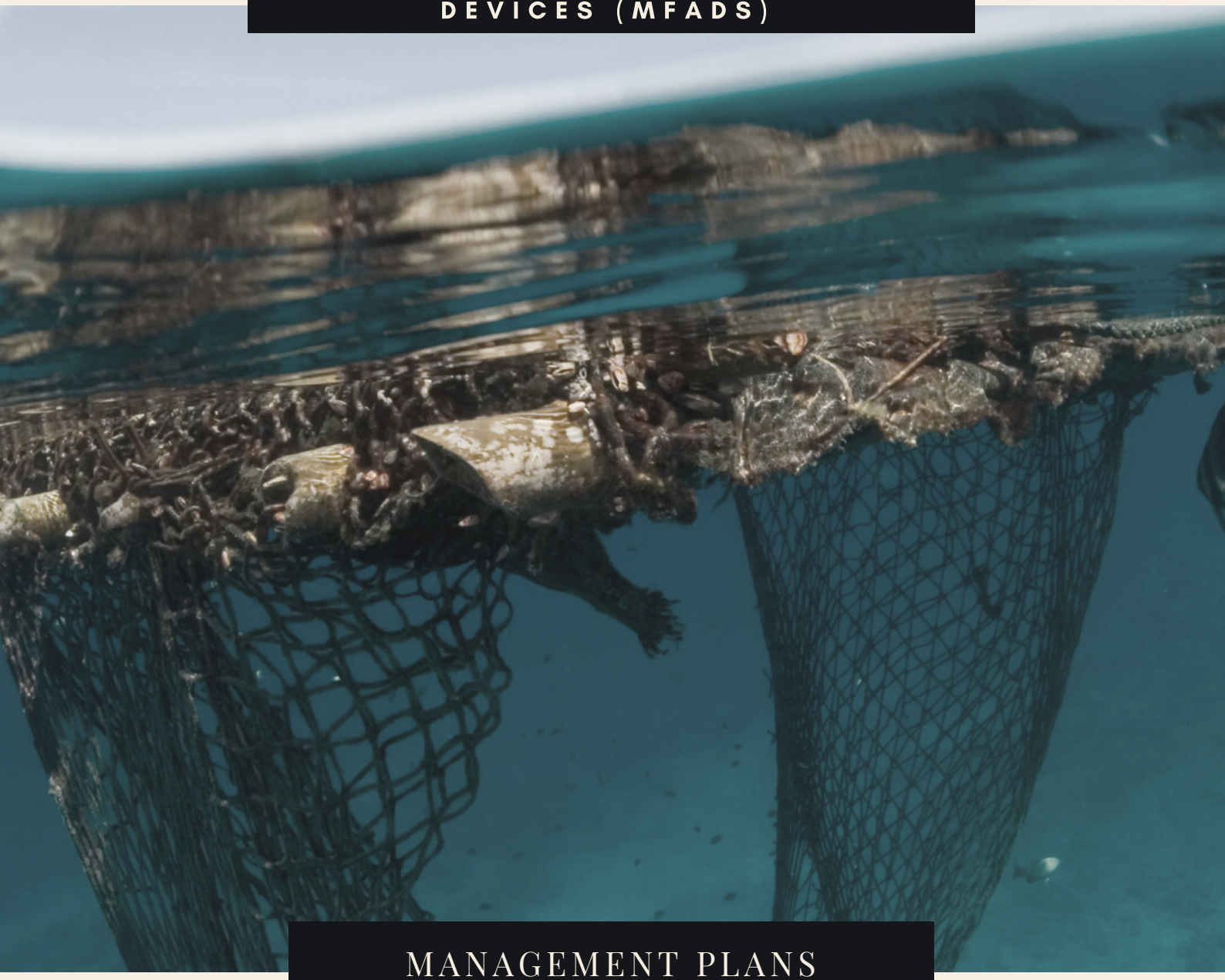
Food and Agriculture Organization of the United Nations

WECAFC HIGH RES LOGO

GUIDE FOR THE DEVELOPMENT OF

MFADs

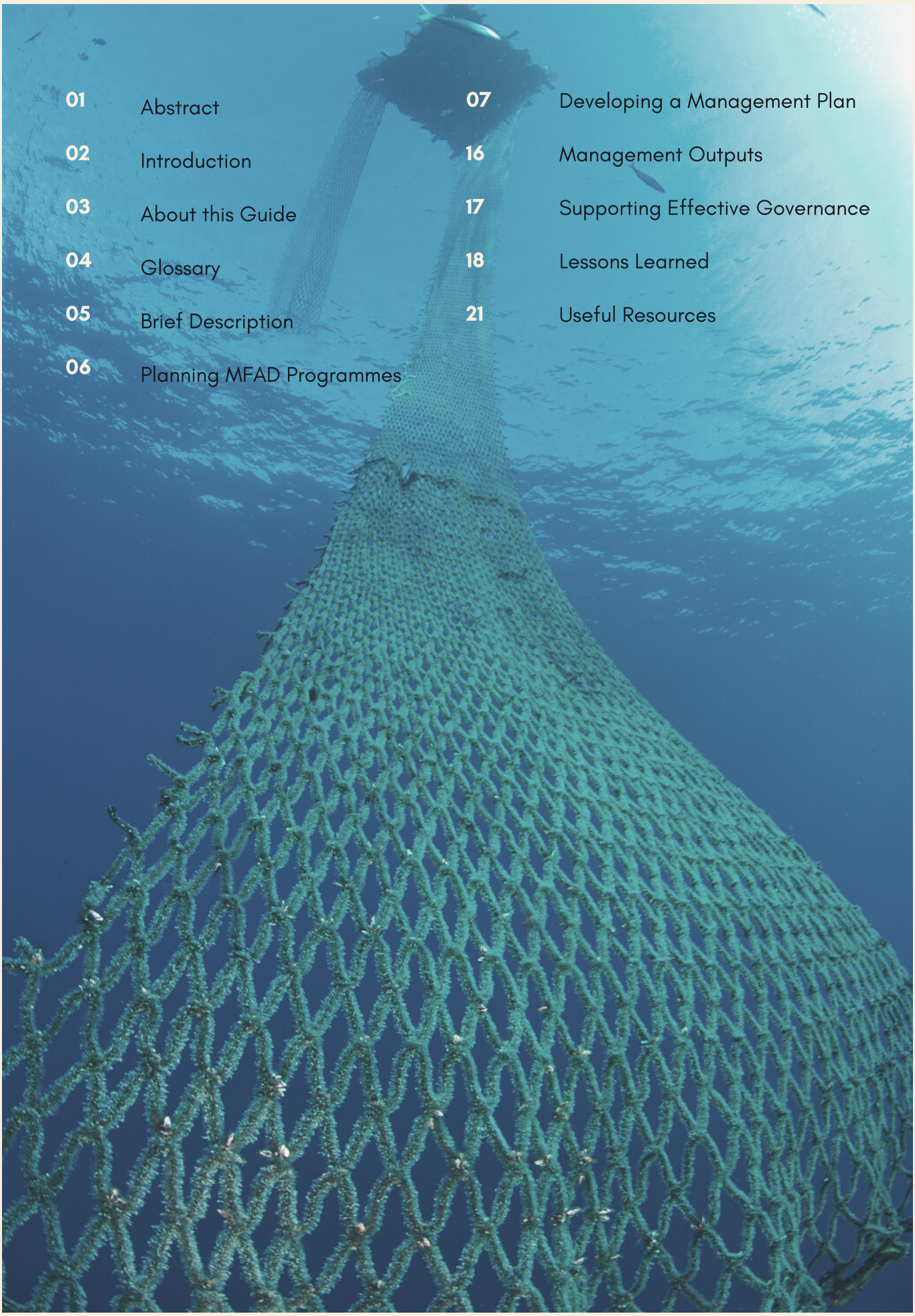
MOORED FISH AGGREGATING DEVICES (MFADS)



MANAGEMENT PLANS

November 2021

TABLE OF CONTENTS



ABSTRACT

The increased promotion of the use of moored fish aggregating devices (MFADs) in the Caribbean has warranted the need for management plans that promote interactive governance and the Ecosystem Approach to Fisheries (EAF). The lack of management may degrade potential MFAD benefits and increase risk of negative social and ecological outcomes. In an effort to promote the sustainability of fisheries using MFADS in the WECAFC area, the development of a guide was recommended by the WECAFC MFAD Working Group, to support the development of MFADs management plans and their governance. This guide outlines a four-step process of developing MFAD fisheries management plans that promote the practical application of EAF. For each step, key activities and main outputs are outlined as well as recommended tools and considerations for implementation. Guidance and strategies for supporting effective governance are presented. The penultimate section of the guide details lessons learned to promote social learning and adaptive management. The guide ends with a comprehensive list of useful resources.

