association should be a priority consideration when sharing data and information.

6. Protection

Member States should ensure the protection of sensitive information and prohibit unauthorized or inappropriate use of TK by third parties, including development and implementation of penalties for such.

7. Ownership, Control and Access

Access to TK is a matter of local law, protocol and practice. Fishers should have legally recognized rights, ownership and control over their individual TK. Fisheries Associations should have legally recognized authority to collect and compile TK. Fisheries Divisions should have legally recognized authority to retain ownership and control over their aggregated TK. Fishers should have full access to any documents and research that includes their individual TK.

8. Aggregated Information

Member States Fisheries Divisions should only access and use aggregated TK for fisheries management activities, and regional protocols should be established to formalize sharing of TK.

9. Equal Recognition

TK should be given equal recognition and value with Science information.

10. Integrity

Government, Researchers, Managers and Organisations should respect TK and not claim TK as their own work. Intellectual Property protocols should be adopted by Member States to ensure proper use of TK by Third Party users.

11. Intellectual Property

Fishers and Fisheries Associations should have clearly recognized means to exercise control to protect their intellectual property and knowledge.

12. Use

Member States should establish clear protocols (model protocol attached as Annex 1) to ensure protection of the Intellectual Property Rights of Traditional Knowledge holders is protected during collection, storage and use of the information derived from the TK. These protocols should provide clear guidance on acceptable processes to collect, store and use the TK.

APPENDIX 1 to ANNEX 4 - TRADITIONAL KNOWLEDGE STUDY PROTOCOL

DEFINITIONS

Within this Traditional Knowledge Study Protocol:

"Researcher" – a company, group or individual that has primary responsibility to undertake and deliver a Traditional Knowledge Study for a Member State Fisheries Division; the Researcher can include any individual (e.g. interviewer, researcher, fieldworker, etc.) contracted or employed to undertake work for the Study.

"Government" - any Member State Fisheries department, agent or representative.

"Traditional Knowledge" (TK) - the collection of wisdom and experiences that the Fishers have with all components of the natural environment; the interrelationships that exist between all life forms from a unique historical, cultural, social, economic, and spiritual perspective.

"Traditional Knowledge Study" (TKS) - all components related to the planning, collection, analysis, reporting and distribution of Fishers' traditional ecological knowledge in the eastern Caribbean.

"TK Report" - a document that considers TK data pursuant to a Project defined in this TKS Protocol.

"Community" - group, organization or association of Fishers and their affiliated communities.

"Fishers" (Participant) - an individual community member who is involved with the harvest of local fishery resources for the purpose of catching fish for food or livelihood who has agreed to participate in a TKS.

"Project" - any undertaking that has triggered a TKS to occur, including fishery management planning.

"Proponent" - a company, group, or person responsible for undertaking a Project (including Member State Fishery Division).

BEFORE BEGINNING A TKS

As one begins to undertake a TKS, several activities must be completed by the Researcher prior to gathering and documenting ecological knowledge. These activities are the required first steps for all TK Studies.

When developing a TKS proposal, the Proponent should pay attention to the following principles in relation to the scoping of its TKS:

- The TKS should be completed in an appropriate time manner that is consistent with Member State Project approvals processes for the Project. Proponents and Researchers should be cognizant that TK Studies that are completed early in the decision-making process which may affect the knowledge holder process will decrease the likelihood of unforeseen project delays.
- A new TKS is required where a previous TKS for the same study area is more than five years old.
- If a TKS has been completed for the same study area, and is less than five years old, the existing TKS may be considered. However, Fisheries Divisions may consider the following factors, but not limited to:
 - the type of project proposed and its scope; and,
 - the amount and quality of TK data previously documented.

• If a TKS was previously completed covering the same study area, a new TKS may incorporate the historical component of the original Study with the consent in writing from the initial Researcher.

Notice to the Fishers

TK is significant and its documentation requires transparency and accountability. To ensure communities are aware that a TKS is being undertaken - and to ensure that those who are developing the TKS have the required capacity and skills to do so - Letters of Intent shall be sent to the relevant fishers' organizations. The letter shall contain the following information:

Proponent Project Information:

- Information regarding the Project Proponent; and
- Specific details regarding the nature of the proposed Project, such as the location of project, type of project, and any other relevant details.

Researcher Information:

- Name and credentials of principal researcher; name and title of all other personnel who will take part in researching and preparing the TKS;
- Background information regarding the Researcher, which shall include any prior experience in addressing Fishers issues;
- Researcher capacity regarding Fishers community engagement skills;
- Researcher capacity regarding Fishers cultural knowledge and Fishers language skills; and,
- Contact information (mailing address, fax, e-mail, telephone, and contact person).

TKS Information:

- Purpose and use of the TKS;
- Process for gathering TK (i.e. interviews, site visits, etc.);
- Anticipated process for identifying Participants who will be interviewed;
- Details of the information to be provided to any Researchers (i.e. maps, photos, reports, etc.);
- Fishers communities where TK will be gathered; and
- Expected time frame for developing the TKS.

GATHERING FISHERS TRADITIONAL KNOWLEDGE

Beginning the process of gathering TK, the Researcher shall adhere to the following procedures.

Engaging Fishers

The Researcher shall work with the Fishers to gather TK. All Researchers, their employees, and contractors, shall conduct themselves and their activities in a manner respectful of Fishers cultural norms and the values of the community. Researchers should remember that their activities are to be based on developing a positive relationship with the community, recognizing that the ability to document TK within a community is a privilege. Trust building with community leaders and Participants should be the aspiration of the Researcher. Researchers should be mindful that Participants are sharing their traditional knowledge and personal / cultural experiences, much of which is often considered sacred.

Adequate Resources

It is recommended that the Researcher ensure that enough time, funding, and resources are available to aid the collection of sufficient TK data.

Scope of Traditional Knowledge

While collecting TK data the Researcher shall remember that TK is held by individuals who have acquired the information through personal experience and through Fishers cultural practices and traditions, which are distinct from western science practices. Therefore, gathering TK demands an approach which respects both the knowledge gathered and the way it was transmitted and gained.

Type of Data - historic and current

The Fishers have acquired knowledge through subsistence and spiritual practices which have continued to take place over a long period of time. This information is relevant to a TKS and where applicable, historic, and current data shall be included.

TK is drawn from a wide range of traditional and cultural activities. When gathering TK, the Researcher shall include information on all relevant Fishers harvesting practices, and data on species / resources exploited. In addition, locational data shall be included listing all Fishers areas to collect resources and materials to support their fishing activities (materials for making boats and gear) and fishing. Landing and marketing areas.

Because both historic and current data is relevant to a TKS, information gathered shall consider both first and second-hand knowledge as provided by the Participant. Both historic and current (defined as "within living memory") data are relevant. Within living memory can include information transmitted to the informant by a parent or a grandparent. The knowledge passed down is relevant and, if credible, is to be included in the TKS.

Historical research employs a combination of gathering oral history from Participants and written sources. It may document TK of an area going back hundreds of years. As with any data, the written and oral history sources must be assessed for credibility before being included in the TKS.

Study Area

When determining the study area for the TKS, the Researcher shall consider the nature of Fishers harvesting practices and the use and occupation which may extend over an area larger than the proposed Project area. For example, the project area may be limited to specific coastal areas, but the harvesting activities which form part of the relevant TK data, could take place, adjacent to, or extend beyond the study area. To ensure that TK data is recorded in a manner consistent with the nature of the activity, the Researcher shall document TK data in its entirety, which may require establishing a buffer and study area beyond the specific study area, allowing for a broader ecological understanding.

Adequacy of Data

It is important that the Researcher ensures that an adequate amount of data is collected within the proposed study area, and that such TK data is credible and reliable. This will depend on a number of factors which can include, but may not be limited, to the identification of Participants who are relied upon for TK, the geographic area where the proposed project is located, the extant historical data, and the current state of the geographic area.

Interviews

The Researcher must confirm that the Participants interviewed are recognized by their Fishers community and acknowledged by their community as a credible provider of TK data.

When gathering data, individual interviews with Participants are the most appropriate mechanism for gathering TK and are required in the work plan. Group gatherings can also be utilized but must be done in conjunction with one-on-one interviews as they will not be satisfactory on their own.

