Fishery data collection and integration strategy for underpinning sustainable fisheries management in Montserrat
DRAFT

Prepared for Fisheries and Oceans Governance Unit – Department of Agriculture
Government of Montserrat

This document was produced for the Government of Montserrat.
It remains in draft form until it is incorporated into the Government's fisheries policy

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Joint Nature Conservation Committee

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Prepared for

Fisheries and Oceans Governance Unit - Department of Agriculture
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About SAERI

The South Atlantic Environmental Research Institute (SAERI) is an academic organisation conducting research in the South Atlantic from the tropics down to the ice in Antarctica. SAERI's remit includes the natural and physical sciences. It aims to conduct world class research, teach students, and build capacity within and between the South Atlantic Overseas Territories.

About JNCC

The Joint Nature Conservation Committee (JNCC) is the statutory adviser to the UK Government and devolved administrations on UK and international nature conservation. Its work contributes to maintaining and enriching biological diversity sustaining natural systems.

JNCC delivers the UK and international responsibilities of the Council for Nature Conservation and the Countryside (CNCC), Natural Resources Wales, Natural England, and Scottish Natural Heritage (SNH). The functions that arise from these responsibilities are principally to:

- advise Government on the development and implementation of policies for, or affecting, nature conservation in the UK and internationally;
- provide advice and disseminate knowledge on nature conservation issues affecting the UK and internationally;
- establish common standards throughout the UK for nature conservation, including monitoring, research, and the analysis of results;
- commission or support research which it deems relevant to these functions.

JNCC, originally established under the Environmental Protection Act 1990, was reconstituted by the Natural Environment and Rural Communities Act 2006. Support is provided to the JNCC by a company limited by guarantee (JNCC Support Co) that the Committee established in 2005.

Acknowledgments

We wish to thank the members of the Government of Montserrat, the Department of Agriculture, and the Fisheries Unit for their discussions, hospitality and facilitation of this Territory to Territory (T2T) project. In particular, thanks go to the Honourable Minister Claude Hogan, Mrs Daphne Cassell, Ms Melissa O'Garro, and Mr Alwyn Ponteen for hosting our visits and for their availability and support throughout the project. The project benefited greatly from engaged and open discussions with the fishers of Montserrat and support of the Montserrat Fishers and Boaters Association.

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1 EXECUTIVE SUMMARY

The Government of Montserrat (GoM) has identified improvement in fisheries management and production as a key element to the over-all goal *"To redevelop agriculture (crop, livestock, aquaculture and marine resources) to promote food security, satisfy local demand and to target specific markets for import substitution and export."* as set out in the Agricultural Strategy and Marketing Plan (ASMP) for Montserrat 2016-2021. To achieve this, the GoM has been engaged in a number of processes to improve the fishery namely, a program to improve data gathering and analysis in the fishery, as well as a legislation review, and marine spatial planning initiatives.

This Data Integration Strategy aims to provide a consolidated view of these, compare them to a modern standard in fisheries sustainability, identify residual gaps in meeting sustainability targets, and to provide a strategy for implementation. This strategy focuses on fisheries related data streams and management of current and new data.

To address critical data issues identified we recommend urgent actions in Year 1 are;

- Revise Data Collector job description, which includes measuring (rather that estimating) catch and effort, and at the species level.
- Develop, and revise the fisheries unit managers job description to reflect their role;
- Carry out regular biological data collection across primary species.
- Working hours of Data Collectors to align with fishing activity.
- Data collector role to include observations at sea.
- A policy goal of 100% coverage of the fishery, but with scheduled sampling of different levels of data collection.
- Construction of data collection facilities at Little Bay.
- Improved primary and secondary reporting of data to meet local, regional and international obligations.

Once more robust data collection processes are established, the fishery will be better able to build knowledge of the fishery through;

- Spatial analysis of catch and effort
- Understanding of age, growth and reproduction of target species locally and of straddling fish stocks.
- Measure and mitigate impacts of fishing on the reef and by-catch species

The managers and stakeholders of the fishery will then be informed on an evidence basis to implement modern licencing, compliance and marine spatial planning regimes. A comprehensive Harvest Control strategy and Fisheries Management Plan can be developed that would be representative of the sustainability goals and function of the fishery that is desired by GoM and its stakeholders.

We recommend a 5-year plan for implementation, culminating in a full independent assessment of the stock status, efficacy of conservation measures, and review of fishery and marine environment management tools.

2 INTRODUCTION

2.1 ACHIEVING A SUSTAINABLE FISHERY

Understanding the impact of fisheries on marine ecosystems receives a great deal of global attention. In addition to reported declines in targeted fish stocks, there is particular concern over the detrimental effects of fishing on the habitats in which fish stocks exist, and the cascading effects on wider ecological processes. However, the need for fish-based protein persists across all societies; it is recognised that sustainable fisheries can meet this need. Moreover, sustainable fisheries can help meet economic targets as well as preserving the social and cultural values of fish and fishing in many regions.

Fisheries science aims to ensure economic and ecological sustainability. In the modern sense, this is inclusive of minimising detrimental impact on non-target species, habitats and processes supporting the target fishery. In addition, the stock and marine ecosystem must be protected from Illegal, Unreported and Unregulated (IUU) fishing. Unfortunately, in practice, achieving sustainability under these criteria is not an easy task, requiring long-term datasets that span a wide range of fishing industry and scientifically collected species' biological and ecological data and indeed, a great deal of collaboration between governments, industry, NGO, and other stakeholders.

In the absence of such wide-ranging data and comprehensive management processes, fisheries can operate sustainably if a precautionary approach is adopted (for definition, see The Precautionary Principle and Approach) by fisheries policy makers, managers, regional authorities and stakeholders. In this way, risks to overfishing of the stock and the impacts of fishing on the ecosystem can be mitigated through prudent management regulation when uncertainties are not well defined. This is particularly applicable to data-poor fisheries that support mainly local artisanal fishers and/or local subsistence fishing where data collection and research programs cannot be financially supported by limited if any, licencing and/or other fees revenue. Criticisms of the precautionary principle are primarily attributed to the lack of real-world precaution that often falls short of addressing uncertainties in ecosystem processes, and poor monitoring and regulation of catch and by-catch. Precautionary principles may ultimately hinder economic growth if over-precaution is applied at the risk of under-exploiting a stock for full, sustainable, economic benefit. In such cases, there is a minimum data requirement such that the level of precaution can be evaluated.

The management approach ultimately adopted should be guided by policy that defines the economic and social objectives, sustainable use of the resource, conservation goals, (dis)incentives, the level of acceptable risk, and the approach for managing uncertainty. The policy will then be supported by a clear management plan for collection of fishery and environmental data aimed at assisting fisheries manager's decision making and re-evaluation of fisheries/environment policy for further development.

2.2 MEETING THE GOALS OF THE GOVERNMENT OF MONTSERRAT

The Government of Montserrat (GoM) has identified improvement in fisheries management and production as a key element to the over-all goal *"To redevelop agriculture (crop, livestock, aquaculture and marine resources) to promote food security, satisfy local demand and to target specific markets for import substitution and export."* as set out in the Agricultural Strategy and Marketing Plan (ASMP) for Montserrat 2016-2021. To achieve this, the GoM has been engaged in a number of processes to improve the fishery namely, a program to improve data gathering and analysis in the fishery, as well as a legislation review, and marine spatial planning initiatives.

The GoM's goals of establishing robust fisheries monitoring practices for ensuring a sustainable fishery and limiting the impact on the marine environment are also in part, driven by the desire for meeting the goals and targets set out in the **United Nations Sustainable Development Goals** (sustainabledevelopment.un.org). A well run, sustainable fishery in Montserrat will directly contribute to meeting **Goal 14 – Life Below the Water** (supported by UKGOV SDG policy), specifically;

14.2 - By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans;

14.4 - By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics;

14.5 - By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

14.A - By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism;

14.B - Provide access for small-scale artisanal fishers to marine resources and markets;

14.C - Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in UNCLOS, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of The Future We Want.

A well-managed, sustainable fishery will also have direct or indirect positive impacts Montserrat's society through other SDG targets including;

SGD 2 – End hunger and achieve food security;

SGD 3 – Ensure healthy lives and promote well-being;

SGD 5 – Achieve gender equality

SGD 8 – Promote sustainable economic growth

SGD 13 – Combat effects of climate change

2.3 IMPORTANCE OF DATA

Without good data collection, the health and sustainability of the fishery cannot be monitored. Establishment of comprehensive, robust data collection protocols will facilitate early detection of the signs of overfishing such as;

1. Reduced fish size / biomass / total catch
2. Changes in reproduction patterns, especially species with sequential hermaphroditism
3. Increased fluctuations in stock indices
4. Change in species composition and reduced diversity of the multi-species assemblage

If management tools are to be implemented, then good data collection will allow for accurate assessment of efficacy of such tools, for example;

1. Biological controls – triggers based on juveniles, habitats, spawning grounds, by-catch
2. Catch controls – catch limits, closed areas, temporal closure
3. Gear control – mesh size, locations, seasons
4. Monitoring and surveillance - Increased levels of data collection
5. Pollution control

Ultimately, high-quality comprehensive data will form the evidence-basis for management objectives of ensuring sustainability of fish and fishing, effective consultation, and increased potential economic development through new fisheries. A funding strategy can be developed to support harvest control and the fisheries management plan.