CITATION: Vallès, H. and S-A. Cox. 2021. Guide for the development of moored fish aggregating devices (MFADs) management plans. Western Central Atlantic Fishery Commission (WECAFC) Working Document. 25pp

INTRODUCTION

The use of MFADs has greatly increased in the Caribbean region in recent decades. As these fisheries continue to expand and be actively promoted, it is critical that we recognise their current extent and understand potential positive and negative social and environmental outcomes. The lack of management plagues MFAD fisheries across the region and threatens the optimization of social and environmental outcomes.

The WECAFC Secretariat is currently executing an EU-funded project aimed at improving the management MFADs in the Wider Caribbean for the sustainability of fisherfolk livelihoods.

Project activities include updating the current state of knowledge about the MFAD fisheries in the region, including identifying the most pressing issues in need of management attention.

The creation of a guide was also recommended to support the development of MFADs management plans and their governance.

This document outlines the guide, which begins with a brief description on MFAD fisheries in the Caribbean. This introduction is followed by the four-step process of developing MFAD fisheries management plans that promote the practical application of EAF. For each step, key activities and main outputs are outlined as well as considerations for implementation.

Guidance and strategies for supporting effective governance are presented. The penultimate section of the guide details lessons learned to promote social learning and adaptive management. The guide ends with a comprehensive list of useful resources.

ABOUT THIS GUIDE

This document summarises key messages gathered from technical reports, academic publications, grey literature and survey responses to guide readers on best practices for the development of MFAD management plans and their governance.

The target audience of this guide is diverse, potentially including fisheries managers, resource users, researchers, policy makers, and parties interested in MFAD management and governance, and therefore encompassing both technical and nontechnical readers. Hence, the guide deliberately uses simplified technical language while making reference to technical sources for those interested in further reading.

The four main parts of a MFAD are used to correspond to the four main steps in the EAF planning process. This analogy is used to keep readers engaged and simplify key messages so that they can be easily understood .

The *Anchoring System* aligns with the first step '**Initiation and Planning**'. This step anchors the process and provides baseline information needed to inform decision making.

The *Main Line* corresponds with step 2, '**Identify and Prioritise Issues',** this aptly illustrates the main issues that need to be addressed by the management plan.

Aggregators, the main attraction of the MFAD, is related to the third step, '**Develop Management System**' which is an integral part of the EAF planning process.

The final step '**Implement and Monitor**', is creatively illustrated by *Buoys*, which is an indicator of the location of MFADs. This step entails monitoring the implementation of the management system using predetermined indicators.

GLOSSARY

In the sections that follow, specific terms are used to guide MFAD fishery managers and stakeholders through the four step EAF planning process. These terms are defined below:

Key Activities
Recommended actions to be taken by managers and stakeholders when developing a comprehensive management plan.

Main Outputs
The direct immediate term results associated with the implementation of key activities.

Considerations/recommendations
Suggestions and guidance notes that should be taken into account when weighing management options. These points highlight the ideal situation and provide targets that managers can aspire to achieve.

Interactive Governance
A theoretical perspective that emphasizes the governing roles of state, market and civil society.

The **Ecosystem Approach to Fisheries** (**EAF**), and other related concepts (e.g. **Ecosystem Based Management, EBM**), have developed in response to the need to implement, in a practical manner, the principles of sustainable development.

National Intersectoral Coordinating Mechanisms (NICs)
NICs are multi-level, multi-stakeholder organisational structures that facilitate effective governance through policy cycles.

BRIEF DESCRIPTION

MFAD FISHERIES IN THE CARIBBEAN

Moored FADs were first introduced in the Caribbean in the late 1960s, since then the number of reported MFADs deployed has grown to over 3500 (Figure 1), most of which are privately deployed (Wilson et al. 2020).

MFADs have become widely utilized by artisanal fishers in small, undecked fishing vessels, with the majority of catch sold for domestic consumption (CRFM 2015).

In 2001, the Western Central Atlantic Fisheries Commission (WECAFC) ad-hoc working group on the development of sustainable MFAD fishing, organized by the FAO in collaboration with IFREMER was established to serve as the primary regional forum for exchanging MFAD fishery updates and advances (FAO 2002).

Several programmes have played a key role in initiating and encouraging MFAD use in the Caribbean, including the French Research Institute for the Exploitation of the Sea (IFREMER)'s Moored Fish Aggregating Devices in the Lesser Antilles (MAGDALESA) program.

From 2013 to 2018 the Japanese International Cooperation Agency (JICA)'s Caribbean Fisheries Co-Management (CARIFICO) program focused on facilitating MFAD fisheries and cooperative management practices with a pending follow-up CARIFICO II.

Most recently in 2021, Barbados, Bermuda and Bonaire have begun the deployment of MFADs in an effort to support and improve fishers' livelihoods.

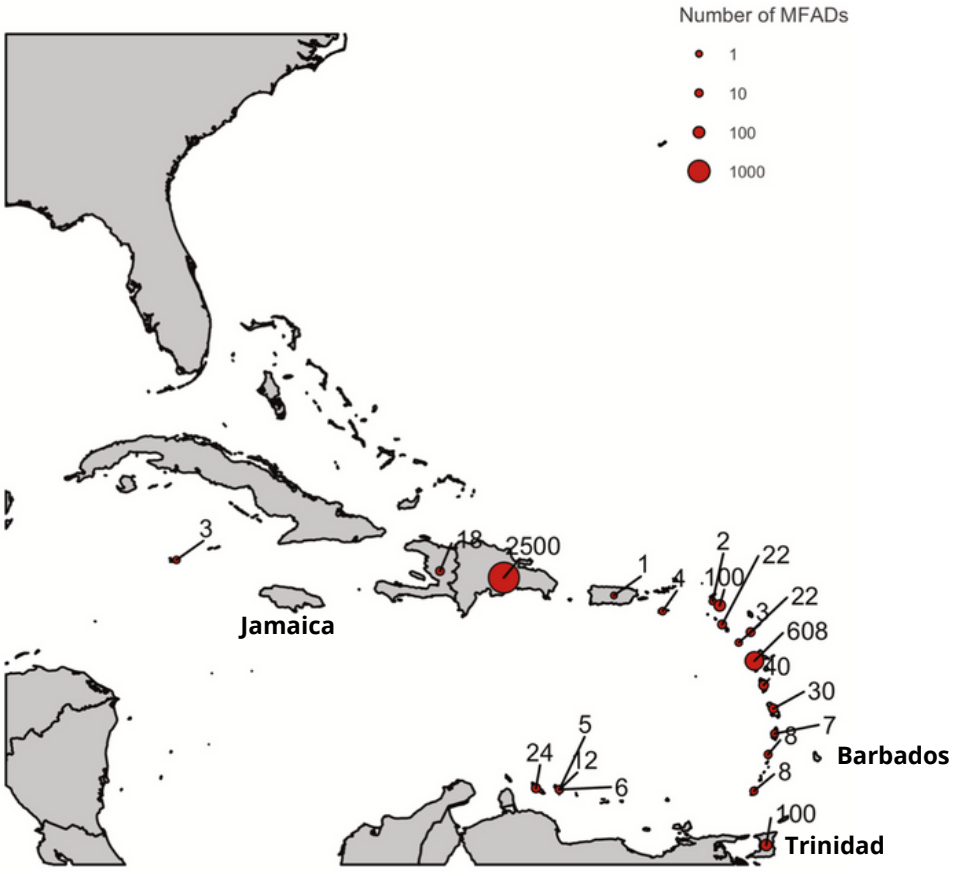


Figure 1: Map of current estimated numbers of MFADs in the insular Caribbean. Source: Wilson et al. 2020

PLANNING MFAD PROGRAMMES

CONSIDERATIONS BEFORE IMPLEMENTING A MFAD PROGRAMME

There are a few points to be taken into consideration before embarking on a MFAD programme. Familiarity with at least some of the basic information needs listed below is the first step in successful MFAD programme planning (Andersen and Grant 1996):

- Basic statistics relating to the make-up of the local fishing fleet, including vessel types, numbers, capabilities, and areas of operation;
- Knowledge of the fishing techniques and gear in use, and the costs and returns involved in existing local fishing efforts;
- An understanding of local market systems and opportunities, including the level of demand for fresh fish in urban and rural areas, existing distribution systems, and levels of imports and exports.