Target Group

When gathering TK, the Researcher must ensure that the individual(s) selected to be interviewed have specific knowledge of the study area or have conducted land or water-based use activities in the proposed study area. Researchers are reminded that TK held by different Fishers can be diverse and may vary by gender, age, and lifestyle. Researchers must demonstrate that efforts were made to gather a variety of data from different Participants.

Cultural Appropriateness

When undertaking interviews, Researchers must possess sufficient understanding of the Fishers' way of life thus ensuring that interviews are conducted in a manner respectful of Fishers culture, traditions, and practices. The interviews will include:

- Language options, including local dialects and terminology;
- Having the interview occur in the Participant's place of preference;
- Respect for the Fishers spiritual and cultural beliefs; and,
- An appropriate gift, item, etc., as a thank you for participation and information.

Interview Materials

Researchers shall ensure that he or she has the appropriate materials required to document the TK that is provided when conducting an interview. This shall include maps (either digital or paper copies) to provide a clear delineation of the project and buffer areas. If using a laptop for maps, ensure the batteries are charged and that the adapter is included in the field pack carried to all interviews. If using paper maps, ensure the field pack includes pens, markers, overlays, and paper to record all data provided by the knowledge holder.

While it is advisable to record all interviews to document the information provided, audio or visual recording may only be done with the prior, informed consent of the Participant.

Informed Consent – Education and Agreement

Before any data collection takes place, the Researcher must first secure the free, informed consent of the Participant. Two key elements to informed consent are education and agreement. The Researcher shall ensure all Participants are provided with detailed project information and TKS information to allow them to make an informed decision whether to participate in the Study.

• Agreement - Researchers must ensure that the Fisher's decision to participate in the TKS is voluntary and that he / she clearly understands the use of the TK. The Participant must signify that she / he understands that:
- their participation is voluntary;
- he / she can end the interview or withdraw her / his participation at any time;
- she / he does not have to answer any question with which she / he is not comfortable;
- if desired, his / her identity will be kept confidential; and,
- that the TK provided will be included in the TKS, which may become public record.

A written Consent and Release Form explaining and identifying the above Agreement factors must be signed and completed.

- **Education** Researchers must provide the relevant information to ensure that the Participants demonstrate a clear understanding of:
- •
- the type of Project proposed its location, and goals (purpose of its development);
- the scope and purpose of the TKS; and,
- the use of the TKS data in the applicable approval process(es).

Site Visits

The purpose of the site visit is to gather ecological knowledge regarding the availability of resources and the importance of the Fishers. Any TK identified during the site visit may correspond to previous TK provided in the interview process or may be newly acquired TK.

During the site visit it is the responsibility of the Researcher to ensure the safety of the Participant and the Researcher themselves. The Researcher shall ensure all safety legislation, regulations, and policies are complied with by all members of the party during the site visit.

Historical Research

The TKS must include a historical review of the Fishers relationship to the proposed study and surrounding area. The historical data shall include information obtained from primary and secondary¹⁰ written sources and can include Fishers oral history. Historical and ecological data that is broad in scope, not specific to the TKS area, and of little relevance to an understanding of the Fishers relationship to the study area may not be useful to the TKS and should be excluded.

If no primary or secondary records, relevant to TK, in the study area are uncovered during the documentary review, this information should be disclosed in the TKS Report together with a description of the research undertaken and a list of the sources consulted.

WRITING THE TKS

In the written format of the TKS, the Researcher shall ensure that the following components are included and addressed in the following manner:

GIS Data

GIS software program should be used to ensure that the presentation of the TK data allows an easy comprehension. When identifying areas and resources for Fishers use and significance careful attention

¹⁰ Primary sources are original, first-hand information sources including diaries, letters, news film footage, official records, etc. Secondary sources interpret and analyze primary sources and can include textbooks, commentaries, magazine articles, encyclopedias, etc.

must be paid to the protection and privacy of fishing sites and areas, as provided by the Participant. Where a resource site location is considered culturally significant and/or is seen by the Participant or Fishers community as a site should be kept private, the data should be presented in general terms and not site specific.

Historical Data

The Researcher shall ensure that the historical information included within the TKS is specific to the Project area, or the immediate surrounding area, and will lead to a greater understanding of TK.

Consultation and Intellectual Property Rights

The TKS must include a provision acknowledging that the TK contained within the Study is subject to the intellectual property rights of the Fishers, which they individually and collectively hold.

Fishers' Significant Species Analysis

To ensure that the TK gathered is presented in a manner allowing a clear understanding of the significance of fish and marine plant species to the Fishers, the Researcher must include an analysis of any species, identified by the Participants and other research, to be present, harvested, or near the study area. Such an analysis shall include an adequate amount of base line information to acknowledge the significance of the species to the Fishers and the potential availability of these species within the project and immediate surrounding area.

When determining the significance of the TK data, the Researcher must take into consideration both scientific ecological perspectives and Fishers ecological practices and perspectives.

Confidential Data

The Researcher must give due regard to TK data that is of a private, as indicated by a Participant or the Fishers' community and use their discretion to ensure that such data is referenced in a manner that considers the integrity and privacy of the Fishers.

TK REPORT

Consultant's Role

When a TKS is completed, the Researcher must provide a copy to the Fisher or their representative organization, as appropriate, with correspondence indicating that it is completed and being submitted 's for the Fishers' or organizations' consideration. The final TKS should be provided on a timely basis, where possible within 14 days of completion.

TK Study Distribution

Upon completion of a TKS, it is important that all relevant Fishers parties receive a copy of the Study in a timely manner, to permit an understanding of its findings.

The TKS must be provided to the Fishers' communities that provided the TK data and/or those that are in the immediate vicinity of the Study area; along with relevant Fishers organization.

The TKS can be provided in either a digital format by e-mail, or in a hard copy format delivered by postal mail. The TKS sent to a Fishers community or communities shall be directed to the attention of the appropriate authority of the respective community or organization.

Upon request, any Participant who provided TK data shall be provided with either a digital or hard copy of the final TKS.

APPENDIX 2 TO ANNEX 4

TRADITIONAL KNOWLEDGE STUDY PROTOCOL CHECKLIST

For the Fisheries Division:

- TKS should be completed early in management planning process.
- TKS is required:
 - where a previous TKS for same study area is more than 5 years old
 - if a TKS has been completed for the same study area, and is less than 5 years old, the significant changes to the management plan may be under consideration.

For the Researcher:

The Researcher must:

- Provide a letter of intent to fishers' organization or community where TK will be gathered.
 - Project Information nature, location, type of project, etc. Researcher Information name, credentials, capacity, experience, contact information, etc.
 - TKS Information purpose, use, process, details, names of fisher communities where information will be gathered, expected timeframe
- Work with the Fisher communities Allow enough time, funding, and resources
- Gather TK in a respectful manner
- Provide information / data of all relevant harvesting and foraging practices and species / resources that are exploited
- Consider both first and secondhand knowledge. Both historic and current data are relevant.
- Ensure an adequate amount of data is collected within proposed study Area
- Ensure participants are recognized credible TK providers.
- Ensure participants have knowledge of specific area.
- Ensure appropriate materials are present when conducting the interview.
- Ensure Secure the free, and informed consent of the Participant.
- Ensure a site visit(s) to the proposed project area. Ensure a historical review is included.
- Provide a copy the Fishers, and their representatives organizations and communities, as appropriate.

ANNEX 5: DATA AND INFORMATION REQUIREMENTS REPORT (SUMMARY)

REPORT STATUS

Multiple projects involved the review of data collection systems, identification of data and information requirements and examination of data management and reporting procedures for the Eastern Caribbean flyingfish fishery. This review was conducted for selected member States in the sub-region. This report provides a summary of the information prepared by NEXUS Coastal Resource Management Ltd. (NEXUS) presented in the following NEXUS / ERG project reports:

- "Review of Fisheries Operations and Related Data Collection Systems"
- "Evaluation of the Process of Implementation of the Recommendations for National-Level Management and Improvements in National Data Collection Systems"
- "Recommendations for Enhanced Data Collection Systems"
- "Draft Final Sub-Regional Data Policy for Eastern Caribbean Flyingfish"
- "Draft Final Technical Report: Technical Support on Implementation of Management/Stress Reduction Measures in the Eastern Caribbean Flyingfish Fishery"

This separate document is provided for completeness in NEXUS' project deliverables.

OVERVIEW

The combined results of the various findings from the multiple reports illustrate the need for ongoing attention to national data collection systems in order to harmonize data and information regarding the shared resource. By examining the findings measures can be determined to align national data management and information systems so they are consistent with regional and sub-regional fisheries management plans.