In addition to achieving domestic policy and management targets, robust locally collected data will feed into regional and international stock management and monitoring programs, and support more realistic national economic metrics of stability and growth. Providing best quality data will underpin informed decisions and guidance locally and internationally.

2.4 FISHERY BACKGROUND

The fisheries of Montserrat have been reviewed recently by different groups highlighting the description of the fishery, stock, management and other characteristics (e.g. Medley 2008; Ponteen, 2013; Sustainable Fisheries Group, 2015 & 2016; Environmental Law Institute, 2015; OCTA, 2017). More broad descriptions of Montserrat's marine resources and management have also been reviewed (e.g. LTS International, 2007; CaribInvest Ltd, 2012; ABP Marine Environment Research Ltd, 2013; Waitt, 2016).

Montserrat has undergone relatively recent catastrophic natural disasters (volcanic related activities, tropical cyclones, extreme weather) which has meant much of the fishery today is still in a re-building phase. Significant fishing infrastructure required to support fisheries in port areas are still being re-built, and fishers themselves are still adjusting to a significantly reduced fishing area around the Island. Other threats to the fishery are also recognised such as impacts of proposed coastal

development, and long-term changes such as impacts of climate change on ocean temperature and its consequences on the reef ecosystem, and sea level rise.

The fishery of Montserrat plays a relatively small part in Island's over-all economy, albeit it's likely to be larger than currently considered (Farga 2017). Despite this, the fishery plays a significant role in supporting food security for the nation as well as recognising a widely shared cultural value.

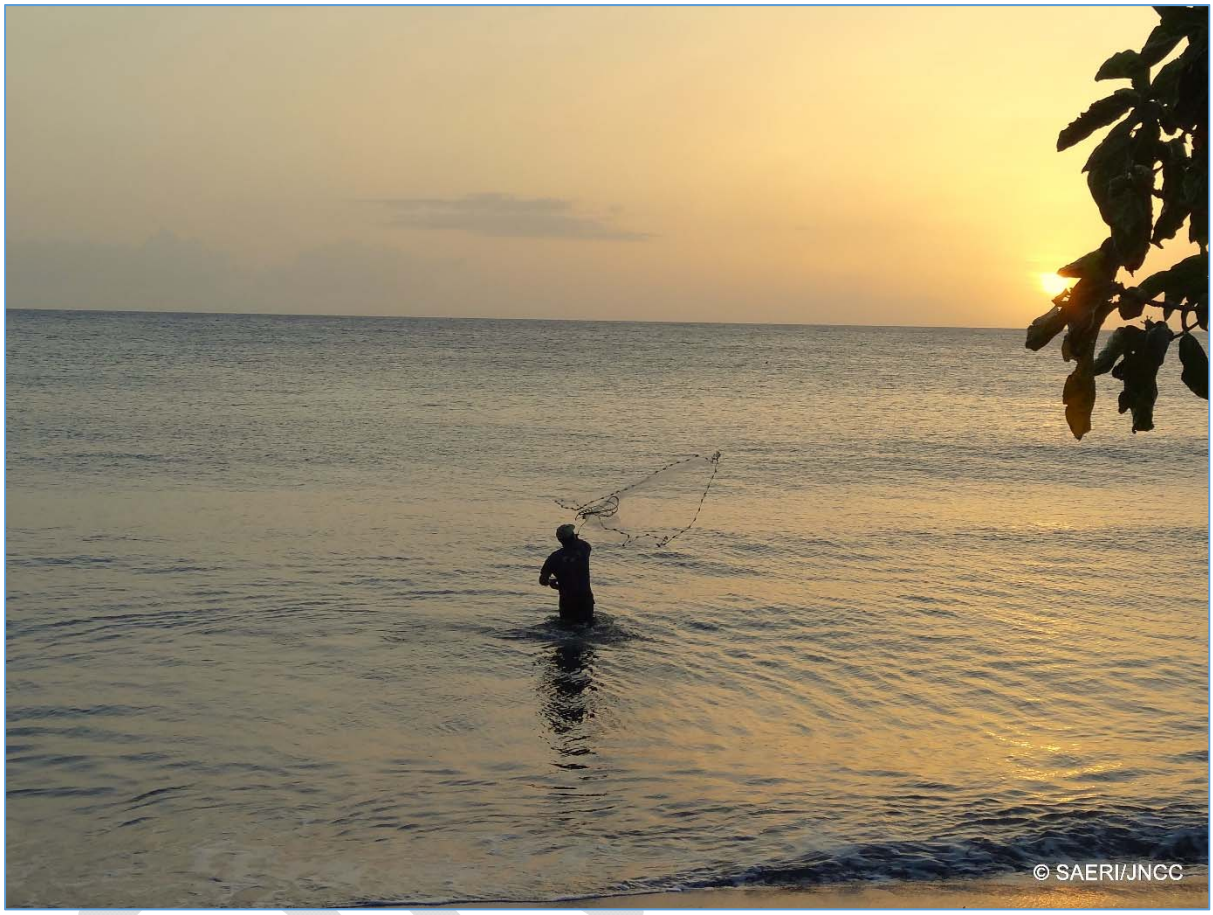


Figure 1. Evening recreational fishing for baitfish at Isle's Bay

Situated within the Department of Agriculture is the Fisheries Unit. The Unit currently consists of the Chief Fisheries and Ocean Governance Officer (FOGO) and two Data Collectors (DC). The FOGO reports to the Director of Agriculture. The DCs report to the Fisheries Assistant, which was vacant at the time of writing this report. A new position of Fisheries Officer has been created and is currently vacant. The job descriptions of each role and organisation and flow of decision-making is presented in Appendix 2. The Fisheries Unit operates under the Fisheries Act (revised 2013), as well as a number of related pieces of environmental legislation. These are currently under review by the Waitt Institute, and proposals for improved and better integrated legislation for fisheries and marine planning are currently in development. The fishery operates within the territorial waters, which share boundaries with three other Caribbean States. The key strategy document for the fishery is embedded within the larger Agriculture Strategy and Marketing Plan (ASMP) for Montserrat 2016-2021.

In addition to the current fishing fleet and gears used (pots, beach seine, bottom longlines, gill nets, trolling hand lines, spear fishing), the Department of Agriculture financially supported the

development of a FAD (Fish Aggregating Device) fishery in collaboration with the Fishers and Boaters Association. This project aims among other things, to relieve pressure on the reef fishery as well as provide fishers with a more consistent supply of higher-value fish product (Government of Montserrat 2016, Edwards et al 2017a). The program was proposed to be carried out for 2017-2019 with the possibility of extension of 5 years after review and evaluation during the first project cycle. At the time of writing this report, two of the three proposed FAD's had been deployed, with the first FAD being lost.

Montserrat has a number of legal obligations to gather and report fisheries data at the Caribbean regional level as well as to the International community. These are (extracted from *Guidelines for Improving Montserrat's Fisheries Data Management and Information Collection (Version 1)*, Government of Montserrat 2014*)*;

- The Agreement for the Implementation of the provision of the United Nations Law of the Sea (UNCLOS)), which specifies responsibilities for collecting and exchanging data necessary for stock assessment and policy development.
- The Code of Conduct for Responsible Fisheries (CCRF) which calls for use of the best scientific evidence available, bilateral and multilateral cooperation in research and data collection and dissemination.
- United Nations Fish Stocks Agreement (UNFSA) addressing directly the issues of responsibility of fishing nations in fisheries data collection and statistics.
- United Nations (UN) Conference on Environment and Development (UNCED) (Agenda 21). Chapter 17, which sets out the guidelines for Coastal States, where necessary, to improve their capacity to collect, analyse, assess and use information for sustainable use of the fisheries resources.
- The Agreement establishing the Caribbean Community Common Fisheries Policy calls on CARICOM Member States to accurately collect and compile fisheries catch, effort, biological, ecological, economic, social and other relevant fisheries data.
- Reporting to the International Commission for the Conservation of Atlantic Tunas (ICCAT). Coordinated through CRFM, Montserrat is a member of ICCAT by virtue of the UK membership.

2.5 AIMS OF THIS DOCUMENT

In 2016 JNCC facilitated a Territory to Territory Partnership between the GoM and Falkland Islands Government (FIG). This T2T Partnership aims to assist Montserrat in the development of data infrastructure to support spatial planning and technical support for fisheries management.