INFORMATION NEEDS CONTINUED

- Data on whether inshore marine resources are locally over-exploited or depleted, and, if so, to what degree and in what areas;
- Information on local pelagic fish resources, including abundance and seasonality;
- An assessment of the risks to safety that fishermen are currently facing.

RESOURCE NEEDS

- Human resources with project management skills;
- Sufficiently skilled manpower;
- Suitable survey and deployment vessels and equipment;
- Funds for seabed survey, FAD materials and deployment;
- Funds for maintenance and monitoring.

FAD PROGRAMME PLANNING/ IMPLEMENTATION CHECKLIST

The use of a programme checklist (Figure 2), can help in the planning process by ensuring that all the necessary stages of the programme are carried out and none are overlooked.

Read more here (**Page 44**)

MFAD PROGRAMME ANALYSIS

Quantifying the potential benefits and costs of a MFAD programme is important in determining success. It is necessary to estimate the changes in overall production that should result from the MFAD deployments.

Read more here (**Page 31**)

Needs assessment:	**Date**	**Reference**
Investigate extent of reef and demersal over-exploitation.		
Investigate market demand and supply.		
Assess need to alleviate conflict on fishing grounds.		
Site identification:		
Take into account presence and motivation of local fishermen and investigate customary ownership, etc.;		
Take into account availability of fishing boats and gear; and identify communal fishing practices and fishermen's organisations.		
Assess physical characteristics of possible sites (depth, currents, etc.).		
Assess distance from markets and state of transport systems.		
Financing requirements:		
Investigate and encourage availability of fishery loans and grants from development and commercial banks and Government for boats, engines and gear.		
Seek budget guidance from Government.		
Programme planning:		
Obtain necessary data to undertake cost-benefit analysis (costs of FADs, boats, gear, fuel, wages, measures of likely catch rates, fishing trip times, measures of interest and discount rates, opportunity cost of labour).		
Undertake cost-benefit analysis and prepare programme proposal in time for Government or donor budget cycle (Note: Governments have their own formats; most donor agencies require proposals in the Logical Framework format shown opposite).		
Programme implementation:		
Undertake detailed site surveys, particularly for depth and current; and take into account fishermen's views.		
Design appropriate FAD and mooring; buy materials and construct initial number of FADs. Encourage fishermen to participate.		
Deploy FADs and revisit early to ensure no immediate problems, and at regular intervals to ensure appropriate maintenance.		
Replace FADs lost as early as possible.		
Programme monitoring and evaluation:		
Undertake FAD catch, fishermen and market monitoring in addition to or in conjunction with Government statistical programmes. Use results to reassess cost-benefit analyses.		
Review relative operating efficiencies and security of deployed FADs with a view to new placements (as replacements or in subsequent phases).		
Improve FAD designs as appropriate to circumstances (wind, waves, location, fishermen's advice).		

Figure 2: FAD Programme Planning/Implementation Checklist. Source: Anderson and Gates 1996

DEVELOPING A PLAN

PROMOTING THE ECOSYSTEM APPROACH TO FISHERIES (EAF)

A MFAD programme should be integrated within a MFAD fishery management plan. The development of a comprehensive MFAD fishery management plan should align closely with the EAF planning process to ensure success.

The purpose of the EAF process is to develop and implement an integrated set of management arrangements for a fishery to generate more acceptable, sustainable, and beneficial community outcomes. EAF planning steps have been specifically developed to apply to the management of fisheries, with a special emphasis on the engagement of fishers and other fisheries stakeholders throughout the entire process.

The schematic below illustrates the four main steps in the EAF planning process and highlights the importance of consulting stakeholders and using the best available knowledge throughout the entire process.

A summary of key activities is outlined for each step to guide fisheries managers and stakeholders on charting the best way forward.

An implementation timeline is also included to illustrate the general length of time the entire process can take (5-10 years). The timeline clearly shows that this is not a process that should be rushed if successful outcomes are to be achieved.

The sections that follow, expand on each step of the EAF planning process and offer key actions and main outputs to support implementation. Useful resources are also outlined. For more guidance on planning and implementing EAF within Ecosystem Based Management (EBM) read Fanning et al. 2011 and visit the FAO EAF Toolbox.

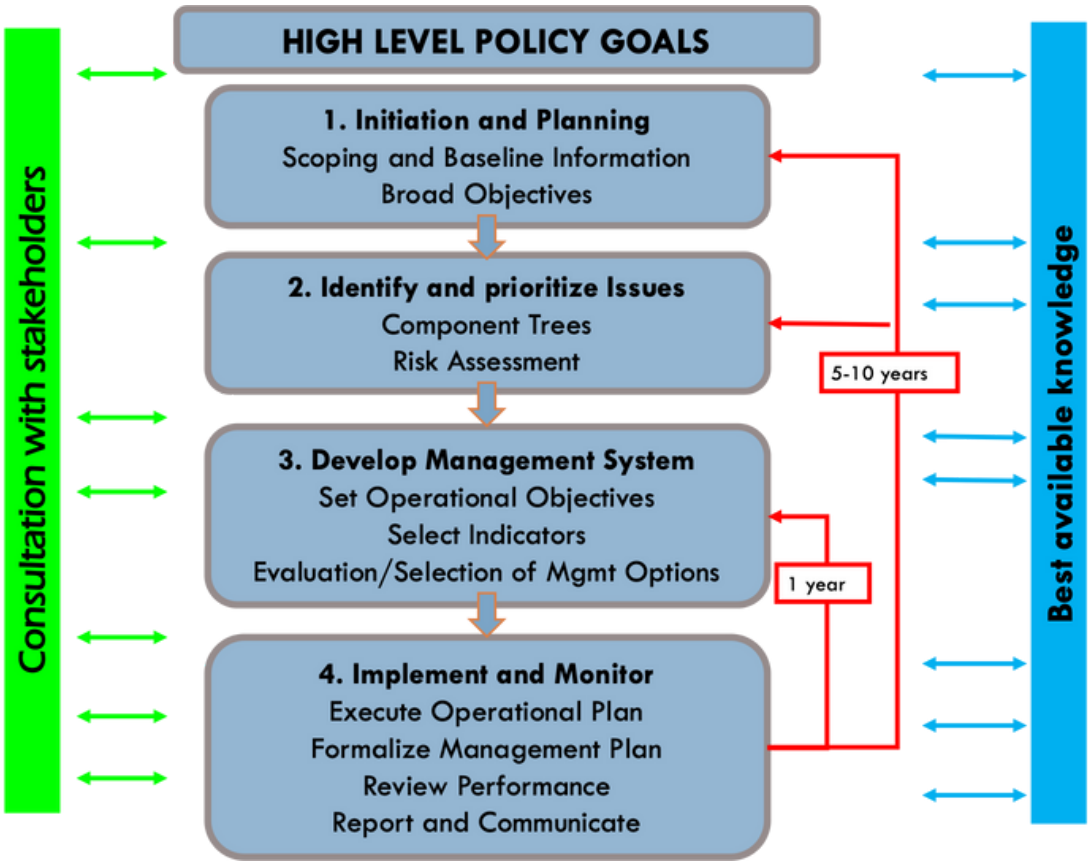


Figure 3: EAF Planning Process. Adapted from FAO 2017

INITIATION AND PLANNING

STEP 1: ANCHORING SYSTEM

The first step in developing a MFAD fisheries management plan (FMP) anchors the process. Initiation and planning entails consulting fishers and other stakeholders at the outset to generate an agreed and clear definition of the MFAD fishery (scale and type) and a shared understanding of the social, economic and ecological objectives to be achieved. Examples of broad management objectives typically associated with MFAD fisheries are given below.

According to the EAF Toolbox, 'planning should not proceed until there is sufficient support and the scope of the exercise is at a practical level. A perceived lack of information should not, however, be used as an excuse to delay initiation because EAF deals with such situations'.

Process and specific MFAD fisheries considerations are also presented for deliberation by the MFAD FMP project team.

PROCESS CONSIDERATIONS

- Avoid social-ecological mismatch -- policy cycles fit stakeholders, management unit, scope of the fishery.
- Determine the scale and scope of key institutions to involve -- public, private, civil society, etc.
- Use a national or regional inter-sectoral coordination mechanism for the initiation of planning, by visioning.
- Promote inter-sectoral solutions informed by highly collaborative and interdisciplinary research.
- Review relevant legislation and management plans locally and from other countries with similar circumstances.