REVIEW OF EXISTING DATA COLLECTION SYSTEMS

In each of the selected countries (Grenada, Barbados and Trinidad and Tobago) Fisheries Division staff collect landings data for all species at designated markets. They also collect some effort (number of vessels that regularly berth and fish from the site) and value chain data (prices) at these sites. Furthermore, vessel information is collected through national vessel registries which contain information on vessel type, size, construction material, owner, and principle landing site. However, it is apparent that these registries are not verified by Fisheries Division staff to determine redundancies and do not provide any information on recreational vessels which may be incidentally involved with fish harvesting. Unfortunately, Fisheries Division staff collect little to no data about the types/amount of fishing gear used by fishers, fishing activity location or the time it took fishers to catch the fish they are landing at the market.

It was noted that data collected at principle landing sites were recorded on paper forms by designated data collectors. These forms are then summarized on a weekly basis and provided to the Fisheries Division data manager. This data is compiled and manually inputted into an electronic format (Excel spreadsheets in Grenada and Trinidad & Tobago and Microsoft Access in Barbados), which is a time-consuming and labor-intensive process. In some instances, illegible written text can result in errors being transcribed from the daily landings sheets and in other instances there can be incomplete data sets because of lost or misplaced forms.

DATA POLICY CONSIDERATIONS

The process of collecting, processing and analyzing data can be financially costly and can exceed the available human resources and administrative systems. Therefore, Member States should make every effort to be efficient in their data collection processes. Data should not be collected simply to compile information that may not have a defined purpose. Data collection should be focused on providing the information needed to achieve Member State and sub-regional policy objectives. This means that data should be collected to directly support fisheries management decision-making. Other interesting and supportive data and information can be extracted from academic research and consultants' reports, if available.

Flyingfish fishery data required:

HARVEST DATA

- Fishing Effort (days)
- Catch (weight / number for all species)
- Location of Fishing Activity
- Landed weight
- Landed value
- Number of harvesters / employees
- Number of vessels by type

In addition to the harvest data, Fisheries Divisions should be collecting social and economic data and information to inform management decisions. This should include:

SOCIAL AND ECONOMIC DATA

- Harvester income (gender disaggregated data)
- Hourly wages of fishery workers (gender disaggregated data)
- Vessel earning (per trip, season, year)
- Market prices purchases from harvesters
- Vessel operating cost all types (fuel, equipment, labour, food)
- Investment cost to enter fishery (boats, equipment)
- Employment at markets (gender disaggregated data)
- Occupations at markets (gender disaggregated data)
- Wages/salaries for market workers (gender disaggregated data)
- Operating/maintenance costs markets
- Processing at markets (weight, value)
- Price sold at markets
- Cost of transportation / storage (per kilo, per kilometer)
- Number of processors
- Employment (gender disaggregated data for Boatbuilding, Equipment manufacture / sales

- Number processing workers/ employment
- Processing worker earnings/hourly wages (gender disaggregated data)
- Period and duration of operation
- Total processing throughput (weight / value all species, flyingfish)
- Processing revenue / production per year
- Cost of operations/gross margin on revenue
- Market Price
- Cost of value-added processing
- Destination of final products local (e.g. grocery, hotels, restaurants, etc.)
- Destination of final products export (e.g. grocery, hotels, restaurants, etc.)
- Total value local sales
- Total value export sales
- Cost of transportation (method, local, export)
- Retail locations / destinations final product
- Total annual retail sales

Other biophysical data which can be useful in informing management of the flyingfish fishery, such as habitat integrity, environmental condition, oceanographic condition etc., can be compiled by national Fisheries Divisions from research and studies conducted by other external departments, agencies or academic institutions.

The general policy to promote participatory management, within Caribbean Community Common Fisheries Policy, provides useful insight on who and how data should be collected and shared. Involving fishers, market staff, and consumers in data collection enhances the opportunity to promote these groups in the participatory management of the Eastern Caribbean flyingfish fishery.

Enhanced participation of fishers in the collection of data can also advance co-management systems in the overall fishery in the Eastern Caribbean. However, co-management systems require effective organizational structures that represent fishers and other industry groups. In the absence of these organizations, providing a regulatory foundation and capacity building support could be considered to develop them.

Consistency among Member State data collection systems will facilitate data sharing and sub-regional analysis of the fishery. While it is unlikely that a single technology will be used across fleet sectors and among Member States, it is essential that the types of data collected be the same. Therefore, there should be a policy to harmonize the type of data collected and their units of measure.

DATA COLLECTION PROGRESS TRACKING

It is important to track the progress of any new or revised data collection system in order to determine the effectiveness of the data management systems and whether specific management objectives are being met. As such, there are a number of different approaches Fisheries Divisions can take to conduct annual reviews of implementation measures to enhance data collection systems. These include the following:

- 1. Has there been development and implementation of regulatory instruments requiring the use of fisher log sheets, logbooks or appropriate electronic data collection tools?
- 2. Has there been an adoption of regulatory instruments that ensure the requirements for, and role of, fishers' organizations in fishery management?
- 3. Are there fishers' organizations representatives from all communities and / or landing sites?
- 4. Are all of these representatives registered members of a fishers' organization?
- 5. Have the data collection instruments (log sheets, logbooks, data cards, apps etc.) been made available to all fishers?
- 6. Have there been focused governance and data management training courses provided to all fishers' organizations?
- 7. Has there been training in data recording, such as use of log sheets, logbooks or appropriate electronic data collection tools, provided to all fishers?

Proper manager assessment of the implementation of recommendations must also account for the varying harvesting strategies and locations (sites and activities) where managers collect data (available across Member State fisheries). Furthermore, managers must use performance indicators to assess the level of implementation for both catch monitoring (on boat data collection) and monitoring of landings (port / dockside monitoring).

Furthermore, to properly assess the progress, selected performance indicators must include both quantitative and qualitative assessment mechanisms. For example, these may include the following as it relates to the implementation of dockside monitoring:

Quantitative assessment of implemented recommendations:

- Number of dockside monitors employed at all landing sites.
- Number of vessels logged at landing sites (to determine % coverage)
- Number of fishers using recordkeeping tools
- Number of records completed / percentage of fleet using log sheets or books
- Number of cameras used for dockside monitoring
- Number of purchase slips issued / records of intake weights / volumes in fishery processing / retail facilities
- Number of export permits / weigh slips issued
- Number of vessels using electronic monitoring equipment (cameras,
- recording scales, etc.)
- Number of data analysts hired to review electronic data
- Hours of data analyzed

Qualitative assessment of implemented recommendations:

• Managers should perform an attitudinal survey of market facility staff and fishers to determine changing perceptions of the industry. This survey should focus on staff perceptions on data collection and their voluntary participation in data collection activities. Survey results can provide useful insight in determining reliability and consistency in data collection systems along the flyingfish value chain.

RECOMMENDATIONS FOR DATA COLLECTION SYSTEM

The following provides an overview of recommendations that were provided to CRFM and Member States from other consultancy reports.

1. Building Capacity

Each Fisheries Division should employ a data manager who is conversant in and knowledgeable about statistical analysis and support staff capable of assuming data collection responsibilities as this will ensure a transitional plan for consistent data management into the future.

Recommend that, where possible, fishers' organizations active be a fundamental unit for data collection. Where they are not established or not active, it is recommended that efforts be made to encourage fishers to establish organizations / associations to facility their involvement in data collection and management. Fisheries Division staff should make efforts to train existing and new fishers' organizations in record keeping and use of appropriate technologies.

2. Introduction of Recordkeeping tools, Electronic Monitoring, and Purchase Slips

Recommend that Member States enact legislation requiring all fishers to keep detailed government issued record keeping tool of their catch, landings, and other relevant information (log sheet, logbook, or other technologically appropriate catch tracking tool). Investigate electronic monitoring systems to be used by Fisheries Divisions to monitor fishery activity, enforce regulations and to collect various types of oceanographic data. Finally, buyers should be responsible for providing fishers with purchase slips that clearly indicate the date, time and the quantity of fish that they purchased. Buyers should then submit copies of these purchase slips to Fisheries Divisions.

3. Consistency of Data Content

Data should be collected and compiled in a standardized format. Fisheries Divisions use of a common storage platform for data collected through standardized reporting systems (i.e. log sheets, logbooks, or other technologically appropriate recordkeeping tool) will ensure data consistency across Member States' systems.