This project is part of the T2T Partnership framework, with delivery support from the Falkland Islands Government South Atlantic Environmental Research Institute (SAERI). It is funded by the OT CSSF Programme, 'Enhancing Economic Security through Environmental Resilience' in the Overseas Territories. This Programme aims to improve the Overseas Territories' long-term economic planning to support growth and diversification by embedding the role of the natural environment in economic and spatial planning through existing or new policies or legislation to protect and enhance the value of the vital natural capital.

There are currently several streams of data, review and advice feeding into the development of Montserrat's fishery (see Section 3), coming from various organisations with specific areas of

expertise. The over-all aim of this project is to provide a consolidated view of these, and to develop a strategy for implementation of advice and protocols by the Government of Montserrat. This strategy will focus on fisheries related data streams and management of current and new data. Other areas such as the GoM's re-drafting of their legal and policy framework will be touched on as they relate to providing the tools for improved fisheries data collection and other information required for an assessment of sustainability.

Specifically, the aims of this document are;

- *To summarise the strengths of the current data collection programs*
- *To document the new developing programs for data collection and supporting legal and policy frameworks*
- *To carry out a gap analysis of data collection and supporting processes, and identify key areas of development required for fishery sustainability evaluation.*
- *To provide a 5-year strategy for filling identified gaps and integrating data streams.*

By meeting the targets of the proposed strategy, the GoM will be able to assess fishery sustainability in a more robust, modern way. This strategy will also provide the tools for the GoM to report with confidence, the required local, regional and international fisheries data reporting obligations.

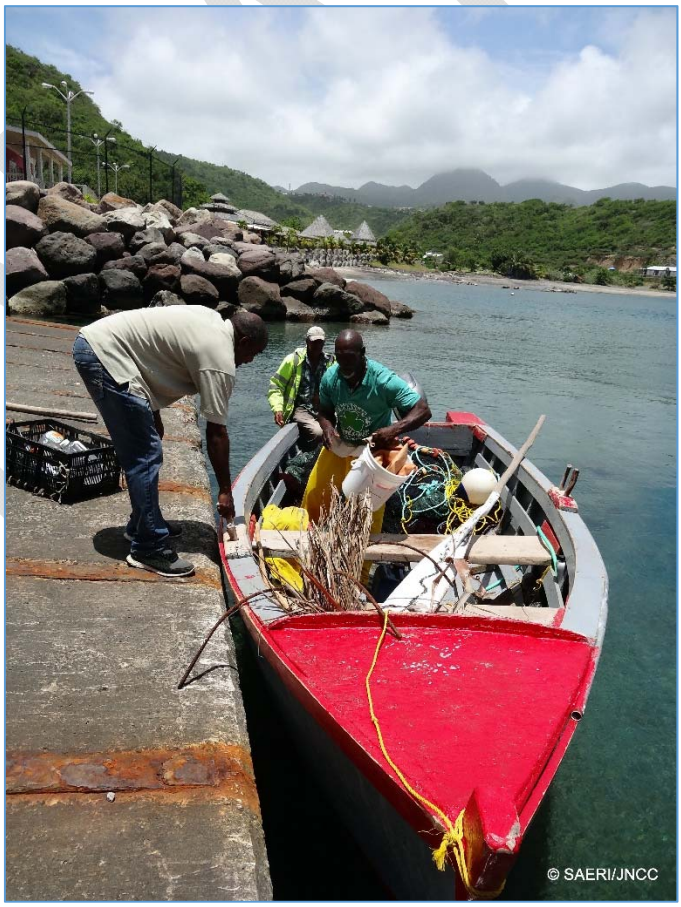


Figure 2. Landing fish catch at Little Bay

3 METHODS

3.1 MEASURES OF A SUSTAINABLE FISHERY

There are numerous standards for determining sustainability of a fishery, however most share similar principles in which those criteria are based. The Marine Stewardship Council (MSC) standard for sustainability is a widely recognised sustainability standard under which both small local fisheries as well as large commercial fisheries are currently certified. Here, we broadly align with the MSC standard as guidance for developing sustainability measures in Montserrat.

Essential data, management tools, and processes required for an evaluation of sustainability of Montserrat's fishery fall under the following three areas;

TARGETED STOCK

- Is catch and effort monitored?
- Is biological data collected?
- Is there sufficient data to support an assessment of the biomass, production, and structure of the target stock?
- Is uncertainty identified and accounted for in the harvest strategy?
- If stocks are low, is there a rebuilding program in place?
- Are there regulations for fishing effort? E.g. number of vessels, catch limits, spatial/ temporal management, gear restrictions?
- Is there a biologically-based management decision tree?
- Is there external review of the harvest strategy?

SPECIES, HABITATS AND ECOSYSTEMS

- Is there fish by-catch? If so, how is it managed?
- Are ETP (Endangered, Threatened, and Protected) species impacted by fishing? If so, are these monitored?
- Does fishing impact on benthic species and habitats? Are these impacts monitored?
- Is fishing, fish removal, or impacts on habitats affecting ecological processes such as trophic links (e.g. grazing, predator-prey interactions, keystone species)?
- Is there any residual impact of the fishery, including waste management?

LEGAL, POLICY, MANAGEMENT FRAMEWORKS

- Is there a legal framework for managing the fishery?
- Is the fishery management consistent with fishery legislation?
- Are there clearly defined management goals and a management strategy?
- Is there a policy-level principle for acceptable levels of exploitation?
- Are there compliance monitoring and enforcement tools?
- Are there incentives or disincentives for sustainable fishing?

- Is there a mechanism for dispute resolution and judicial review?
- Are fundamental human rights and property rights protected?
- Is there transparency in the management of the fishery? Is there a consultation process?
- Is there a research and management plan? Is there are review process for these?

3.2 KEY PEOPLE AND STAKEHOLDERS

A period of three weeks was spent in Montserrat, hosted by the Department of Agriculture's Fisheries and Ocean Governance Manager, Alwyn Ponteen. A work space and internet was provided in the fisheries office; an air-conditioned office in the GoM's fisheries market complex. This office has historically served as a base for the DCs, and now is the office of Mr Ponteen and his team.

Government of Montserrat

Hon. Claude Hogan – Former Minister of Agriculture, Trade, Housing, Lands, and Environment
Ms Melissa O'Garro - Director of the Department of Agriculture
Mr Alwyn Ponteen – Chief Fisheries and Ocean Governance Manager
Mrs Lyandra Lee and Mr Javiere Adams - Fisheries DCs
Mrs Laverne Rogers-Ryan – GIS – Dep of Ag - Physical Planning
Mr Dyonne Duberry – Department of Agriculture – Data Manager

Montserrat Fishers and Boaters Association

Mr Sheldon Carty – President
Individual Fishers

Regional Fisheries Organisations

Mrs June Masters – CRFM Statistics and Information Analyst.
Mr David Robin – Ocean Governance & Fisheries Coordinator - OECS Commission – Ocean Governance and Fisheries Unit.
Terrence Phillips – Senior Technical Officer, CANARI
Vernel Nicholls Chairperson – Caribbean Network of Fisherfolk Organisation (CNFO)

Non-Governmental Organisations

Ms Marisa Sorrel - Coral Cay
Ms Robin Ramdeen – Waitt Institute / Blue Halo
Ms Kathryn Mengerink – Waitt Institute
Mr Patrick McConney – Senior Lecturer, UWI-CERMES

Academic Institutions

Dr Sarah Lester – Sustainable Fisheries Group, University of California Santa Barbara
Ms Lennon Thomas - Sustainable Fisheries Group, University of California Santa Barbara

Montserrat National Trust

Mrs Sarita Francis - Executive Director

Tourism

Montserrat Tourist Board

Mr & Mrs Jay and Charly Steed – Montserrat Island Diver Centre

Mr Andrew Myers – Scuba Montserrat

Ms Vita Wade – Aquamontserrat

3.3 KEY DOCUMENTS REVIEWED

The bibliography of all documents reviewed and cited references in this Strategy are found in Appendix 3. Every effort was made to review final versions of documents however, is some instances only drafts were provided or found. All documents can be obtained from the Government of Montserrat Fisheries Unit.

3.4 PROJECT OVERSIGHT

This strategy has been developed by the South Atlantic Environment Institute (SAERI) and the Joint Nature Conservation Committee (JNCC) through a partnership with the Government of Montserrat. The project was monitored through a steering committee made up of the aforementioned members, meeting via skype fortnightly. This strategy is an output from a larger Fisheries data management project.

4 OBSERVATIONS AND GAP ANALYSIS

Below is a summary of observations made during this study. They are sub-divided into those areas of fishery Sustainability Measures identified in the Methods. 3. A gap analysis is then made in consideration of those programs that are currently in place for improvement of management of the fishery. An assessment of residual gaps is then done, of which will form the basis for the ongoing 5-year strategy.