BROAD MFAD MANAGEMENT OBJECTIVES

In a recent survey, 20 participating countries/territories with MFAD fisheries placed increasing fisher revenue, increasing fishing efficiency and reducing fuel consumption in the top five in a list of objectives for supporting MFADs.

Other frequently cited objectives included decreasing coastal and nearshore fishing pressure and increasing availability of fish products and food security. These were the most cited objectives across the region. However, some locations also listed very different objectives, such as promoting co-management and collaboration among fishers, increasing safety at sea, minimizing transboundary fishing, and supporting a recreational fishing market.

These differences across locations in some of the objectives highlight the importance of understanding local context during the scoping exercise to adequately address local needs.

SPECIFIC MFAD FISHERY CONSIDERATIONS

During the scoping exercise:

- Explicitly define what a MFAD is (e.g. does it include data buoys or oil rigs?),
- Assess the importance of the MFAD fishery in terms of (full- and part-time) fishers and vessels and its nature (e.g. subsistence, recreational, commercial),
- Estimate current MFAD numbers and main areas of deployment,
- Identify the main target and non-target species and assess extent to which such species are shared regionally,
- Describe the main fishing techniques,
- Describe the current MFAD designs,
- Describe the diversity of models of MFAD funding (individual, collective, public) and key stakeholders,
- Describe the post-harvest sector and markets,
- Describe existing (formal or informal) MFAD fishery management and governance systems.

INITIATION AND PLANNING

STEP 1: ANCHORING SYSTEM

KEY ACTIVITIES

- Initial process planning and stakeholder support including team formation;
- Defining the MFAD fishery, societal values and broad objectives; and
- Finalise the scoping and background document.

MAIN OUTPUTS

- Formation of a MFAD FMP project team and selection of the team leader.
- Scoping and background document that includes the definition of the MFAD fishery.
- A road map that includes the specific methods and EAF tools to be used during the planning process.

TOOLS AND INFORMATION SOURCES

There are many consultation tools that can be used to assist fisheries managers in getting appropriate stakeholder engagement and understand the likely issues that will be involved in maintaining this engagement.

To determine what tools and participation levels are most appropriate, the available human resources, skills in facilitation, project management, etc. plus any financial constraints should be identified.

Although higher levels of stakeholder and expert engagement can increase ownership of the outcome, they also increase the logistics, expense and duration.

Click here to view instructions on applying the list of tools that can support Step 1. An early brain storming or SWOT analysis with the MFAD planning team is highly recommended.

BRAINSTORMING

Brainstorming is a group creativity technique that is used to quickly produce ideas and solve problems. Employing this method at workshops can generate objectives, issues, threats and activities for closer examination afterwards.

After ideas are generated they are often categorized, discussed and prioritized for further analysis.

This process is therefore relevant for several of the EAF planning steps, both with respect to identifying what needs to be managed and it can also be used to help determine how things can be managed to develop an effective management system.

Click here to view instructions on how to facilitate a brainstorming exercise.

SWOT ANALYSIS

A SWOT analysis is a strategic planning method that can be used to evaluate the **S**trengths, **W**eaknesses, **O**pportunities and **T**hreats that may be faced in undertaking the MFAD fishery planning process or in implementing a proposed set of EAF based management arrangements.

A SWOT analysis can be done by first using a brain storming session to identify ideas and the analysis can then be used to order these multiple ideas and refine them into useful categories.

Download a SWOT Analysis template here.

Click here to view instructions on how to facilitate a SWOT Analysis.

IDENTIFY AND PRIORITISE ISSUES

STEP 2: MAIN LINE

Step two involves the identification of all relevant resource "assets", community outcomes and the issues affecting their management (generated either by the fishery or external factors) and determine priorities for direct action to best achieve broad management objectives.

Issues can be separated into the three EAF component groups namely: Ecosystem Wellbeing, Human Wellbeing and the Ability to Achieve.

SPECIFIC MFAD FISHERY ISSUES AND CONSIDERATIONS

Ecosystem well-being

Major concerns include potential negative impacts of MFADs on target species by facilitating capture of juveniles (e.g. yellowfin tuna, dolphinfish) and regionally overexploited fish species (e.g. blue marlin).

These concerns also include incidental entanglement or catch of non-target species (e.g. sharks) on MFADs, potential interference of MFADs on the migration routes of target species (ecological traps), impacts of lost MFADs on the ecosystem as marine litter, and increasing evidence that MFAD fishing does not reduce fishing pressure on nearshore / coastal ecosystems.

In addition, IUU fishing and insufficient exchange of info on MFADs across the region are issues of concern. It is thus highly recommended that priorities in the ecosystem domain align as much as possible with ICCAT's 19-02 Recommendation to support conservation and management of regional stocks and that MFAD programmes follow a precautionary approach.

SPECIFIC MFAD FISHERY ISSUES AND CONSIDERATIONS

Human well being

In the context of MFADs, this concerns potential positive impacts by increasing fisher revenue and fishing efficiency and food security, but potential negative impacts by increasing fisher conflict, illegal transboundary fishing, potential accidents at sea and fuel costs.

Ability to Achieve

In a recent survey, inexistence or inadequacy of local MFAD management plans and regulations and/or limited capacity to enforce regulations when these exist ranked very high in terms of priority issues in the region. These were also the most pervasive issues identified across the region. However, several countries/territories also listed as high priority other challenges such as lack of adequate fishery data collection systems and weak governance structures across stakeholder groups.

PROCESS CONSIDERATIONS

- Align issues with the agreed policies and priorities of regional fisheries bodies, where feasible, in order to facilitate policy coherence on shared resources.
- Provide an economic valuation of MFAD fisheries in order to determine acceptable trade-offs.
- Use transboundary diagnostic analysis and causal chain analysis to help determine root causes of issues.
- Link issues to major factors, like climate and disasters, to ensure a comprehensive and coherent approach.
- Provide analysis and advice to policy-makers that incorporates knowledge from diverse stakeholders.
- Ensure that the voices of marginalised groups that may include other fishers, women, youth and minorities are clearly heard
- Determine the criteria for prioritization ahead of the process of selection in order to be fair and transparent.

IDENTIFY AND PRIORITISE ISSUES

STEP 2: MAIN LINE

KEY ACTIVITIES

- Asset and issue identification.
- Issue prioritisation and risk assessment.

MAIN OUTPUTS

- A complete set of issues sorted into **ecological assets** (e.g. stocks, habitats and ecosystems) **social and economic outcomes** (e.g. food security and economic development), **governance systems** (e.g. access and tenure, democratic processes) and the **threats, drivers and impacts** (e.g. climate change related) relevant to the fishery.
- The relative level of risk to be taken and priority needed to deal with each of the issues.

TOOLS AND INFORMATION SOURCES

Workshops that engage fishers and other stakeholders are highly recommended at this stage. There are a number of workshop tools that can assist with effective issue identification and structuring. These include checklists, component lists and dot-based ranking.

These can be used separately but also in combination to help ensure (i) good participation, (ii) comprehensive sets of issues are generated and (iii) these are sorted into the relevant EAF categories to facilitate their alignment with one or more of the broad fishery management objectives.

Input from fishers and other stakeholders can also be facilitated through focus groups or key informant interviews.

Click here to view instructions on applying the list of tools that can support Step 2.

EAF COMPONENT LISTS

EAF component lists can be used to assist with the orderly identification of issues for a MFAD fishery by providing a standardised starting point and a simple framework. These lists can prompt discussion on what issues may be relevant for each of the EAF components in a consistent and hierarchical manner.

The component list approach uses a set of starting points/generic issues and lists to display the identified issues. This means it is technically much easier to use as it doesn't require access to computers or projectors.

Click here to view instructions on how to facilitate an EAF Component List exercise.

DOT BASED RANKING

Sticky dot voting is an interactive tool used widely by workshop facilitators to assist groups in the prioritisation of ideas and to decide which are the most important to take forward. This method is frequently used in conjunction with issue identification sessions such as brainstorming.

There are many variations on this theme but the core idea is that each stakeholder has a limited allocation of sticky dots that they can place on the issues they think are most important.

Whether an individual can use all their dots on the one issue or if they must spread them among different issues varies between facilitators and can have implications for the outcomes.

Click here to view instructions on how to facilitate a Dot based ranking exercise.

DEVELOP MANAGEMENT SYSTEMS

STEP 3: AGGREGATORS

The third step involves the development of a management system to cost-effectively and holistically deal with all high priority issues. This system should include clear operational objectives and the ability to monitor and assess performance using indicators and targets.