4. Data Storage, Access and Sharing

Member States should have secure computer systems capable of storing raw data supplied by fisher organizations or Fisheries Divisions. Additionally, Member States should develop national data protocols that determine the way compiled and aggregated data will be shared with third party users (i.e. academia, etc.), including research ethic protocols regarding access to and use of fishers' data and local knowledge.

CLOSING

It is understood that collecting data is necessary for enhanced EAF management of the flyingfish fishery which requires coordination amongst Member States using standardized data structures. It is also understood that the economic climate and Fishery Division capacities require examination of alternative means to cost efficiently collect data. In addition to providing information necessary for flyingfish fishery management, understanding the current status of the biophysical and socio-economic condition of the flyingfish fishery within the region will provide valuable information for planning "Blue Economy" development activities. Consideration should be given to inter-departmental collaboration and / or independent research projects involving academic and multi-lateral funding sources.

ANNEX 6: IMPACT ASSESSMENT TOOLS

DOCUMENT PURPOSE AND OBJECTIVE

Below are four impact assessment tools, which address NEXUS Coastal Resource Management Ltd. (NEXUS) work under CRFM consultancies – "Technical Support to Enhance Data and Information Management Decision Support" and "Technical Support to Facilitate Long-term Enhancement of Livelihoods and Human Well-being for Eastern Caribbean Flyingfish Fisheries".

The impact assessment tools aim to assess whether the main objectives / actions to enhance data collection and information management systems and sustainable livelihoods and human well-being for Eastern Caribbean flyingfish fishery. Considering that there have been recommendations that the flyingfish fishery is integrated with the harvest of other species many of the indicators will deal with broader fishery data and livelihood considerations.

These impact assessment tools can be used to facilitate the Caribbean Regional Fisheries Mechanism's (CRFM) continued assessment of the work completed relating to the Eastern Caribbean flyingfish fishery consultancies. There are a variety of ways in which the CRFM can collect the necessary information needed to adequately assess each of the questions associated with each indicator. Depending on the nature of the questions, information could be collected through stakeholder surveys, annual reports, published data and other information sources.

Information needed for the impact assessment tools are likely to come from a variety of sources, which may include directly from CRFM staff, fishers, fishery officers, fisher organizations, international organizations (i.e. FAO), academic institutions, and more.

The four impact assessment tools in this report include two tools for the Data Management project and three tools for the Livelihoods Project. Specifically, these tools will assess the following:

Data Project:

- 1. Impact of the online database and information repository for CRFM use to assess improvements in stakeholder access to data and information of relevance to application of the EAF assessment and management of Eastern Caribbean flyingfish.
- 2. Impact on system and procedures supporting the generation of updated EAF management advice, for follow up evaluation by CRFM.

Livelihoods Project

- 1. Impacts of updating the EAF management recommendations to incorporate socio-economic information.
- 2. Assess the effectiveness of the value chain analysis and stakeholder awareness building activities.

IMPACT ASSESSMENT TOOLS FOR DATA MANAGEMENT PROJECT

The impact assessments will draw on various sources of data and information, which may include documents, data analysis, surveys, or stakeholder interviews. Some questions below will be easily addressable without data collection, and others will require data collection. CRFM could perform the impact assessments regularly following the consultancies' completions, for example every 12 - 18 months.

Tool 1: Online Database and Information Repository

The following indicators of success are provided in the section below, which includes questions for use in evaluating progress and success. Indicators are focused on the online database and information repository relevant to the application of the EAF assessment and management of Eastern Caribbean flyingfish. This impact assessment should be conducted on an annual basis to determine incremental improvement in the use and support for the online database and information repository.

Tool Objective: Assess the impact of the online data and information repository for CRFM use to assess improvements in stakeholder access to data and information of relevance to application of the EAF assessment and management of eastern Caribbean flyingfish.

Indicator 1: Database is populated, accessed and used by regional fisheries management organizations and agencies.

- 1. What CARICOM Member States are currently populating, accessing and using the database?
 - Antigua and Barbuda
 - The Bahamas
 - Barbados
 - Belize
 - **Dominica**
 - Grenada
 - Guyana
 - 🗆 🗆 Haiti
 - Jamaica
 - Montserrat
 - Saint Kitts and Nevis
 - Saint Lucia
 - Saint Vincent and Grenadines
 - Suriname
 - Trinidad and Tobago

Please provide any necessary explanation for this response:

2. Has there been an increase number of government departments using the database? *[For each country]:*

- No increase (0% achieved)
- Minimal increase (1 30% achieved)
- Moderate increase (30 70% achieved)
- Strong increase (70 99% achieved)
- Very strong increase (100% achieved)

- 3. Has there been an increase number of fishery organizations using the database? *[For each country]:*
 - □ □ No increase (0% achieved)
 - □ □ Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 4. Has there been an increase number of individual researchers using the database? *[For each country]:*
 - □ □ No increase (0% achieved)
 - Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

5. Has there been an increase number of academic institutions using the database? *[For each country]:*

- No increase (0% achieved)
- Minimal increase (1 30% achieved)
- Moderate increase (30 70% achieved)
- Strong increase (70 99% achieved)
- □ Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 6. Has there been an increase in the number of users of the database outside of the region?
 - □ □ No increase (0% achieved)
 - ☐ Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - □ Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 7. What is the frequency in which the database is updated with new information?
 - [For each country]:
 - No update
 - □ □ Minimal update (annually)
 - Moderate update (bi-annually)
 - Regular update (quarterly)
 - Constant update (monthly)

Please provide any necessary explanation for this response:

- 8. Are research reports being updated/provided in the database?
 - [For each country]:
 - □ □ No update
 - ☐ Minimal update (annually)
 - Moderate update (bi-annually)
 - Regular update (quarterly)
 - Constant update (monthly)

9. How many staff are dedicated to the maintenance of the database?

Regional:

- Zero
- One One
- More than One

National:

[For each country]:

- Zero
- One
- More than One

Please provide any necessary explanation for this response:

- 10. How much funding has been allocated to the maintenance of the database? Regionally:
 - □ □ No funding
 - □ □ Minimal funding
 - □ □ Moderate funding
 - □ □ Strong funding

Within Member States:

[For each country]:

- □□ No funding
- ☐ ☐ Minimal funding
- □ □ Moderate funding
- **Strong funding**

Please provide any necessary explanation for this response:

Indicator 2: Member State government support and use of the database.

- 1. Which of the following Member States are currently providing financial or human resource support for the database?
 - Antigua and Barbuda
 - The Bahamas
 - **Barbados**
 - Belize
 - Dominica
 - Grenada
 - Guyana
 - □□ Haiti
 - Jamaica
 - Montserrat
 - Saint Kitts and Nevis
 - Saint Lucia
 - Saint Vincent and Grenadines
 - Suriname
 - Trinidad and Tobago

- 2. Has there been an increase level of support by government departments for the database? *[For each country]:*
 - □ □ No increase (0% achieved)
 - Minimal increase (1 30% achieved)
 - □ □ Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - □ Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 3. What is the frequency in which the database is updated with new information? *[For each country]:*
 - \square No update
 - □□ No upuate
 - Minimal update (annually)
 - Moderate update (bi-annually)
 - Regular update (quarterly)
 - Constant update (monthly)

Please provide any necessary explanation for this response:

4. Are research reports being updated / provided in the database?

[For each country]:

- Minimal or no update (annually)
- Moderate update (bi-annually)
- Strong increase (quarterly)
- □ □ Very strong increase (monthly)

Please provide any necessary explanation for this response:

- 5. How many staff are dedicated to the maintenance of the database? *[For each country]:*
 - *For each countr*
 - Dero Dero
 - More than One

Please provide any necessary explanation for this response:

- 6. How much funding has been allocated to the maintenance of the database?
 - [For each country]:
 - No funding
 - □ □ Minimal funding
 - Moderate funding
 - **Strong funding**

Please provide any necessary explanation for this response:

Indicator 3: Regional organization support and use of the database.