4.1 TARGETED STOCK

4.1.1 Data collection

Current activity

There are currently two GoM Fisheries DCs. This is a non-technical role, with emphasis on working directly with fisher activity and is customer oriented. Their Job Description (Annex 1) outlines their roles as (in summary);

1. Daily data collection (catch, effort, biological) and assist with inputting into the database.
2. Assist with cutting of meat and fish and equipment maintenance, and collect revenue
3. Assist with fisheries stores, turtle surveys, and managing sand and aggregate on beaches.
4. Supervise the cleaner and other temporary hired staff.
5. Required to 'be able to at a quick look to estimate catches based on species and weight of each species'. Must be able to verify information coming from fishers.
6. Must determine when to do actual weigh-ins to as opposed to estimations, to verify visual estimates.
7. Submit oral and written (monthly, quarterly) reports.
8. Must be prepared to work weekends and nights.
9. Must have a driver's licence.

Some of these tasks are not current to the needs of the Fisheries Unit, such as processing of meat and fish and managing revenue, and as such are no longer carried out by the DCs.

DCs have an air-conditioned office, individual laptops, a single desktop PC for email. DCs generally keep regular weekday hours (8am – 4pm) and sign in to a log-book daily. DCs do not have a vehicle for visiting landing sites, and rely on fishers to arrive at the fisheries offices or meeting at other locations. DCs do not work on weekends. No biological data is currently collected by DCs. DCs enter data and fill out daily log books.

There is no plan for data collection specifically for FAD fishery operations; data collection will be as is conducted for other fisheries.

Current gaps

There are serious deficiencies in the current system of data collection. It is unclear what the exact proportion of total fishing effort is monitored by DCs, but based on previous studies (e.g. OCTA, 2017), preliminary studies using iVMS (Edwards et al 2017b), Value chain studies (Fraga 2017) and personal observations by the consultants (SAERI / JNCC) the overwhelming perception is that most landing events are not captured. There are fishers who do not land catch at Little Bay, but rather Isles Bay and these landings are not represented in the database. Over 50% (Fraga 2017) of fishers do not fish full time, but have full-time employment elsewhere in other sectors. As such, landings made in early morning, evenings and weekends are not being monitored by DCs who work 8am-4pm Monday to Friday. Further, when data is collected, DCs are only required to make estimates of catch routinely and periodically confirm estimation through measuring catch.

Of concern is that these deficiencies have been identified many times in past reports. To highlight a few;

- *Developing Fishery Data Collection Systems for eastern Caribbean Islands (Mahon, 1991).* To meet an identified priority for fishery data collection, a data collection program was designed for Montserrat, including use of total censusing of catches across 90-95% of landed catch and a sampling program, and the use of purchase slips from retailers for unobserved landed catch.
- *Draft Fisheries Management Plan (GoM, 2006)* Action Plan to address Key Issues i) Inadequate data Monitoring systems, ii) Insufficient information on fishery resource status, iii) lack of data on fisheries costs/revenues.
- *Review of the Data Collection and Management Systems of the Marine Fisheries in Montserrat (Medley, 2008).* Section 5: Recommended Data Collection, including i) recoding of landings by species, ii) estimates of CPUE, iii) estimates of sampling error, iv) directly measure catch rather than estimate weight, v) biological sampling.
- *Diagnostic and Analytical Review of the Environmental Governance Systems of Montserrat (CaribInvest (West Indies) Limited, 2012) "*A general constraint identified by stakeholders which is impacting on their ability to manage Montserrat's coastal and marine resources is the paucity of information on and about the resources. The collection of more baseline data on the country's coast and marine resource is therefore needed."
- *Reconstruction of the total marine fisheries catches for Montserrat (Ramdeen et al, 2012).* Identified large under-reporting of fish catches.
- *Montserrat: Marine and Fisheries Sectors (Association of the Overseas Countries and Territories (OCTA), 2017)*. Executive Summary: i) The fisheries data collection and analyse needs to be greatly improved, ii) data-collection staff do not normally work on weekends when the fishers are most active, iii) "The present system of data recording…… is archaic, labour intensive and time consuming and leaves too much room for errors……", iv) DCs must collect length and weight frequency data.

Despite these reports highlighting both the importance of high quality and comprehensive data collection and the current deficiencies, there is little evidence to suggest that data collection protocols have improved.

Collection of biological data is a requirement of the DC's job role however, there is no protocol for biological data collection and none is currently regularly collected. A recent fisheries assessment was conducted using newly collected fisheries dependant and independent survey data (Waitt/Blue Halo and the Sustainable Fisheries Group, 2016). Using length-frequency data, length-based assessment techniques for data poor fisheries, and ecological/biological characteristics from other regions of the Caribbean, they found indications of over-fishing in some reef species. However, long-term and more comprehensive datasets are required to more fully understand patterns of abundance, size/age structure and ecology of the fished populations. Without improvements in the frequency, quality and spectrum of fisheries data, it would not be possible to have confidence in any assessment of sustainability for these fisheries.

With respect to the trial FAD fishery, although the proposal for FAD fishing suggests that performance will be evaluated in the second year, there is no data collection protocol proposed, or description of metrics for such an evaluation. Additionally, there is currently no science or management plan for the FAD fishery in general. It is noted that at the time of this writing this report, there was no regular FAD based catch being landed therefore it may be too early to have developed a robust data collection protocol for FAD fishing.

Current improvement plans

The GoM in partnership with JNCC and SAERI, have supported a fishery data collection workshop, demonstrating a variety of fishery-dependant and independent data types and methods of collection. Both DCs attended and participated in the full workshop. The DCs have been issued with an iPad and trained to in using a bespoke 'CatchApp' for data collection at the site of landing. This is integrated with the iVMS unit testing; both CatchApp and iVMS are developed by Succorfish. Digital hanging scales have been issued to the DCs for more accurate measurements that can be taken regularly. Fish baskets have been purchased for ease of sorting catch at the point of landing. Measuring boards have been purchased for length measurements. Electronic balances have been purchased for weight measurements.

Figure 3. Fisheries Unit measuring boards

In addition to the current recruitment of a Fisheries Assistant, recruitment to fill a new role of Fisheries Officer is underway. The Fisheries Officer's role is to ensure implementation of fisheries laws, policies and programs, manage over-all data collections, data entry, and quality control. The new position will be line-managed by the Fisheries and Oceans Governance Officer.The post is initially proposed for 4 years.

Residual gaps and solutions

As a result of the workshop and reports from Waitt/Blue Halo, the Fisheries Unit team as well as other GoM staff and fishers are now more aware of requirements to improved fisheries data collection. Critical next steps are to train the Fisheries Unit team to be able to proficiently collect such data, and develop the routines and protocols for DCs are still required. There is also a need for improved measuring of DC performance. These should be the first gaps to be addressed by the Fisheries Assistant and Fisheries Officer. Facilitating this may require several initiatives such as, better reconciliation of total fishing effort and numbers of DC observations, improved communication with DCs, fishers, and possibly the Port Authority. A schedule of data collection could be trialled; an example is found in Appendix 1.

Figure 4. Biological data collection training

The DC role is currently a non-technical role, where importance is placed on customer service. It is not clear when the DC job description was last reviewed, but there appear to be elements that

are outdated and other areas that need some modernisation, particularly in light of new training and desire of the GoM to enhance data collection and quality generally. Revised elements of the DC job description should include:

1. Consideration of the new level of science and engagement of the DC. In this respect, the job title could be changed to 'Fisheries Observer', which would then allow for alignment with international standards in data gathering.
2. Legislation and Policy should reflect the importance of the DC in the management of the fishery. Licence conditions should require fishers to facilitate good data collection, ideally through collaboration rather than enforcement.
3. The enhanced role includes more technical knowledge and responsibility for equipment and data reporting. The role should be revised to reflect this by requiring some technical background.
4. Essential attributes should include an eye for detail, a methodical approach, enthusiastic and problem-solving attitude, diplomatic approach to conflict, ability to work unsupervised at times.
5. Require a proven knowledge of basic software such as MS Office, supporting the enhanced reporting role of the DC.
6. Monitor compliance and be trained in some evidence gathering. This can be done in collaboration with the Police and/or Port Authority.
7. Flexibility in hours of work should be required.
8. Ability/willingness to occasionally work at sea for in situ observations of fishing practices.

The revised DC role may require a commensurate salary increase. This increased cost could be offset by not requiring set hours, but rather DCs could work on an hourly basis where they would be required to log in and out of work pre- and post-data collection and data entry sessions.