The critical part of the management system is to determine what combination of management measures will most likely achieve each of the operational objectives given the available resources and any other constraints.

In the case of a MFAD fishery this involves assessing which of the current management arrangements, if they exist, have deficiencies or inefficiencies and identifying potentially better alternatives.

Each option should be evaluated based on their cost effectiveness, impact on risks and objectives, likelihood of adoption etc. to determine which is the most appropriate. A list of management measures typically adopted in MFAD management plans is given below.

PROCESS CONSIDERATIONS

- Create a memorandum of understanding between resource users to minimise potential conflicts.
- Link the management of ecological assets to national or regional socio-economic outcomes to support practical implementation of EAF.

MFAD MANAGEMENT OPTIONS/MEASURES

- Delineate spatial areas for MFAD use;
- Set minimum distance separating MFADs;
- Set maximum number of MFADs;
- Maintain a registry for MFAD deployment, replacement, and disposal;
- Establish MFAD user fees and licensing systems;
- Establish conflict resolution mechanisms;
- Establish MFAD fishing closures;
- Set rules or regulations on:
  - Dealing with incidental by-catch,
  - Minimizing juvenile catches,
  - Provision of economic data by MFAD fishers,
  - Provision of catch and effort data and vessel location data by MFAD fishers,
  - MFAD materials (e.g. no entangling materials) and design (e.g. minimum buoyancy),
  - MFAD marking; deployment, replacement, and disposal; loss reporting; maintenance and repairs,
  - Fishing gear and techniques used on MFADs,
  - Fisher behaviour on MFADs.
- Set penalties for breaching of rules/regulations.

PROCESS CONSIDERATIONS CONTINUED

- Determine the level of political commitment and institutional capacity required to sustain management.
- Take into account the entire fisheries value chain including post-harvest, marketing and consumption.
- Manage fisheries interactions with other sectors via marine spatial planning, coastal management, etc.
- Ensure EAF explicitly contributes to meeting the sustainable development goals and other outcomes.
- Review the completeness and connectedness of the policy cycles related to the management system.
- Assess risk and uncertainty to determine what are suitable indicators of management performance.

DEVELOP MANAGEMENT SYSTEMS

STEP 3: AGGREGATORS

KEY ACTIVITIES

- Determine operational objectives;
- Select indicators and performance measures; and
- Evaluate and select management options.

MAIN OUTPUTS

- Clear and appropriate operational objectives covering each of the issues that requires direct management.
- Identification of one or more indicators and their associated performance measures that can be used to monitor the performance of each operational objective.
- Selection of the most cost effective set of management measures designed to generate acceptable levels of performance for all operational objectives.

TOOLS AND INFORMATION SOURCES

There is a suite of tools that can assist managers with developing and implementing management systems. These include but are not limited to:

- Reviews and summaries of indicators and performance measures,
- Community Based Monitoring,
- Collecting fishery data for performance management,
- Harvest Strategies and Control Rules, and
- Cost benefit Analysis.

Technical Tools

- Social and Economic Assessment Methods,
- Quantitative stock assessment methods,
- Multicriteria Analysis,
- Management Strategy Evaluation (MSE), and
- GIS based decision support.

Click here to view instructions on applying the list of tools that can support Step 3. Selecting the best option may involve some form of expert judgement.

COMMUNITY BASED MONITORING

Community-based ecological monitoring (CBM) or participatory monitoring and evaluation (PM&E) are tools that can be used in the process of integrating public/community participation in the collection, analysis and interpretation of data, changes or trends in the natural environment that occur in a particular ecosystem.

Observations, traditional and local knowledge are valuable inputs even in initial planning stages.

Involvement and ownership at the local or community level is very important in promoting successful conservation efforts that can be sustained in the long-term.

Click here to view instructions on how to facilitate community based monitoring.

COST BENEFIT ANALYSIS

A Cost-Benefit Analysis (CBA) can be employed to assess whether the case for undertaking a major initiative, such as completing a highly participatory MFAD planning process, is cost effective for government. It can also be used to determine which of a number of different management options may be the best choice.

The CBA process involves explicitly or implicitly weighing the total expected costs against the total expected benefits of one or more measures in order to choose the best or most appropriate option.

Click here to view instructions on how to perform a Cost benefit analysis.

IMPLEMENT AND MONITOR

BUOYS

The final step seeks to document the actions required to implement the management system, monitor their completion, and evaluate and report on their performance in delivering acceptable community outcomes.

According to the EAF toolbox, the review process includes three inter-related cycles.

- Frequent reviews of the MFAD fishery operations to determine if each of the activities outlined in the operational plan is being undertaken or not.
- Periodic reviews of the outcomes to determine whether the activities undertaken are generating an acceptable level of performance.
- Occasional review of the entire MFAD FMP. After a pre-determined period, review the entire management system to check if it is still relevant to current circumstances.

An important activity in the management process is to regularly report the outcomes of the management system to all MFAD fishery stakeholders. This allows them the opportunity to consider whether the performance against each of the objectives has been acceptable or not.

Reporting actions include:

- Increasing stakeholder engagement;
- Promoting regional collaboration and networks;
- Pursuing multi-sectoral integrated approaches;
- Building public awareness; and
- Promoting communication mechanisms and networks.

Technical reports on progress can be prepared as videos with documents as back ups. Podcasts can also be used as a reporting platform.

PROCESS CONSIDERATIONS

- Agree on the time, spatial and other scales for monitoring and evaluating each major element of the MFAD plan.
- Continue participatory monitoring and evaluation (PM&E) processes conducive to learning and adaptive management.
- Consider engaging members of National Intersectoral Coordinating Mechanisms (NICs) in PM&E processes.
- Develop communications plans to inform all relevant stakeholders of what actions will be occurring and when.
- Set the MFAD plan within legislation to the extent necessary, supported by relevant agencies and stakeholder groups.
- Where performance is not acceptable, or there has been a perturbation, implement alternative management measures.

KEY ACTIVITIES

- Develop an Operational plan and monitor its progress;
- Formalization of the MFAD fishery management plan;
- Review performance of the Management system; and
- Reporting, communication and auditing of performance.

MAIN OUTPUTS

- Creation of a detailed operational (implementation) plan;
- Formal adoption of the EAF based management 'plan';
- Regular reports on level of activities completed to execute the operational plan; and
- Periodic reports on the performance of the entire management system.

IMPLEMENT AND MONITOR

STEP 4: BUOYS

TOOLS AND INFORMATION SOURCES

There are many tools that can assist MFAD fishery managers in implementing and monitoring the performance of the management system. These include but are not limited to:

- Operational plan template,
- Communication tools,
- Project planning steps,
- Project planning and management software,
- Performance monitoring,
- Management Strategy Evaluation (MSE),
- Fisheries Enforcement Compliance,
- Stakeholder meetings, and
- Eco-labeling/Certification.

TOOLS AND INFORMATION SOURCES

The performance of the MFAD fishery should be regularly communicated to stakeholders directly at meetings. Local extension officers, direct contacts or media personnel can promote meetings and share outcomes.

Short reports (e.g. fishery bulletins) could be developed and circulated to all MFAD fishery stakeholders including broader use of web pages, social media, email and even text messages. Unexpected or serious events may require a special effort, e.g. using radio and/or TV.

Click here to view instructions on applying the list of tools that can support Step 4.

OPERATIONAL PLAN

Creating and executing an operational plan entails working through the full set of EAF management measures developed in Step 3 and determining (i) what are the specific activities that need to be done; (ii) who are the actual persons/institutions that will be responsible for completing these activities; and (iii) are there really enough resources (both people and financial) to complete each of the tasks. It is not until after this detailed analysis is done that you can be confident that your proposed MFAD management arrangements are feasible.

The operational plan can be produced in several forms including a simple text document, a spreadsheet or created using project management software.

Click here to view instructions on how to develop an operational plan.

COMMUNICATION TOOLS

The first step in developing a communication strategy and plan is determining what is the best way of communicating with stakeholders. This will be based upon what message is trying to be communicated, who is the target audience and what level of resources and time are available.

The plan should be developed in conjunction with the other consultation tools that are being used. A SWOT analysis could also help to identify where the major threats and opportunities are to help focus the communications strategy.

Download templates here.

Click here to view resources, communication templates and tools.

MANAGEMENT OUTPUTS

EXAMPLES OF REFERENCE MANAGEMENT OUTPUTS

If the MFAD management plan is to be anchored on EAF principles of long-term sustainable exploitation of regionally shared pelagic resources, then it is recommended that it seeks to pursue the following management outputs.