- 1. Has there been an increase number of fishery organizations using the database? *[For each country]:*
 - □ □ No increase (0% achieved)
 - Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Very strong increase (100% achieved)

2. Has there been an increase number of individual researchers from regional organizations using the database?

[For each country]:

- □ □ No increase (0% achieved)
- □ □ Minimal increase (1 30% achieved)
- Moderate increase (30 70% achieved)
- Strong increase (70 99% achieved)
- Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 3. Has there been an increase number of academic institutions using the database? *[For each country]:*
 - □ No increase (0% achieved)
 - □ □ Minimal increase (1 30% achieved)
 - □ □ Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 4. Has there been an increase in the number of users from international fisheries organizations?
 - □ □ No increase (0% achieved)
 - Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Very strong increase (100% achieved)

Please provide any necessary explanation for this response:

- 5. Are additional regional research reports being updated/provided in the database?
 - [For each country]
 - No update
 - Minimal update (annually)
 - Moderate update (bi-annually)
 - Regular update (quarterly)
 - Constant update (monthly)

Please provide any necessary explanation for this response:

Tool 2: Data Collection Systems for EAF Management

Tool Objective: Assess the impact on system and procedures supporting generation of updated EAF management advice for follow up evaluation by the CRFM

Indicator: Member State data management systems and procedures support the generation of updated EAF management advice.

1. What level of change has been experienced in national policies and regulations regarding data collection and storage?

[For each country]:

- □ □ No progress (0% achieved)
- Minimal progress (1 30% achieved)
- Moderate progress (30 70% achieved)
- Strong progress (70 99% achieved)

Very strong progress (100% achieved)

Please provide any necessary explanation for this response:

- 2. What level of change have Member States made to improving their data management systems? *[For each country]:*
 - □ □ No improvements (0% achieved)
 - □ □ Minimal improvements (1 30% achieved)
 - Moderate improvements (30 70% achieved)
 - Strong improvements (70 99% achieved)
 - \Box Very strong improvements (100% achieved)

Please list indicators of progress:

- 3. What is the frequency of data collection and input into national data management systems? *[For each country]:*
 - Daily
 - Weekly
 - Bi-monthly
 - Monthly or more

Please provide any necessary explanation for this response:

4. What is the level of completeness of the data being collected (difference between actual data and required data)?

[For each country]:

- No information gaps (0% missing information)
- Minimal information gaps (less than 10% missing information)
- Moderate information gaps (10 40% missing information)
- Severe information gaps (40 75% missing information)
- Very severe information gaps (75 100% missing information)

Please provide any necessary explanation for this response:

- 5. To what extent are fishers and/or fisher organizations involved in data collection and storage? *[For each country]:*
 - No involvement (0%)
 - Limited involvement (Less than 30%)
 - Moderate involvement (30 70%)
 - Strong involvement (70 99%)
 - Complete involvement (100%)

Please provide any necessary explanation for this response:

6. What is the number of employees within Member State Fisheries Divisions dedicated to data collection and storage?

[For each country]:

- None None
- 1 to 2
- 3 or more

Please provide any necessary explanation for this response:

7. What is the number of employees within regional organizations dedicated to data collection and storage?

[For each country]:

None

□ □ 1 to 2

3 or more

Please provide any necessary explanation for this response:

What is the number of employees within Member State Fisheries Divisions involved with to data analysis?

[For each country]:

None

8.

- 1 to 2
- 3 or more

Please provide any necessary explanation for this response:

- 9. What is the number of employees within regional organizations involved with to data analysis? *[For each country]:*
 - None None
 - □ □ 1 to 2
 - 3 or more

Please provide any necessary explanation for this response:

10. What is the level of regional harmonization of data collection systems? *[For each country]:*

- No harmonization (0% achieved)
- □ Minimal harmonization (1 30% achieved)
- Moderate harmonization (30 70% achieved)
- Strong harmonization (70 99% achieved)
- Complete harmonization (100% achieved)

Please list indicators of progress:

IMPACT ASSESSMENT TOOLS FOR LIVELIHOODS PROJECT

The impact assessments will draw on various sources of data and information, which may include documents, data analysis, surveys, or stakeholder interviews. Some questions below will be easily addressable without data collection, and others will require data collection. CRFM could perform the impact assessments regularly following the consultancies' completions, for example every 12 - 18 months.

Tool 3: Socio-Economic Information for EAF Management

The following indicators of success are provided in the section below, which includes questions for use in evaluating progress and success. Indicators are focused on socio-economic data, value chain enhancement and value chain analysis relevant to the application of the EAF assessment and management of Eastern Caribbean flyingfish. This impact assessment should be conducted on an annual basis to determine incremental improvement in the use and support for the online database and information repository.

Tool Objective: Assess the impacts of updating the EAF management recommendations to incorporate socio-economic information.

Indicator: ECFF-FMP adequately incorporates socio-economic information.

1. Do national fisheries management plans include in their objectives and protocols the collection of socio-economic data?

[For each country]:

- No collection of socio-economic data
- Minimal collection (1 30% achieved)
- \square Moderate collection (30 70% achieved)
- Strong collection (70 99% achieved)
- \Box Complete collection (100% achieved)

Please provide any necessary explanation for this response:

2. Have Member State countries made progress in examining and revising their data collection systems to incorporate socio-economic data (level of effort)?

[For each country]:

- No progress
- □ □ Minimal progress (1 30% achieved)
- Moderate progress (30 70% achieved)
- Strong progress (70 99% achieved)
- Complete progress (100% achieved)

Please provide any necessary explanation for this response:

- 3. Do Member State Fisheries Division collect socio-economic data (i.e. employment data for men and women, income data, educational/training data, etc.) (level of progress)? *[For each country]:*
 - No collection of socio-economic data
 - □ Minimal collection (1 30% achieved)
 - □ □ Moderate collection (30 70% achieved)
 - Strong collection (70 99% achieved)
 - Complete collection (100% achieved)

Please list indicators of change:

- 4. Has there been an increase in gender equity within the fishing industry (level of change)? *[For each country]:*
 - □□ No Change
 - □ Minimal Change (1 30% achieved)
 - □ □ Moderate Change (30 70% achieved)
 - Strong Change (70 99% achieved)
 - Complete Change (100% achieved)

Please list indicators of change:

- 5. Has there been an increase in the average income of fishing families?
 - [For each country]:
 - No increase
 - □ □ Minimal increase (1 30% achieved)
 - Moderate increase (30 70% achieved)
 - Strong increase (70 99% achieved)
 - Complete increase (100% achieved)

Please provide any necessary explanation for this response:

6. Has there been an increase in income diversification amongst fishing families? *[For each country]:*

- No increase
- Minimal increase (1 30% achieved)
- Moderate increase (30 70% achieved)
- Strong increase (70 99% achieved)
- Complete increase (100% achieved)

Please provide any necessary explanation for this response:

Tool 4: Value Chain Awareness

Tool Objective: Assess the effectiveness of the value chain analysis and stakeholder awareness building activities.

Indicator: Stakeholders are aware and understand the fisheries value chain.

1. Do Fisheries Extension Officers provide information regarding fisheries value chain to industry participants?

[For each country]:

- Minimally (once every few years)
- Moderately (annual basis)
- Frequently (bi-annual basis)
- Very frequently (monthly)

Please provide any necessary explanation for this response:

2. Are there formal training programs available to industry participants regarding fisheries value chain and development opportunities?

[For each country]:

- No
- Yes, offered once a year
- Yes, offered bi-annually
- □ □ Yes, offered quarterly

- 3. What is the rate of participation in these value chain training programs?
 - [For each country]:
 - Minimally (once every few years)
 - □ □ Moderately (annual basis)
 - Frequently (bi-annual basis)
 - Very frequently (monthly)

Please provide any necessary explanation for this response:

Indicator: Member States conduct value chain analysis to promote socio-economic sustainability.