A DC manual should be produced, outlining the roles and responsibilities of the DC, as well as sample collection methods and species ID guide. This should include a checklist of data to collect for ease and speed of data collection process. With the issuing of new tools and protocols, the DCs should be able to collect the following at the minimum;

- Catch and effort data from all fishing trips including weight by species, date, area fished, number of traps pulled, and total soak time of traps and lines, number of hooks.
- Fishery-dependent random and non-random length and weight samples of all species
- Length frequency data.
- Collection of otoliths, sex/maturity.
- Inspect for any compliance requirements.
- Interview fishers for any arising fishing trends or issues.

The implementation and benefit of the CatchApp and iVMS technology would be maximised by ensuring corresponding landings data were accurate and comprehensive. Analysis of iVMS trials (Edwards et al 2017b) demonstrated that much of the iVMS data could not be used because no associated landings were recorded.

At present, Succorfish store iVMS and CatchApp data on behalf of the GoM. However, the long-term data support by Succorfish needs to be clarified and formalised. Portability or movement of their database to other data storage methods/groups needs to be made very clear if there is no long-term commitment from Succorfish. Data would then be accessed remotely or downloaded by the GoM for use locally. In this respect, a well-structured relational database should be developed for storage of fisheries data within the GoM. In parallel with this, there is a need for a data security policy, data access and back-up redundancy protocols. This may in part, be an area currently considered under a related program for broader data management improvements in the GoM.

One aim of the developing FAD fishery is to reduce impact of fishing on the reef. However, there is no plan for monitoring the FAD fishery at present, other than general data collection. It would be useful to design a FAD monitoring and science plan, such that metrics were designed detect reduced fishing on the reef or increased uptake of FAD fishing. In parallel with this there is a need to monitor impact on the reef, if any. The FAD fishery management plan would also include a schedule of regional and international reporting and communication of FAD fishing results, with the aim of knowledge exchange and improvement of FAD fishing in Montserrat.

4.1.2 Stock assessments

Current activity

There have been few stock assessments carried out on Montserrat's fisheries. Assessments are carried out on an ad hoc basis. Recent assessments were done in 2016 (Waitt, Sustainable Fisheries Group) and CRFM working group (2011). There is no immediate plan for the next stock assessments.

Current gaps

A robust, modern stock assessment or analysis of basic fishery biological trends cannot currently be undertaken on the basis of data quality and quantity collected by the Fisheries Unit. From follow-up conversations with S Lester and L Thomas (Sustainable Fisheries Group) during the Data Collection Workshop, an unpublished 'wish-list' of desirable data necessary for a more robust assessment was discussed, providing trends in catch, effort, and demographic patterns for monitoring (S Lester and L Thomas, pers. com.). These include;

a) Catch and effort data from all fishing trips that includes: landed weight by species, date, area fished, number of traps pulled, and total soak time of traps.
b) Fishery-dependent monthly length and weight samples of all species listed above.
c) Heat map of fishing activity in Montserrat's waters (from iVMS data).
d) Local (Montserrat) information on growth rates (von Bertalanffy parameters), age/length at maturity, longevity, and natural mortality for the following species (in order of priority):

1. squirrelfish (*Holocentrus adscensionis*)	2. blue tang (*Acanthurus coeruleus*)
3. doctorfish (*Acanthurus chirurgus*)	4. silk snapper (*Lutjanus vivanus*)
5. coney grouper (*Cephalopholis fulvus*)	6. mahogany snapper (*Lutjanus mahogani*)

7. lane snapper (*Lutjanus synargris*)	8. spotlight parrotfish (*Sparisoma viride*)
9. bar jack (*Caranx ruber*)	10. red hind (*Epinephelus guttatus*)
11.queen triggerfish (*Balistes vetula*)	

e) Benthic habitat data from 100 m shelf out to 3 nm offshore
f) High resolution bathymetry data from shore to 3 nm offshore, including habitat mapping.
g) Movement and home range for gar (tagging and/or genetic studies)

In addition to these, discards of fish at sea are not presently accounted for. The species and size range of discard species is necessary for estimating real-world impact of fishing on the target stock. It has been suggested that small under-sized fish are released. However, those species with swim bladders are unlikely to survive.

Current improvement plans

The GoM have engaged with external institutions to develop programs to improve data collection in most of these areas, meeting points a) to d) listed above. The Waitt Institute / Blue Hallo programs have completed an island–wide benthic habitat survey through diver observed surveys and drop-cam surveys. These data are available to the GoM through the SeaSketch web application. Addressing point f), there are plans for a UK Hydrographic Office lead survey for improvements of local and regional navigational charts that would necessarily be multibeam based. Once collection of these critical data begins, a more robust assessment can be considered.

Residual gaps and solutions

Given that the gar fishery is an important one for Montserrat*, it would be of benefit to have a management plan for this species. In addition to the aforementioned biological and demographic data, movement of gar in the region is necessary for accurate estimation of total extraction from this stock. This would require a programme in collaboration with neighbouring States, but could be co-ordinated through CRFM and their programme of annual meetings and working groups. Stock identification could start in a cost-effective way through regional analysis of size/age structure and reproductive patterns. On the basis of these analyses, decisions can be made about implementing a longer-term tagging and genetics program.

Estimating catch discards is still a gap in critical knowledge of fishing mortality for each species. To resolve this, DCs may need to make periodic trips to sea with fishers to collect quantitative data on special and temporal discard patters associated with different fishers and gear types. This would be a key role for the DC if their job description was re-evaluated as suggested above.

If the improvement programs for quality and scope of fisheries data collection are carried out, a plan for the next assessment period should be developed. The assessment would test the

***** Although thought to be important today, this fishery can be particularly labour intensive with few vessels currently fishing for gar. This fishery may become less important in the future, but consequently may put pressure on other fisheries.

quality and value of new data collection and a further gap analysis could be carried out for better refining data collection. At the time of this assessment, there should be better understanding of uncertainties in stock parameters; management decisions would then be informed by precautionary advice considers known and unknown uncertainties.

A suitable time would be five years from the initiation of the revised data collection program. Ideally this should go out to tender, with the aim of establishing a formal assessment document suitable for international review. This could be done through an MSC grant (https://www.msc.org/about-us/credibility/all-fisheries/global-fisheries-sustainability-fund), CRFM, Canadian-Caribbean Cooperation Fund, or other with suitable familiarity with the Montserrat situation.

4.1.3 Harvest Strategy

Current activity

There is no harvest strategy for any of Montserrat's fisheries. There were a set of Fisheries Regulations drafted in 2009 (Draft document supplied by A Ponteen) designed to support the Fisheries Act 2002 (revised 2013) that included a wide range of licence conditions and conservations measures for fisheries. For example, mesh sizes for fishing gears, and closed areas and seasons. None of these are currently in force however, fishers tend to use proposed mesh sizes as guidance for their own nets and traps, and are also used a basis for returning undersized catch.

A Marine Spatial Planning process is underway that includes among other things; proposed spatial closures and limited use areas with respect to fisheries. Delineation of these were proposed through stakeholder interviews and available habitat mapping. Conservation priorities have been proposed on the basis of precautionary need rather than an actual identified issue. There is a MSP Steering Committee, who recently voted on proposed options presented by Waitt / Blue Halo.

Current gaps

There is a statutory requirement for a Fisheries Plan under the Fisheries Act 2002 (revised 2013) and there is an incomplete draft available from 2006 structure on a CRFM template. This plan has not been finalised. Development of this critical document should be priority for the GoM; it will outline the strategic goals and level of precaution described in policy, describe management of the fishery, describe science and monitoring programs, advice from stock assessments, and perceived uncertainties in biology and ecology of the stocks. This Plan would also necessarily include the developing harvest control, biologically based decisions trees, and a schedule of internal and/or external review.

Current improvement plans

Fisheries Legislation and policy are currently being revised. These revisions may retain those statutory requirements contained in the Fisheries Act 2002 (revised 2013). New Legislation and

Policy will likely capture new modern concepts in fisheries management that will be integrated with broader marine spatial planning and ocean governance. Development of theses should reflect the improved data collection plans discussed above, and describe how these new data will be best used for long term ecological and economic sustainability of the fishery.

Residual gaps and solutions

Whether the Fishery Plan will continue to be a statutory requirement or not, there should be few residual gaps to developing a harvest strategy and publishing it in the Fishery Plan. This also assumes that critical data will be gathered in a robust and systematic way. Once drafted, the Fishery Plan should be reviewed via stakeholder consultation, including CRFM and other regional and international stakeholders.

4.2 SPECIES, HABITATS, ECOSYSTEMS

4.2.1 By-catch monitoring

Current activity

Montserrat's fisheries catch is generally mixed finfish caught with pots, sein netting for small pelagic fish (gar or ballyhoo), gill nets targeting inshore shoaling fish, single hook pelagic longlines, demersal multi-hook long-lines, bottom rod/handline fishing, pelagic trolling, or spearfishing. All fish catch is retained, generally. The only fish discarded are undersized catch, or those suspected risk of ciguatera poisoning. Discarded catch is currently not recorded (see above).