1 –Maximization of fishing yields on MFADs while maximizing safety at sea conditions and minimizing fuel consumption by effectively and efficiently regulating MFAD numbers (not too many, not too few) and their distribution;

2 –Equitable distribution of fishing opportunities on MFADs among authorized fishers, while remaining profitable and minimizing user conflicts, by effectively and efficiently regulating fishing access to MFADs;

3 – Maximization of fishing yields on MFADs while minimizing negative biological effects on exploited stocks (minimizing juvenile catches, catches of regionally overexploited species, and non-target species) by effectively and efficiently regulating fishing effort, techniques and target sizes and/or species on MFADs;

4 – Adoption of MFAD designs that prevent animal entanglements and that are adapted to the local oceanic context so that there are minimal losses at sea, but when such losses occur, they can be either recovered swiftly (e.g. electronic tagging) or contribute little to marine littering (e.g. biodegradable materials);

5 – An effective monitoring system for maintenance and repair of MFADs to inform (1) and (4);

6 – An effective monitoring system to collect fishing catch and effort and biological data to inform (3);

7 – An effective monitoring system to collect data on socio-economic variables (revenue; fuel consumption) to inform (1) and (2);

8 – A monitoring, control, surveillance system to detect breaching of regulations and act upon them;

9– An adequate funding system based (at least partially) on fisher revenue generated by MFADs to support all of the above; and

10 – An adequate legal, institutional, and governance framework to support all the above.

EFFECTIVE GOVERNANCE

PROMOTING INTERACTIVE GOVERNANCE OF MFAD FISHERIES

Promoting interactive governance of MFAD fisheries can be operationalised through the promotion of National Intersectoral Coordinating Mechanisms (NICs). NICs are multi-level, multi-stakeholder organisational structures that facilitate effective governance through policy cycles (Compton et al. 2020).

NICs can be seen as the operational input into governance processes. In the context of MFAD fisheries, NICs could be important mechanisms for implementing MFAD management plans and monitoring and evaluating progress.

Establishing and sustaining NICs is challenging. Given the track record of NICs becoming inactive it is important to monitor the performance and activity levels of newly established NICs. Using existing NICs to promote MFAD management may be the best strategy to ensure success.

Depending upon their mandates and circumstances NICs may handle all or some stages of the policy cycle associated with MFAD Fisheries Management Planning. The five basic stages are:

(1) Data and information,
(2) Analysis and advice,
(3) Decision-making,
(4) Implementation, and
(5) Review and evaluation.

A properly functioning NIC carries out its mandate within the assigned stages of the policy cycle while demonstrating good governance in practice.

Click here to learn more about NICs

NICs IDEAL FEATURES

Features include:

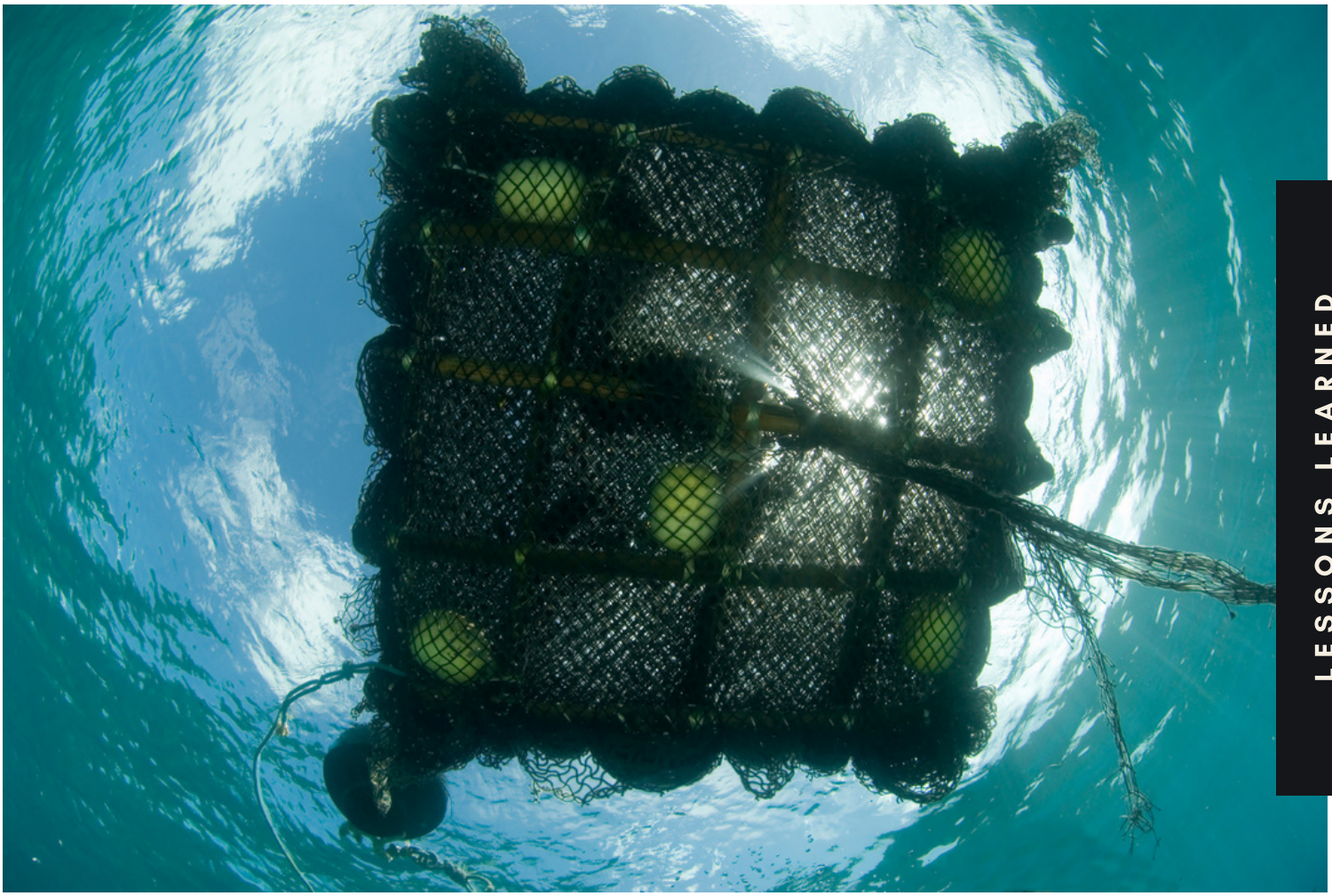
- A comprehensive inclusion of stakeholders;
- A supportive environment that creates opportunities for stakeholder participation and encourages individuals to become champions and leaders;
- Be politically endorsed both administratively and legally with clear mandates;
- Have well-established reviewing processes for evaluating effectiveness and enhancing growth through adaptation;
- Have national multi-level integration of sectors; facilitate bilateral linkages between national and regional government processes; and
- Have a scope and mandate that can address specific tasks (Compton et al. 2020).

EXAMPLES OF NICs

- Fisheries Advisory Councils/Committees.
- National Ocean Governance Committees
- Climate Change Committees.
- Multi-sectoral disaster management committees.

GOOD PRACTICES FOR SUCCESSES

- Promote and practice the principles of good governance as fundamental to NIC.
- Ensure the availability and use of up-to-date and non-conflicting legislation.
- Innovatively reduce the operational costs of meetings and communicating.
- Mobilize champions and leaders to give a NIC new energy and direction.
- Develop internal problem-solving and conflict management mechanisms.
- Include multiple stakeholder groups directly or through sub-structures. Read more here



LESSONS LEARNED

Wilson and colleagues (2020) outline valuable lessons learned that should be taken into consideration by fisheries management authorities and resource users. These lessons are outlined below:

- While MFAD fisheries are generally viewed as interventions for increasing fisherfolk incomes, and reducing pressure on inshore reef resources, these fisheries may not necessarily produce these benefits and also come with numerous important and underappreciated risks.

- New MFAD fisheries should be implemented with caution and dedicated attention should be given to improving management of existing MFAD fisheries.

Moreover, the promotion of digital technologies to improve MFAD fishery management information systems has proven very successful in Dominica and Montserrat.

In Dominica, data collectors are using tablets to record catch and effort data and other information that is automatically uploaded to a cloud-based centralised database.

The use of Vessel Monitoring Systems in Montserrat is supporting data collection efforts to assist with monitoring and surveillance at MFADs. It has also supported a data driven approach to marine spatial planning.

These success stories demonstrate the importance of employing technology to support evidence-based decision making.