1. What is the number of employees within Member State Fisheries Divisions involved with value chain analysis?

[For each country]:

- **None**
- 1 to 2
- 3 or more

Please provide any necessary explanation for this response:

- 2. What is the number of employees within regional organizations involved with value chain analysis? *[For each country]:*
 - None
 - 1 to 2
 - 3 or more

Please provide any necessary explanation for this response:

- 3. Have Member States made investments in value chain enhancements?
 - [For each country]:
 - No investment
 - Minimal investment (1 30%)
 - Moderate investment (30 70%)
 - Strong investment (70 99%)
 - Complete investment (100%)

Please provide indicators of determination:

- 4. Have changes been made along the value chain to improve cost? *[For each country]:*
 - □ No change
 - Minimal change (1 30% achieved)
 - Moderate change (30 70% achieved)
 - Strong change (70 99% achieved)
 - \Box Complete change (100% achieved)

Please provide any necessary explanation for this response:

- 5. Have changes been made along the value chain to improve quality? *[For each country]:*
 - □□ No change
 - Minimal change (1 30% achieved)
 - Moderate change (30 70% achieved)
 - Strong change (70 99% achieved)
 - Complete change (100% achieved)

OVERVIEW

The Caribbean Regional Fisheries Mechanism (CRFM) has identified the need for the development of a Decision Support System to aid Fisheries Divisions in the decision-making process regarding the Eastern Caribbean Flyingfish Fishery. The following report provides an overview of Decision Support Systems (DSS) and outlines proposal requirements for contracting professional consulting services to the CRFM for the development of a Decision Support System for Member States participating in the Eastern Caribbean flyingfish fishery. Specifically, when assessing DSS systems it is important to ask the following questions during the identification of the need for a DSS:

- What is a DSS?
- What is the state of DSS in the flyingfish fishery?
- What type of DSS is best suited for the flyingfish fishery?
- What is needed for implementation?

The requirements of the submission are outlined in Section 3.2 Template for Calls for Proposal.

BACKGROUND INFORMATION

Decision Support System

A Decision Support System (DSS) is largely a computer-based application that collects, organizes and analyzes data to assist in the decision-making process, which allows Fisheries Divisions actively identify and solve problems. There are namely three main components of a DSS, namely:

- 1. Database to store data and information on subject matter
- 2. Software system uses models for analysis
- 3. User interface platform for users to use DSS in their decision-making process, the interface also acts as the gateway between the database and software system

A DSS consists of two major sub-systems: the human decision makers and computer systems. "The function of a human decision maker as a component of a DSS is to exercise judgement or intuition throughout the entire decision-making process"¹¹. It is important to note that based on available research there are little to no DSS for fisheries and aquaculture that supports a variety of fish species¹².

There are multiple types of DSSs used, such as:

1. Communications driven DSS

Supports more than one Fisheries Division staff working on a shared task whereby collaborators work together to come up with a series of decisions to set in motion a fisheries management strategy. Most commonly these are targeted at internal teams through a web or client server.

¹¹ Marin, G. (n.d.). *Decision Support System*. Faculty of Computer Science for Business Management. Romanian American University.

¹² Mathisen, B.M., Haro, P., Hanssen, B., Bjork, S. & Walderhaug, S. (2016). *Decision Support Systems in Fisheries and Aquaculture: A systematic review*. Department of Computer and Information Science, Norwegian University of Science and Technology. Norway

2. Data driven DSS

Emphasis on data where the model emphasizes access to and manipulation of a time series of data to fit the decision-maker's needs. It is used to query a database to seek specific answers for specific purposes through a main frame system, client server link or via web. These are most commonly targeted at Fisheries Division managers, staff and fish product / service suppliers.

3. Document driven DSS

More common DSS that searches web pages and finds documents on a specific set of keywords or search terms. This model uses computer storage and processing technologies to provide document retrieval and analysis typically via web or client server systems. This model uses documents to provide decisions and manipulate the information to refine fisheries strategies.

4. Knowledge driven DSS

This is a catch-all category covering a broad range of systems used to provide management advice or to choose products / services. This system can suggest or recommend actions to managers through a person-computer system with specialized problem-solving expertise. This expertise consists of knowledge about a particular subject matter, in this case fisheries management, with an understanding of the problems that it faces and the skills to identify solutions. This model typically uses client / server systems, the web or software running on PCs.

5. Model driven DSS

This is the most complex system that helps analyze decisions or choose between different options. This DSS emphasizes access to and manipulation of financial, optimization and / or simulation models.

Today, most of the DSS in use are developed to generate and evaluate decision alternatives via "what-if" analysis and "goal-seeking" analysis in the design and choice stages. Accounting models facilitate planning by calculating the consequences of planned actions. The support given by a decision support system can be separated into three different, interrelated categories: group support, knowledge-based support and organizational support.

The benefits of DSS are: improves personal efficiency, expedites problem solving, facilitates interpersonal communications, promotes learning or training, increase organizational control, generates new evidence in support of a decision, creates a comprehensive advantage over competition, encourages exploration and discovery on the part of decision maker, reveals new approaches to thinking about problem space.

The CRFM seeks to enhance Member State decision making capacity through the development and implementation of a DSS, which will save time in the decision-making process. It is intended that a well-designed DSS will substantially reduce decision cycle time, increase Fisheries Divisions productivity and allow decision-makers to have access to more timely information. In the context of this Request for Proposals a Decision Support System (DSS) is understood to be a computer-based system that will assist Fisheries Division decision maker(s) to use data and models for solving specific tasks relative to the management of fisheries problems at the local and regional level.

DSS DEVELOPMENT CONSIDERATION & RECOMMENDATION

Decision Support Systems (DSS) are used as effective tools to facilitate decision-making in complex situations where there are multiple components that operate independently or semi-autonomously. Research

has shown that DSSs are particularly useful in situations where decisions deal with complex spatial issues, such as fisheries¹³. In this case, DSSs that include geo-referenced data lend themselves to fisheries decision support systems. As mentioned above, there are five generic types of DSSs to consider: (1) model-driven, (2) data-driven, (3) knowledge-driven, (4) document-driven, and (5) communication-driven. A DSS for fisheries management decision-making should consider the human factors and workplace realities of decision makers, such as psychological decision-making processes, in order to ensure the DSS is designed to provide relevant information that supports sustainable fisheries.

In selecting an appropriate DSS consideration should be given to evaluating alternative models to ensure the implementation of a DSS that will be willingly adopted and utilized by Fishery Managers and industry partners. As such, the DSS should build on current knowledge and understanding of the information that is available and that can be easily rolled out without undue expense for training, skills development or recruitment of new staff. The DSS should also focus on current problems facing the flyingfish fishery.

Based on this approach it is recommended that a knowledge driven DSS be adopted and implemented by Member States for the effective management of Eastern Caribbean flyingfish fishery, as well as other commercially important fisheries in the region. It is understood that Member States will likely require additional technical support to advance and implement a DSS. The following discussion provides greater detail on the recommended approach as well as a template call for proposals for technical services needed to support Member States in the development and operationalization of a DSS.

DSS CONSIDERATIONS

There are multiple factors which must be considered in selecting the appropriate DSS for the Eastern Caribbean flyingfish fishery. These include:

1. Eastern Caribbean Flyingfish Fishery is a shared resource that involves multiple nations.

Involvement of multiple jurisdictions in the management of the fishery means that different fishery priorities, management approaches and data systems are employed in fisheries management decision making. The DSS must accommodate this reality.

2. Cost effectiveness should be considered in light of the fact that Member States are currently experiencing fiscal constraints.

The current global economy has had an impact on many of the economic sectors of the Member States and as a result there are fiscal constraints applied to the Fisheries Divisions. The DSS should, therefore, build on existing capacities without increasing financial burden on the Fisheries Divisions and, if possible, increase decision making efficiencies that may result in financial efficiencies.

3. The DSS must be adaptive to include climate change and global market shifts in the decisionmaking process.

The effects of global climate change have been manifested in environmental changes in the region resulting in transitions in the environmental sustainability of the flyingfish fishery. Similarly, global market changes in consumer preferences are impacting the viability of the fishing industry and as a result the economic

¹³ TM Klein, E Celio, A Grêt-Regamey. (2015). Ecosystem services visualization and communication: A demand analysis approach for designing information and conceptualizing decision support systems. *Ecosystem Services*.

sustainability of the fishery. The DSS should be able to address these issues and provide decision support for transitional resources.

4. The DSS should facilitate integration in decision-making with other resource sectors as part of national efforts to promote blue economy objectives.

Marine fisheries are one of the many components of a blue economy. Each of the various marine sectors can impact each other, therefore, a sustainable blue economy involves integration of all sectors in the decision-making process. Selection of the DSS model should consider the ability to facilitate broader decision support for all marine resource sectors.

Considering that Knowledge Driven DSS covers a broad ranch of systems that build on human-computer systems that involve specialized expertise (i.e. fisheries, marine biology, economics, sociology, etc.) that has an intimate understanding of the problems facing the fishery and the skills to identify solutions. Therefore, it is recommended that a Knowledge Driven model be adopted and implement for the Eastern Caribbean flyingfish fishery DSS.