Current gaps

Better records of by-catch species, their numbers, weights, and sizes are necessary to fully evaluate wider ecological impacts.

Recording of bait species, their numbers, weights, sizes, biological data, and location of catch are needed. Questions that need resolving are 1) is the bait species stock impacted by fishing? 2) is the removal of bait species impacting other species or trophic links? 3) is there by-catch in the bait species fishery? It is thought that currently there is very low removals of bait fish (sprats or small gar) however, confirming the impact of bait fishing would benefit the over-all assessment of sustainability in the fishery.

Current improvement plans

Assuming DC tasks are enhanced there will be improved understanding of discarded catch. The system of data collection and monitoring should be such that the DCs will be able to detect if there are any changes in by-catch or discard patterns.

Residual gaps and solutions

There should be few residual gaps in data collection of fish by-catch. However, fishers should be consulted regarding taking DCs to sea occasionally. Monitoring of the use of bait species should be conducted by DCs, and reporting of the use of bait should be included in licencing legislation and policy.

4.2.2 Endangered, Threatened, Protected Species

Current activity

Caribbean reef sharks (*Carcharhinus perezi,* IUCN listed as 'Near Threatened') are caught regularly as by-catch, with catch weights ranging in the few hundred pounds per year. Sharks are not protected specifically in Montserrat however, Montserrat is signatory to the Convention on the Conservation of Migratory Species of Wild Animals through the Convention of Migratory Species of Wild Animals Act 2013.

Turtles are also caught occasionally. The Turtles Act 2002 bans the catch of turtles or possession of turtle product or turtle eggs between 01 June and 13 September.

Invertebrate by-catch such as conch and lobster is occasionally caught and retained, but other encrusting or mobile invertebrates are not reported.

There is no seabird or marine mammal by-catch in Montserrat's fisheries as far as we understand.

By-catches of turtles, sharks and conch are only sporadically reported. When by- catches are reported, they are entered in the database. Where a 'zero' daily catch is recorded in the database, this may mean that no information was available.

Current gaps

Better collection of shark, turtle and invertebrate by-catch is required particularly conch and lobster, and also including discarded by-catch. Although not in breach of the Convention of Migratory Species of Wild Animals Act 2013, Caribbean reef sharks are IUCN listed as "Near Threatened" with a "declining" population trend and as such efforts should be made to better understand their status in Montserrat. Turtles have been managed in Montserrat through a collection of eggs that are raised in a hatchery run by the Fisheries Division and it would be useful to know if this is contributing to turtle catch.

Current improvement plans

There will be enhanced data collection in the fishery, and these recording of these catches should be made part of the routine. Fishers should be encouraged to report all by-catch, including discarded sharks and turtles. This is for the benefit of conservation of the species, and not necessarily for compliance monitoring.

Residual gaps and solutions

The analysis of improved data collection of these species and groups may suggest the necessity for development of National Plans of Action or similar for management and protection of these groups. Given the past JNCC investment and current GoM investment into turtle monitoring, egg collection and hatching, and release, an assessment of the impact of the hatchery vs catch of turtles could be assessed. External funding can be sought to assist in this and the National Trust may be suitable partners to help facilitate such work. Alternatively, analysis may show there is no need for such a plan and if that is the case, then simple monitoring should continue as routine.

4.2.3 Habitats

Current activity

Waitt / Blue Halo have conducted the only recent reef survey of habitats and species with a habitat map produced. Surveys included both diver based transect surveys using standard methods, as well as drop-cam surveys deeper water. There is a plan for follow up second habitat survey. Blue Halo have carried out a survey of fishing/marine habitat values. Though consultation a set of conservation priorities have been mapped; these are based on a precautionary need rather than an actual identified issue. Coral Cay are a conservation diver organisation who have also conducted surveys, primarily directed at training divers for conservation work. Their data will be available for the GoM to support Marine Spatial Planning and other initiatives such as proposed UK Hydrographic surveys of local areas and JNCC supported habitat mapping.

Currently based in Montserrat, Blue Halo will be departing the islands in the near future Coral Cay will be leaving the island in2017.

In the pot fishery, floats and pots are often lost. This may be due to boats cutting float lines or bots being swept into deeper water, or other factors. There is concern that lost pots continue to catch fish after being lost (so called 'ghost fishing') and can damage the reef. Although there is no observed evidence for this, the fact that pots regularly go missing does mean that at least some damage to the reef as well as ghost fishing is likely a likely possibility.

Current gaps

There is no plan for continuation of monitoring work. The dive centre Island Divers have discussed taking over the Coral Cay diver training scholarship program and continuing with basic surveys. These surveys do not include deep areas of the target pot or long line fisheries, nor do they include pelagic fisheries. There is no monitoring plan for any proposed MSP proposals.

Current improvement plans

The GoM is currently developing a Marine Spatial Plan for Montserrat. At the time of writing this report, there was consensus from the MSP Steering Committee on a plan for spatial and

temporal management of fishing and other marine activities. This plan will next go through a public consultation process.

Residual gaps and solutions

There are no plans for filling above identified gaps in knowledge of impacts of fishing on the reef; developing a strategy for monitoring impacts of fishery on the reef habitats and species should be a priority. Impacts can be examined relatively easily and cost-effectively with the use of drop-cameras and enhanced DC duties. As MSP proposals develop, a management plan should be developed, including a monitoring program for determining efficacy of management tools, a science plan for filling knowledge gaps, and plan for regular review of management tools, and a budget. Can be facilitated through regional or international funding programs and partnerships.

4.2.4 Ecosystems

Current activity

Similar to other parts of the Caribbean, the invasive lionfish are present in Montserrat and are likely to be having an impact on the reef community and function by preying on juveniles and adults of many reef fish and invertebrate species. Fishers are encouraged to catch lionfish, although they are not able to target them specifically with the gears used. The GoM holds an annual lionfish competition and local restaurants are encouraged to promote lionfish on their menus.

In other parts of the Caribbean, it has been suggested that the removal of herbivorous fish, in particular parrotfish, are contributing to declines in coral diversity and health The removals of parrotfish in the Montserrat fishery have been identified as a potential conservation issue however, as yet there is no empirical data to support this.

There is an identified concern that sediment run-off derived from pyroclastic volcanic flows is negatively impacting the near shore reef ecosystem. The group Coral Cay has been conducting reef surveys on such impacted locations, and their data is available for further analysis.

Current MSP planning initiatives by the GoM have identified areas of temporal and spatial closures to fishing and other activities, aimed at habitat and fisheries conservation priorities, among other things. This process is currently in the consultation phase.

There is an impact of lost pots and pot floats. Pot floats are currently made from 'Clorox' bottles which quickly deteriorate in the sun, adding plastic to the ocean. Evidence of lost pots and floats in various states of deterioration can be seen on some beaches.

The Fisheries Act 2013 requires all commercial fishing vessels to be registered. This is currently being enforced by the GoM, with a staged approach to full fleet registration. Once this process is complete, there will be a similar approach to licencing of all fishers. Licences will include a set of licence conditions, including conditions regulating waste management (Ponteen pers com).

There is no fishing permitted in the exclusion zone, meaning that there is little data available to monitor recovery of these areas of reef.

Current gaps

There is no comprehensive plan for continued monitoring of the reef community. Given that the fishery by its nature removes many elements of the reef trophic chain, it is important to better understand the impacts of such removals on both the links between fish species and the impact on reef health. The role of parrotfish should be examined specifically.

Studies should include an assessment of the impact of lionfish on the reef. Although Coral Cay has produced some data on occurrence and size distribution, there is little information on other stock characteristics. Lionfish caught by Coral Cay are not permitted to be landed. This means that valuable biological data cannot be gathered, such as age, sex, maturity, stomach contents.

The GoM currently encourages fishers and restaurants to catch and consume lionfish however, there is no monitoring plan to provide efficacy of this program.

Monitoring of reef health should continue, with emphasis on areas within and outside areas impacted by sediment run-off. Monitoring should also include areas within the exclusion zone.

Figure 5. Registered fishing vessel showing vessel name and registration number

Current improvement plans

There are currently no plans to fill gaps in knowledge of effects of fishing on the reef ecosystem processes.

Residual gaps and solutions

Long-term monitoring programs should be established once MSP plans are finalised. The monitoring plan would integrate fishery dependant data with fish and reefs surveys for better understanding the reef ecosystem and dynamics in a holistic way.

The GoM could support fisheries through subsidies or other means, to use modern floats/buoys that would be more likely to be seen by oncoming vessels and have a much longer life while in use.