LESSONS LEARNED

SAINT LUCIA MFAD FISHING RULES

Stakeholders in Saint Lucia have co-developed a simplified set of rules to reduce conflicts and promote safety at sea (see below). MFAD users are encouraged to self police and hold each other accountable.

- MFADs deployed by DoF and commercial fishers are for the use of commercial fishers only.
- No tampering with MFAD; covering of light, removal of buoys , removal of lights.
- Do not tie your boat to the MFAD.
- Any gear caught in MFAD should be cut off and left there. No pulling of MFAD line.
- Trolling near MFAD should be with or against the sea current (following drop-line).
- MFAD Fishers should keep boats, lines and baits at 'safe distance' from the MFAD.
- Baitfish should not be targeted as main catch.
- Fishing communities cannot claim ownership of MFADs.
- Navigation lights must be used on fishing vessels venturing out early morning.
- Captain/boat-owner must keep boat catch records and report MFAD catch data to DoF.
- Respect other FAD users at all times.
- Report any incident to Extension Officers or Fisheries or Police.
- Observe the 'Rules of the road' ... and give-way to avoid conflicts.
- Keep to one or same rotation.
- Sports fishers to fish at least 1 mile away from a MFAD.

LESSONS LEARNED

ENGAGING FISHERFOLK IN THE CARIBBEAN

- Invitations to consultations should be sent via WhatsApp (preferred platform) accompanied by posted flyers at landing sites. Formal letters can be sent by mail and emailed to National Fisherfolk Organisations (NFO).
- Online and face-to-face meetings should be scheduled on evenings (6:30 - 8:30 PM) to facilitate greater participation. Engagement during the off season is preferred.
- Information should be distilled for distribution on WhatsApp and Fisherfolk Organisations' Facebook pages. Photos and videos are effective in communicating important key messages.
- Piggyback on existing annual events such as Easter (April), Fisherfolk Week (June) and World Fisheries Day (21 November) to engage fisherfolk in familiar territory.
- Discussions on MFAD management can be included as an agenda item at NFO monthly meetings or the Board Meetings and General Assembly of the Caribbean Network of Fisherfolk Organisations (CNFO).
- The MFAD project team can consider employing interactive methods such as game simulation, foresight exercises and scenario building to engage fisherfolk and keep their interest.
- Consider providing a reasonable stipend for participation in whole day workshops to compensate fisherfolk for their time. An honorarium should be considered if traditional knowledge is being documented. The stipend or honorarium negotiated should be commensurate with local rates.

USEFUL RESOURCES

Anderson, J. and P. D. Gates. 1996. South Pacific Commission Fish Aggregating Device (FAD) Manual. Volume I: Planning FAD Programmes. South Pacific Commission Noumea, New Caledonia.

Bianchi, G., and K. Cochrane. 2011. Meeting the Challenge of Applying an Ecosystem Approach to Fisheries Management Some Experiences and Considerations Based on the FAO's Work. In Centre for Maritime Research (MARE) Publication: Vol. 6. Towards Marine Ecosystem Based Management in the Wider Caribbean (p. 426). Amsterdam: Amsterdam University Press.

Beverly, S., D. Griffiths and R. Lee. 2012. Anchored fish aggregating devices for artisanal fisheries in South and Southeast Asia: benefits and risks. FAO Regional Office for Asia and the Pacific, Bangkok, Thailand, RAP Publication 2012/20,65p.

Compton, S., P. McConney, P. A. Murray, N. Nembhard, T. Phillips. 2019.' Influencing regional Caribbean small-scale fisheries policy through protocol'. In FAO. 2019. Westlund, L. & Zelasney, J. eds. Securing sustainable small-scale fisheries: sharing good practices from around the world. FAO Fisheries and Aquaculture Technical Paper No. 644. Rome. 184 pp

Compton, S., P. McConney, I. Monnereau, B. Simmons and R. Mahon. 2020. Good practice guidelines for successful National Intersectoral Coordination Mechanisms (NICs): Second Edition. Report for the UNDP/GEF CLME+ Project (2015-2020). Centre for Resource Management and Environmental Studies, The University of the West Indies, Cave Hill Campus, Barbados. CERMES Technical Report. No. 88 2nd 21pp.

Cowan Jr., J. H. Rice, J. C. Walters, C. J. Hilborn, R. Essington, T. E., Jr, J. W. D., & K. M. Boswell. 2012. Challenges for Implementing an Ecosystem Approach to Fisheries Management. Marine and Coastal Fisheries, 4(1), 496-510.

Cox, S-A. and K. Alleyne. 2020. Update on implementing EBM/EAF in the CLME+ region. Report to the UNDP/GEF CLME+ Project (2015-2020). Centre for Resource Management and Environmental Studies, University of the West Indies, Cave Hill Campus. Bridgetown: Barbados. 33 pp

Cox, S-A. and N. Nembhard. 2021. Promoting the means for diffusion of EAF innovation and further development. Developing Organisational Capacity for Ecosystem Stewardship and Livelihoods in Caribbean Small-scale Fisheries (StewardFish) project. Project report to FAO. 42 pp.

Cox, S. and P. McConney. 2021. Perfecting the art of fisheries learning exchanges in the Eastern Caribbean. FAO, Bridgetown. https://doi.org/10.4060/cb3667en

CRFM. 2011. Caribbean Community Common Fisheries Policy (CCCFP). Belize City, CRFM Secretariat.

CRFM. 2013. Report of the CRFM - JICA CARIFICO / WECAFC - IFREMER MAGDELESA Workshop on FAD Fishery Management, 09 - 11 December 2013, St. Vincent and the Grenadines. CRFM Technical & Advisory Document, No. 2013 / 9. 42pp.

CRFM. 2013. Report on the CRFM/JICA fish aggregating device (FAD) management workshop for OECS countries. CRFM Technical and Advisory Document, No. 2013/5. 61pp.

USEFUL RESOURCES

CRFM. 2015. 2015 Draft Sub-regional Management Plan for FAD Fisheries in the Eastern Caribbean (Stakeholder Working Document). Caribbean Regional Fisheries Mechanism (CRFM) Technical & Advisory Document, 2015/05. 94pp.

CRFM. 2017. Report of CRFM CARIFICO Seminar: Strengthening fisheries co-management in the region. CRFM Technical and Advisory Document, No. 2017/4. 68pp

CRFM. 2018. Protocol on Climate Change Adaptation and Disaster Risk Management in Fisheries and Aquaculture under the Caribbean Community Common Fisheries Policy. Belize City, CRFM Secretariat.

CRFM. 2018. Protocol on Securing Small-scale Fisheries under the Caribbean Community Common Fisheries Policy. Belize City, CRFM Secretariat.

Fanning, L., and H.A. Oxenford. 2011. Ecosystem Issues Pertaining to the Flyingfish Fisheries of the Eastern Caribbean. In Centre for Maritime Research (MARE) Publication: Vol. 6. Towards Marine Ecosystem-based Management in the Wider Caribbean Region (pp. 227-240). Amsterdam: Amsterdam University Press.

Fanning, L., R. Mahon and P. McConney. 2009. Focusing on living marine resource governance: the Caribbean Large Marine Ecosystem and Adjacent Areas Project. Coastal Management 37: 219 - 234

Fanning, L., R. Mahon and P. McConney. [Eds.]. 2011. Towards Marine Ecosystem-based Management in the Wider Caribbean. Amsterdam University Press, Amsterdam, 426 p.

FAO. 1995. Code of Conduct for Responsible Fisheries. Retrieved from Food and Agriculture Organization of the United Nations website: http://www.fao.org/3/v9878e/v9878e00.htm

FAO. 2002. Western Central Atlantic Fisheries Commission, Report, First Meeting of the WECAFC Ad Hoc Working Group on the Development of Sustainable Moored FADFishing in the Lesser Antilles, Le Robert, Martinique, 8-11 October 2001, vol. 683, FAO Fisheries, Rome, 2002, https://doi.org/10.1002/bit.1195.

FAO. 2005. Putting into practice the ecosystem approach to fisheries. Rome, FAO. 76pp.

FAO. 2011. FAO - EAFnet—What is EAF. Retrieved October 23, 2019, from Food and Agricultural Organization of the United Nations website: http://www.fao.org/fishery/eaf-net/about/what-is-eaf/en

FAO. 2012. Voluntary Guidelines on the Responsible Governance of Tenure of Land, Fisheries and Forests in the Context of National Food Security. Retrieved from Food and Agriculture Organization of the United Nations website: http://www.fao.org/3/a-i2801e.pdf

FAO. 2015. Voluntary guidelines for securing sustainable small-scale fisheries in the context of food security and poverty eradication. Retrieved from Food and Agriculture Organization of the United Nations website: http://www.fao.org/3/a-i4356en.pdf

USEFUL RESOURCES

Feigenbaum, D., A. Friedlander, and M. Bushing. 1989. Determination of the feasibility of fish attracting devices for enhancing fisheries in Puerto Rico. Bulletin of Marine Science, 44(2): 950-959.