Knowledge Driven DSS Characteristics

In the instance of the Eastern Caribbean flyingfish fishery a Knowledge Driven DSS must consider that decisions regarding the fishery involve various groups including:

- **Fisheries Divisions & Regional Fisheries Organizations** responsible for the management of the fishery to promote biophysical and socio-economic sustainability of the resource;
- **Fishers and their Organizations** responsible for the implementation of the fishery;
- **Processors** responsible for diversifying economic growth and benefit of the harvest;
- **Marketers** responsible for the interface between the harvesters and consumers and provide the initial economic transformation of the catch;
- **Tourism Enterprises/Retailers** responsible for providing fishery products to the end user and enhancing diversification of economic users; and,
- **Other Government Departments** involved with other aspects of the blue economy.

Each of these groups provide information and have knowledge that is useful to effective decision making about the current and future state of the fishery (see Figure 1). They also are affected by decisions and, as a result, have a stake in the decision-making process.



Figure 6: DSS Information Sources

The key features of a Knowledge-driven DSS include the following¹⁴:

- 1. Interactive Dialogue this is used within a knowledge-drive DSS to simulate an examination by a 'real' expert. The questions are designed to promote interactivity between the user and reliable problem solving based on responses.
- 2. Backtrack Capability users can move back through questions and alter responses to allow for a change in recommendation / result based on new information or change in scenario.
- 3. Explain How After a knowledge-driven DSS has reached a solution for the problem, the user can often request an explanation of how the solution was reached. This is a powerful feature as it promotes acceptance of the system, enhances user confident as well as enhances the user's knowledge / expertise.
- 4. Explain Why The systems often allow users to ask why the system is asking a specific question. This feature helps explain the process to the user and enhances their acceptance of the system and their knowledge / expertise.

A knowledge driven DSS should promote collaboration amongst stakeholders and should facilitate comanagement opportunities that involve multiple stakeholders in the management process An effective knowledge driven DSS should build on existing expertise and should be used to focus reasoning and analytical thinking specifically to fisheries decision-making that combines economic, social, cultural and scientific aspects of the fishery. It should not be data-driven so that IT specialist sideline or replace existing expertise.

Knowledge-driven DSSs can be prone to biasing by users, which can be a particularly acute problem where poorly, or ill-informed users are involved in populating and using the DSS for decision-making. It is very

¹⁴ Power, D. (2008). http://dssresources.com/faq/index.php?action=artikel&id=172

important that the implementation of a knowledge drive DSS be founded upon a robust training program that ensures users are taught to avoid distorting or biasing responses to the questions within the system, thus reducing the risk of human error.

The following table provides a summary of existing DSS tools that may be of relevance to the flyingfish fishery. These are categorized whether it is a tool that focuses on analysis, data or forecasting. The table provides information on the name, function, users, data requirements and costs associated with the DSS systems.

Tool Category	Tool Name	What does it do?	Potential Users	Data Requirements	Costs
DSS analysis	Conservation Management System	A practical approach to management planning for sites of conservation and recreation importance – terrestrial	Scientists, Strategic Planner, Case Officer		Commercial ~£750 Would probably need modification for marine use.
DSS data	SeaZone	Collation of data sources needed for MSP into one database	Scientist, Strategic Planner, Case Officer	None, it provides data	Commercia >£100. Defra access agreement
DSS communication	Fishermap (Finding Sanctuary)	A web-based mapping tool allowing fishers to enter areas that are valued by them	Scientist, Strategic Planner, Case Officer, Public	None as it is a data collation tool	Free to users – modification would need payment to software company
DSS forecasting	MARA, Marine Aggregate Extraction Risk Assessment	Performs structured probabilistic environmental risk assessments for aggregate extraction	Programmer, Scientist, Strategic Planner		Availability not clear, runs in ArcGIS
DSS analysis	Marxan	Estimates efficient reserve networks by maximizing estimated benefits and minimizing estimated costs	Programmer, Scientist		Free, Open source, GIS interface coming soon
DSS analysis	Performance Assessment System and Marine Planning	Evaluates the effectiveness of each marine plan by assessing the maintenance of ecosystem conditions	Scientist, Strategic Planner, Case Officer		Non clear whether it has available software tools
DSS forecasting	FLR – Fisheries Library in R	Fisheries stock assessment and management strategy evaluation	Programmer	Model parameters	Free
DSS forecasting	Ecospace	Spatial ecosystem model, predicts population dynamics	Programmer, Scientist	Model parameters	Free

Table 4: Summary table of Decision Support Systems¹⁵

¹⁵ Stelzenmüller, V., Lee, J., South, A., Foden, J., and S. I. Rogers. (2013). Practical tools to support marine spatial planning: A review and some prototype tools. *Marine Policy*. 38, 214-227.

Tool Category	Tool Name	What does it do?	Potential Users	Data Requirements	Costs
		into the future based on who eats who, can simulate closed areas			
DSS forecasting	Isis-fish	A generic and spatially explicit simulation tool to evaluate the impact of management on fisheries	Scientist	Model parameters	Free
DSS forecasting	Fishing relocation model	To predict where fishing effort may be relocated if areas are closed	Programmer, Scientist		Not available
DSS analysis	CommunityViz	An advanced yet easy- to-use GIS software to visualize, analyze, and communicate about land-use decisions	Scientist, Strategic Planner, Case Officer, Public		Commercial \$750 US per annum incl. support. \$300 software only + requires ArcGIS9
DSS analysis	Index	Interactive GIS planning support tools for designing future scenarios and ranking by goal achievement	Scientist, Strategic Planner		Commercial \$1900 US
DSS analysis	NatureServe Vista	DSS for conservation planning, tools for planners, resource managers and communities. Set up by NGO the Nature Conservancy	Scientist, Strategic Planner, Case Officer, Public		Free, but website wasn't always available
DSS analysis	Balance: MSP recipes for the Baltic (not operational software)	Comprehensive collection of recipes for MSP analyses	Programmer, Scientist		Free recipes that can be implemented in the GIS of choice
DSS forecasting	Atlantis	Ecosystem model to support strategic fisheries management	Programmer, Scientist	Model parameters	Not clear where available
DSS analysis	Ecosystem Management Decision Support (EMDS)	Knowledge-based decision support of ecological assessments	Programmer, Scientist, Strategic Planner	Landscape data	Commercial
DSS analysis	Doris-Marine Protected Areas Decision Support Tool	Web-based application for designing, viewing and reporting on marine protected areas	Scientist, Strategic Planner, Case Officer, Public		User password – not apparent how to obtain. Custom Commercial software
DSS analysis	Aries	Web tool for ecosystem service assessment and valuation. Appears to have straight-forward	Not yet available: Scientist, Strategic		Not yet available

Tool Category	Tool Name	What does it do?	Potential Users	Data Requirements	Costs
		methods for looking at spatial distribution of activities	Planner, Case Officer, Public		
DSS analysis	OSS: optimization support system	To identify comprehensive, adequate and representative locations for conservation planning	Scientists		Not clear, links to ArcGIS & commercial optimization software
Spatial interaction DSS	Sketch Planning	The public accesses information, models, maps, plans and computing methods available to the planners. Decisions are coordinated and innovations tested. Transformation of public hearing from confrontation into collaboration	Programmer, Scientist, Strategic Planner, Case Officer, Public	Decision dependent. May be paper-based or digital	If digital, requires significant investment: Commercial >£100
Spatial Interaction DSS	Web-HIPRE	Web-based tool for public/stakeholder involvement in decision making software for decision analytic problem structure, multi- criteria evaluation and prioritization based on value trees	Programmer, Scientist, Strategic Planner, Case Officer, Public	Expert defined objectives	Free, online

Data Considerations

There are a variety of data points and data types that should be collected for a DSS for the flyingfish fishery. The DSS should be designed in a way that takes advantage of the data that is already collected by Fisheries Divisions and their authorized agents (i.e. Fisher Organizations). This includes information collected through the Catch Documentation Scheme (refer to Catch Documentation Scheme Report by NEXUS Coastal Resource Management Ltd. for more information), which can then be easily inputted into a DSS. The following provides an overview of the type of data that should be included within a DSS:

- Logsheet Data
 - o Catch
 - Landings
 - o Effort
 - Location
 - o Bait
 - o Gear
- Purchase Slips Data
 - Species purchased
 - Number of Units Landed

- Unit Price
- Price Paid
- Processor Certificate Data
 - Species Purchased
 - Unit Type
 - Number of Units Purchased
 - Purchase Cost
 - Number of United Processed
 - Type of Product Produced
 - Sale Cost

- Number of Units Sold
- Location of Sale
- Fisheries Export Slip Data
 - Species Exported
 - Quantity Exported
 - Export Destination
 - Export Value
 - Sex disaggregated data
 - Investment Costs

Roles & Responsibilities

Additional Data

- Income
 - Wages
- Market Price
- Operating Costs
- o Revenue

The following provides an overview of the roles and responsibilities of the various stakeholder groups involved in the flyingfish fishery:

1) Regional Organizations:

Will provide a platform for storing and accessing information across the region and a process for sharing information between relevant users.