4.3 LEGAL, POLICY, MANAGEMENT FRAMEWORKS

Current activity

The primary strategy document for the GoM Department of Agriculture is the Agricultural Strategy and Marketing Plan (ASMP) for Montserrat 2016-2021. The primary purpose of this document is "to present a cohesive framework for a policy of food import substitution in Montserrat with a commitment to the exploration and development of niche market opportunities for selected commodities." This document set out the larger strategic goals of the Agriculture department including;

- Reduce Montserrat's dependence on imported fresh food
- Increase consumption of local food
- Explore and exploit niche market opportunities for local food products
- Expand production of processed food products
- Attract young people into agricultural production
- Apply more modern technologies to the sector as a whole
- Promote consumption of fresh food as a contributor to wellness

The Plan includes a SWOT analysis for Ocean Resources and Fisheries. These then form the basis for Key Results Areas (KRA) and subsequent work plans.

The Fisheries Act (2013) is the main legislation for the fishery, described as "AN ACT TO REVISE THE FISHERIES ACT AND TO MAKE PROVISION FOR THE PROMOTION, MANAGEMENT AND CONSERVATION OF FISHERIES AND FISHERIES RESOURCES AND FOR MATTERS CONNECTED THEREWITH." Among other things, this describes the statutory requirements for a Fisheries Advisory Committee, and a National Fisheries Plan. The Plan is to be reviewed by the Committee, presented to the Minister, and periodically reviewed. Copies are to be made available to the public at a reasonable cost, and proceeds are to go to the Environmental Fund.

Vessel registration is a legal requirement under the Fisheries Act (2013). Although it has historically not been enforced, registration is now being taken up by fishers with full fleet registration to be enforced soon. Once vessel registration is complete, a licence will be required for all fishers (also currently a legal requirement under the Act). This is being designed for fishers to carry with them while fishing. A set of licence conditions is being drafted.

There is a somewhat effective mechanism for GoM transparency in the fishery. Feedback and dissemination of information and development is currently through a strong word-of-mouth process. The Chief Fisheries Officer stays in regular contact with the fishers through the Boaters and Fishers and Boaters Association. There is a poorly utilised Fisheries website.

Current gaps

The ASMP was accepted with no funding attached to supporting its goals.

There is a statutory requirement for a Fisheries Management Plan (Fisheries Act 2013) however, this has yet to be completed and therefore exposing the GoM to a risk of litigation. CRFM has provided a template for Fisheries Management Plans in the Caribbean, and this has been utilised but not finalised in Montserrat.

Recreational fishing is not monitored or licenced.

There is poor uptake of new initiatives from vessels operating out of locations other than Little Bay, such as Isles Bay where fish is landed and sold in Salem.

Transparency in Fishery policy and management is not as fully developed as it could be. The fishers have expressed an interest in receiving more feedback from the GoM on their efforts to support data collection and sustainable fishing, especially as it is proposed that they do more than they currently do to support data collection, for example.

Current improvement plans

For fisheries related goals in the ASMP, funding has been sought externally (e.g. JNCC, Darwin+, Waitt, harbour development funds, EU BEST, CRFM), and there are some limited internal funds available. An application to DFID has been made for EC$6million, however this is still being evaluated by DFID.

Fishery and MSP Legislation and policy review and advice are currently being provided by Waitt. These are being drafted with the aim of providing modern legislation and policy for Fisheries and other marine based activities. A Fisheries and Oceans Governance Committee has been formed to guide this process.

With respect to developing iVMS programs, fishers will have online access to their own iVMS data once the system is up and running. This is a significant improvement in GoM transparency and fostering of fisher collaboration.

During the recent fisheries data workshop, a day was designated specifically for local fishers and stakeholders; and this was widely received as a positive and useful day of presentations and workshopping of ideas and management proposals.

Residual gaps and solutions

A Fisheries Management Plan is urgently required. A funding and implementation strategy needs to be produced supporting the Fisheries Management Plan. The statutory requirement

for a Plan may change after the Legislation Review is complete however, this is still an essential document that to guide fishery data collection, science and management.

The revised fisheries and MSP legislation should include a plan for enforcement, particularly as it relates to recording of vessels, issuing of licences, reporting of data, and monitoring and enforcement of closed/restricted fishing.

The Fishery Act and all its present and future statutory documents should be publicly available on the Fisheries website for download. Vessel registration and Licence applications should also be available on the website. Other feedback to fishers can be available, including monthly and annual statistics reports, new programs, announcements, etc. Fishers should be encouraged to check the Fisheries website regularly. If the internet is not accessible to some fishers, then the Fishers and Boaters Association Members can facilitate dissemination of information to its members. Some members expressed an interest in monthly fishery update meetings, presented by the GoM to discuss data, novel observations, or any other issues arising.

5 IMPLEMENTATION – 5 YEAR PLAN

A timeline for a 5 year implementation plan building on the actions identified in this strategy is outlined below:

5.1 YEAR 1: URGENT ACTIONS

Year 1		M 1	M2	M 3	M 4	M 5	M 6	M 7	M 8	M 9	M 10	M 11	M 12
Draft Harvest Strategy													
	Draft												
	Consultation												
	Publish on web												
Registration and Licencing													
	Registration of vessels												
	Draft Fishing licence												
	Licence Consultation												
	Implenation of licnece												
Draft Fishery Management Plan													
	Draft												
	Consultation												
	Publish on web												
Re-describe Data collector JD													
	Consultation												
	Advertise												
	Reccruitment												
Data collector Handbook													
Data storage and management													
Review Protocols													
Facility at Little Bay													
Develop MSP monitoring plans													
	Funding												

5.2 YEARS 2 - 4: ONGOING MONITORING

Year 2-4		Yr 2	Yr 3	Yr 4
Monitor catch reporting and stock				
	Gar w/CRFM			
Analysis of fisheries samples				
	Otoliths			
	Spatial analysis			
	Develop Stock			
	assessment models			
Inter-annual habitat/fisheries surveys				
	Lionfish survey			
	Reef/habitat survey			

5.3 YEAR 5: REVIEW

Year 5		Q1	Q2	Q3	Q4
Stock Asessment					
	Tender				
	Complete				
Fishries Rewiew					
	Tender				
	Review				
MSP review					
	Tender				
	Review				
Revised Fishery Management Plan					

6 LOGICAL FRAMEWORK

Link to Gant charts
Year 1
Year 2 - 4
Year 5

Data Integration Strategy to Support Sustainable Fisheries in Montserrat

Sustainability Measure		Residual Gap	Proposed Action	Means of Verification	Indicator of success	Funding Plan
1. Target Stock						
1.1 Data collection	a)	Revise and updated fisheries managers and Data Collector Job description	Re-describe Data Collector Job Description. Re-name to Scientific Fisheries Observer.	When complete.	When complete.	GoM. May increase DC pay level, but will also have reduced hours.
	b)	Produce Data Collector Manual	GoM/JNCC/SAERI to produce a set of protocols, code of conduct, and guide for DCs	When complete.	When tested.	GoM/JNCC/SAERI
	c)	Train Data Collectors	External person to provide training	DC demonstrate good knowledge of techniques.	A 'pass' given by the Chief FOGO and recorded in the DC logbook.	SAERI/JNCC to support
	d)	Implement data collection schedule	Link with Port Authority and Fishers to communicate fishing activity. iVMS link to mobile phone and/or email alerts. Provide vehicle, or compensation for use of private vehicles.	Compare Data Collector Log book entries and entered data with Port Authority records and iVMS	Target of 90% of all fishing activity to be monitored	GoM
	e)	Construction of DC facilities at Little Bay	Concrete bench with secure storage beneath. Seawater supply. Shelter/shade.	When complete.	When complete.	GoM

Sustainability Measure		Residual Gap	Proposed Action	Means of Verification	Indicator of success	Funding Plan
	f)	Data entry and storage	Improved data entry via CatchAp or similar. Link to modern relational database.	Error checking and reports. Compare with logbooks	Smooth system of data collection, entry into database and ability to produce reports.	GoM/JNCC/SAERI
1.2 Stock Assessment	a)	Monitor quality and quantity of fisheries data.	Develop reporting procedures for monitoring Catch, Effort, Species, by-catch, etc.	Production of reports	Demonstrate feed-back to fishers.	GoM
	c)	Establish Otolith analysis process	Link with laboratory for analysis of otoliths. Develop schedule of numbers and species based on first 6 months sampling,	Production of reports	Feedback from stock assessment reports	GoM, T2T
	d)	Spatial analysis	Analysis of catch, effort, species, fleet behaviour.	Quarterly reports	Feedback and inform MSP and Compliance measures	GoM, T2T
	d)	Develop stock assessment models	Prepare for 5 yearly Assessment by conducting first pass analysis of data and test stock assessment approaches.	Report	Feed into full Assessment	GoM
	e)	Stock Assessment	Tender and carry out assessments on key indicator species. Link with CRFM to conduct Gar assessment.	Present assessment. Workshop gar data at CRFM	Implement changes in science gathering and management	GoM, External institutions, CRFM
1.3 Harvest Control Strategy	a)	Develop Harvest strategy	Harvest Strategy to align with Fisheries Management Plan, MSP regulations, and Licence Conditions.	When completed	Ongoing assessment	GoM