Friedlander, A., J. Beets and W. Tobias. 1994. Effects of fish aggregating device design and location on fishing success in the U.S. Virgin Islands. Bulletin of Marine Science, 55(2-3); 592-601.

Garcia, S. M., and K. L. Cochrane. 2005. Ecosystem approach to fisheries: a review of implementation guidelines, ICES Journal of Marine Science, Volume 62, Issue 3: Pages 311–318, https://doi.org/10.1016/j.icesjms.2004.12.003

Garcia, S.M., A. Zerbi, C. Aliaume, C. T. Do Chi, G. Lasserre. 2003. The ecosystem approach to fisheries. Issues, terminology, principles, institutional foundations, implementation and outlook. FAO Fisheries Technical Paper. No. 443. Rome, FAO. 71 p.

Gervain, P., L. Reynal, J. Defoe, M. Ishida and E. Mohammed. 2015. Manual of Best Practices in Fisheries that use Moored Fish Aggregating Devices: FAD Design, Construction and Deployment. Caribbean Regional Fisheries Mechanism Special Publication No. 6. Vol. I. 55pp.

Gomes, C., R. Mahon, W. Hunte, and S. Singh-Renton. 1998. The role of drifting objects in pelagic fisheries in the southeastern Caribbean. Fisheries Research, 34(1): 47-58.

Guyader, O., Bellanger M., Reynal L.,Demaneche S., and Berthou P. 2013. Fishing strategies, economic performance and management of moored fishing aggregating devices in Guadeloupe. Aquatic Living Resources, 26: 97–105.

Hassell, N. and S-A. Cox. 2020. Examination of Ecosystem Approach to Fisheries (EAF) related International Guidelines. CERMES report to FAO on Developing Organisational Capacity for Ecosystem Stewardship and Livelihoods in Caribbean Small-scale Fisheries (StewardFish) Project. 23 pp.

Jaquemet, S., M. Potier, and F. Ménard. 2011. Do drifting and anchored Fish Aggregating Devices (FADs) similarly influence tuna feeding habits? A case study from the western Indian Ocean. Fisheries Research. 107. 283-290. 10.1016/j.fishres.2010.11.011.

JICA (Japan International Cooperation Agency). 2012. Study on the Formulation of a Master Plan on the Sustainable Use of Fisheries Resource for Coastal Community Development in the Caribbean. Caribbean Regional Fisheries Mechanism (CRFM). Tokyo: JICA.

Kingsford, M. 1998. Fish attraction devices (FADs) and experimental designs. 1998. *Scientia Marina*, 63(3-4): 181- 190.

Klima, E.F. and D. A. Wickham. 1971. Attraction of coastal pelagic fishes with artificial structures. *Transactions of the American Fisheries Society*, 100: 86-99.

Lay, M. 2011. Networking for partnerships. *International Collective in Support of Fishworkers, SAMUDRA Report*, No 59: 13-16.

USEFUL RESOURCES

McConney, P., R. Pomeroy and R. Mahon. 2003. Guidelines for coastal resource co-management in the Caribbean: Communicating the concepts and conditions that favour success. Caribbean Coastal Co-management Guidelines Project. Caribbean Conservation Association, Barbados. 56pp.

McConney, P. and T. Phillips. 2011. Collaborative planning to create a network of fisherfolk organizations in the Caribbean. Collaborative resilience: moving through crisis to opportunity. pp. 207-230.

McIntosh, S., M. Lay, P. McConney and T. Phillips. 2010. The Development of a Caribbean regional network of fisherfolk organisations and its role in influencing fisheries policy. Proceedings of the 62nd Gulf and Caribbean Fisheries Institute. 298-305.

Montes, N., C. Sidman, K. Lorenzen, M. Tamara and M. Ishida. 2019. Influence of fish aggregating devices on the livelihood assets of artisanal fishers in the Caribbean. Ocean and Coastal Management 179:104823

Montes, N., C. Sidman, K. Lorenzen, M. Honda, M. Tamura, and M. Ishida. 2017. Co-Management of FAD Fisheries: A Socio-Economic Analysis of Off- shore Fishers Residing on CARIFICO Member Islands. Tokyo: Japan International Cooperation Agency; Gainesville, FL: Florida Sea Grant, University of Florida.

Moreno, G., Dagorn, L., Capello, M., Lopez, J., Filmalter, J., Forget, F., ... Holland, K. 2016. Fish aggregating devices (FADs) as scientific platforms. Fisheries Research, 178, 122-129. doi:10.1016/j.fishres.2015.09.021

Pomeroy, R.S., B.M. Katon, and I. Harkes. 2001. Conditions Affecting the Success of Fisheries Co-Management: Lessons from Asia. Marine Policy 25:197-208.

Pomeroy, R.S., P. McConney, and R. Mahon. 2004. "Comparative Analysis of Coastal Resource Co-Management in the Caribbean." Ocean & Coastal Management 47(9-10):429-447.
Sen, S., and J.R. Nielsen. 1996. "Fisheries Co-Man- agement: A Comparative Analysis." Marine Policy 20(5):405-418.

Sadusky, H., P. Chaibongsai, D.J. Die, J.Agar. and M. Shivlani. 2018. Management of moored fish aggregation devices (FADs) in the Caribbean. Collect. Vol. Sci. Pap. ICCAT, 74(5): 2230-2242

Sidman, C., K. Lorenzen, A. Magloire, R. Sebastien. 2015. Towards a sustainable Caribbean FAD Fishery: Introducing lures to incentivize co-management efforts. Florida Sea Grant Technical Publication (TP-214). University of Florida.

Sidman, C., K. Lorenzen, R. Sebastien, A. Magloire, J. Cruickshank-Howard, J. Hazell, J. Masters. 2014. Toward a Sustainable Caribbean FAD Fishery: an Analysis of Use, Profitability and Shared Governance. Florida Sea Grant Technical Publication (TP-206). University of Florida.

USEFUL RESOURCES

Sidman, C., K. Lorenzen, A. Magloire, R. Sebastien, J. Hazell, J. Masters, and H. Johnson. 2013. Piloting an engagement strategy to support Co-management of the Caribbean FAD fishery. Proceedings of the 66th Gulf and, vol. 66. Caribbean Fisheries Institute, pp. 119-124.

Sidman, C., N. Montes, K. Lorenzen, M. Tamura, and M. Ishida. 2018. Towards Co-Management of Caribbean FAD Fisheries: The CARIFICO Experience. Proceedings of the 70th Gulf and Carib- bean Fisheries Institute (GCFI).

Tamura, M., M. Ishida, M., Sidman, C., Montes, N., Lorenzen, K. 2018. Facilitating Co- managed Fisheries in the Caribbean Region: Good Practices and Guidance from the CARIFICO Experience. Tokyo: Japan International Cooperation Agency. Florida Sea Grant Technical Publication TP-234, University of Florida, Gainesville, FL.

Townsend, H., C. J. Harvey, Y. deReynier, D. Davis, S. G. Zador, S. Gaichas, M. Weijerman, E.L. Hazen and I.C. Kaplan. 2019. Progress on Implementing Ecosystem-Based Fisheries Management in the United States Through the Use of Ecosystem Models and Analysis. Frontiers in Marine Science

UNEP. 2011. Taking Steps toward Marine and Coastal Ecosystem-Based Management. - An Introductory Guide. 68pp.

Ward, T., D. Tarte, E. Hegerl and K. Short. 2002. Ecosystem based management of marine capture fisheries. World Wide Fund for Nature, Australia. 80 pp.

Widyatmoko, A.C., B.D. Hardesty and C. Wilcox. 2021. Detecting anchored fish aggregating devices (AFADs) and estimating use patterns from vessel tracking data in small-scale fisheries. Sci Rep 11, 17909. https://doi.org/10.1038/s41598-021-97227-1

Wilson, M. W., J. M. Lawson, M. I. Rivera-Hechem, J. C. Villaseñor-Derbez, S. D. Gaines. 2020. Status and trends of moored fish aggregating device (MFAD) fisheries in the Caribbean and Bermuda, Marine Policy Volume 121, 104148