2) Fisheries Divisions

Will maintain the DSS and will act as the primary user for decision-making. Accordingly, the Fisheries Division will maintain the information within the DSS necessary to support timely and effective decision-making. This information should be in a format that is easily interpreted and understood by all users and participants in the decision-making process, including fishers, buyers, marketers and processors.

3) Fisher Organizations

Will provide up-to-date information to the DSS and will use the DSS to support day-to-day harvest decisions that do not compromise the health and safety of fishers or the sustainability of the targeted species.

4) Other Stakeholders

Stakeholders involved with fish marketing, processing, retail or tourism enterprises involving harvesting / sale of fish should have access to the DSS to ensure decisions related to their operations are well informed and contribute to the sustainable utilization of the resource.

All of the above users should ensure knowledge derived from their operations and activities is contributed to the DSS to augment, update and improve the information within the system.

TEMPLATE CALL FOR PROPOSALS

A Submission shall be evaluated in accordance with the requirements of the Request for Proposal and the Terms of Reference.

Understanding the Project

The Proponent should demonstrate an understanding of the objectives of the work, technical requirements, constraints, and any special considerations associated with the Services. The Proponent shall provide a

description of the Services and technical requirements, highlighting those that are of particular significance to the project and delivery of services. *Firm Experience*

The Proponent shall present the firm(s) who shall comprise the Project Team. The prime consultant and sub-consultant(s) shall be identified, and the roles of all firms shall be described.

The Proponent must demonstrate previous firm experience on projects of similar scope and scale. A description of a minimum of three (3) projects completed by the Project Team within the last five years, shall be included. The project descriptions shall demonstrate the Proponents' experience on similar projects, and where applicable, project experience in the Eastern Caribbean. The project descriptions should include:

- Description of the project
- Key personnel and their roles and responsibilities on the project
- Client reference

Project Team

The Proponent shall present the team members who shall comprise the Project Team. The roles and responsibilities of each Team Member shall be described, including the roles of the prime consultant. The Proposal shall identify a Project Manager, who will be the main point of contact with the CRFM.

The Proponent shall outline the ability of the Project Team to provide the Services and to fulfill the objectives and scope of work of this Project as set out in the Terms of Reference. The Proponent shall demonstrate the experience and qualifications of the Project Team members, including the number of years of experience for each team member.

Project Schedule

The Proponent shall provide a detailed Project Schedule that outlines the timelines and demonstrates a logical approach in undertaking the Proponent's Work Plan to meet the project requirements.

Costing

The costing submission shall clearly show the project costs. The submission shall also indicate the daily professional fees and associated disbursements.

Statement of Work

Work Plan / Project Methodology

The Proponent shall provide a detailed Work Plan, demonstrates the proposed Project Methodology. The Work Plan shall demonstrate that the Proponent understands the Project. It is also the Proponent's opportunity to present innovative ideas or approaches to the Project.

The Work Plan is the Proponent's opportunity to describe how the Proponent proposes to meet the requirements of the Terms of Reference and provide the Deliverables specified. The Work Plan should identify how and when the Services shall be conducted, individual responsibility for each Service, and demonstrate that the Project can be completed on schedule as outlined in the Terms of Reference.

The Work Plan will be evaluated based on how closely it meets the Project requirements and how it demonstrates a logical approach to delivering the required Services.

Specifically, the Proponent should consider the following methodology for the development of the Eastern Caribbean Flyingfish Fishery DSS:

Identify the challenges that are underlining the need for a DSS

- Regional scale or country-specific
- Based on this prepare a draft outline to formalize the development process

Collect Information

• Concentrate on reviewing existing DSS models, evaluation criteria and mechanisms

Design DSS

- Workshops with fishery managers and data managers
- Define the requirements for the DSS (Workshop 1)
- Discuss early draft of DSS and evaluation criteria (Workshop 2)

Develop DSS

- Identify technological requirements of hardware, software, people and procedures.
- Application and verification of DSS (Workshop 3)

The Proponent should define how each of the following five key groups or individuals will be engaged and involved in the development of the DSS:

- 1. The end user(s) (Decision-makers)
- 2. Intermediary technicians and data collectors
- 3. Technical support
- 4. Systems expert(s)
- 5. DSS developer (the Proponent)

Furthermore, the Proponent will be expected to address each of the following data requirements in the Eastern Caribbean Flyingfish Fishery DSS.

- Logsheet Data
 - Catch
 - Landings
 - o Effort
 - Location
 - o Bait
 - o Gear
- Purchase Slips Data
 - Species purchased
 - Number of Units Landed
 - Unit Price
 - Price Paid
- Processor Certificate Data

- Species Purchased
- Unit Type
- Number of Units Purchased
- Purchase Cost
- Number of United Processed
- Type of Product Produced
- Sale Cost
- Number of Units Sold
- Location of Sale
- Fisheries Export Slip Data
 - Species Exported
 - Quantity Exported
 - Export Destination

- Export Value 0
- Additional Data •
 - Income 0
 - Wages 0
 - Market Price 0
 - 0
 - 0
 - Operating Costs Revenue Sex disaggregated data Investment Costs 0
 - 0

Terms of Reference

Objectives

The project objectives are summarized as follows:

- 1. Improve Member State Fisheries Division decision-making capacity through the design and implementation of a Decision Support System.
- 2. Strengthen stakeholder access to data and information of relevance to the application of Ecosystem Approach to Fisheries for the Eastern Caribbean Flyingfish Fishery.

Scope of Services

CRFM should invite proposals from qualified, professional consulting firms to design, develop and implement a Decision Support System for the Eastern Caribbean Flyingfish Fishery. This assignment should include, but not be limited to, the following Project tasks:

1. Continued Assessment of Needs for the DSS

- a. Ongoing identification of the challenges that are underlining the needs addressed by the DSS
 - Regional scale or country-specific
 - Based on this prepare a draft outline to formalize the development process for a DSS

2. Data and Information Gathering

- Collect data and information that will be used to both develop a DSS and populate a DSS
 - Concentrate on reviewing existing DSS models, evaluation criteria and mechanisms

3. Design DSS

- Facilitate consultation with fishery managers and data managers to ensure DSS meets their needs and is within their capabilities to operate
 - Define the requirements for the DSS (Workshop 1)
 - Discuss early draft of DSS and evaluation criteria (Workshop 2)

4. Develop DSS

- Identify technological requirements of hardware, software, people and procedures.
- Application and verification of DSS (Workshop 3)
- Launch DSS in pilot country

Deliverables

The project deliverables should include but not be limited to the following:

- 1. Inception Report and Work Plan
- 2. Needs Study
- 3. Decision Support System
- 4. Final Technical Report

ANNEX 7: ADDITIONAL CONSULTANCY PRODUCTS AVAILABLE UNDER SEPARATE COVER

The reports listed below are published as part of CRFM Fishery Report -2019/2.

- 1. Management Performance Review
- 2. Management, Monitoring and Evaluation Report
- 3. Report on EAF Management and Policy Cycle
- 4. Gender in Eastern Caribbean Flyingfish Fisheries
- 5. Catch Documentation Scheme Report
- 6. Multi-Objective Assessment Report
- 7. Recommendations for Enhanced Data Collection Systems
- 8. National Vessel Census Report
- 9. Fishery Assessment Report of the Eastern Caribbean Stock of Four-wing Flyingfish 2018

The CRFM is an inter-governmental organization whose mission is to "Promote and facilitate the responsible utilization of the region's fisheries and other aquatic resources for the economic and social benefits of the current and future population of the region". The CRFM consists of three bodies – the Ministerial Council, the Caribbean Fisheries Forum and the CRFM Secretariat.

CRFM members are Anguilla, Antigua and Barbuda, The Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Haiti, Jamaica, Montserrat, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, Trinidad and Tobago and the Turks and Caicos Islands.

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