Sustainability Measure		Residual Gap	Proposed Action	Means of Verification	Indicator of success	Funding Plan
2 Species, Habitats, Ecosystems						
2.1 By-Catch monitoring	a)	Training of Data collectors to go to sea	Data Collectors to got to sea with Fishers for assessment of by-catch	Pass Health and Safety training, Sea Survival training.	Able to go to sea	GoM. Safety gear, including life jacket, sunglasses, sun block, water.
2.2 ETP Species	a)	Shark population assessment	To link with CRFM or other institution for improved assessment of shark and shark by-catch	Initiate shark monitoring program	Annual report on Shark catch	GoM and National Trust
	b)	Turtle population assessment	To link with CRFM or other institution for improved assessment of turtle and turtle by-catch	Improve turtle monitoring program	Annual report on turtle catch and other activities catch	GoM and National Trust
2.3 Habitats	a)	Training of Data collectors to go to sea	Data Collectors to got to sea with Fishers for assessment of impacts of pot fishing on the reef	Pass Health and Safety training	Able to go to sea	GoM. Safety gear, including life jacket, sunglasses, sun block, water.
	b)	Alternative pot fishing gear	Support Fishers to develop alternatives to current pot design. Break-away design, biodegradable. Use of modern floats/buoys.	Link to licence conditions	100% uptake of new pot design	GoM and Fishers Association
	c)	Habitat surveys	Propose and carry out drop-cam surveys designed to detect impact of pot fishing and MSP spatial plan efficacy	Completion of survey	Analysis of data.	GoM + other institutions
2.4 Ecosystems	a)	Develop proposals for fish/reef and Lionfish surveys	Write proposals for inter-annual fish/reef surveys and lion fish surveys.	Submission of applications	Funding successful	GoM and other institutions
	b)	Inter-annual fish/reef surveys	Carry out surveys designed to detect impact of parrot fish removal on corals and MSP spatial plan efficacy	Completion of survey	Analysis of data.	GoM + other institutions

Sustainability Measure		Residual Gap	Proposed Action	Means of Verification	Indicator of success	Funding Plan
	c)	Inter-annual Lion fish surveys	Carry out surveys designed to detect impact of Lion fish the reef system and MSP spatial plan efficacy	Completion of survey	Analysis of data.	GoM + other institutions
3 Legal, Policy, Management						
3.1 Fishery Management Plan	a)	Draft Fishery Management plan	Overview of the fishery, Conservation Measures, stock assessment etc.	Complete draft	Complete draft	GoM
	b)	Issue Licences conditions	Fishers to be licenced with a set of conditions described in the Harvest Control	Completion of licence and conditions	100% Fisher's licenced	GoM
	c)	Fisheries Review	At the end of Year 4, look to tender for a review of the fishery	Completion of review	Feedback into Fisheries and MSP	GoM
	d)	MSP Review	Multi-department assessment of MSP, efficacy of tools, etc	Completion of review	Feedback into Fisheries and MSP	GoM

APPENDIX 1: DATA COLLECTOR SCHEDULE PROPOSAL

Assumptions

- 2 x Data Collectors with revised job descriptions – working hourly.
- 1 x Fisheries Assistant working regular hours.
- Observer alerted to vessel going and coming via email or text alert from iVMS geo-fence.
- Fishers able to assist to help facilitate sample processing.
- Schedule has flexibility and can be tuned to meet the needs of the GoM.

Data Collector 1	**Location = Little Bay**						
Task	**Sat**	**Sun**	**Mon**	**Teu**	**Wed**	**Thu**	**Fri**
Weigh Total catch Weigh species catch Gear type, effort, notes		Rotational Roster					
Standard tasks Sample for length-weight Otolith sex/maturity	2 people Rotational Roster		with Fisheries Assistant		with Fisheries Assistant		

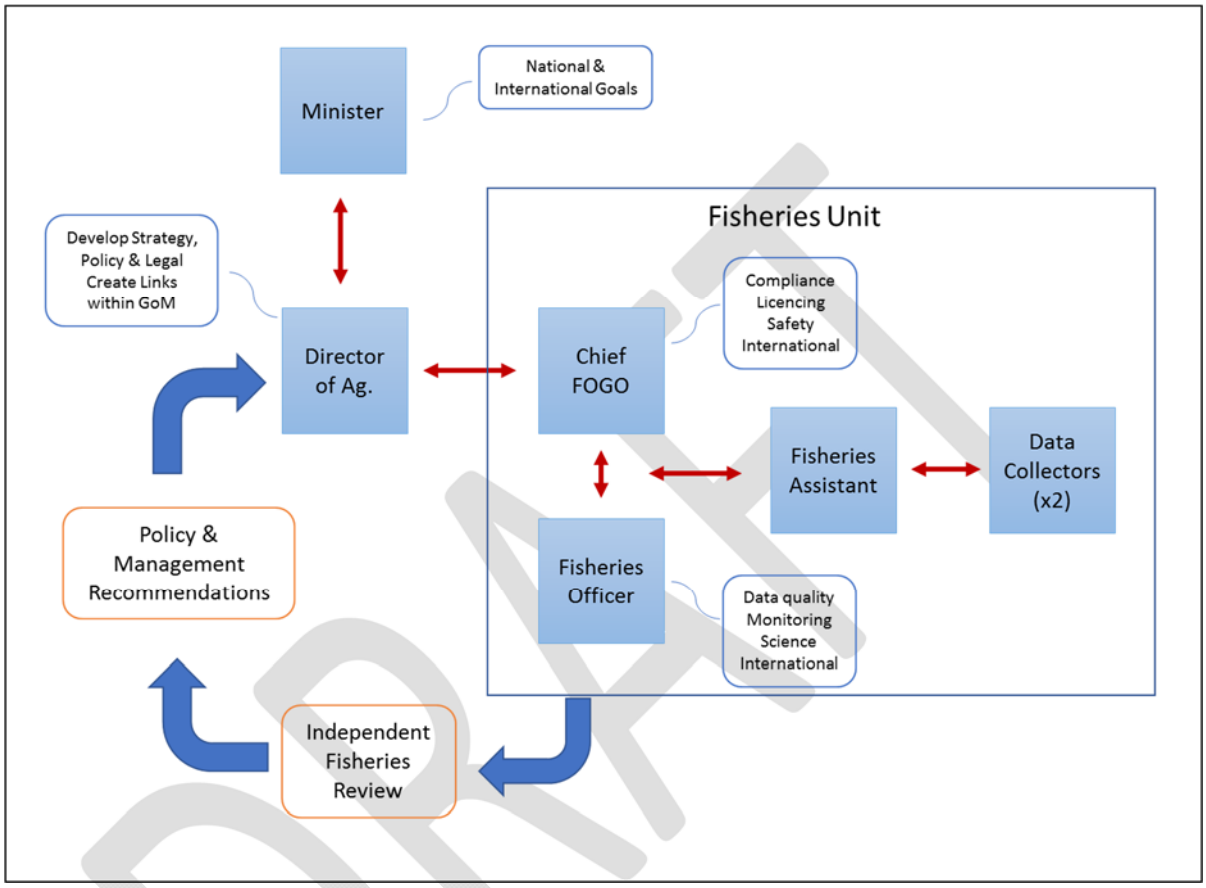
Data Collector 2	**Location = Ilse's Bay/other locations**						
Task	**Sat**	**Sun**	**Mon**	**Teu**	**Wed**	**Thu**	**Fri**
Weigh Total catch Weigh species catch Gear type, effort, notes	Rotational Roster						
Standard tasks Sample for length-weight Otolith sex/maturity		2 people Rotational Roster		with Fisheries Assistant		with Fisheries Assistant	

Fisheries Assistant	**Tasks**						
	Daily			**Monthly**			
Mornings	With Data collectors			Reports	QA		
	Sample Processing				Monthly meeting with Fishers		
Afteroon	Data Entry			Equiptment servicing			
	Reporting			Calibration			

Data Collectors / Fisheries Assistant			**Tasks**				
Twice per month			Gear inspection				
Random allocation of Data collector to Vessel.			By-catch reporting				
			Safty Gear inspection				
			Licence / registration inspection				

APPENDIX 2: JOB DESCRIPTIONS (AS AT SEPT 2017)

Assumed roles and workflows between members of the Fisheries Unit. Job descriptions for the Fishery Unit are also presented.



[To be inserted at the time of PDF'ing]

1. Data Collector JD
2. Fisheries Assistant JD
3. Fisheries Officer JD
4. Chief Fisheries Officer JD

APPENDIX 3: BIBLIOGRAPHY

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